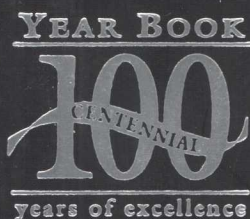

YEAR BOOK®

YEAR BOOK OF CRITICAL CARE MEDICINE® 2001



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2001

The Year Book of CRITICAL CARE MEDICINE®

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Journals Represented

Mosby and its editors survey approximately 500 journals for its abstract and commentary publications. From these journals, the Editors select the articles to be abstracted. Journals represented in this YEAR BOOK are listed below.

Acta Anaesthesiologica Scandinavica
American Journal of Cardiology
American Journal of Kidney Diseases
American Journal of Medicine
American Journal of Obstetrics and Gynecology
American Journal of Respiratory and Critical Care Medicine
American Journal of Roentgenology
American Journal of Surgery
American Surgeon
Anaesthesia
Anaesthesia and Intensive Care
Anesthesiology
Annals of Internal Medicine
Annals of Surgery
Annals of Thoracic Surgery
Archives of Disease in Childhood
Archives of Disease in Childhood, Fetal and Neonatal Edition
Archives of Neurology
Archives of Surgery
British Journal of Anaesthesia
Burns
Chest
Circulation
Clinical Nephrology
Clinical Pediatrics
Critical Care Medicine
European Heart Journal
European Respiratory Journal
Infection Control and Hospital Epidemiology
Intensive Care Medicine
Journal of Burn Care and Rehabilitation
Journal of Cardiothoracic and Vascular Anesthesia
Journal of Clinical Neuro-Ophthalmology
Journal of Clinical Pathology
Journal of Electrocardiology
Journal of Emergency Medicine
Journal of Neurosurgery
Journal of Pediatrics
Journal of Thoracic and Cardiovascular Surgery
Journal of Trauma: Injury, Infection, and Critical Care
Journal of the American College of Cardiology
Journal of the American College of Surgeons
Journal of the American Geriatrics Society
Journal of the American Medical Association
Journal of the American Society of Nephrology
Kidney International
Lancet

Mayo Clinic Proceedings
Neurosurgery
New England Journal of Medicine
Otolaryngology - Head and Neck Surgery
Pediatric Research
Pediatrics
Respiratory Medicine
Scandinavian Cardiovascular Journal
Stroke
Surgical Neurology
Thorax
Transfusion

STANDARD ABBREVIATIONS

The following terms are abbreviated in this edition: acquired immunodeficiency syndrome (AIDS), cardiopulmonary resuscitation (CPR), central nervous system (CNS), cerebrospinal fluid (CSF), computed tomography (CT), deoxyribonucleic acid (DNA), electrocardiography (ECG), health maintenance organization (HMO), human immunodeficiency virus (HIV), intensive care unit (ICU), intramuscular (IM), intravenous (IV), magnetic resonance (MR) imaging (MRI), and ribonucleic acid (RNA).

NOTE

The YEAR BOOK OF CRITICAL CARE MEDICINE is a literature survey service providing abstracts of articles published in the professional literature. Every effort is made to ensure the accuracy of the information presented in these pages. Neither the editors nor the publisher of the YEAR BOOK OF CRITICAL CARE MEDICINE can be responsible for errors in the original materials. The editors' comments are their own opinions. Mention of specific products within this publication does not constitute endorsement.

To facilitate the use of the YEAR BOOK OF CRITICAL CARE MEDICINE as a reference tool, all illustrations and tables included in this publication are now identified as they appear in the original article. This change is meant to help the reader recognize that any illustration or table appearing in the YEAR BOOK OF CRITICAL CARE MEDICINE may be only one of many in the original article. For this reason, figure and table numbers will often appear to be out of sequence within the YEAR BOOK OF CRITICAL CARE MEDICINE.

Publisher's Preface

The publication of the 2001 YEAR BOOK series marks the 100th anniversary of the original Practical Medicine Series of Year Books. To commemorate this milestone, each 2001 Year Book includes an anniversary seal on the cover. The content and format of the Year Books remain unchanged from the beginning of the last century—each volume consists of abstracts of the best scholarly articles of the year, accompanied by expert critical commentaries.

The first Year Book appeared in 1900 when Gustavus P. Head, MD, produced the first *Year Book of the Nose, Throat and Ear*, a volume consisting of highlights from the previous year's best literature, enhanced by expert observations. Dr Head assembled a small group of distinguished physicians to serve as editors, and the first series of Year Books was published in 1901. The first volumes of the Year Book series—*General Medicine*, *General Surgery*, *The Eye*, *Gynecology*, *Obstetrics*, *Materia Medica and Therapeutics*, *Pediatrics*, *Physiology*, and *Skin and Venereal Diseases*—appeared at monthly intervals, with 10 volumes published in 1 year. The entire series was met with critical enthusiasm.

In 1904, Dr Head's brother, Cloyd, assumed responsibility for the management of the Year Books. In 1905, the volumes began to appear at regular intervals during the calendar year instead of on a monthly basis. By World War I, the Year Books had been established as an authority on medical and surgical progress.

The postwar period brought about a significant change in the practice of medicine: specialization. To accommodate the rise of specialization in medicine, the Year Books were now sold as individual volumes rather than only as a complete set. This change brought about a tremendous response and sales of the books increased. In 1922, the Year Books became even more specialized, as the books now had different editors for the different medical specialties covered in each volume. Later, in 1933, the title of the series changed from the Practical Medicine Series of Year Books to the Practical Medicine Year Books to reflect these new designs.

The Year Books have grown significantly from the first 10-volume series in 1901 to a diversified series of 32 volumes in 2001. That the Year Book series is the only series of their kind to have survived is a testament to the vision and commitment of its founders. Some minor changes in format and design have occurred throughout the years, but the mission of the Year Book series—to provide a record of exceptional medical achievements distinguished by the reflections of many of the great names in medicine today—has remained constant.

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1 Cardiovascular

Hemodynamic Monitoring

Patient Characteristics and ICU Organizational Factors That Influence Frequency of Pulmonary Artery Catheterization

Rapoport J, Teres D, Steingrub J, et al (Mount Holyoke College, South Hadley, Mass; Baystate Med Ctr, Springfield, Mass; Tufts Univ, Boston; et al) *JAMA* 283:2559-2567, 2000 1-1

Objective.—Interactions between clinical and demographic characteristics, organizational aspects of practice setting, type of reimbursement, and physician decisions to monitor nonsurgical ICU patients with a pulmonary artery catheter (PAC) were retrospectively examined.

Methods.—Data for 10,217 nonsurgical patients (45% female) at 34 ICUs at 27 hospitals were collected during 1998. The Simplified Acute Physiology Score, resuscitation status at admission, and type, size, and model of ICU were recorded for the 831 (8.1%) patients with a PAC. The probability of catheter use was estimated based on patient characteristics, ICU organization, and diagnostic category.

Results.—PAC use was significantly related to white race (odds ratio [OR], 1.38), private insurer (OR, 1.33), limited intervention resuscitation status, and older age. Full-time ICU physician staffing significantly decreased the use of PAC (OR, 0.36). Patients admitted to a surgical ICU were more than twice as likely to receive a PAC than patients admitted to other types of ICUs.

Conclusion.—Types of ICU, insurance, and physician, and race significantly influenced PAC use. Examination of organizational influences on PAC use can help identify issues for review.

► With its introduction in the early 1970s, the PAC was quickly accepted and put to wide use, despite the absence of controlled randomized studies demonstrating its benefit. Despite criticisms of its utility in the last 5 years, the PAC continues to be considered an important technologic tool by the intensivist.

Although previous studies have alluded to the variability of PAC use from institution to institution, Rapoport and colleagues nicely demonstrate the interplay between ICU organizational factors and patient characteristics in determining the frequency of PAC use. With the exception of more severe

illnesses (eg, shock), for which the indication for a PAC is less controversial, their results suggest a considerable amount of physician bias as to utilization of this ICU technology. Thus, where there are no clear-cut protocols, physician training and experience become more important in determining the use of a PAC. The increased use of PACs in critical care medicine training institutions is not surprising. What is surprising is their decreased use in ICUs staffed by full-time intensivists. As suggested by the authors, more moderate use of PACs perhaps reflects a more prompt reaction of intensivists to recent literature.

Although uncontrolled for other potential undefined variables, these findings, as they relate to the influence of socioeconomic factors on the use of PACs, add to the growing body of data that reimbursement, sex, and race are key determinants to the utilization of health care resources.

Incidentally, this study is a perfect example of the use of data generated from Project Impact. Expect to see more of this in the future.

R. L. Añel, MD

R. P. Dellinger, MD

The Incidence of Major Morbidity in Critically Ill Patients Managed With Pulmonary Artery Catheters: A Meta-analysis

Ivanov R, Allen J, Calvin JE (Rush-Presbyterian-St Luke's Med Ctr, Chicago)
Crit Care Med 28:615-619, 2000

1-2

Objective.—Despite studies addressing a variety of efficacy end points, the effects of pulmonary artery (PA) catheterization on patient outcomes remain uncertain. One nonrandomized retrospective study suggested increased mortality in patients with PA catheters, leading to calls for a moratorium on their use. However, a recent meta-analysis suggested a nonsignificant reduction in mortality in patients with PA catheters. The effects of PA catheterization on morbidity outcomes was determined by meta-analysis.

Methods.—A review of the literature identified 16 randomized controlled trials of the effectiveness of PA catheter-guided treatment. Twelve of these trials, which included 1610 patients, had data on morbidity. Organ failures, defined according to the criteria of the American College of Chest Physicians/Society of Critical Care Medicine Consensus conference, were considered to represent major morbidity.

Results.—About 63% of patients managed with PA catheters experienced morbidity events, compared with 74% of control patients. The relative risk ratio for lower morbidity in the PA catheter group was 0.78 95% CI, 0.64 to 0.94 (Fig 2). Thus, PA catheter-guided treatment reduced the risk of morbidity by about 22%. None of the covariates examined was a significant predictor of morbidity.

Conclusions.—Meta-analysis of the available data from randomized trials suggests that PA catheter-guided management reduces major morbidity events in critically ill patients. Although the main analysis excluded

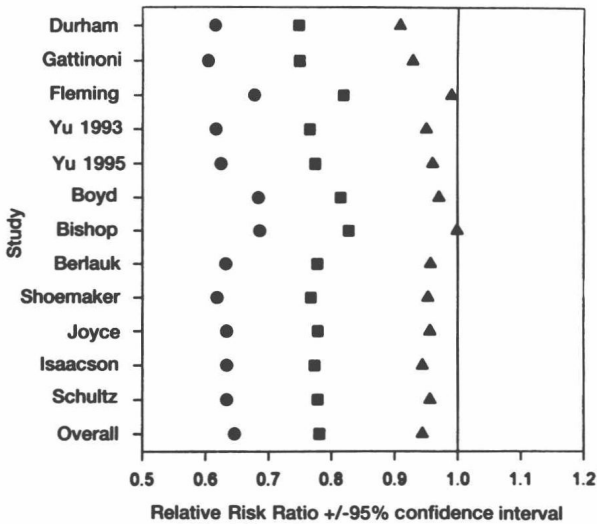


FIGURE 2.—Sensitivity analysis for major morbidity. The overall relative risk ratio (*squares*) with lower (*circles*) and upper (*triangles*) 95% confidence limits is displayed at the bottom of the figure. The relative risk ratio and confidence limits are recomputed in turn with each study being omitted once. (Courtesy of Ivanov R, Allen J, Calvin JE: The incidence of major morbidity in critically ill patients managed with pulmonary artery catheters: A meta-analysis. *Crit Care Med* 28:615-619, 2000.)

minor morbidity, the data suggest that PA-catheter therapy also reduces the overall complication rate. The findings support the continued use of PA catheter-guided strategies.

Is the Placement of a Pulmonary Artery Catheter Still Justified Solely for the Measurement of Cardiac Output?

Sakka SG, Reinhart K, Wegscheider K, et al (Friedrich-Schiller-Univ of Jena, Germany; Univ of Hamburg, Germany)

J Cardiothorac Vasc Anesth 14:119-124, 2000

1-3

Background.—In the assessment of cardiac function and for guidance of therapy in the ICU, cardiac output (CO) is an important hemodynamic variable. A number of techniques can be used in the measurement of CO, each with advantages and disadvantages. The pulmonary artery thermodilution technique (CO[PA]) has become the gold standard since the introduction of the pulmonary artery catheter by Swan and Ganz in 1970. The oldest technique for measurement of CO based on the Fick principle (CO[FICK]) may have clinical relevance, but it has the disadvantages of slow response time and the equipment required. Other techniques that have been used for measuring CO include transpulmonary artery thermodilution (CO[AORTA]) and continuous pulmonary artery (CCO) measurements. These 4 techniques were compared in a prospective clinical study.

Methods.—In a surgical ICU of a university hospital, 12 adult patients with sepsis or septic shock were evaluated. The patients were deeply sedated and mechanically ventilated in a pressure-controlled mode. Each patient was equipped with a 7.5F 5-lumen pulmonary artery catheter for continuous measurement of CO as well as a 4F aortic catheter with an integrated thermistor. The 4 clinical techniques for measurement of CO (CO[PA], CO[AORTA], CO[FICK], and CCO) were evaluated, for a total of 51 CO measurements in 12 patients.

Results.—Data were subjected to linear regression analysis, which revealed the highest correlation between CO(AORTA) and CO(PA), whereas agreement between these 2 techniques and CCO was lower. All 3 techniques correlated comparably with CO(FICK).

Conclusion.—There were high and similar correlations among the 4 CO techniques, with the highest agreement between CO(PA) and CO (AORTA). Because measurement of CO can be obtained with similar accuracy from the less-invasive transpulmonary aortic thermodilution technique, it would appear that there is no longer a justification for the placement of a pulmonary artery catheter solely for measurement of CO, unless continuous measurement of CO is necessary.

Failure of a Brief Educational Program to Improve Interpretation of Pulmonary Artery Occlusion Pressure Tracings

Zarich S, Pust-Marcone J, Amoateng-Adjepong Y, et al (Bridgeport Hosp, Conn)

Intensive Care Med 26:698-703, 2000

1-4

Background.—It has been reported that the use of pulmonary artery catheters (PACs) in critically ill patients is associated with a higher mortality rate and longer stays in the hospital than when patients are not treated with a PAC. However, it is unclear whether this observed increase in mortality was associated with the insertion and subsequent presence of the catheter or the misinterpretation of data obtained from the PAC. It is likely that 1 factor contributing to these findings is the inability of clinicians to reliably measure pulmonary artery pressure tracings, which leads to inappropriate and possibly deleterious treatment. In previous studies, it was demonstrated that critical care practitioners performed poorly when they were asked to interpret a pulmonary artery occlusion pressure from a clear tracing. Before this report, no study had examined whether improved performance in use of the PAC can be gained from an educational program.

Methods.—A brief educational program designed to reduce the variability of interpretation of pulmonary artery occlusion pressure (PAOP) tracings was conducted among 23 ICU nurses and 18 physicians. PAOP tracings were interpreted by the participants before and 1 week after they received a single brief educational session and/or written materials that were designed to reduce the interobserver variability of PAOP interpreta-

tion. The mean population and chief of critical care's readings were used as reference values. The differences between 2 reference values—before and after the educational intervention—were compared.

Results.—No significant differences were found in the variability in before and after PAOP interpretations in either the nurse or physician groups.

Conclusion.—The educational intervention was ineffective in reducing the interobserver variability in interpretation of PAOP tracings. It is recommended that more comprehensive educational tools or sustained programs may be necessary for the improvement of PAOP interpretation by critical care practitioners.

► (Abstracts 1–2 through 1–4). The use of the PAC for the critically ill patient remains controversial. An article published by Connors¹ in 1996 created considerable controversy as this study suggested that patients who had PACs inserted had a greater mortality rate than those who had not. This study has been criticized for multiple experimental design flaws. Nevertheless, it has appropriately pointed out to academic physicians that there is no level 1 evidence that supports benefit for the PAC. It also has allowed us to refocus on alternative, less invasive measurements to provide the same or similar information. Perhaps, most importantly, it has pointed out that to give the PAC a legitimate chance to improve outcome, it is necessary to obtain accurate values and apply them appropriately to the clinical situation. PACs cannot be blamed if the measurements are performed inaccurately or the physician responds inappropriately to the information.

Invanov and colleagues, (Abstract 1–2), who performed a meta-analysis that included the Connors' article, came up with a contrary viewpoint that morbidity is decreased with the use of the PAC. Sakka and colleagues (Abstract 1–3) point out that there are good, noninvasive alternatives for measuring cardiac output. Although ascertaining the hemodynamic profile as to cardiac index and systemic vascular resistance is useful in the differential diagnosis of hypotension, the ability to measure filling pressures of the left ventricle (PAOP) with the PAC is useful in many clinical circumstances. Left ventricular filling pressures are not obtained by this noninvasive method.

Zarich and colleagues (Abstract 1–4) point out the knowledge deficit existing in most ICUs relative to interpretation of PAOP readings and that this deficit cannot be overcome by simple brief training programs. A joint educational effort by most of the United States critical care societies has led to the creation of a comprehensive training program in the use of the PAC called the pulmonary artery catheter education program.² This program is much more likely to produce significant and lasting results than the brief program described by Zarich and colleagues.

R. P. Dellinger, MD

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2. Bernard GR, Spoko G, Cerr F, et al: Pulmonary artery catheterization and clinical outcomes: National Heart, Lung, and Blood Institute and Food and Drug Administration Workshop Report. *JAMA* 283:2568-2572, 2000.

Predictors of Mortality in Acute Respiratory Distress Syndrome: Focus on the Role of Right Heart Catheterization

Vieillard-Baron A, Girou E, Valente E, et al (Hôpital Ambroise Paré, Boulogne, France; Hôpital Henri Mondor, AP-HP, Créteil, France)

Am J Respir Crit Care Med 161:1597-1601, 2000

1-5

Background.—Right heart catheterization (RHC) is often performed diagnostically or therapeutically in patients with acute respiratory distress syndrome (ARDS), but RHC may increase the risk of death among critically ill patients. This study at 2 medical ICUs sought to identify risk factors for mortality and to evaluate the contribution of RHC, while adjusting for intensity of hemodynamic support. The independent prognostic abilities of several variables (septic shock, cause of ARDS, Simplified Acute Physiology Score [SAPS] II, and use of epinephrine or norepinephrine) were assessed.

Methods.—Hemodynamic monitoring was accomplished in 1 of 2 ways in the 119 patients studied: RHC on demand or no RHC. Mortality was determined and various parameters were evaluated regarding their roles as independent predictors of death.

Results.—Mortality differed between the 2 centers (65.5% and 37.2%), with the higher value seen where nearly 64% of patients were monitored with RHC. This center's patients also had lower PaO_2 /fraction of inspired oxygen ratios, higher positive end-expiratory pressure values, plus a higher incidence of extrapulmonary causes of the ARDS and an increased use of epinephrine/norepinephrine. Finally, these patients were also hospitalized much more frequently (70% vs 28%) than those at the other center. The SAPS II and Logistic Organ Dysfunction scores when ARDS was diagnosed differed significantly between the patients undergoing RHC and those not having RHC. Those not having RHC were significantly less likely to need vasopressor support than those having RHC, and RHC patients were overall more often hospitalized before being admitted to the ICU than those not having RHC. Two factors found to be independently and significantly associated with death were the administration of epinephrine or norepinephrine and extrapulmonary causes of ARDS. Eliminating the vasopressor factor, statistically significant correlations with death were also found with the presence of septic shock, the use of RHC, and a high SAPS II score at diagnosis of ARDS (Table 3).

Conclusions.—These data confirm that patients in whom RHC is used tend to be physiologically sicker and therefore have a higher mortality. The only 2 independent predictors of mortality were an extrapulmonary cause of ARDS and the need for epinephrine/norepinephrine to control circulatory failure, which indicates a maximal hemodynamic support effort.

TABLE 3.—Summary of Multivariate Analysis for Identifying Variables Independently Associated With Death

Variables	Adjusted OR	95% CI	p Value
Model A (including vasopressors)			
Epinephrine or norepinephrine	13.89	2.59-74.59	0.003
Nonpulmonary cause of ARDS	7.36	1.15-35.77	0.02
Model B (excluding vasopressors)			
SAPS II at the time of diagnosis	1.04	1.00-1.07	0.04
Septic shock	7.37	2.16-25.12	0.002
Right heart catheterization	4.26	1.09-16.62	0.04
Nonpulmonary cause of ARDS	4.69	1.25-17.54	0.02

Note: The variables introduced in the models were: SAPS II, $\text{PaO}_2/\text{FiO}_2$, septic shock, right heart catheterization, and nonpulmonary cause of ARDS.

Abbreviations: ARDS, Acute respiratory distress syndrome; CI, confidence interval, FiO_2 , fraction of inspired oxygen; OR, odds ratio; SAPS, Simplified Acute Physiology Score.

(Courtesy of Vieillard-Baron A, Girou E, Valente E, et al: Predictors of mortality in acute respiratory distress syndrome: focus on the role of right heart catheterization. *Am J Respir Crit Care Med* 161:1597-1601, 2000.)

Therefore, it is not the RHC but the patients' worse physiologic condition that is most contributory to the higher mortality.

► A common complaint against journalism is that when a person is accused of a crime and arrested it is front-page news, but when that person is exonerated, it is buried at the back of the newspaper. This is what appears to be happening here with the pulmonary artery catheter. When the catheter was implicated in excess mortality in ICU patients several years ago, the news made the "front-page" in major medical journals (and actually was on the front page of *The New York Times*). This study (the findings of which were not on the front page of *The New York Times*), confirms some of the most obvious flaws in the previous data. The authors do an excellent job of documenting the treatment selection bias introduced when the catheter is used (ie, physicians tend to place the catheter in patients whom they consider "sicker" and in those who are not responding to conventional therapy; hence, the association between the catheter and excess mortality). All of this had been postulated before¹ but this is the first time anyone has actually demonstrated it in a believable fashion. The authors make no claims for the utility of the pulmonary artery catheter in critically ill patients but, to their credit, they bring a measure of moderation back into the discourse. My sense is that this is not the last time we will see this type of spurious cause and effect in the critical care literature and it is unfortunate that this article will not receive the same level of attention as those that documented the association. For that reason, this article is a "must read" for everyone.

C. M. Franklin, MD

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1. Mueller HS, Chatterjee K, Weil MH, et al: American College of Cardiology Consensus Document: Present use of bedside right heart catheterization in patients with cardiac disease. *J Am Coll Card* 32: 840-864, 1998.