

Physician Risk Assessment and APACHE Scores in Cardiac Care Units

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Summary

Background: The need to correct outcome data for case mix is well recognized, but risk assessment for coronary care unit (CCU) patients remains problematic.

Hypothesis: This study determined the feasibility of using physicians' opinions to predict mortality for CCU patients and compared their results to Acute Physiology and Chronic Health Evaluation II (APACHE II) scores.

Methods: A prospective observational study was performed on consecutive patients admitted to a university-affiliated Veterans Affairs Medical Center CCU over a 2-month period. Physician assessment of likely mortality during hospitalization, obtained using an MD Prognosis Score ranging from 1 (best) to 7 (worst), was compared with APACHE II scores.

Results: MD Prognosis Scores were obtained on 122 of the 237 eligible patients (51% response rate) and averaged 2.3 ± 1.4 (mean \pm standard deviation). APACHE II scores on these patients averaged 9.9 ± 4.8 (range 2–29) with very poor correlation between the two methods ($r = 0.3$). Of the four patients who died, three had MD prognosis scores of 7. None of the survivors had scores of 7 and only three had scores of 6. APACHE II did not predict a high likelihood that any of the patients would die (none with $> 90\%$ likelihood of mortality).

Conclusions: APACHE scores are inadequate for cardiac patients. Although physicians can identify CCU patients most likely to die, reliance on physician scoring systems is limited by difficulties in obtaining their opinion. A new meth-

od of risk assessment for acutely ill cardiac patients is needed if CCU outcomes are to be compared across institutions.

Key words: Acute Physiology and Chronic Health Evaluation, coronary care unit, severity of illness, risk assessment, prognosis, physician assessment

Introduction

Measuring the quality of health care remains problematic and, at a minimum, requires adjusting for differing characteristics of the patients served.¹ Accurately determining risk-adjusted outcome is particularly important where large numbers of patients are at greatest risk, such as occurs in intensive care units (ICUs). Several severity of illness measures have been developed to predict outcome in general and/or surgical ICUs,^{2–5} but risk adjustment methods specifically designed for coronary care units (CCUs) are lacking. The most widely published ICU scoring system, Acute Physiology and Chronic Health Evaluation II (APACHE II),² has had little application in CCU.^{6–8} Factors predictive of outcome in patients with heart disease may be lost or overshadowed when mixed with data from patients with such greatly differing illnesses. Although several studies have predicted mortality for specific cardiac diagnoses, such as myocardial infarction,^{9, 10} they are applicable only to a small subset of patients admitted to a CCU where, for example, unstable angina, congestive heart failure, and arrhythmias are also common. Moreover, APACHE scores were not intended to prognosticate for individuals, but for comparisons of groups of patients, thus limiting their usefulness to the practicing physician. The study reported herein was stimulated by the need for an easy to use severity of illness score for CCUs specifically applicable to all cardiac patients.

Because physician opinion of severity of patient illness has had reasonable predictive power in other settings,^{11–13} we hypothesized that CCU physicians could provide a readily obtainable assessment of patient severity of illness that would have as good or better predictive value than objective methods such as APACHE II.² We therefore developed a simple scoring system for physician assessment of the severity of illness of CCU patients and used it as part of a pilot study aimed at im-

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proving our ability to predict outcome for patients with acute cardiac disease.

Methods

The primary care physicians (second- or third-year post-graduate residents) were asked to complete a brief questionnaire for all patients admitted to the CCU (6-bed coronary care unit and 6-bed telemetry unit) of the Minneapolis Veterans Affairs Medical Center. An overall prognosis score was provided on a scale of 1 (good prognosis, with <1% mortality risk) through 7 (bad prognosis, with >95% expected mortality), with intermediate numbers: 2 = 2–5% mortality, 3 = 6–10% mortality, 4 = 11–20% mortality, 5 = 21–50% mortality, and 6 = 51–95% mortality. The scale was not designed to be linear, but rather to reflect mortality risk in ranges that have intuitive categorical meaning for a patient's outlook.

Because acute decompensation of ischemic heart disease (IHD) accounts for over 60% of our CCU admissions, we requested additional prognostic information for patients with IHD. Cardiac status was rated along a spectrum of severity (graded 1 through 7) in four specific areas: (1) Severity of presenting symptoms as related to the likelihood that they represented noncardiac pain (least severe), progressive angina, unstable angina, or acute myocardial infarction (most severe); (2) an estimate of myocardial function; (3) an estimate of the amount of myocardium acutely at risk, and (4) assessment of how likely the myocardium at risk is salvageable.

Assessments were based on the patient's history, physical examination, routine laboratory tests, electrocardiogram, and chest x-ray, but not on specialized studies such as echocardiography, radionuclide imaging, or cardiac catheterization (except as would be known as part of the past medical history). The physician risk assessment was correlated with APACHE-II scores (obtained from the medical records by a nurse specialist) using linear regression analysis.

Results

Over the 2-month study period, 264 new patients were admitted to the CCU. Of these, 237 (90%) had a primary cardiac diagnosis. Adequately completed physician risk assessment forms were obtained on 122 (51%). Thus, we were unable to obtain physician assessment on a substantial number of patients. Even with enticements (a free lunch), we failed to improve the questionnaire completion rate.

APACHE II scores were obtained for all patients having completed physician risk assessment forms. The mean APACHE-II score was 9.9 ± 4.8 (range 2–29), and the mean physician risk assessment (MD prognosis) score was 2.3 ± 1.4 (range 1–7). Figure 1 shows the lack of correlation between MD prognosis and APACHE-II scores ($r = 0.3$).

Examination of individual scores for survivors (closed circles in Fig. 1) and nonsurvivors (inverted triangles) provides a general comparison of the relative accuracy of the MD prog-

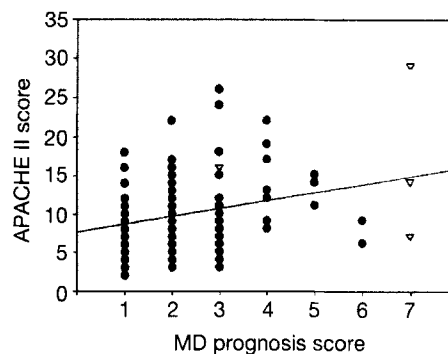


FIG. 1 Comparison of physician prognosis score and APACHE II score for 122 coronary care unit patients ($r = 0.3$). ∇ = Patients who died prior to hospital discharge, \bullet = survivors (some points overlap).

nosis score and the APACHE II score in predicting outcome. Four patients (3.3%) died prior to hospital discharge, and they had MD prognosis scores of 7, 3, 7, and 7. As noted above, for a score of 7 the physician estimates a 95% \geq likelihood of the patient dying during that hospital admission. Review of the IHD severity scores of these four patients provides additional insight into the possible causes of mortality. The patient with an overall prognosis score of 3 had a left ventricular (LV) function score of 6 (i.e., severe LV dysfunction), and two of the other patients had scores indicating severe cardiac symptoms and no salvageable myocardium. None of the patients who survived received a score of 7, and only three survivors received scores of 6.

The APACHE II scores of those who died were 7, 16, 29, and 14, respectively. A death rate approaching 90% can be predicted by APACHE II scores only when the score is > 35, and 29 was the highest score in our patients. Clearly the physicians were able to detect problems that predicted fatal outcome in three of the four patients who died, whereas the APACHE II scoring system failed to foresee their demise.

Discussion

Our observations support the thesis that physicians can predict outcome in the CCU reasonably well if their opinion can be obtained. Charlson *et al.*¹¹ previously reported a 99.5% success rate in obtaining ratings for 604 ICU patients by residents using a 9-point scale ranging from not ill to moribund. They concluded that "clinical judgment may suffice to classify the clinical severity of patients at the time of enrollment in prospective trials and can provide a useful method of controlling for case mix." In a study by Kruse *et al.*,¹⁴ both clinical assessment and APACHE II scores were highly predictive of outcome, but APACHE II added little to the clinical decision-making process for individual patients. Brannen *et al.*¹² found that physicians were significantly better than APACHE in predicting outcome in a medical ICU. Despite these studies, no method of physician risk assessment of critically ill patients appears to have gained widespread use.

The difference in success rates for obtaining physician assessments in our trial compared with that of Charlson *et al.*¹¹ is striking, but with no obvious explanation. We asked for voluntary participation by the residents, but also made it clear that this was not a job requirement. It was our contention that if the tool could not gain reasonable acceptance on a voluntary basis, it would not be accepted for widespread use. We did not survey those who refused to estimate prognosis to determine reasons for nonparticipation and can make no inference about the effect of the poor response rate on our results. Due to the significant time and cost required to obtain APACHE scores, we did not obtain these scores for patients for whom physician assessment was not obtained. Nonparticipation was primarily a function of individual physicians rather than of the type of patient admitted, and since there was no stratification by severity of illness in assignment of patient to physician at the time of admission, it is unlikely that the patients not in the study differed significantly from those included. In any case, the participation rate was obviously too low to encourage use of physician questionnaires as a viable tool for estimating prognosis in the future.

Despite reservations because of small sample size and incomplete physician participation, our data support the thesis that, when obtainable, formalized physician assessments of severity of illness can provide reasonably accurate predictions of mortality that may be better than objective scoring systems. This is very important when considering results of studies that use severity of illness scoring systems to correct for case mix when analyzing outcomes of intervention initiated by physicians based on their judgment of severity of illness and prognosis. Connors *et al.*¹⁵ for example, used APACHE III scores¹⁶ for case-matching in a study assessing the efficacy of right heart catheterization in ICU patients and concluded that right heart catheterization increased both mortality and utilization of resources. It is possible that APACHE III failed to adjust for factors that increased both the likelihood of right heart catheterization and death (i.e., that despite the attempts at case matching, the catheterized patients were indeed sicker). Our study suggests that physicians' clinical judgment could differ from scoring systems enough to account for large differences in projected outcome.

Despite the ability of physicians to predict severity of illness accurately, we are forced to conclude that physician surveys do not provide a practical tool for generalized use in assessing risk and outcome. A uniform methodology is lacking, physician cooperation is difficult to obtain, and any tool developed that requires active physician participation would not be applicable to retrospective analyses. Based on the results of our pilot study, physician input into predictive algorithms would best be extracted from information they routinely provide in medical records in their daily practice caring for pa-

tients. This could readily include diagnoses (as currently extracted for coding purposes) as well as therapeutic intervention, but not specialized scoring systems.

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