Evaluation of the Charlson Weighted Comorbidity Index and the MacCabe Classification as Predictors of Mortality in Patients with Nosocomial Bloodstream Infection due to *Pseudomonas aeruginosa*

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ABSTRACT

ground: *Pseudomonas aeruginosa* bacteremia is associated with a high lity rate. Many factors have been shown to increase the risk of mortality. ver, the impact of underlying disease as measured by the Charlson ted comorbidity index (WCI) and the MacCabe classification in patients with comial bloodstream infection (nBSI) due to *P. aeruginosa* has not been ated.

ctive: To evaluate the utility of the Charlson index and the MacCabe fication as predictors of mortality in patients with *P. aeruginosa* nBSI.

ods: Charlson and MacCabe scores were assessed for a cohort of 57 with *P. aeruginosa* nBSI. Charlson WCI was dichotomized into scores of d ≥3 points. The MacCabe classification was dichotomized into non-fatal vs. tely fatal and rapidly fatal diseases. Univariate analysis was performed to ate the association of the following variables with mortality: Charlson index, Cabe classification, age, gender, BSI acquired in the intensive care unit, uate antimicrobial therapy, and cardiovascular, respiratory, renal, tologic and hepatic failure. Variables significant in univariate analysis were ed into a logistic regression model. Due to the colinearity between these two rbidity variables, separate stepwise logistic regression (SLR) models were to assess independent predictors for mortality.

lts: In univariate analysis, the Charlson WIC and MacCabe classification able to predict overall mortality, OR 4.46 (CI95 1.3-15.2, p=0.014) and OR (CI95 1.3-11.9, p=0.013), respectively. In the first model (Charlson WCI) tologic failure (OR 7.5; CI95 2.04-71.8, p=0.006) and cardiovascular failure 5.7; CI95 1.3-19.5, p=0.017) were found to be independently predictive of lity in patients with *P. aeruginosa* BSI. Similarly, in the second model Cabe classification), variables independently related to death were the ing: hematologic failure (OR 6.6; CI95 1.7-53.9, p=0.010) and ovascular failure (OR=6.1, CI95 1.4-20.6, p=0.014).

lusions: The development of hematologic and cardiovascular failure were endent predictors of death. Neither the Charlson index nor the MacCabe fication predicts mortality in patients with *P. aeruginosa* nBSI, suggesting nderlying disease processes are less important than the development of ssociated end organ dysfunction in predicting survival.

INTRODUCTION

monas aeruginosa remains an important pathogen in community and settings. It ranks among the top ten pathogens causing bloodstream n (BSI) in the United States and Canada, and the attributable mortality of *P. osa* bacteremia is as high as 34%.

actors have been shown to increase the risk of mortality. However, the of underlying disease as measured by the Charlson weighted comorbidity (WCI) and the MacCabe classification in patients with nosocomial eam infection (nBSI) due to *P. aeruginosa* has not been evaluated. The of our study was to evaluate the utility of the Charlson index and the e classification as predictors of mortality in patients with *P. aeruginosa*

METHODS

Setting: The Virginia Commonwealth University Medical Center is a 820-bed tertiary care facility in Richmond, Virginia. The hospital houses 9 intensive care units and a burn unit; approximately 30,000 patients are admitted annually.

Study design: Charlson and MacCabe scores were assessed for a cohort of 57 adults with *P. aeruginosa* nBSI. Charlson WCI was dichotomized into scores of <3 and ≥3 points. The MacCabe classification was dichotomized into non-fatal vs. ultimately fatal and rapidly fatal diseases.

Statistical methods: Mean values were compared using 2 sample t tests for independent samples. Proportions were compared using a χ^2 test. All tests of significance were 2-tailed, and α was set at 0.05. Independent predictors of mortality were identified by means of stepwise logistic regression analysis, using variables found to be significant in univariate analysis. Due to the colinearity between the Charlson WCI and the MacCabe classification, separate stepwise logistic regression (SLR) models were used to assess independent predictors for mortality. To also estimate the hazard ratio of progression to death for these two comorbidity variables, we used the multivariable-adjusted Cox proportional hazard regression model.

RESULTS

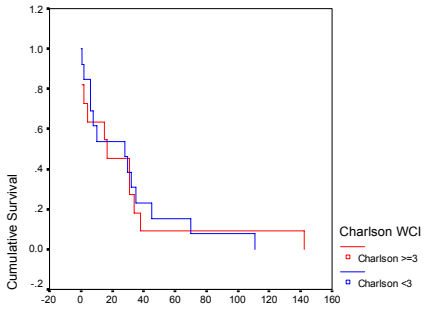
Table 1: The Charlson Weighted Index of Comorbidity

Assigned Weight for Disease	Condition
1	Myocardial infarct Congestive heart failure Peripheral vascular disease Cerebrovascular disease Dementia Chronic pulmonary disease Connective tissue disease Ulcer disease Mild liver disease Diabetes
2	Hemiplegia Moderate or severe renal disease Diabetes with end organ damage Any tumor Leukemia Lymphoma
3	Moderate or severe liver disease
6	Metastatic solid tumor AIDS

Table 2: The MacCabe Classification

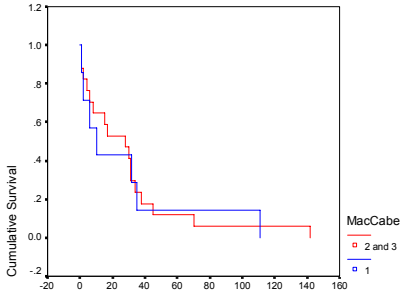
Class	Prognosis
1	None or Non-fatal disease
2	Ultimately fatal disease
3	Rapidly fatal disease

Figure 1: Survival in cohorts stratified by the dichotomized Charlson WIC



Time (days) to death due to bacteremia

Figure 2: Survival in cohorts stratified by the dichotomized MacCabe classification



Time (days) to death due to bacteremia

RESULTS (continued)

Table 3: Risk factors for death in patients with *P. aeruginosa* nosocomial bloodstream infection, considering Charlson WCI

	Univariate Analysis*		Multivariate Analy	
Risk factor	OR	*P*	OR	*P*
Hematologic failure	12.4	0.001	7.5	0.0
Cardiovascular failure	5.5	0.003	5.7	0.0
Charlson WIC ≥3	4.46	0.014	3.6	0.0

*Variables not significant in univariate analysis are not shown

Table 4: Risk factors for death in patients with *P. aeruginosa* nosocomial bloodstream infection, considering MacCabe classific

	Univariate Analysis*		Multivariate Anal	
Risk factor	OR	*P*	OR	*P*
Hematologic failure	12.4	0.001	6.6	0.0
Cardiovascular failure	5.5	0.003	6.1	0.0
MacCabe 2 and 3	3.96	0.013	3.7	0.0

*Variables not significant in univariate analysis are not shown

CONCLUSIONS

- The development of hematologic and cardiovascular failure independent predictors of death.
- Neither the Charlson index nor the MacCabe classification pr mortality in patients with *P. aeruginosa* nBSI, suggesting underlying disease processes are less important than the develo of BSI-associated end organ dysfunction in predicting survival.

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