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Should we add clinical variables to administrative data for risk adjustment of comparisons between hospitals?

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This study assessed whether adding 3 readily accessible clinical variables to hospital administrative data might improve the risk adjustment for inter-hospital comparisons. We compared 3 alternative risk adjustment models for 30-day case-fatality rates (CFR) after admission for acute myocardial infarction (AMI):

- (1) Administrative model (age, sex, and comorbidities);
- (2) Clinical-augmented administrative model (administrative data plus 3 clinical variables: systolic blood pressure, heart rate, and ECG characteristics on admission); and
- (3) Clinical demographic model (the 3 clinical variables plus age and sex).

Analysis was conducted on data for 1743 patients admitted to 21 hospitals in Queensland, with a principal diagnosis of AMI between January 1, 2003 and December 31, 2005. There was only fair agreement between the administrative model and the clinical-augmented administrative model (weighted kappa = 0.66). Only 68.7% of the risk-adjusted CFR were in the same decile of risk; 9.9% were 3 or more deciles apart (Table 1). The clinical-augmented model reduced extrabinomial variation and slightly improved discrimination ($c = 0.83$ vs. 0.79 , $P = 0.01$) (Table 2). In contrast, removing comorbidities from the clinical model did not alter performance greatly: similar discrimination ($c = 0.80$ vs. 0.83 , $P = 0.07$), excellent agreement for predicted CFR (weighted kappa = 0.82), and no extrabinomial variation for either model.

The results of this study, published in 2007¹, suggest that addition of only 3 readily accessible clinical variables to administrative data improves the risk adjustment for interhospital comparisons of AMI case-fatality rates.

Table 1. Agreement between deciles of predicted values for each model

Comparison	% Within 1 Decile	% 2 Deciles Apart	% 3 or More Deciles Apart	Weighted Kappa
Clinical-augmented administrative model vs administrative model	68.7	21.4	9.9	0.66
Clinical-augmented administrative model vs clinical-demographic model	93.1	4.1	2.7	0.82

Table 2. Beyond-chance variation, discriminatory power and calibration of models

Variables in model	Extra binomial variation (95% CI), P^1	C-Statistic	Hosmer-Lemeshow Calibration Statistic
Administrative variables	0.56, (0.30, 0.79), $p < 0.001$	0.79	$\chi^2(8) = 7.25$, $p = 0.5094$
Clinical + administrative variables	0.03, (0.00, 0.26), $p = 0.149$	0.83	$\chi^2(8) = 4.95$, $p = 0.7631$
Clinical + demographic variables	0.01, (0.00, 0.03), $p = 0.244$	0.80	$\chi^2(8) = 5.01$, $p = 0.7566$

¹P-value for whether the extra-binomial variation is different from zero

1. Johnston TC, Coory MD, Scott I, Duckett, S. Should we add clinical variables to administrative data? The case of risk-adjusted case fatality rates after admission for acute myocardial infarction. *Medical Care* 2007;45(12):1180-1185