IND-066 ANALYZING DIFFERENCES IN CLINICAL OUTCOMES BETWEEN HOSPITALS

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Objective:
To examine the variation between hospitals in rates of severe intraventricular haemorrhage (IVH) in preterm babies adjusting for both case mix and sampling variability.

Methods:
A cross-sectional study of data from 24 neonatal intensive care units (NICUs) in the Australian and New Zealand Neonatal Network was carried out. During the three-year period, 1995 – 1997, there were 5,413 infants of gestational age 24 to 30 weeks.

The three outcome measures were: the crude rates for severe (grades 3 and 4) IVH; the rates adjusted for case mix using logistic regression; and the rates adjusted for sampling variability using shrinkage estimators. Shrinkage estimation was used for both the crude and the case mix adjusted rates.

Results:
The overall rate of severe IVH was 6.8%, but crude rates for individual units ranged from 2.9 to 21.4%, with an inter-quartile range (IQR) from 5.7 to 8.1%. Adjusting for the five significant predictor variables, gestational age at birth, 1-minute Apgar score, antenatal corticosteroids, transfer after birth and gender, actually increased the variability in rates (IQR: 5.9 to 9.7%). Shrinkage estimators, which adjust for differences in unit sizes and outcome rates, reduced the variation in rates (IQR: 6.3 to 7.5%).

Adjusting for case mix and using shrinkage estimators showed that one unit had a significantly higher adjusted rate than expected, while another was significantly lower. The excess number of IVH in the hospital with high rates was five cases. In contrast, if all units could be improved so as to achieve an average rate equal to the 20th centile of 5.74%, then 60 cases of severe IVH could be prevented.

Conclusions:
IVH is one of the major morbidities of the very preterm baby and the more severe grades of 3 and 4 are invariably associated with death or survival with disability. Because of this, reduction in rates of IVH is a clinical and research priority within neonatology. The analysis in this paper was stimulated by the wide variation between hospitals that was apparent in the crude rates for severe IVH.[1]

This case study shows that shrinkage estimators have a greater impact on the estimate of the variation in outcomes between hospitals than adjusting for case mix. Shrinkage estimators also have the property that they have a lower prediction error for the 'true' underlying hospital rate than the crude or case mix adjusted rates.

From the point of view of how to report clinical indicators, adjusting rates for case mix and shrinkage allowed us to estimate the 20th centile and the potential reduction in severe IVH (60 in this case). Concentrating on using the quality improvement tools to shift the overall mean of all hospitals to the 20th centile rather than identifying the worst performing hospitals will achieve much greater reductions in morbidity.

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1. Heuchan AM, Evans N, Henderson Smart DJ, et al. Perinatal risk factors for major intraventricular haemorrhage in the Australian and New Zealand Neonatal Network, 1995 to 1997. *Arch Dis Child Fetal Neonatal Ed* 2002;86:F86-F90.