Stroke outcome

National variations in mortality and functional outcome: should we be worried?

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International registries should be established to monitor process and outcome of care after stroke

The ultimate goal of our efforts in (pre-)clinical stroke research and patient management is to deliver effective and high quality care at reasonable cost. It follows that we should be able to measure the results of the delivery of stroke care on an aggregate level, and, when variations at the hospital or national level are encountered, we should be able to point out the factors that cause this variation. This is not easily done.

In this issue, Gray *et al* (see pages 327–33) present an analysis of national variations in mortality and functional outcome after stroke.¹ This substudy was based on the data from a large randomised multicentre trial of a low molecular weight heparin, tinzaparin.² Outcome was defined as death or dependency at 6 months from onset of stroke. The authors point out that one would expect outcomes to be similar throughout the western world, after adjustment for variations in the distribution of prognostic factors among patients (sometimes designated as “case mix”) and, perhaps, health resource use. The analysis strategy in this study is as interesting as it is straightforward: first compare crude outcome rates for groups of countries, then adjust for prognostic factors, and after that try to explain remaining variation by variations in the care process and care structure.

Interestingly, there were large variations in outcome among the countries in this study. In absolute percentages the risk of death and dependency ranged between 44% and 67%, and this variation did not seem to be caused by chance. After adjustment for a wide range of prognostic factors, and after grouping the countries into regions, a significant difference remained between Britain on the one hand and the USA and Scandinavian countries on the other, but the difference between Britain and north western Europe had disappeared. Variations in mortality were even more impressing than variations in the combined outcome: the

authors noted that when grouped by geographical region, death rates were 40–50% lower in North America and Scandinavia than in Britain ($p = 0.0001$). The significant variation in case fatality remained after adjustment for case mix variables.

Should we take these figures at face value, and specifically worry about British stroke care? Perhaps yes, as the IST investigators reported similar results a few years ago.³ But there may be something wrong. The ideal study should select a representative group of hospitals and should consecutively include patients. Information on important prognostic factors that are expected to significantly affect outcome should be gathered, and pre-specified analyses should be carried out. Clearly, this study was not designed in this way, because it had a different main purpose. The number of patients in each national subgroup is low, considering the inclusion period of 2 years.² This indicates that multiple selection mechanisms may have played a role, and this undoubtedly has led to unobserved systematic differences in prognostic profile between the subgroups. The disproportionately large variation in mortality as compared to the variation in the composite outcome of death and dependency, is difficult to explain in terms of differences in stroke management processes. In fact, when the authors tried to explain this variation by the differences in quality indicators of process of care, this was not possible. This leaves the large variation unexplained and suggests systematic bias.

We still have plenty to worry about. Stroke outcome may be better in Scandinavia and the US, but the differences with the UK are probably strongly overestimated (note that the author of this editorial commentary is from mainland Europe). Nevertheless, something may have to be done here. What should worry us more, is that there is cause for alarm, and we do not have the data to check this in any way. Gray *et al* should be commended for bringing this to our

attention. We need representative, international, large, simple, prospective stroke registries that monitor process and outcome of care. Examples of such national registries exist, for example in the Netherlands.⁴ Some European registries and inventories have been reported, but these did not allow for firm conclusions with respect to the relationship between quality of care and outcome, because of their size and the limited data that have been gathered,⁵ or because of their sole focus on the structure and process of care.^{6,7} Examples also exist in the cardiovascular realm, although these studies have not attempted to explain variation between countries with process indicators of the quality of care.^{8,9} It is clearly time for such a registry to be developed. Many questions have to be answered and we may have to use sophisticated statistical techniques to analyse centre effects and to adjust for case mix, but we owe it to our patients and to society that we are able to report on the result of our core business in a consistent and sophisticated way.

J Neurol Neurosurg Psychiatry 2006;**77**:288.
doi: 10.1136/jnnp.2005.075879

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Competing interests: none declared

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