

### 3. Organisation of vascular services

#### Hospital workload >> Published evidence

Numerous studies of surgical practice in recent years have examined the relationship between the volume of procedures performed and outcome. Birkmeyer<sup>5</sup> used Medicare data from the United States to look at the effect of the number of operations performed by a hospital on the outcome of mortality, for 14 procedures. Mortality decreased as volume increased for all 14 procedures, although the strength of the effect varied between different types of procedure.

One of the procedures examined was elective repair of unruptured aortic aneurysm. There were over 140,000 such operations in the Medicare population in the study period. Figures were adjusted for a number of risk factors including mode of admission. Taking the risk adjusted odds ratio for hospitals performing less than 17 cases a year as one, the ratio for hospitals doing 31-49 cases a year was 0.70 (confidence intervals [CI] 0.64-0.76), and for hospitals doing greater than 79 cases a year the odds ratio was 0.58 (0.53-0.65).

A second paper by Birkmeyer<sup>6</sup> used two years' data from the United States from Medicare patients to examine the interaction of a surgeon's volume of cases with the hospital workload. Surgeons working at a large hospital will probably do a large number of procedures, but some individual surgeons working in high volume hospitals may do a low number of procedures. This may or may not affect outcome. The paper examined how much of the observed phenomenon of reduced mortality at high volume hospitals should be ascribed to the volume of work performed by the surgeon, for a number of procedures. For repair of non-ruptured abdominal aortic aneurysm, surgeons were divided into low, medium and high volume surgeons on the basis of performing less than eight, eight to 17.5, and greater than 17.5 aneurysm repairs annually. The adjusted odds ratio for operation in a low volume hospital (as defined for this study) compared to a high volume hospital was 1.4. Of this variation 57% could be ascribed to variations in the volume of operations performed by the surgeon. (As a comparison, 100% of the variation in aortic valve surgery outcome could be ascribed to the effect of the volume of work of the surgeon.)

A paper by Urbach<sup>7</sup> examined data for five complex procedures from Canadian hospitals. This paper showed an adjusted odds ratio of 0.62 (CI 0.46-0.83) for repair of unruptured AAAs at high volume hospitals compared to low volume hospitals (number of aneurysm repairs 6,279). This study also found that for some combinations of procedures, improved outcome in one procedure was associated with high volumes of another procedure.

These results from studies with much greater numbers than the number of unruptured AAAs in this study (434 elective AAA repairs, 86 emergency unruptured repairs) show that outcome is better when both surgeon and hospital undertake greater rather than smaller volumes. Presumably the effect of hospital volume reflects expertise and resources in anaesthesia, intensive care, nursing care, laboratory and imaging services and so forth.

The definitions of low volume and high volume used in these studies were constructed for the purpose of analysis and cannot be used to set levels of work to define good practice. The Leapfrog Group<sup>8</sup> is an American collaboration of 170 organisations that purchase healthcare. The Group's aims are to improve the safety, quality and affordability of healthcare. It has suggested that hospitals should perform a minimum volume of 50 elective AAA repairs a year. Only 19 hospitals in this study achieved this level of work.