From the Executive Editor

"The greatest good to the greatest number"

THE PHILOSOPHER JEREMY BENTHAM, WHO founded University College London, said "It is the greatest good to the greatest number of people which is the measure of right and wrong". His sentiments have relevance to those considering cardiology services for children and young people. One of the key questions about our speciality is what is the optimum size for a paediatric cardiac unit? Ours is a small speciality, where units have often been established by enthusiastic individuals or teams. The pattern of the provision of the service has not been planned. It has developed. Different units have varied greatly, both in size and in the spectrum of care they provide. This is changing, and paediatric cardiac services throughout the world are increasingly being planned on a regional or national basis. The starting point for such plans has to be determining configuration of the ideal unit. How many cardiologists? How many surgeons? How many nurses? And, perhaps fundamentally, how many patients? Do bigger centres with a more rapid surgical throughput achieve better outcomes than small centres?

Surprisingly, no one really knows the answer to most of these questions. Many of the studies that have been cited as evidence that an increased volume of activity by a hospital or an individual clinician leads to better outcomes for the individual patient are flawed. They fail to control for differences in case mix and severity when comparing units. In fact, those studies that do exist often do not differentiate between the volume of activity by a hospital and that by individual clinicians. The only measure of outcome they use is hospital mortality. The evidence is, therefore, limited, but it is not non-existent.

One of the most important studies on this topic was published in 1995 by Jenkins and her colleagues.[1] The study retrospectively reviewed patients who had undergone surgery for congenital cardiac malformations in California in 1988, and in Massachusetts in 1989. A total of 2833 cases undergoing treatment at 37 centres were included in their analysis. Volume of activity ranged between 1 and 602 operations. The overall hospital mortality was 7.7%. In their analysis, the authors took account of the complexity of the cases, and the characteristics of the populations. They concluded that the adjusted mortality rate in centres performing fewer than 10 operations per year was 18.5%, between 10 and 100 operations it was 7.9%, between 101 and 300 operations it was 8.2%, and in those performing more than 300 a year it was 3%. Only the last of these was significant, leading to the conclusion that centres performing more than 300 operations for congenital heart disease had better outcomes. In fact, the figure of 300 operations was arbitrary. The largest centre below this level did 182 operations, and the smallest above this figure did 362. So, a dividing line anywhere between 183 and 361 would have given the same results.

This study gives us evidence that size of centre may be an important determinant of surgical mortality, but it does not tell us how big the ideal centre should be. Furthermore, it does not tell us the minimum number of operations that need to be undertaken by individual surgeons to achieve the best results.

Another study by Hannan and colleagues, published in 1998,[2] tried to answer this last question. Again, the study was retrospective, and looked at children undergoing congenital cardiac surgery, but this time in 16 hospitals in New York between 1992 and 1995, with a total of 7169 operations. The overall hospital mortality was 6.75%. In their analysis, the authors found evidence that volumes of cases treated by individual hospitals and individual surgeons influenced the risk-adjusted hospital mortality. There was a significant relationship throughout the range of volumes, but the maximal differentiation in mortality between centres dealing with low and high volumes was at hospitals undertaking fewer than 100 operations, and with individual surgeons undertaking fewer than 75 operations. The risk-adjusted mortality for a surgeon dealing with such low volumes surgeon in a hospital also with a low volume was 8.94%, whilst for a surgeon undertaking more than 75 operations in a hospital with a volume greater than 100 operations the risk-adjusted mortality was 5.45%.

It would be surprising if there was no relationship between the amount of work undertaken by hospitals

or surgeons and the outcome of surgery for congenital cardiac disease. The studies that I have cited confirm the intuitive view that there is a relationship. The minimum volume of activity for a hospital appears to be somewhere between 100 and 300 operations annually. We have no idea if there is an optimal maximum volume. We do not have the definitive answer to the question about optimum size, but we cannot ignore the evidence we do have. In 2000, Lundström and his colleagues reported the experience of a major reconfiguration of paediatric cardiac services in Sweden.[3] The number of centres undertaking surgical procedures was reduced from four to two, the two remaining centres then undertaking about 900 operations a year between them. Overall mortality for 1988 to 1991, before reconfiguration, was 9.5%. From 1995 to 1997, after reconfiguration, it was 1.9%. Some of this fall in mortality may reflect improvements in care unrelated to the reconfiguration, but the authors believe that the centralization of surgery into larger centres was an important factor. They also report other improvements in the quality of care that could only have been achieved in the larger centres.

As we have discussed here before, the way we provide care to children with heart disease is changing.

Part of this change must be a critical review of how we configure the service. Hospitals and individual clinicians must make sure that their volume of work is sufficient to achieve the best results. We do not yet know the optimal size of a unit, and we do not have all the answers to the questions I asked at the beginning. Nevertheless, there is a great deal of evidence that we cannot ignore. We would welcome further debate on these issues in our pages and on our website.

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References

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