Association between volume of severely injured patients and mortality in German trauma hospitals

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Background: The issue of patient volume related to trauma outcomes is still under debate. This study aimed to investigate the relationship between number of severely injured patients treated and mortality in German trauma hospitals.

Methods: This was a retrospective analysis of the TraumaRegister DGU® (2009–2013). The inclusion criteria were patients in Germany with a severe trauma injury (defined as Injury Severity Score (ISS) of at least 16), and with data available for calculation of Revised Injury Severity Classification (RISC) II score. Patients transferred early were excluded. Outcome analysis (observed versus expected mortality obtained by RISC-II score) was performed by logistic regression.

Results: A total of 39,289 patients were included. Mean(s.d.) age was 49.9(21.8) years, 27,824 (71.3 per cent) were male, mean(s.d.) ISS was 27.2(11.6) and 10,826 (29.2 per cent) had a Glasgow Coma Scale score below 8. Of 587 hospitals, 98 were level I, 235 level II and 254 level III trauma centres. There was no significant difference between observed and expected mortality in volume subgroups with 40–59, 60–79 or 80–99 patients treated per year. In the subgroups with 1–19 and 20–39 patients per year, the observed mortality was significantly greater than the predicted mortality (P < 0.050). High-volume hospitals had an absolute difference between observed and predicted mortality, suggesting a survival benefit of about 1 per cent compared with low-volume hospitals. Adjusted logistic regression analysis (including hospital level) identified patient volume as an independent positive predictor of survival (odds ratio 1.001 per patient per year; P = 0.038).

Conclusion: The hospital volume of severely injured patients was identified as an independent predictor of survival. A clear cut-off value for volume could not be established, but at least 40 patients per year per hospital appeared beneficial for survival.

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Introduction

The relationship between hospital volume and trauma outcomes is under debate, with several cut-offs proposed¹⁶. Centralization and creation of trauma systems and centres are based on a perceived volume–outcome benefit, but the exact number of patients and their corresponding severity of injury are not clear across studies¹⁶. The American College of Surgeons (ACS) Committee on Trauma requires a minimum of 1200 patient admissions for level I trauma centres; 240 (20.0 per cent) of these are supposed to have an Injury Severity Score (ISS) of at least 16⁷. In Germany, the issue of patient volume or caseload is controversial. There already exist requirements for a clearly defined number of operations and interventions, for example with regard to transplantations or endoprostheses. The effect of patient volume on mortality among patients with major trauma is not yet clear and it is not possible to make general recommendations⁷–¹⁹. With a view to improving the quality of care, the present study aimed to analyse the effect of patient volume on mortality in German trauma centres. This may also have implications for other European countries.