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The effect of ethnicity on in-hospital mortality following emergency abdominal surgery: a national cohort study using Hospital Episode Statistics

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ABSTRACT

Objectives: Ethnicity has complex effects on health and the delivery of health care in part related to language and cultural barriers. This may be important in patients requiring emergency abdominal surgery where delays have profound impact on outcomes. The aim here was to test if variations in outcomes (e.g. in-hospital mortality) exist by ethnic group following emergency abdominal surgery.

Study design: Retrospective cohort study using population-level routinely collected administrative data from England (Hospital Episode Statistics).

Methods: Adult patients undergoing emergency abdominal operations between April 2008 and March 2012 were identified. Operations were divided into: 'major', 'hepatobiliary' or 'appendectomy/minor'. The primary outcome was all cause in-hospital mortality. Univariable and multivariable analysis odds ratios (OR with 95% confidence intervals, CI) adjusting for selected factors were performed.

Results: 359,917 patients were identified and 80.7% of patients were White British, 4.7% White (Other), 2.4% Afro-Caribbean, 1.6% Indian, 2.6% Chinese, 3.1% Asian (Other) and 4.9% not known, with crude in-hospital mortality rates of 4.4%, 3.1%, 2.0%, 2.6%, 1.6%, 1.7% and 5.17%, respectively. The majority of patients underwent appendectomy/minor (61.9%) compared to major (20.9%) or hepatobiliary (17.2%) operations ($P < 0.001$) with an in-hospital mortality of 1.7%, 11.5% and 3.9% respectively. Adjusted mortality was largely similar across ethnic groups except where ethnicity was not recorded (compared to White British patients following major surgery OR 2.05, 95% 1.82–2.31, $P < 0.01$, hepatobiliary surgery OR 2.78, 95% CI 2.31–3.36, $P = 0.01$ and appendectomy/minor surgery OR 1.78, 95% 1.52–2.08, $P < 0.01$).

Conclusions: Ethnicity is not associated with poorer outcomes following emergency abdominal surgery. However, ethnicity is not recorded in 5% of this cohort and this represents an important, yet un-definable, group with significantly poorer outcomes.

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Introduction

Ethnicity can be classified by referring to a community of people who share the same culture and/or by referring to an ancestral population which comprises their self-identity.¹ Self-reported ethnicity captures both the shared experiences/culture of an individual and their self-identity. According to the 2011 Consensus in some areas of the United Kingdom, especially around London, over 70% of the population report their ethnicity as 'non-white'.² Even those who are considered 'White' are comprised of a heterogeneous group of residents from Poland, Greece, Romania, Bulgaria and other Eastern countries.

Ethnicity has complex effects on health and the delivery of health care.^{3–5} This is a major issue not only in the UK, but also in other countries such as mainland Europe and the United States, both formed of similarly diverse communities.⁶ Many challenges exist when treating patients from an ethnic background different to that of the health service provider. These can be patient-related including language barriers and cultural barriers e.g. omissions of sensitive elements in the history and adequate expose patients for examinations.^{7,8} In addition, there are known provider-related biases linked to racial and ethnic prejudice.⁹ At a population level, the effects of these factors are difficult to quantify individually, but may have a cumulative effect in delaying diagnosis, treatment and outcomes.

Rapid diagnosis and treatment is essential in patients requiring urgent and emergency abdominal surgery.^{10–12} Inappropriate delays produce profound effects on short-term outcomes such as in-hospital mortality, which are widely used as markers of quality.^{13,14} Inappropriate delays in care resulting from issues arising from ethnicity would be expected to have a significant impact on those requiring emergency surgery. However, this is unclear.

In England, Hospital Episode Statistics (HES) is an administrative dataset that collates information on all National Health Service (NHS) and private patients admitted to NHS hospitals in England on a per-episode basis. HES can monitor population-level outcomes following elective and emergency operations. Self-reported ethnicity is recorded in HES. HES data in recent years have high completeness of ethnic group information (typically exceeding 90%) and accurate in 95% of records when validated.^{15–17} There have been notable improvements in ethnicity recording in the past decade.

The aim of this study was to test if variations in outcomes (e.g. in-hospital mortality and length of hospital stay) exist by ethnic group in patients following emergency abdominal surgery.

Methods

Hospital Episode Statistics (HES)

A description of the HES database has been published previously.¹⁸ In brief, it is an administrative dataset that collates information on all NHS and private patients admitted to NHS hospitals in England. Each admission contains a primary diagnosis and secondary diagnoses which are categorised according to ICD-10 (international classification of diseases, 10th revision),¹⁹ along with patient-level demographic data

including age, ethnicity and home postal code. This study is exempt from UK National Research Ethics Committee approval as it involved analysis of an existing dataset of anonymized data for service evaluation. A data sharing agreement with the Health and Social Care Information Centre (HSCIC) to use Hospital Episode Statistics data has been granted. Studies performed at the Department of Informatics, Queen Elizabeth Hospital Birmingham fall under that arrangement and has been approved by Data Access Advisory Group (DAAG) hosted by the HSCIC.

Database inclusions and variable coding

All patients over the age of 18 years classified as an 'emergency' admission between 1st April 2008 and 31st March 2012 and undergoing a surgical procedure on either their digestive tract or an abdominal organ were included. [Supplementary Table 1](#) shows the Office of Population Censuses and Surveys Classification of Interventions and Procedures (OPCS-4.5) codes used to identify patients. OPCS-4 codes were grouped into: major, hepatobiliary and minor/appendicectomy. By using the unique patient identifier it was possible to determine whether a patient had had at least one emergency admission within England in the year prior to the admission of interest.

Ethnicity is recorded as part of the general demographics. Ethnicity is grouped into White British; White Irish or Other White; Black African, Caribbean, Other or Mixed; Indian; Pakistani, Bangladeshi, Other Asian or Mixed; Chinese, Other or Other Mixed; or Not stated/known. Diagnoses were recoded into broad categories using the ICD-10 code in the primary diagnosis field; digestive system, neoplasm or other. Patients were grouped into six age cohorts: 18–34, 35–44, 45–54, 55–64, 65–74, and 75 + years according to age at time of surgery. The adjusted Charlson co-morbidity score was considered in three categories: 0, 1–4, and ≥ 5 .²⁰

The indices of multiple deprivation (IMD) 2007 are an overall score of deprivation derived from seven domains, based on routinely collected statistics; income, employment, health, education, training and skills, barriers to housing and services, crime and living environment.²¹ Quintiles derived from these scores, classified from 1 (most deprived) to 5 (least deprived) were used here.

Outcome variables

The primary endpoint of interest was in-hospital all-cause postoperative mortality. This information is recorded within HES. 'Length of stay' is the time (in days) spent in hospital during the index admission and 'days until operation' is the time (in days) between the date of admission and the operation taking place. Medians (with interquartile range) are referred to in unadjusted analyses.

Univariable and multivariable analysis

Categorical variables were tested for association with the death outcome variables using the χ^2 test, the Mann–Whitney test was used to test non-normally distributed continuous variables. Variables including age, gender, primary diagnosis, co-morbidities, deprivation, and previous

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