# Understanding Administrative Abdominal Aortic Aneurysm Mortality Data

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**WHAT THIS PAPER ADDS**
This manuscript explores the quality of a national administrative data set within a single health board in Scotland. Limiting the process to a single region has allowed interrogation of all patient health records.

**Objective:** Administrative data in the form of Hospital Episode Statistics (HES) and the Scottish Morbidity Record (SMR) have been used to describe surgical activity. These data have also been used to compare outcomes from different hospitals and regions, and to corroborate data submitted to national audits and registries. The aim of this observational study was to examine the completeness and accuracy of administrative data relating to abdominal aortic aneurysm (AAA) repair.
**Methods:** Administrative data (SMR-01 returns) from a single health board relating to AAA repair were requested (September 2007 to August 2012). A complete list of validated procedures; termed the reference data set was compiled from all available sources (clinical and administrative). For each patient episode electronic health records were scrutinised to confirm urgency of admission, diagnosis, and operative repair. The 30-day mortality was recorded. The reference data set was used to systematically validate the SMR-01 returns.
**Results:** The reference data set contained 608 verified procedures. SMR-01 returns identified 2433 episodes of care (1724 patients) in which a discharge diagnosis included AAA. This included 574 operative repairs. There were 34 missing cases (5.6%) from SMR-01 returns; nine of these patients died within 30 days of the index procedure. Omission of these cases made a statistically significant improvement to perceived 30-day mortality ($p < .05$, chi-square test). If inconsistent SMR-01 data (in terms of ICD-10 and OPCS-4 codes) were excluded only 81.9% of operative repairs were correctly identified and only 30.9% of deaths were captured.
**Discussion:** The SMR-01 returns contain multiple errors. There also appears to be a systematic bias that reduces apparent 30-day mortality. Using these data alone to describe or compare activity or outcomes must be done with caution.

## INTRODUCTION

Administrative data are gathered for the primary purposes of capacity planning, commissioning services, and, ultimately, remuneration. Data collection is also part of clinical work and can be used to populate specialty and procedural registries. Both clinical and administrative data have been used to identify variation in process and outcome for defined conditions or interventions. Several authors have explored the completeness of clinical and administrative data sets[1,2] and have indicated a high level of agreement, concluding that data collected by the administrative team could provide a means of validating data gathered by clinicians. Furthermore, it has been suggested that administrative data could be used to directly measure clinical performance at hospital and clinician level. However, others have described weaknesses of administrative data sets.[3–8]

Powerful voices have asserted that clinician engagement in the process of data gathering and governance is imperative.[9] However, the precise role and, perhaps more importantly, the extent of clinician involvement and influence in the process has yet to be fully defined. Key issues relate to resource and the implication of using medical time to collect or verify data, but also to the lack of independence of data gathered by an individual or group with a large stake in the reported outcomes. Any failure to identify a group of cases with adverse outcomes, through systemic flaw or bias, would have real effects on reported performance. If the generation of robust data is to be the responsibility of the clinician, it is important to understand methods of data collection and intrinsic weaknesses of the process within both clinical and administrative systems. An

advantage of the NHS is that it remains a largely closed system of care. As such, it would seem appropriate to make full use of this to standardise and optimise data collection and analysis.

The National Vascular Registry (NVR) is part of a quality improvement framework introduced with the aim of reducing mortality following elective surgery for abdominal aortic aneurysm (AAA). Vascular surgeons are encouraged to enter clinical data on patients undergoing operative repair through a secure web-based data collection system. These clinical data are then linked to national administrative data to define health board contribution to the registry.[10] However, concerns remain about data quality and administrative coding — a process that is not subject to external audit.[11]

National administrative data in Scotland are derived from the Scottish Morbidity Record (SMR), with episodes generated for each hospital admission (similar to Hospital Episode Statistics [HES] data in England and Wales). The acute services activity are recorded and reported as SMR-01 data. As with HES, SMR-01 returns are populated using diagnostic (ICD-10) and treatment (OPCS-4) codes derived from discharge summaries. Each episode contains fields for up to six diagnostic and four procedural codes, with relevant dates for the episode of care and the intervention. Hospital episode data are collated at health board level and submitted electronically to the Information and Statistical Division (ISD) of NHS Scotland.

Diagnostic (ICD-10) and operative coding (OPCS-4) of aortic conditions is complex; diagnostic codes discriminate between repair of AAA for "rupture" and repair "without mention of rupture," but the operative coding is subtly different, separating cases into emergency and non-emergency categories. This allows identification of an elective repair of intact AAA, an emergency repair of a ruptured AAA, an emergency procedure for a non-ruptured aneurysm (symptomatic AAA), but also creates the potential for conflict of codes with a "ruptured" aneurysm being repaired as an elective procedure (possible, but rare). Also recorded within administrative data is the hospital-assigned urgency code (scheduled or emergency) for admission.

The primary aim of the present work was to ascertain the completeness and accuracy of national administrative data relating to AAA repair within a single health board. The purpose was to assess the reliability of any measure of outcome derived from these administrative data in an unmodified form.

## METHOD

Permission to collate, store, and examine patient identifiable data was obtained from the Caldicott Guardian (September 2007 to August 2012 inclusive). The Community Health Index (CHI) number (a unique patient identifier used throughout Scotland derived from the patients date of birth) was used to access electronic patient health records. Indications, dates of intervention, and precise procedures were validated from case records. Thirty-day mortality was calculated.

Greater Glasgow and Clyde Health Board administrative data, in the form of SMR-01 returns (centrally held national data set, HES equivalent) were extracted for all hospital episodes featuring diagnostic or procedural codes relating to infra-renal AAA, in any of the data positions. Mortality for this group was sourced from National Records, Scotland (a population registry), which can be linked to SMR-01 returns, using the CHI number. Each entry in the SMR-01 data set was examined individually and each AAA repair procedure verified.

To examine the completeness and accuracy of the SMR-01 returns, a Reference data set was derived from all available sources. Clinical data were collected from theatre registers, secretarial diaries, and personal logbooks. It was not possible to gain access to theatre activity data held electronically for the period of interest as the system had been upgraded and older files were no longer accessible, therefore this search was performed manually. The final Reference data set was a composite of SMR-01 returns and clinical data. Each case was examined and assigned to a category for indication (asymptomatic, symptomatic, or ruptured) and another for repair procedure (open or endovascular).

The first search was for cases that were recorded in both the SMR-01 returns and the Reference data set. The number of procedure-related episodes miscoded, but still present in the SMR-01 returns in some form, was established, as were the number of procedures entirely omitted. The data were then interrogated to establish how the SMR-01 returns appeared at face value using the recorded ICD-10 and OPCS-4 codes. This analysis was repeated, excluding cases in which the recorded urgency category of the index episode, assigned by the coding process (elective or emergency), conflicted with either the ICD-10 or OPCS-4 codes. Thirty-day mortality was recorded for each search. These data were compared with the validated outcomes within the Reference data set. This process is summarised in Fig. 1.

## RESULTS

### Reference data set: validated primary AAA intervention — patients, procedures, indications, and outcomes

There were 608 procedures for AAA identified from all available sources. Of these, 497 (81.5%) patients were male and 261 (42.7%) were endovascular interventions (Table 1). There were two patients, recorded in a theatre register by name only, who appeared to have had AAA repair but no further record of their progress or outcome could be identified. These were excluded from further analysis.

### Clinical data set: data derived from all known clinical sources

There were 499 procedures identified (Table 1). There were 54 deaths within 30 days of procedure in this cohort. (The two inadequately identified cases mentioned above appeared in this subgroup and were excluded from subsequent analysis.)