Validation and comparison of electronic health care data with automatic data acquisition in acute high-risk abdominal surgery

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INTRODUCTION

Acute High-risk Abdominal (AHA) surgery carries high morbidity and mortality, and in 2012 a national AHA protocol was introduced in Denmark, to improve quality and ensure consistency of treatment nationwide. This is continuously monitored based on automatic data acquisition (Figure 1), however, external validation remains sparse.



Figure 1. National algorithm for identification of patients with acute high-risk abdominal conditions requiring surgery.
Abbreviations: Index-contact defines relevant diagnosis- and procedure code. Contact defines the registration of an acute admission to the hospital.

Aim

To assess completeness and correctness of data from the Danish National Quality Registry for AHA surgery patients treated at Aalborg University Hospital.

METHODS

We conducted a retrospective, single-center validation study at Aalborg University Hospital, Denmark, including patients treated during the period from 28th March 2022 to 30th April 2024. Patients meeting predefined AHA criteria were identified through manual audit of operating theatre booking lists and confirmed by electronic health record (EHR) review. This manually identified cohort served as reference and was compared with cases captured by the Danish National Quality Registry for AHA surgery patients.

RESULTS

Completeness

A total of 701 patients were identified across the two data sources. Of these, 211 (30.1%) were present in both cohorts, 455 (64.9%) were identified only in the manually audited cohort, and 35 (5.0%) appeared only in the registry cohort (Figure 2).

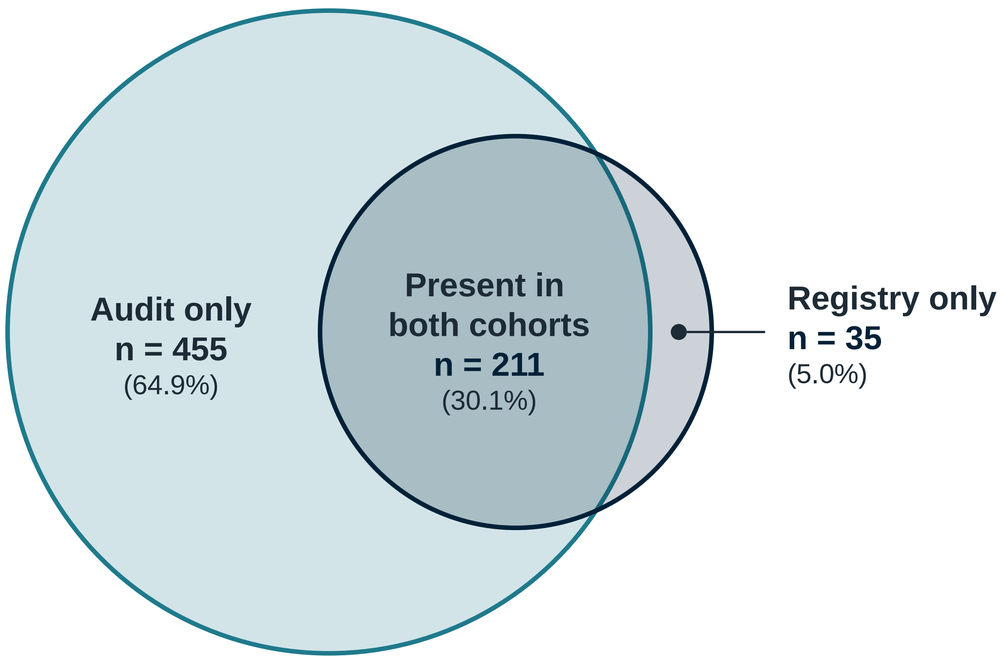


Figure 2. Study design – two data sources compared (areas proportional to n)

Manual audit (EHR cohort)
Theatre lists + EHR review · n = 666

National Quality Registry (AHA cohort)
ICD-10 diagnosis + procedure codes · n = 246

Accordingly, the registry algorithm failed to identify 64.9% (455 of 701) of all identified cases.

The main discrepancies appeared to be related to the identification algorithm.

Correctness

Of the 35 cases found only in the registry cohort, 24 (9.8% of the total cohort) did not fulfil predefined AHA criteria upon chart review and were thus falsely identified. These included patients with cancer or other chronical conditions booked for subacute procedures, patients with a suspected AHA-diagnosis who upon diagnostic surgery did not meet the criteria, but also patients with a suspected non-AHA-diagnosis booked for surgery accordingly (i.e. obs. appendicitis). The remaining 11 were missed due to misinterpretation of the procedure booked on the theatre list or incorrect booking.

Thus, the sensitivity of the automatic data acquisition was calculated to 32.3% (Figure 3).

$$\text{Sensitivity} = \frac{\text{True positive}}{\text{True positive + false negative}} = \frac{211+11}{(211+11)+455} = 32.3\%$$

Figure 3. Sensitivity of electronic national registry algorithm for automatic identification of acute abdominal emergency conditions requiring surgery compared to manual auditing of the electronic health records in the period from March 2022 to April 2024.

Of the 211 patients found in both data sources, 206 had available time stamps for admission and first surgical procedure, which is one of the key quality indicators monitored. Among these, 14 (6.8%) showed discrepancies exceeding 24 hours between the two sources regarding the interval from admission to time of surgery (Figure 4).

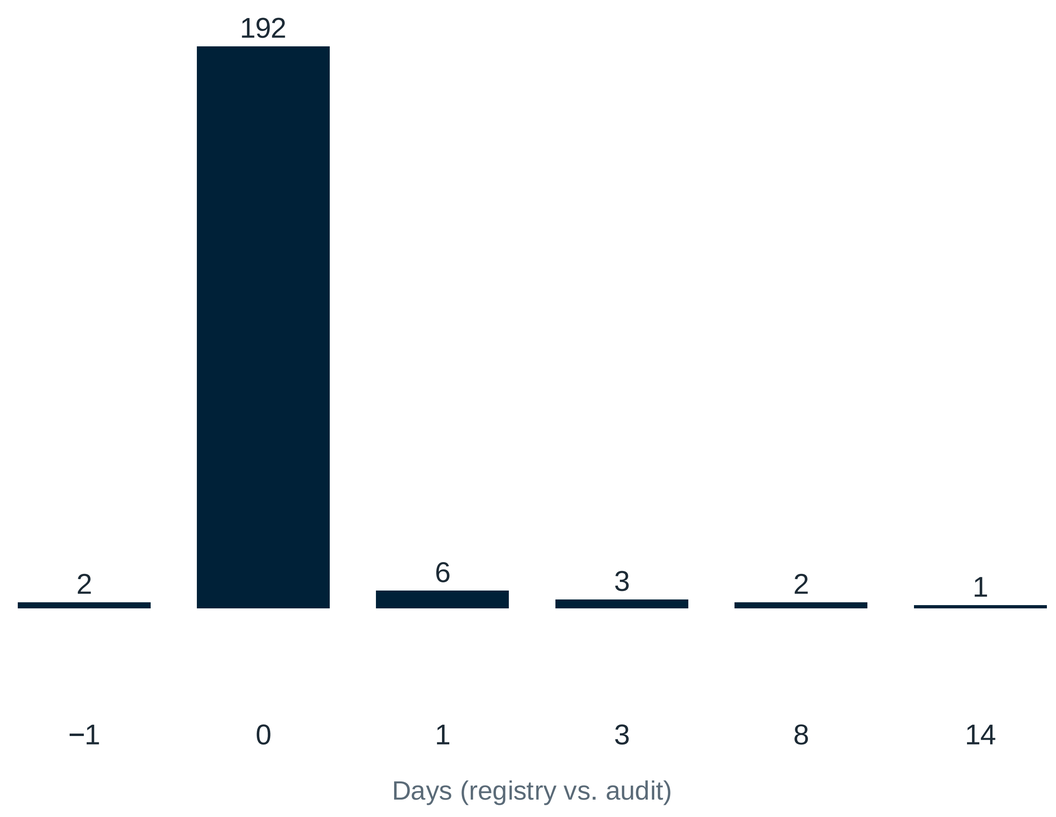


Figure 4. Time stamps (n = 206)

CONCLUSION

Our study demonstrated significant limitations in data completeness within the Danish National Quality Registry for AHA surgery patients. Notably 64.9% of patients were not identified by the algorithm combining procedure coding and data on admission.

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