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ARTICLE

Ruptured: Retrospective Analysis Undertaken for Patients Treated for Unexplained Retroperitoneal or Abdominal Pain in the Emergency Department

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Abstract

Aims/Background Symptomatic abdominal aortic aneurysms carry significant mortality risk. This is supplemented by the Royal College of Emergency Medicine guidelines which suggest imaging for patients 50 years of age or older presenting with unexplained abdominal, flank, or back pain. This study aimed to evaluate the prevalence and mortality rates of patients with symptomatic abdominal aortic aneurysms in a high-risk population and to assess scanning rates in the accident and emergency department.

Methods Retrospective analysis of patients presenting to the accident and emergency department at a district general hospital over 6 months was performed. Patients 50 years of age or older presenting with abdominal, flank, or back pain were included. Collected data points included; whether or not a scan was performed in the emergency department, the modality of imaging, whether an abdominal aortic aneurysm was identified on the scan, the age of patients with an abdominal aortic aneurysms identified on the scan, size of the identified abdominal aortic aneurysms, primary diagnosis at the time of review in the emergency department, and all-cause mortality rates.

Results 361 patients were identified to have an indicated scan, of which only 122 (33.8%) had a scan in the emergency department. In the syndromic group, the prevalence and 30-day mortality of patients with an abdominal aortic aneurysm were 5.5% and 1.1% respectively. Only 12 out of 20 patients with an abdominal aortic aneurysm were identified in the emergency department.

Conclusion The criteria outlined by the Royal College of Emergency Medicine does well at identifying patients with abdominal aortic aneurysms when followed. However, this study reveals that scanning rates in the emergency department are low. The encouragement of scanning and improved ultrasound skills among emergency medicine clinicians can reduce missed diagnoses. Additionally, we recommend further studies to assess the mortality rates of emergent abdominal aortic aneurysm presentations.

Key words: abdominal aortic aneurysm; ruptured abdominal aortic aneurysm; abdominal pain; emergency department; ultrasound

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Introduction

Acute abdominal pain is one of the most common presenting complaints for patients attending the emergency department (Kocher et al, 2011). Additionally,

a detailed history and examination are required to differentiate between a vast array of potential diagnoses, including those arising from gastrointestinal, urological, gynaecological, or vascular pathologies. This is complicated by the fact that older patients, particularly in the geriatric population, present with atypical signs which can lead to misdiagnoses and higher mortality rates (Spangler et al, 2014). Of the potential diagnoses, one of the most concerning and life-threatening is a ruptured or symptomatic abdominal aortic aneurysm (AAA). This is a disease found almost exclusively in the elderly population, with the prevalence of AAA being approximately 1 in 70 men over the age of 65 in England (NICE, 2023). It also carries a mortality rate reported at approximately 40% even after surgical intervention (Kühnl et al, 2017; Wise et al, 2015). To counter this, the Royal College of Emergency Medicine (RCEM) guidelines recommend considering a diagnosis of a ruptured AAA in patients 50 years of age or older presenting with abdominal/back pain and hypotension, patients with known AAA and symptoms of abdominal/back pain or hypotension/collapse, and in patients where an alternative diagnosis is considered more likely but AAA rupture must still be radiologically excluded prior to referral (The Royal College of Emergency Medicine (RCEM), 2019). It is advised that the patients that meet the mentioned criteria receive imaging in the form of an ultrasound (US) of the aorta, or a computed tomography (CT) scan. We hypothesise that the RCEM criteria is robust and does identify patients with symptomatic AAAs if followed, but also hypothesise that the scanning rates in emergency departments, especially within district general hospitals (DGHs), are low. As such, this study was conducted to assess the prevalence of AAA in the high-risk population outlined by RCEM, and to evaluate all-cause mortality and scanning rates of this group of patients within the emergency department.

Methods

A single-centre retrospective observational study was undertaken at a single DGH in the North West of England (Blackpool Victoria Hospital). The electronic records of all patients presenting to the emergency department with abdominal, back, or flank pain from January 2021 to June 2021 were reviewed. Electronic records reviewed included; assessment in the accident and emergency department (A&E), imaging results, and discharge summaries. All other notes were on paper and not assessed in this study. Patients identified in the high-risk group meeting indications for a scan in the emergency department as per RCEM included:

(1) Patients 50 years of age or older presenting with unexplained abdominal/flank/back pain;

(2) Patients with presumed renal colic with non-convincing evidence of pyelonephritis;

(3) Patient with known AAA with abdominal pain.

Patients excluded from the ‘high risk’ group included:

(1) Patients under the age of 50;

(2) Patients with recent imaging displaying an aortic diameter less than 3 centimetres;

(3) Patient with a known AAA with no abdominal pain;

(4) Patient with abdominal pain attributable to alternative diagnosis or diagnosis matching symptoms of an alternative pathology;

(5) Pregnant women.

An AAA was defined as an abdominal aorta with a transverse diameter of 3 centimetres or greater (Kent, 2014). Collected data points of the high-risk group included; whether or not a scan was performed in the emergency department, the modality of imaging, whether an AAA was identified on the scan, the age of patients with AAA identified on the scan, size of AAA, primary diagnosis at the time of review in the emergency department, and all-cause mortality rates. Analysis of the scanning rate of the high-risk patients in the emergency department as recommended by RCEM was performed, in addition to analysis of the prevalence and mortality rates of patients with a confirmed AAA in this patient cohort.

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (WMA, 2022). National research ethical approval was not required as per the research and development department at Blackpool Teaching Hospitals (reference: SE 0829). Authorisation was provided for service evaluation prior to the commencement of the study. Due to the retrospective nature of the study and the use of anonymized patient data, informed consent was not required. Data was collected from the NEXUS Blackpool Victoria Hospital based electronic patient record system (Blackpool Teaching Hospitals (BTH), 2024), Maxims Cloud ED (2024), and Sectra (2024) online systems. We ensured adherence to ethical guidelines and aimed to ensure the integrity of the research and the protection of patient confidentiality.

Results

Between January 2021 and June 2021, 920 patients, 50 years of age or older presented to the emergency department with abdominal pain, flank pain, or back pain. Of the 920, 361 patients were identified to have an indicated scan as per RCEM guidance. Of the 361 patients that met the imaging criteria, 122 (33.8%) had a scan in the A&E setting (89 patients by US, 33 patients by CT). Of the 122 patients that had a scan in A&E, 12 patients were identified as having an AAA (6 by US, 6 by CT) which resulted in 3 patients being transferred to a tertiary centre with a vascular department, one death from rupture, and 8 patients entering AAA surveillance.

Conversely, out of the 361 patients for whom a scan was recommended, 239 (66.2%) left the emergency department without any form of imaging. Out of the 239 patients, 8 had subsequent imaging displaying evidence of an AAA, including one patient who later died from rupture. Fig. 1 details a breakdown of the outcomes of the patients included in this study.

Additionally, all but one of the twenty patients with confirmed AAA were over the age of 65 (Table 1), and the average size of AAA seen on imaging was 4.8 cm. The sizes of the AAAs in patients who did not receive imaging in the A&E setting ranged from 3.3 cm to 10.0 cm (Fig. 2). There was a wide range of differential

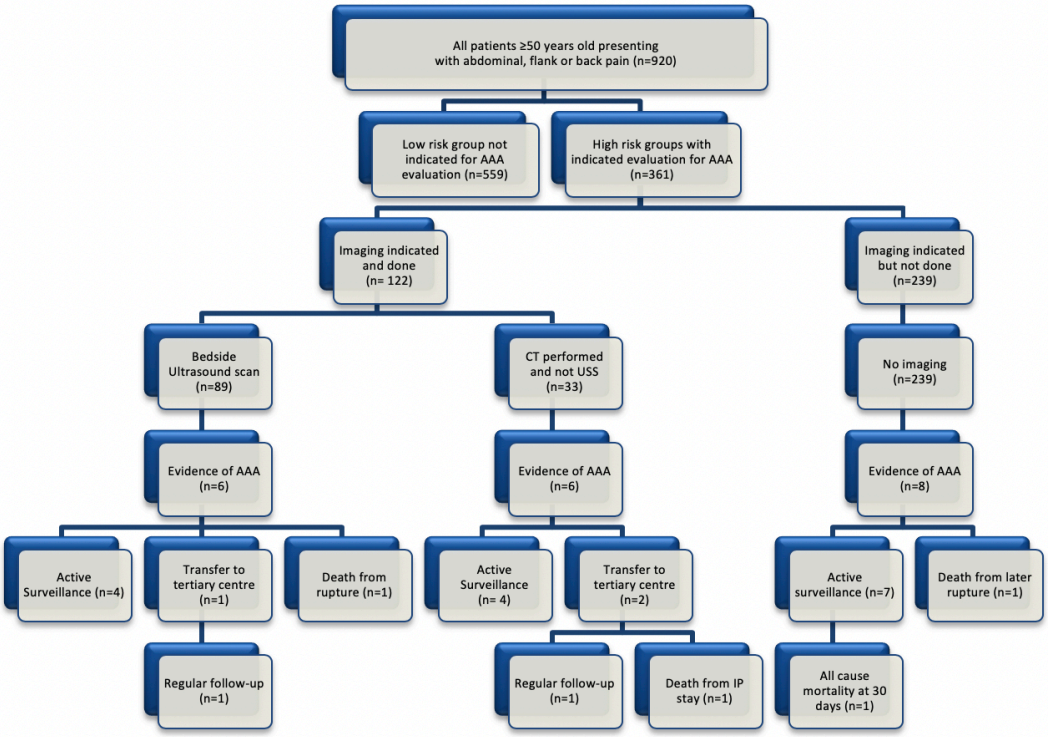

Fig. 1. Outcomes of patients ≥50 years old presenting with abdominal, flank or back pain between January and June 2021. AAA, abdominal aortic aneurysm.

Table 1. Age distribution of patients identified with AAA.

Age category	No. of patients
50–70	4*
70–80	8
80–90	7
90–100	1
Total	20

* One patient was under 65 years old.

diagnoses at the time of review in the emergency department among the 20 patients with confirmed AAA, including differentials such as gastritis, constipation, and biliary disease (Fig. 3). This figure also reflects the importance of imaging as some patients left the emergency department with specific diagnoses such as AAA with impending rupture, while others were labelled as unexplained abdominal pain. This is directly related to why patients with symptomatic AAAs are mislabelled and referred to inappropriate specialities which can significantly impact patient care.

Overall, the prevalence of AAA in the high-risk group proposed by RCEM was 5.5% (20/361). 30-day all-cause mortality in this subset of patients was 1.1% (4/361). 122 of 361 (33.8%) indicated scans took place in the A&E setting resulting in 8 out of 20 (40%) of patients with AAA being identified after the patient left the emergency department (including one patient who later died of AAA rupture).

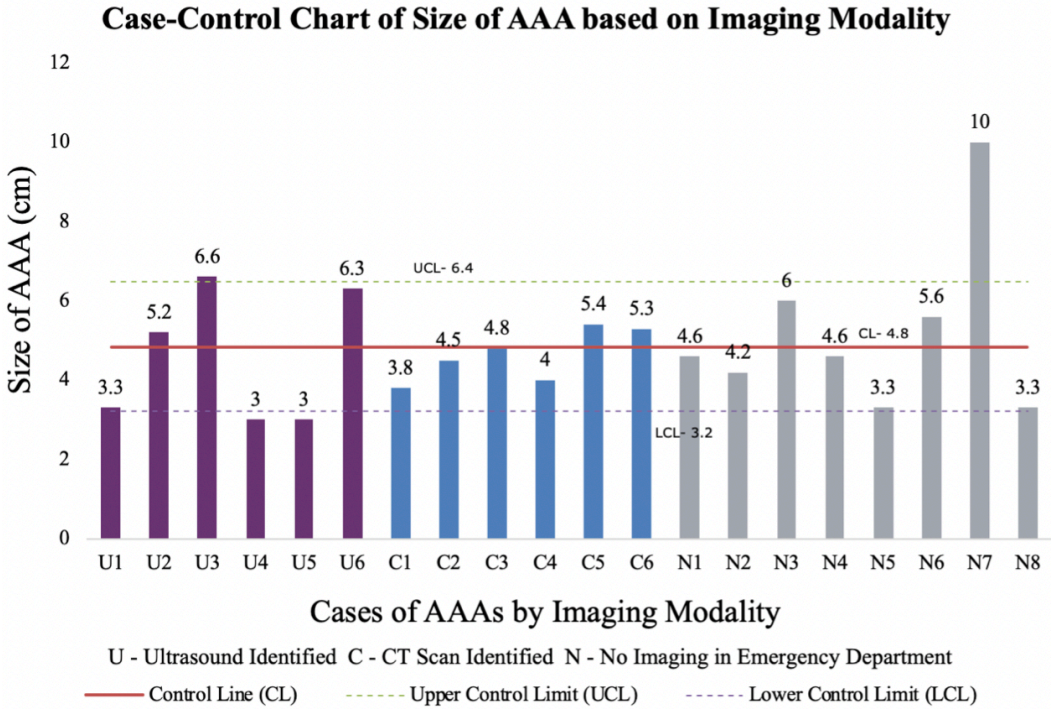

Fig. 2. Control chart of size of AAA identified based on the method of imaging in the emergency department. U represents patients who had an AAA identified by bedside ultrasound scan, C represents patients who had an AAA identified by a CT scan, N represents patients who did not have imaging in the emergency department but had subsequent imaging identifying an AAA. 20 patients with an AAA were identified in total. Control line - Mean of process data, Upper Control Limit - Process mean + 3 standard deviation, Lower Control Limit - Process mean – 3 standard deviation.

Discussion

The results of this study show that the criteria outlined by RCEM to identify patients at high risk of having a symptomatic AAA are sufficient when adhered to. However, this study also highlights that scanning rates and adherence to the RCEM guidance are low. In order to improve the scanning rates and reduce the number of patients with AAAs being missed, a multiple-intervention, multidisciplinary approach must be used. The use of US should be encouraged in the emergency department due to its accessibility, low-cost nature, and its accuracy (Rubano et al, 2013). Following the results of this study, the emergency department at Blackpool Victoria Hospital in collaboration with the Skills & Simulation department, developed a US-themed teaching course targeted at emergency medicine clinicians in order to improve their confidence and competence in using the US scanner and identifying AAAs in high-risk patients. Additionally, the education of staff in the emergency department, especially doctors who have recently rotated, to consider a ruptured or symptomatic AAA as a differential for patients presenting with unexplained severe pain is essential. This is echoed by the "Think Aorta" campaign which encourages requesting a CT scan to produce a definitive diagnosis in this group of patients in A&E (Think Aorta, 2024). The "Think Aorta" campaign has produced a poster detailing the above, this poster was also placed in various areas of the emergency

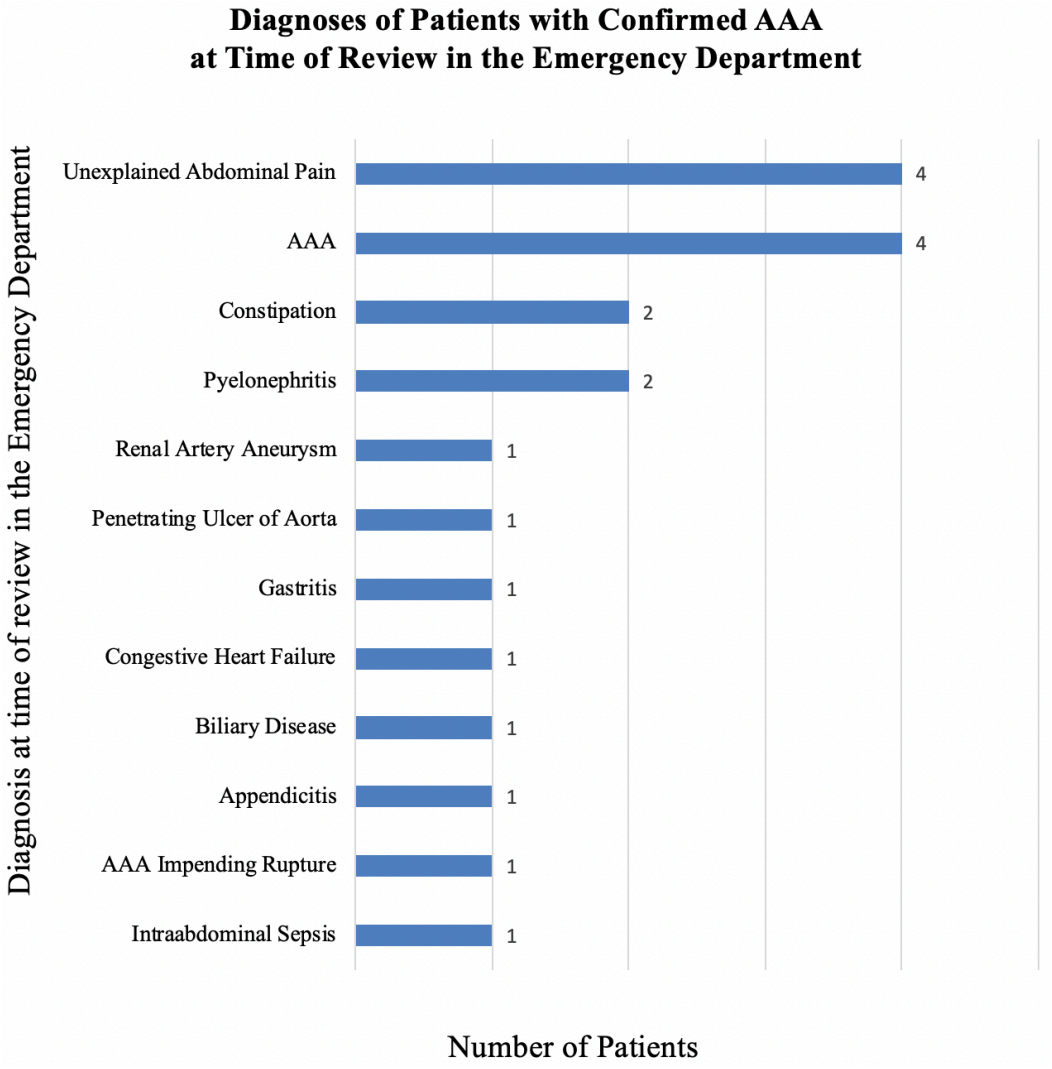

Fig. 3. Diagnoses of patients with AAA at the time of review in the emergency department.

department at Blackpool Victoria Hospital. Finally, with simulation becoming a prominent teaching tool among National Health Service (NHS) teaching hospitals and focused assessment for AAAs using US a requirement in the RCEM curriculum (The Royal College of Emergency Medicine (RCEM), 2021), each emergency medicine department should have the facilities and senior staff available to create their own US-based teaching courses.

This study was limited by its single-centre and retrospective nature. Moreover, upon review of the patient's electronic notes which only included the patient's assessment in the emergency department (paper notes used on the wards), imaging results, and the patient's discharge summary, we were able to assess the presence of an AAA, but did not record if there was another cause for the abdominal pain (example: cholecystitis with an incidental AAA). Additionally, the study subjects were taken from an emergency department at a DGH in the North West of England that sees approximately ninety thousand patients per year, making accessibility to CT scanners difficult and placing time-related pressures that may dissuade a clinician from performing a US of the abdomen. Also, a study by Jacomelli et al (2017)

highlighted that men over the age of 65 are more likely to decline AAA screening in low social economic areas in the UK, and being that Blackpool is one of the most deprived areas UK, this may influence the prevalence of symptomatic AAAs or ruptures (Joint Strategic Needs Assessment (JSNA) Blackpool, 2022). The study did not report long-term follow-up data of patients and did not obtain patient data following intervention. Finally, this study did not analyse if patients who did not have a scan in the emergency department as per the RCEM guidance were associated with a higher and statistically significant mortality rate.

Conclusion

In conclusion, the criteria outlined by the Royal College of Emergency Medicine does well at identifying patients with abdominal aortic aneurysms when followed. However, this study reveals that detection and bedside scanning rates for patients with suspected symptomatic AAAs in the emergency department are low. The encouragement of scanning and improved ultrasound skills among emergency medicine clinicians can reduce missed diagnoses. This should be supplemented in a multi-intervention approach such as US-themed teaching courses and promotion of the RCEM criteria and the "Think Aorta" campaign. The authors of this article recommend further multi-centre, prospective studies to more accurately assess scanning rates and their correlation with mortality in patients with AAAs.

Key Points

- Symptomatic or ruptured abdominal aortic aneurysms are life-threatening.
- RCEM suggests requesting imaging for patients 50 years of age or older presenting with unexplained abdominal, flank, or back pain.
- This study aimed to evaluate the prevalence and mortality rates of patients with abdominal aortic aneurysms in a high-risk population and to assess scanning rates in A&E.
- 361 patients were identified to have an indicated scan, of which only 122 (33.8%) had a scan in the emergency department, and only 12 out of 20 patients with an abdominal aortic aneurysm were identified in the emergency department.
- In the syndromic group, the prevalence and 30-day mortality of patients with an abdominal aortic aneurysm were 5.5% and 1.1% respectively.
- Scanning rates in the emergency department are low, improved ultrasound skills can reduce missed diagnoses.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

TJM and AR designed the study and were involved in data analysis and writing of the manuscript. SA and JZ performed analysis and interpretation of data. TYC made a substantial contribution to the acquisition of data. RA supervised and provided key input to the conception of the study. All authors made substantial contributions to the study. All authors contributed to the critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated sufficiently in the work to take public responsibility for appropriate portions of the content. All authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work are appropriately investigated and resolved.

Ethics Approval and Consent to Participate

As per the research and development department at Blackpool Teaching Hospitals (reference: SE 0829), the current study does not require national research ethics approval and patient informed consent is waived. Authorisation was provided for service evaluation prior to the commencement of the study. Due to the retrospective nature of the study and the use of anonymized patient data, patient privacy is fully protected, and informed consent is not required.

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Conflict of Interest

The authors declare no conflict of interest.

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