

# DIAGNOSING URINARY TRACT INFECTION IN THE EMERGENCY DEPARTMENT: A COHORT STUDY USING ELECTRONIC HEALTH RECORDS

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## Background

Concern over delaying antibiotic treatment for severe infection means that clinicians have a low threshold for initiating antibiotics in the emergency department (ED) for patients with suspected urinary tract infection (UTI) syndromes. Although a non-infectious cause is established for many of these cases, antibiotics are often continued unnecessarily, which drives the emergence of antimicrobial resistance.

Urinary tract infection syndromes are a leading cause of ED attendance and hospital admissions but differentiating UTI from other conditions with a similar clinical presentation can be challenging. Previous studies have suggested that UTIs may be both over and under-diagnosed in the ED,<sup>2</sup> particularly in the elderly,<sup>3</sup> with one study suggesting that >40% of elderly patients who were treated for UTI had no evidence of this condition.<sup>4</sup> However, estimating the degree to which over and under diagnosis occurs in the ED is difficult.

Using electronic health records, we set out to estimate the frequency of over-diagnosis of UTI syndromes in the ED, in order to estimate the potential to reduce antibiotic prescribing by stopping antibiotics early for patients with no evidence of bacterial infection.

## Methods

We undertook a cohort study in patients who were investigated for suspected UTI syndromes at Queen Elizabeth Hospital, Birmingham which is a large teaching hospital in England. Individuals were eligible for inclusion in the study if they attended the ED between 1<sup>st</sup> January 2014 and 30<sup>th</sup> June 2017 and had a urine sample submitted for microbiological culture from the ED. We randomly selected 1000 cases from this population, selecting 700 cases who had been admitted to hospital.

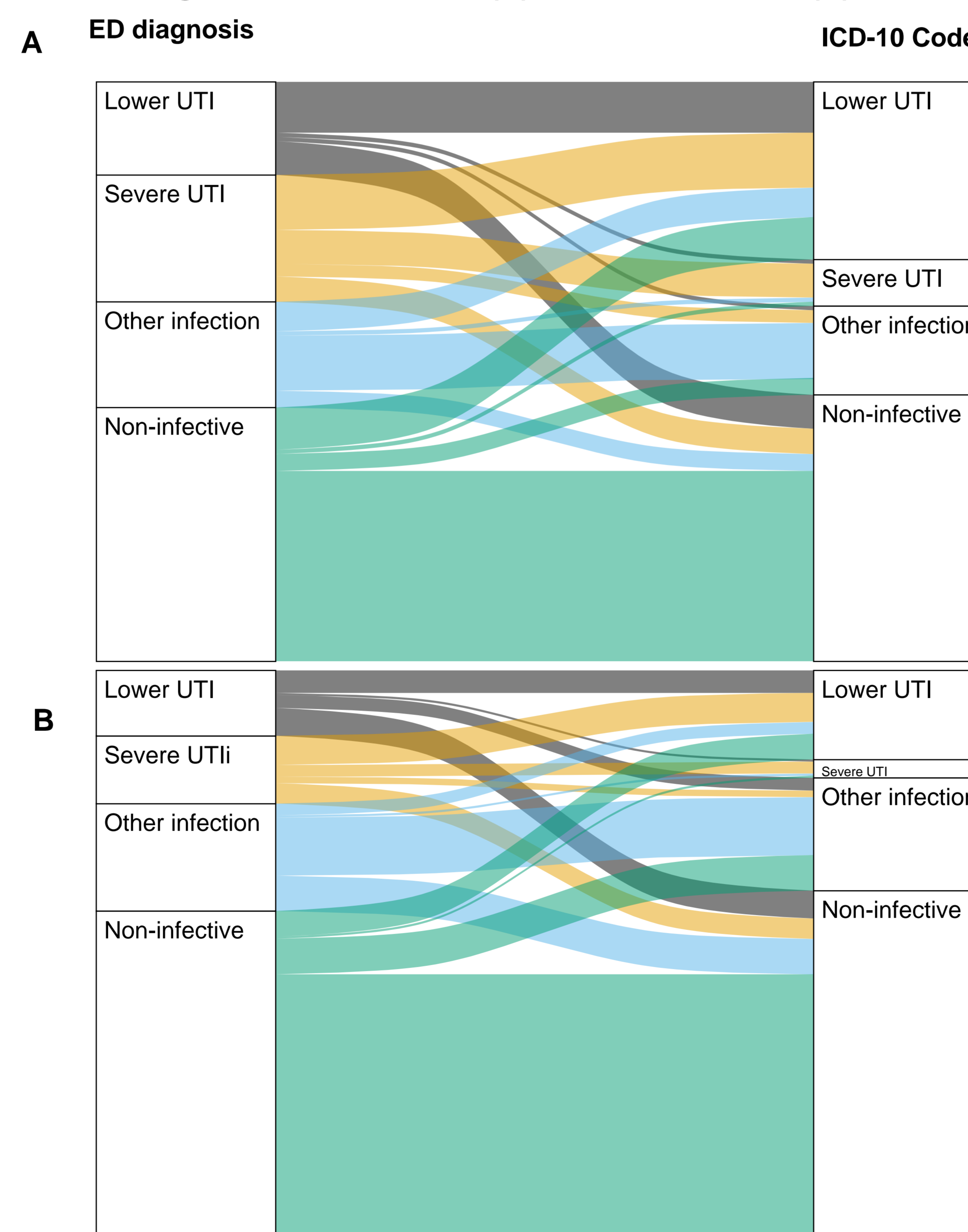
We extracted data on age, gender and social deprivation, urinary symptoms, antibiotic prescriptions, co-morbidities, urinary catheterisation, vital signs and biomarkers for infection from the electronic health record. We also obtained information on symptoms and antibiotic prescriptions from the ED record.

At QEHB ED diagnoses are recorded using structured data which discriminates between lower UTI, pyelonephritis and urosepsis. For patients with each of these conditions we estimated the proportion of patients with clinical/microbiological evidence of UTI based on a combination of urinary symptoms, urinary white cell count (>40) and urine culture ( $10^3$ - $10^5$  cfu/mL dependent on the context) (primary

outcome). For patients who were admitted to hospital, we estimated the proportion of patients who stopped antibiotics at admission or within the following 72 hours. We also compared the ED diagnosis to the primary ICD-10 code which represents the main reason for the patient's admission. ICD-10 codes for UTI syndromes were based on the NHS quality outcomes framework. Infectious/non-infective reasons for admission were defined by ICD-10 chapters.

The study was registered as audit ref: CARMS-13674. Research ethical approval was not required since the analysis used anonymised data that had been collected as part of routine clinical care

**Figure 1. Relationship between ED diagnoses and the reason for admission based on ICD-10 code, comparing patients with microbiological evidence of UTI (A) and those without (B)**



## Results

943 patients met the study inclusion criteria and 289 patients were diagnosed with a UTI syndrome in the ED. There were 56 cases of pyelonephritis, 42 cases of urosepsis and 191 cases of lower UTI.

Antibiotic treatment was recorded for 173 cases of lower UTI and in these patients clinical /microbiological evidence of UTI was lacking in 49/70 (70.0%) admitted patients and 61/103 (59.2%) non-admitted patients. Antibiotic treatment was recorded for almost all cases of pyelonephritis but 33/54 cases (61.1%) lacked clinical/microbiological evidence to support this diagnosis. Clinical/microbiological evidence to support a urinary source of infection was only available for 11/42 (26.1%) cases with an ED diagnosis of urosepsis.

In patients who were admitted to hospital with an ED diagnosis of UTI syndrome, this was the main reason for admission in less than 40% of patients, based on comparison with ICD-10 codes (Figure 1).

Antibiotics were stopped at admission or within 72 hours in 15.5% (25/161) and 23.3% (37/161) of patients with an ED diagnosis of UTI syndromes respectively.

## Discussion

60-70% of patients who were diagnosed with lower UTI or pyelonephritis in the ED lacked clinical/microbiological evidence of this condition. Antibiotics were stopped in less than one quarter of these patients, suggesting there is scope to further reduce antibiotic prescribing for this common condition. Our findings highlight the importance and potential impact of reviewing and revising antibiotic prescribing decisions as part of antimicrobial stewardship initiatives.

Diagnostic criteria for UTI are notoriously difficult with laboratories employing different protocols. We evaluated ED diagnoses against clinical/microbiological criteria derived from medical records and acknowledge that this may have failed to distinguish cases of asymptomatic bacteriuria and/or incorrectly classified patients who had been recently treated with antibiotics. Although our results are based on a single hospital, it seems feasible that the issue of over-diagnosis of UTI syndromes in the ED is common to other UK hospitals, since similar findings have been reported from previous studies.

### References:

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