Protocol for Surveillance of Antimicrobial Resistance in Urinary Isolates in Scotland

Version 1.0
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General enquiries and contact details

This is the first version (1.0) of the Protocol for Surveillance of Antimicrobial Resistance in Urinary Isolates in Scotland.

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1. Introduction

Urinary tract infections (UTI) are amongst the most common infections diagnosed in patients in both community and hospital settings and healthcare professionals frequently have to make decisions about prescriptions of antimicrobials for treatment of UTIs. The prevalence of antimicrobial resistance is increasing, and in the majority of cases antimicrobial therapy is initiated empirically before culture results are available.

Currently national surveillance of antimicrobial resistance in Scotland is focused around blood stream infections as this is the most consistently tested and reported type of infection due to its clinical importance. However, it is not the most efficient indicator of emergence and spread of resistance, as resistance often evolves in organisms in other body sites (e.g. respiratory tract, gastrointestinal tract and urinary tract) before these enter the bloodstream. An earlier indication of emerging resistance may be obtained from surveying organisms from other body sites than the bloodstream. In particular urinary isolates are likely to reflect resistance to commonly prescribed oral antimicrobials in hospitals and the community. With the recent emergence of carbapenemase producing Gram-negatives across the UK and other countries it has become imperative to expand surveillance systems to include urinary and other body-site specific isolates. As a result surveillance of antimicrobial resistance in urinary isolates will be introduced in Scotland from January 2012. This protocol provides information to users (diagnostic microbiology laboratories) on testing and reporting to HPS.

Given the large number of urines processed by laboratories and associated data quality issues, it is neither feasible nor practicable to include all significant isolates. The requirements for testing and reporting outlined in this protocol are based on quantitative and qualitative information obtained in a survey of Scottish diagnostic laboratories (2011) of numbers (and distribution of isolates) and methods used for susceptibility testing and phenotype identification.

The statistical power with which changes in resistance frequencies can be determined will vary between species (i.e. for *E. coli* small changes can easily be detected while for more rare organisms only larger changes can be detected). The sample size required to determine emerging resistance will be the same in both small and large NHS Boards.

Each Scottish NHS Board is required to provide susceptibility data on 400 urinary samples per quarter (1600 per year). Susceptibility data should be generated in VITEK 2 systems and be identified to species level. The use of VITEK 2 systems is central to the standardization of species identification and susceptibility testing across all diagnostic laboratories. This approach is in line with the CNO letter to laboratories of March 2011.

Finally, NHS Boards should start participating in the new surveillance programme of AMR in urinary isolates from **1 January 2012**.

2. Aim

The aim of the AMR surveillance of urinary isolates is to strengthen and complement the existing national programme on antimicrobial resistance in bacteraemias by providing early warnings on emerging multidrug resistant strains and changes in proportions of resistance in commonly isolated urinary organisms.

This will be obtained through quarterly monitoring of antimicrobial resistance in a subset of urinary specimens from all NHS Boards using standardised susceptibility testing methodology, by detecting and reporting;

- changes in antimicrobial resistance proportions
- changes in proportions of ESBL (*E. coli*)
- changes in proportions of multidrug resistance (MDR)
- emerging carbapenemase producing organisms (and typing results)

3. Data definitions and inclusion criteria

Definition of eligible urinary samples

Urinary samples with significant growth, for which species have been identified and antimicrobial susceptibility tested in VITEK 2 systems, are eligible for inclusion in the UTI AMR surveillance. If identification of species has not been carried out in VITEK 2 an alternative sufficiently discriminatory method is to be decided by the laboratory (for *E. coli* identification on chromogenic agar would be acceptable).

Multiple isolates in one urinary sample

In cases where urinary samples had more than one organism cultured, a maximum of two isolates (i.e. two different organisms) from the same urinary sample should be included in the surveillance. It is assumed that laboratories do not carry out susceptibility testing when more than two organisms are present in the same sample.

Repeat samples

Repeat samples from the same patient, cultured within 2 weeks of the first isolation, should be excluded.

4. Reporting to HPS

Quarterly reporting of samples

Each NHS Board should submit data representing 400 consecutive non-duplicate urinary samples each quarter via the Observa/ECOSS link containing information on species and susceptibility results from VITEK 2.

In cases where two organisms from the same sample have been cultured these count as one entry as the reporting requirement is based on number of samples.

For NHS Boards with more than one laboratory the number of specimens from each laboratory should represent the proportion of urinary specimens that each laboratory tests out of the total for that NHS Board.

HPS will filter the first 400 non-duplicate specimens per quarter from the VITEK data stream from each NHS Board.

5. Data analysis at HPS

Data quality check

Each quarter the data received at HPS will be checked for completeness, duplicate samples and checked for transcription errors. Quality reports will summarise completeness figures and potential data quality issues. The data will be checked for repeat samples (and other repeat entries). If a NHS board (or specific laboratory) do not meet the submission criteria HPS will contact the NHS Board/laboratory in question.

Data analysis

Data will be analysed on an annual basis in order to determine changes in susceptibility, emergence of new resistances and changes in proportion of ESBL-producers. The submitted data (derived from VITEK) are linked to additional patient and sample information stored in ECOSS (received from NHS Boards' LIMS).

The following outputs will be generated:

- Numbers of culture positives (tested in VITEK) submitted per quarter by each NHS Board will be summarised (this should be at least 400 non-duplicate specimens per NHS Board per quarter).
- A breakdown into number of mid-stream urines, catheter sample and non-defined urines will be summarised (to the extent these data are available).
- The proportion of ESBL-producing organisms will be calculated for *E. coli* and *K. pneumoniae*.
- Susceptibility data will be analysed using 'SIR' categories ('percentage susceptible + Intermediate', and 'percentage resistant' will be calculated) at Scotland level. For *E. coli* and *K. pneumoniae* distribution of MIC-values will be determined.
- Resistance will be monitored against agents used for treating UTIs (indications as listed in SIGN88 guideline are given in parenthesis) (1) and against other agents that are important as indicators of development of resistance:

  <u>Agents used for treatment of UTI:</u>
  - nitrofurantoin (acute lower UTI)
  - trimethoprim (acute lower UTI, alter. bacterial UTI in men)
  - ciprofloxacin (acute upper UTI, bacterial UTI in men)
  - co-amoxiclav (alternative acute upper UTI, alter bacterial UTI in men)

  <u>Other agents:</u>
  - extended spectrum beta-lactams (ampicillin/amoxicillin)
  - third generation cephalosporins (cefotaxime/ceftazidime)
  - carbapenems (meropenem)
  - aminoglycosides (gentamicin)
  - tetracycline

  - Frequency of multidrug resistance (when resistance to more than 3 categories of antimicrobials are observed)

Additional data from ECOSS AMR-alerts and Colindale (ARMRL) Typing data

Unusual resistance profiles (and phenotypes) in urinary isolates which have been detected in this surveillance programme and/or by the HPS AMR-alert system will be summarised and analysed.

Typing results from ARMRL, Colindale, on Scottish urinary isolates will be summarised as well.

Limitations to the data

Since only a proportion of all urine specimens are tested and reported in this programme, small changes in resistance among more rare organisms (non-E. coli) and emergence of new phenotypes (e.g. carbapenemase producers) may be missed by chance. However, the sample size (i.e. 400 specimens per month) has been estimated to be sufficient to detect even minor changes in resistance and ESBL proportions among *E. coli* at NHS Board level.

The sampling of patients with urinary tract infection also pose a problem as sampling tends to concentrate on patients who did not respond to empirical antimicrobial treatment and therefore potentially is biased towards higher resistance levels.

For this programme to be fully effective it needs to run alongside more comprehensive local surveillance of urinary tract infections.

6. Publication

Data will be published in the SAPG Annual Report on Antimicrobial Use and Resistance.

7. Future developments

Urinary isolates are derived from a range of conditions including acute lower UTI, acute upper UTI and catheter associated UTI. Furthermore, the distribution of organisms may vary between hospital acquired and community acquired UTI, and variations in disease severity, age and sex may all cause bias in the relative frequencies of antimicrobial resistance within each species

(2). Currently information held in ECOSS on sample types (midstream urine, catheter urine), location of patient in hospital or community and further clinical details are incomplete. The AMR UTI surveillance could be improved by collecting additional information on sample type and clinical details.

Reference List

1. Scottish Intercollegiate Guidelines Network (SIGN). Management of suspected bacterial urinary tract infection in adults - a national clinical guideline. 2006.
Ref Type: Report

2. Farrell, D. J., Morrissey, I., De, R. D., Robbins, M., and Felmingham, D. A UK multicentre study of the antimicrobial susceptibility of bacterial pathogens causing urinary tract infection. J Infect, 2003, 46: 94-100.
Ref Type: Journal