Short Communication

Impact of selective reporting of antibiotic susceptibility test results on the appropriateness of antibiotics chosen by French general practitioners in urinary tract infections: a randomised controlled case-vignette study

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ABSTRACT

Selective reporting of antibiotic susceptibility test (AST) results is a potential intervention for laboratory-based antibiotic stewardship. The aim of this study was to assess the impact of AST reporting on the appropriateness of antibiotics selected by French general practitioners for urinary tract infections (UTIs). A randomised controlled case-vignette study in a region of northeast France surveyed general practitioners between July and October 2015 on treatment of four clinical cases of community-acquired *Escherichia coli* UTIs (two cases of complicated cystitis, one of acute pyelonephritis and one male UTI). In Group A, selective reporting of AST results was used for the first two cases and complete reporting for the other two cases; these were reversed in Group B. The overall participation rate was 131/198 (66.2%). Provision of selective AST results significantly increased the rate of adherence to national guidelines for first-line antibiotic treatment in Cases 1, 3 and 4 by 22.4% (55.2% vs. 32.8%, $P = 0.01$), 67.5% (75.0% vs. 7.5%, $P < 0.001$) and 36.3% (45.3% vs. 9.0%, $P < 0.001$), respectively. The improvement in compliance was not significant for Case 2. Prescriptions of amoxicillin–clavulanic acid, fluoroquinolones and cephalosporins decreased by 25.0% to 45.0%, depending on the clinical vignette. Most (106/131, 81.0%) participants favoured the routine use of selective reporting of AST results. In conclusion, selective reporting of AST results seems to improve antibiotic prescribing practices in primary care, and may be considered a key element of antimicrobial stewardship programmes.

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1. Introduction

Bacterial resistance to antibiotics is a major international public health problem. Epidemiologic surveillance networks have confirmed that the prevalence of multidrug-resistant bacteria has risen in the outpatient setting as well as in hospitals. This increase is particularly worrying for extended-spectrum beta-lactamase-producing Enterobacteriaceae. Aware that misuse of antibiotics is the principal factor in the emergence of resistance, public health authorities

have established numerous action plans aimed at combatting this misuse. Antibiotic therapy must be restricted to proven or strongly suspected bacterial infections, and the prescription of broad-spectrum antibiotics, especially cephalosporins and fluoroquinolones, must be limited [1,2].

In France, 90% of antibiotics are prescribed to outpatients, and 70% are prescribed by general practitioners (GPs); more than half of these treatments are unnecessary or inappropriate [3,4]. The principal diseases motivating these prescriptions are (upper and lower) respiratory infections (70%) and urinary tract infections (UTIs, 16%) [4,5]. *Escherichia coli* remains the pathogen most frequently isolated in community-acquired UTIs (70–95%) [5].

Numerous measures have been recommended to improve appropriate use of antibiotics in the outpatient setting [6,7], including selective reporting of antibiotic susceptibility test (AST) results (i.e. six

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drugs or fewer) [8]. There appears to be a close association between AST reporting and antibiotic prescriptions [9]. Antibiotics included on an AST report are prescribed more often, even if they are not indicated [10]. Inversely, a restricted or selective report makes it possible to limit the rate at which some antibiotics are prescribed and to improve de-escalation practices [11–13]. Some professional societies of specialists in microbiology and infectious diseases include this strategy in their guidelines, such as the most recent Infectious Diseases Society of America guidelines, although the level of evidence remains low [8,14,15]. The use of selective rather than complete AST reporting made it possible to improve adherence to the French guidelines for antibiotic prescriptions in UTIs in a case-vignette-based study of French trainees in general practice [16]. However, to the authors' knowledge, no survey of this type has been conducted among senior GPs. As such, the aim of this study was to assess the impact of AST reporting on the appropriateness of antibiotic selection for UTIs by French GPs.

2. Materials and methods

2.1. Design and participants

A randomised-controlled case-vignette survey was conducted in a region of northeast France (Lorraine) between 1 July and 30 October 2015. All GPs practising in Lorraine (population 2,350,000 according to 2012 census) were eligible. The French health insurance database was used to identify GPs eligible for inclusion in this survey ($n = 2630$). In total, 200 GPs were selected at random from this database and allocated to one of two groups: Group A, which received the standard full-length AST report (25 antibiotics, among those recommended by the French Society of Microbiology) for the first two case vignettes (Cases 1 and 2) and selective AST reporting (four to six antibiotics) for the last two case vignettes (Cases 3 and 4); and Group B, which received selective AST reporting for Cases 1 and 2 and a full-length AST report for Cases 3 and 4.

2.2. Survey questionnaire

The questionnaire was drafted, tested and validated by a multidisciplinary working group of doctors specialised in general practice, infectious diseases, public health and microbiology. It had three parts; the first and third parts were common to both groups, while the second part, which included the four case vignettes, differed according to the randomisation group, as described above (Appendix S1).

Part I of the questionnaire included the following information: GPs' sociodemographic data, training in infectious diseases, comfort in using AST results, need for training in interpreting AST results, and assessment of their knowledge about first-line empiric antibiotic therapy of non-severe cases of acute uncomplicated cystitis and acute uncomplicated pyelonephritis.

Part II of the questionnaire included four fictitious case vignettes of community-acquired UTIs frequently encountered in practice [17]. The first two cases concerned acute complicated cystitis: one due to *E. coli* susceptible to multiple drugs (Case 1), and the other due to *E. coli* producing a penicillinase (Case 2). Case 3 concerned non-severe acute uncomplicated pyelonephritis due to *E. coli*, which was resistant to nalidixic acid and secreted a penicillinase (Case 3), and Case 4 concerned a male UTI due to fluoroquinolone-resistant *E. coli*. The patients in Cases 1 and 2 did not receive any empiric antibiotic therapy, while those in Cases 3 and 4 were treated with ciprofloxacin (according to French guidelines) [5]. This part differed in AST reporting (complete or selective) according to study group, as indicated above.

Part III of the questionnaire concerned the participants' perceptions about the utility of selective reporting of AST results in choosing antibiotic therapy, and their general acceptability of selective reporting in current medical practice.

2.3. Selective reporting of antibiotic susceptibility data

The antibiotics mentioned in the selective AST reports were chosen according to the bacterial resistance profile and the patient's sex, which are the only relevant factors routinely available to microbiologists in France. The selected antibiotics always included the first-line antibiotic according to the national guidelines, as well as at least one alternative for patients potentially allergic to this antibiotic [5]. Amoxicillin–clavulanic acid, fluoroquinolones and cephalosporins are all broad-spectrum antibiotics considered to have high potential for selection for resistance. As their use must therefore be limited to the strict minimum according to the French Drug Agency, they were systematically not reported in the selective reports when alternatives existed.

2.4. Data collection

Each of the 200 eligible GPs was contacted by telephone and email to describe the survey and to invite them to participate by completing a web-based questionnaire on the SurveyMonkey website. A tracking number was used for each participant to ensure confidentiality. In Part II of the questionnaire, which included the vignettes and the questions about them, participants selected the antibiotic that they would prescribe from a drop-down menu listing the antibiotics mentioned in the AST report. GPs who had not responded after 1 month received one email reminder.

2.5. Outcomes

The primary outcome was the appropriateness of the intended targeted antibiotic prescriptions, based on the available antibiotic susceptibility data. An antibiotic prescription was considered to be appropriate if it adhered to the 2014 French UTI guidelines [5]. The secondary outcome was the prescription rate of amoxicillin–clavulanic acid, cephalosporins and fluoroquinolones.

2.6. Statistical analysis

Data analysis was performed using STATA Version 9.2 (StataCorp LP, College Station, TX, USA). It was calculated that a sample of 126 participants (63 in each group) would have a power of 90% to detect an absolute difference of 30% (i.e. 50% vs. 20%) for $P = 0.05$. Categorical variables were expressed as proportions, and continuous variables were expressed as means $\pm$ standard deviations (SD). Characteristics of participants were compared between the two groups, as were the percentages of appropriate prescriptions and the percentages of amoxicillin–clavulanic acid, cephalosporins and fluoroquinolones prescribed. Pearson Chi-squared tests were used to compare the categorical variables, and analysis of variance was used to compare the continuous variables. A two-sided $P < 0.05$ was considered to indicate significance.

3. Results

In total, 131/198 GPs (66.2%) participated in the survey: 64/100 (64.0%) in Group A and 67/98 (68.4%) in Group B (Appendix S2).

3.1. GPs' characteristics

Table 1 shows that the 131 GPs who participated in the study did not differ significantly from the 67 GPs who did not participate in terms of their sex ratio, area or type of practice. Most respondents were men (64.8%), their mean $\pm$ SD age was 49.6 $\pm$ 10.7