26th ECCMID
Amsterdam, Netherlands
9 – 12 April 2016
ESCMID

P1219

Antimicrobial stewardship initiatives and their impact on local antimicrobial resistance at an English district general hospital

Jayakeerthi Rangaiah, Hani Habayeb and Clive Grundy

Ashford and St. Peter's Hospitals NHS
NHS Foundation Trust

Dr Jayakeerthi Rangaiah
Consultant Microbiologist & Infection Control Doctor
St Peter's Hospital, Guildford Road, Chertsey
Surrey KT16 0PZ
United Kingdom
Tel: 00441932723423
Jayakeerthi.Rangaiah@asph.nhs.uk

INTRODUCTION

Antimicrobial resistance is now a major global health problem and overuse of antibiotics in humans is one of the main contributing factors. The recently published English surveillance programme for antimicrobial utilization and resistance (ESPAUR 2010-14)[1] revealed an overall increase in antibiotic resistant blood stream infections (BSI) and in particular resistance to 3rd-generation cephalosporins and piperacillin-tazobactam, predominantly in *Klebsiella pneumoniae* (Figure 1). While the proportion of *Escherichia coli* resistant to key antibiotics remained constant, the increased incidence of BSIs meant more individuals have had a significant antibiotic resistant *E. coli* BSI. The study also found increasing use of broad spectrum antibiotics within acute health care facilities (Figure 2) and suggested this as the main contributing factor for increasing resistance.

The objective of the present study was to determine the local incidence of *E. coli* and *K. pneumoniae* BSIs and their resistance trends after introducing a few antimicrobial stewardship initiatives in our hospitals.

METHODS

Antimicrobial stewardship initiatives: The key intervention was to introduce temocillin (in combination with other agents) to treat two of the common clinical conditions where piperacillin-tazobactam had been used. In 2012, we changed the recommended choice of antibiotic from piperacillin-tazobactam to temocillin in combination with amoxicillin to treat hospital acquired pneumonia (HAP). We recommended using teicoplanin in place of amoxicillin if MRSA was suspected and adding metronidazole if there was aspiration. The safety and efficacy of this combination was evaluated in a previous study.[2] In 2013, temocillin was introduced as first line antibiotic of choice along with amoxicillin and a stat dose of gentamicin to treat urosepsis. The clinical efficacy of this is being audited currently. Continuous education in the form of teaching junior doctors on induction and mandatory educational sessions for senior doctors including consultants, frequent antibiotic use & appropriateness audits with active feedback to prescribers happens throughout the year. The local use of antibiotics was calculated using the defined daily dose (DDD) as per the World Health Organization (WHO) and trends of antibiotic resistance in BSI were retrieved from April 2012 to March 2015 from relevant electronic databases. The data on *E. coli* and *K. pneumoniae* were de-duplicated so that only one isolate of these bacteria per patient and per admission was included in the analysis.

Bacteria	Antibiotic resistance (non-susceptibility) metric	Proportion resistant in 2014 (%)	2014 compared to 2010*
Bloodstream infections			
Escherichia coli	% NS to ciprofloxacin	18.7	↔
E. coli	% NS to cefotaxime and/or ceftazidime	11.1	↑
E. coli	% NS to gentamicin	9.6	↔
E. coli	% NS to imipenem and/or meropenem	0.1	↔
E. coli	% NS to co-amoxiclav	42.0	↑
E. coli	% NS to piperacillin/tazobactam	11.0	↑
Klebsiella pneumoniae	% NS to ciprofloxacin	10.9	↔
K. pneumoniae	% NS to cefotaxime and/or ceftazidime	12.1	↑
K. pneumoniae	% NS to gentamicin	7.5	↔
K. pneumoniae	% NS to imipenem and/or meropenem	1.5	↑
K. pneumoniae	% NS to piperacillin/tazobactam	16.9	↑

Figure 1 Antibiotic resistance in key infections, England, 2010–2014 (ESPAUR)

	General Practice	Compared to 2010	NHS Trusts	Compared to 2010
Broad Spectrum Antibiotics				
Penicillins and enzyme inhibitor	0.9	↑	0.9	↑
Cephalosporins	0.26	↔	0.22	↑
Carbapenems	0.001	↔	0.08	↑
Quinolones	0.3	↓	0.2	↔
Narrow Spectrum Antibiotics				
Penicillins (without enzyme inhibitors)	6.2	↑	1.2	↔
Tetracycline	4.5	↑	0.33	↓
Macrolides	2.7	↑	0.5	↑
Sulfonamides and trimethoprim	1.2	↔	0.4	↑
Proportion of broad spectrum antibiotics/ total antibiotics	8.5%	↓	33.3%	↑
Total antibiotic use expressed as DDD per 1000 inhabitants per day	17.1	↑	4.2	↑
Total antibiotic prescriptions expressed as items per STARPU^	1.233	↔		NA

Figure 2 Summary of antibiotic consumption in general practice and NHS trusts, presented as DDD per 1000 inhabitants per day (with changes compared to 2010), England, 2010–2014

RESULTS

Similar to the findings of the ESPAUR, our rates of BSI due to both *E. coli* and *K. pneumoniae* increased during the study period, although not to the same extent (see table to the right). However, unlike the national findings, we observed downward trends in their antibiotic resistance. Resistances to piperacillin-tazobactam (TZP) fell by roughly 50% and 66% in *E. coli* and *K. pneumoniae* respectively. The same trend was also observed for 3rd generation cephalosporins (3GC) and ciprofloxacin although only to a lesser extent. No increase in resistance to temocillin was observed. During the study period, the use of piperacillin-tazobactam decreased from 7908 to 6048 DDD (WHO DDD is 14 gram) while the use of temocillin increased from 7248 to 11532 DDD (WHO DDD is 2 gram).

	2012/13	2014/15	Trend
N° of *E. coli* BSI	210	216	↑
% Resistant to TZP	17	8	↓
% Resistant to temocillin	3	2	=
% Resistant to ciprofloxacin	26	18	↓
% Resistant to 3GC	17	13	↓
N° of *K. pneumoniae* BSI	28	34	↑
% Resistant to TZP	29	9	↓
% Resistant to temocillin	11	3	↓
% Resistant to 3GC	25	18	↓
% Resistant to ciprofloxacin	18	9	↓

DISCUSSION

The Department of Health in England (2013) published 'UK Five year antimicrobial resistance strategy 2013-2015, with three overarching goals:[3]

1) Improve the knowledge and understanding of AMR
2) Conserve and steward the effectiveness of existing treatments
3) Stimulate the development of new diagnostics, antibiotics and novel therapies

In small to medium sized acute health care settings, goals 1 and 2 will be feasible. In order to promote antimicrobial stewardship, NHS England has introduced the target of reducing the antibiotic consumption per 1,000 admissions (total antibiotic consumption, carbapenem and piperacillin-tazobactam consumption per 1,000 admissions) under the commissioning for quality and innovation (CQUIN) framework for 2016-17.[4] Apart from improving infection diagnosis and management, interventions like switching from a broad spectrum antibiotic to temocillin, a narrower spectrum penicillin with high beta-lactamase stability in combination therapy helps reduce the burden of antimicrobial resistance considerably.

CONCLUSIONS

Our findings demonstrate that a proactive antimicrobial stewardship programme with the key intervention of switching from broad spectrum antibiotics to temocillin, a narrow spectrum β-lactamase-resistant penicillin in combination therapy helps reduce the burden of antimicrobial resistance considerably. This study also shows that apart from reducing resistance to broad spectrum antibiotics, these interventions help achieve the targets of reducing use of broad spectrum antibiotics in acute health care settings.

REFERENCES

1. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/477962/ESPAUR_Report_2015.pdf
2. Habayeb et al. "Amoxicillin plus temocillin as an alternative empiric therapy for the treatment of severe hospital-acquired pneumonia ". Eur J Clin Microbiol Infect Dis2015, 34(8):1693-1699
3. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244058/20130902_UK_5_year_AMR_strategy.pdf
4. https://www.england.nhs.uk/wp-content/uploads/2016/03/cquin-nat-indictrs.docx