Antibiotic resistance

- Secondary Care: Facts and figures

EUROPEAN ANTIBIOTIC AWARENESS DAY
A European Health Initiative

Fact 1. Antibiotics remain an invaluable but finite resource. They have contributed to the reduction in mortality and morbidity from infectious disease and have made other treatments and procedures such as cancer treatments and organ transplantation possible.

Whilst the number of infections due to antibiotic-resistant bacteria is growing, the pipeline for new antibiotics is discouraging.

It is important to preserve antibiotics, in particular carbapenems (imipenem, meropenem, ertapenem and doripenem) which are in valuable for the treatment of infections due to multi-resistant gram negative bacteria, including extended b-lactamases.

Carbapenem-resistant Enterobacteriaceae remain an emerging threat (Figure 1)

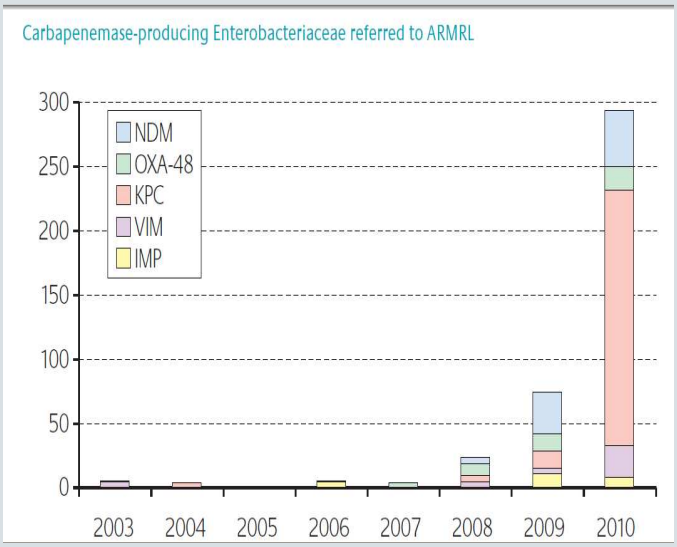

Figure 1: Carbapenemase-producing Enterobacteriaceae referred to Antibiotic Resistance Monitoring & Reference Laboratory, Health Protection Agency, England
http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1294740725984

Fact 2. Antibiotic resistance is an increasingly serious patient safety and public health problem in Europe and the world

The emergence, spread and selection of antibiotic-resistant bacteria is a threat to patient safety in hospitals[1, 2] because:

- Infections with antibiotic-resistant bacteria result in increased patient morbidity and mortality, increased hospital length of stay and costs. [4-5];
- Antibiotic resistance frequently leads to a delay in appropriate active antibiotic therapy[6]
- Inappropriate or delayed antibiotic therapy in patients with severe infections leads to worse patient outcomes and sometimes death[7-9].

Fact 3. Misuse of antibiotics in hospitals is one of the main factors driving antibiotic resistance

Patients who are hospitalised have a high probability of receiving an antibiotic[10] and 50% of all antibiotic use in hospitals may be inappropriate[, 11]. Misuse of antibiotics in hospitals is one of the main factors driving development of antibiotic resistance[12-14].

Misuse of antibiotics include[15]:

- Delaying antibiotic treatment in critically ill patients;
- Prescribing antibiotics unnecessarily
- Using broad-spectrum antibiotics too generously, or narrow-spectrum antibiotics incorrectly;
- Using lower or higher antibiotic dose than appropriate for the specific patient;
- Inappropriate duration of antibiotic treatment - too short or too long
- Not modifying antibiotic treatment according to microbiological culture data results.
- Omitting or delaying doses of prescribed antibiotics

Fact 4. Benefits of prudent antibiotic use

Prudent use of antibiotics can prevent the emergence and selection of antibiotic-resistant bacteria[2, 14, 16-18].Decreasing antibiotic use has been shown to result in lower incidence of antibiotic resistant bacteria and *Clostridium difficile* infections[1, 2, 16, 19] (Figures 2 and 3 overleaf).

Antibiotic resistance

- **Secondary Care:** Facts and figures

EUROPEAN ANTIBIOTIC AWARENESS DAY

A European Health Initiative

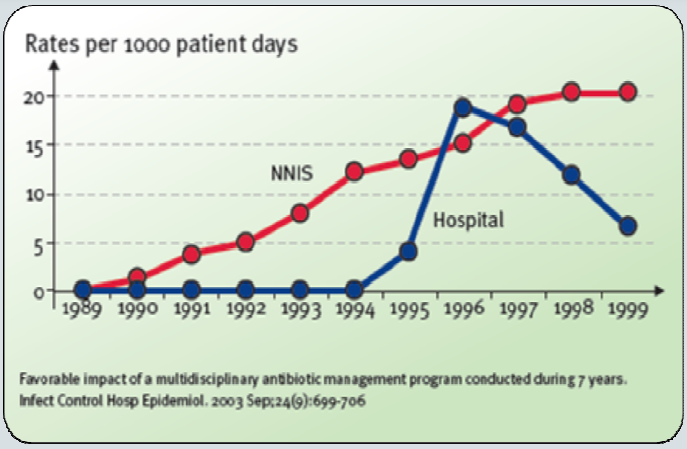

Figure 2. Rates of Vancomycin-resistant *Enterococci* in hospital before and after implementation of the antibiotic management program compared with rates in National Nosocomial Infections Surveillance (NNIS) System* hospitals of similar size. Source: Carling P, et al 2003[16].

*NNIS is now the National Healthcare Safety Network (NHSN).

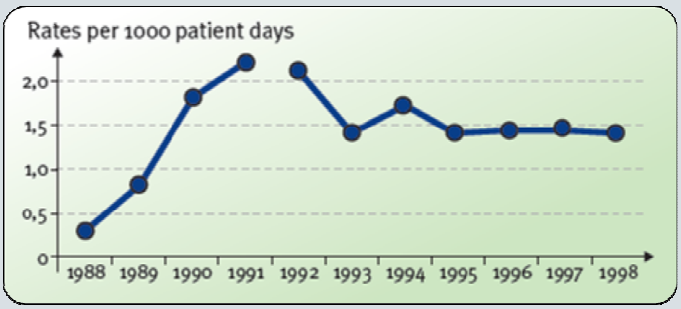

Figure 3. Rates of nosocomial *Clostridium difficile*, expressed per 1,000 patient-days, before and after implementation of the antibiotic management program. Source: Carling P, et al 2003[16].

Fact 5. Multifaceted strategies can result in prudent antibiotic use

Multifaceted strategies to promote prudent use of antibiotics (Antimicrobial Stewardship) include: [2, 16, 20, 21, 22-25]

- Adherence to national **antimicrobial stewardship guidance**[2, 25];
- Ongoing and repeated education of prescribers and specialists [2];
- Adherence to evidence-based **local hospital antibiotic guidelines** and policies[2, 16, 20];
- Monitoring of hospital antibiotic resistance and antibiotic use data to guide empiric antibiotic therapy in severely ill patients[21];
- Administering antibiotic prophylaxis for surgery following guidelines on the correct timing and optimal duration[22];
- For some indications, using shorter rather than longer duration of treatment[12, 23-24];
- Ensuring strategies are in place to prevent delayed doses of antibiotics or patients missing doses
- Taking microbiological samples before initiating empiric antibiotic therapy, monitoring culture results and streamlining antibiotic treatment based on the culture results[25].
- Consult with infectious diseases physicians, microbiologists and pharmacists in your decisions about antibiotic therapy for patients[2,16,20]

References

1. Health Protection Agency Centre for Infections (2009) Pseudomonas spp and E.coli bacteremia in England; Wales and Northern Ireland: 2005 to 2009. http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1274087560639. **2.** Davey P, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst Rev. 2005(4):CD003543. **3.** Bartlett JG, et al. Clindamycin-associated colitis due to a toxin-producing species of Clostridium in hamsters. J Infect Dis. 1977 Nov;136(5):701-5. **4.** Cosgrove SE and Carmeli Y. The impact of antimicrobial resistance on health and economic outcomes. Clin Infect Dis. 2003 Jun 1;36(11):1433-7. **5.** Roberts RR, et al. Hospital and societal costs of antimicrobial-resistant infections in a Chicago teaching hospital: implications for antibiotic stewardship. Clin Infect Dis. 2009 Oct 15;49(8):1175-84. **6.** Kollef MH, et al Inadequate antimicrobial treatment of infections: a risk factor for hospital mortality among critically ill patients. Chest. 1999 Feb;115(2):462-74. **7.** Ibrahim EH, et al. The influence of inadequate antimicrobial treatment of bloodstream infections on patient outcomes in the ICU setting. Chest. 2000 Jul;118(1):146-55. **8.** Lodise TP, et al . Outcomes analysis of delayed antibiotic treatment for hospital-acquired Staphylococcus aureus bacteremia. Clin Infect Dis. 2003 Jun 1;36(11):1418-23. **9.** Alvarez-Lerma F. Modification of empiric antibiotic treatment in patients with pneumonia acquired in the intensive care unit. ICU-Acquired neumonia Study Group. Intensive Care Med. 1996 May;22(5):387-94. **10.** Ansari F, et al. The European surveillance of antimicrobial consumption (ESAC) point-prevalence survey of antibacterial use in 20 European hospitals in 2006. Clin Infect Dis. 2009 Nov 15;49(10):1496-504. **11.** Willemsen I, et al. Appropriateness of antimicrobial therapy measured by repeated prevalence surveys. Antimicrob Agents Chemother. 2007 Mar;51(3):864-7. **12.** Singh N and Yu VL. Rational empiric antibiotic prescription in the ICU. Chest. 2000 May;117(5):1496-9. **13.** Lesch CA, et al. Multi-hospital analysis of antimicrobial usage and resistance trends. Diagn Microbiol Infect Dis. 2001 Nov;41(3):149-54. **14.** Lepper PM, et al. Consumption of imipenem correlates with beta-lactam resistance in Pseudomonas aeruginosa. Antimicrob Agents Chemother. 2002 Sep;46(9):2920-5. **15.** Gyssens IC, et al. Optimizing antimicrobial therapy. A method for antimicrobial drug use evaluation. J Antimicrob Chemother. 1992 Nov;30(5):724-7. **16.** Carling P, et al. Favorable impact of a multidisciplinary antibiotic management program conducted during 7 years. Infect Control Hosp Epidemiol. 2003 Sep;24(9):699-706. **17.** Bradley SJ, et al. The control of hyperendemic glycopeptide-resistant Enterococcus spp. on a haematology unit by changing antibiotic usage. J Antimicrob Chemother. 1999 Feb;43(2):261-6. **18.** De Man P, et al. An antibiotic policy to prevent emergence of resistant bacilli. Lancet. 2000;355(9208):973-8. **19.** Fowler S, et al. Successful use of feedback to improve antibiotic prescribing and reduce Clostridium difficile infection: a controlled interrupted time series. J Antimicrob Chemother. 2007 May;59(5):990-5. **20.** Byl B, et al. Impact of infectious diseases specialists and microbiological data on the appropriateness of antimicrobial therapy for bacteremia. Clin Infect Dis. 1999 Jul;29(1):60-6; discussion 7-8. **21.** Beardsley JR, et al. Using local microbiologic data to develop institution-specific guidelines for the treatment of hospital-acquired pneumonia. Chest. 2006 Sep;130(3):787-93. **22.** Steinberg JP, et al. Timing of antimicrobial prophylaxis and the risk of surgical site infections: results from the Trial to Reduce Antimicrobial Prophylaxis Errors. Ann Surg. 2009 Jul;250(1):10-6. **23.**Chastre J, et al. Comparison of 8 vs 15 days of antibiotic therapy for ventilator-associated pneumonia in adults: a randomized trial. Jama. 2003 Nov 19;290(19):2588-98. **24.**Ibrahim EH, et al. Experience with a clinical guideline for the treatment of ventilator-associated pneumonia. Crit Care Med. 2001 Jun;29(6):1109-15.**25.** Rello J, et al. The value of routine microbial investigation in ventilator-associated pneumonia. Am J Respir Crit Care Med. 1997 Jul;156(1):196-200.**25** Department of Health and Health Protection Agency, (DH and HPA) 2009. Clostridium difficile infection: how to deal with the problem. Available at: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_093220 [Accessed July 17, 2011]

ecdc European Centre for Disease Prevention and Control

Supported by the Department of Health

DH Department of Health