Selected abstracts from the RCPE Healthcare-associated Infection Symposium 2010

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THE EFFECTS OF ANTIMICROBIAL CLASS RESTRICTION

Professor Jan Kluytmans, Professor of Medical Microbiology and Infection Control, VU Medisch Centrum, Amsterdam, and Amphia Hospital, Breda, The Netherlands

We determined the effects of multiple targeted interventions on the use of quinolones and observed resistance to quinolones in *Escherichia coli* in hospitalised patients. A bundle consisting of four interventions to improve the use of quinolones was implemented. The outcome was measured using the monthly use of intravenous (IV) and oral quinolones and the susceptibility patterns for *E. coli* from hospitalised patients. Statistical analyses were performed using segmented regression analysis and segmented Poisson regression models. Bayesian model averaging was used to account for model uncertainty.

Before the bundle was implemented, the annual use of quinolones was 2.7 DDD/100 patient days. After the interventions, in 2007, this was reduced to 1.7 DDD/100 patient days. The first intervention, a switch from IV to oral medication, was associated with a stepwise reduction of IV quinolone use of 71 prescribed daily doses (PDD) per month (95% confidence interval [CI]: 47–95, $p<0.001$). Intervention two, introduction of a new antibiotic guideline and education programme, was associated with a stepwise reduction of overall use of quinolones (reduction: 107 PDD/month, 95% CI: 58–156). Before the interventions the quinolone resistance rate was increasing on average by 4.6% (95% CI: 2.6–6.1) per year. This increase levelled off, which was associated with intervention two and intervention four, active monitoring and feedback of prescriptions. No changes in the trends of resistance rates to other antimicrobials were observed.

This study showed that the hospital-wide use of quinolones can be significantly reduced by an active policy consisting of multiple interventions. The change in quinolone use coincided with the end of the increasing trend of quinoloine resistance.

Declaration of interests None declared.

PROACTIVE AND REACTIVE: ANTIMICROBIAL MANAGEMENT IN GREATER GLASGOW AND CLYDE

Dr Andrew Seaton, Consultant in Infectious Disease, Gartnavel General Hospital, Glasgow

Rising rates of *Clostridium difficile*-associated infection (CDI) and methicillin-resistant *Staphylococcus aureus* (MRSA) with high-profile outbreaks have been a feature of modern-day hospital practice in the UK in recent years. The recognition of the crucial role of antibiotic prescribing in selection of CDI, MRSA and other resistant organisms has lead to the development of a national strategy for antibiotic prescribing through the Scottish Antimicrobial Prescribing Group (SAPG). Within this national framework, local antimicrobial management teams (AMT) have key responsibility for driving prudent prescribing policy in health boards.

NHS Greater Glasgow and Clyde (GGC) health board is the largest health board in Scotland, providing care for a population of about 1.2 million and accounting for approximately 30% of the nation's acute admissions. The GGC AMT, formed in June 2008, has introduced and monitored restrictive guidance in both hospitals and general practice. Specific restrictions have been placed on cephalosporins, quinolones, clindamycin and beta lactam-beta lactamase inhibitor combination agents. Substantial reductions in the volume of these agents and complementary increases in narrower spectrum prescribing have been associated with significant reductions in CDI.

Current challenges for the AMT and for SAPG include monitoring for potential antibiotic-related adverse events (particularly gentamicin toxicity) and vigilance, through surveillance, in detecting changing patterns of prescribing and resistance to recycled agents. The quality of prescribing, both in terms of prudence and efficacy, remain central goals of antimicrobial prescribing programmes. Prescriber education and improved awareness by the whole clinical team are fundamental in ensuring early successes in antimicrobial management are continued.

Declaration of interests None declared.

CLOSTRIDIUM DIFFICILE: LESSONS LEARNT FROM THE CANADIAN EXPERIENCE

Dr Mark Miller, Chair of Infection Prevention and Control, Jewish General Hospital, and McGill University, Montreal, Quebec, Canada

The new millennium witnessed the appearance of a hypervirulent clinical form of CDI rarely seen in previous years: increased severity of symptoms (e.g. diarrhoea, ileus, pancolitis, leukocytosis, sepsis) and a markedly higher morbidity (that is, the need for intensive care and/or colectomy) and attributable mortality. This syndrome has been linked with a novel CD clone, typed as NAP1/027/III/BI, which demonstrated high-level fluoroquinolone resistance, presence of binary toxin genes and in vitro production of high levels of CD toxins.

The largest and earliest described epidemics occurred in Pittsburgh (USA), the Montreal/Sherbrooke area (Canada), and the Netherlands.

Continuous surveillance of CDI in Canada since 2005 has allowed a rare glimpse of this pathogen as it spreads across the country. The Canadian surveillance projects have produced the largest linked clinical/microbiological database of CDI in the world, which has shown:

- The movement of the 'hypervirulent' epidemic strain in Canada mirrors the appearance of severe CDI and healthcare-associated epidemics;
- The patient's age and the infecting strain type are highly predictive of the outcome of CDI;
- CDI epidemics can be controlled quickly by vigorous application of multi-faceted infection prevention and control (IPC) strategies;
- IPC efforts to reduce CDI must be maintained in order to see a sustained effect; lapses in these measures are followed by increased CDI rates.

The story of CDI in Canada is a tragic one: introduction of a virulent pathogen into a healthcare system replete with high-risk patients and inadequate IPC resources led to lethal epidemics. Extraordinary resources were necessary in each instance in order to control epidemics. And the final chapter on this pathogen in Canada has not yet been written.

Declaration of interests Dr Miller has worked as a consultant to Iroko.

CLOSTRIDIUM DIFFICILE: THE UK PERSPECTIVE

Professor John Coia, Director, Scottish Salmonella, Shigella & Clostridium difficile Reference Laboratory, Glasgow

The epidemiology of CDI in the UK has changed in recent years. An increase in the number and apparent severity of CDI in the first half of the past decade, coupled with the occurrence of large outbreaks of infection associated with the emergence of so-called hypervirulent strains, led to the introduction of mandatory surveillance. Laboratory surveillance was further enhanced by the provision of molecular subtyping facilities via the *Clostridium difficile* Ribotyping Network (CDRN) in England, Wales and Northern Ireland, and the Scottish *Clostridium difficile* Reference Service in Scotland. Guidance for the management of CDI was introduced by Health Protection Scotland, the Department of Health and the Health Protection Agency and targets were set for reduction in CDI. Enhanced clinical and infection control efforts, coupled in many cases with the introduction of vigorous antimicrobial stewardship, have been temporally associated with a decrease in CDI across the UK. This talk will discuss the changing epidemiology in more detail, and consider some of the issues and challenges associated with consolidating and improving the gains already achieved.

Declaration of interests Professor Coia has received a research grant from the Scottish Infection Research Network.

CLOSTRIDIUM DIFFICILE: EMERGING ISSUES

Dr Ed Kuijper, Medical Microbiologist, National Reference Laboratory of *C. difficile*, Leiden University Medical Centre, Leiden, The Netherlands

In a recently performed pan-European hospital-based study, the incidence of healthcare-associated CDI varied widely between hospitals (mean: 5.5 per 10,000 patient-days; range: 0–36.3) but was higher than found in a survey in 2005. Most patients had the classical risk profile of an elderly patient with co-morbidity and recent antibiotic use. At three months' follow-up, 22% of patients had died; in 40% of deaths, CDI played a role. Sixty-two different polymerase chain reaction (PCR) ribotypes were found, among which 014 (15%), 001 (10%) and 078 (8%) were most prevalent; the prevalence of PCR ribotype 027 was 5%.

The emergence of type 078 merits attention because it coincides with the increased prevalence of veterinary CDI. Pig breeder farms with recurrent problems of neonatal diarrhoea in the Netherlands and in Spain were all positive for *C. difficile* PCR ribotype 078, indicating the importance of CDI in diarrhoeal piglets and emphasising the need for further research into the association of *C. difficile* emerging disease in humans and animals.

Despite the increasing prevalence of human and veterinary CDI, epidemiological studies on the potential transmission of *C. difficile* between humans and animals are limited. In the Netherlands, we recently investigated 700 stool samples from different animal species and found a low prevalence in dairy cattle. PCR ribotyping of the isolates revealed a species-restricted association, clearly differing from the human situation. Similarly, retailed meat (500 samples) was also found to be contaminated in a very low percentage with *C. difficile* strains, of which the PCR ribotypes are not frequently found in human disease. These observations make it unlikely that animal and food products are an important direct source of human CDI.

The epidemiology of CDI acquired in the community is different than in the hospitals. Community-acquired CDI is an underestimated disease entity. In two recent studies performed in the UK and the Netherlands respectively, stool samples were investigated for the presence of *C. difficile*, irrespective of the physician's request. CDI was diagnosed among 1.5–2% of diarrhoeal patients attending a general practitioner. Community-acquired CDI affected all age groups and 25% had no predisposing risk factor

for CDI. The isolated PCR ribotypes are not frequently encountered in hospital-acquired CDI.

We conclude that CDI is very dynamic, not restricted to healthcare facilities and increasing in various animals.

Declaration of interests None declared.

TARGETS: DO THEY MAKE A DIFFERENCE?

Professor Brian Duerden, Inspector of Microbiology and Infection Control, Department of Health, London

The introduction of mandatory surveillance of MRSA bacteraemias in 2001 and *C. difficile* infection in 2004 showed the scale of the challenge presented by these healthcare-associated infections (HCAI) in the National Health Service (NHS) in England. MRSA bacteraemia figures peaked at 7,700 in 2003/4 and CDI numbers in the over 65 years age group reached 55,681 cases in 2006. These formed the basis of national targets to reduce these infections. The prevention and control of HCAI requires a tripartite partnership between clinicians, who are responsible for the safe care of their patients, health service managers, who must provide the corporate environment to make infection prevention and control effective, and the government/Department of Health, which needs to set standards, ensure that HCAI remains a priority, set targets, monitor the outcome and implement performance management.

The government can also act through legislation, and the Health Act 2006 introduced a statutory code of practice (CoP) for infection prevention and control applicable to all NHS bodies. Under the Health and Social Care Act 2008, a revised CoP was extended to all health and care settings in the independent sector as well as the NHS. All are required to be registered with the Care Quality Commission and registration requires compliance with the CoP. In 2004, a target to halve the number of MRSA bacteraemias was announced. By 2008/9, the NHS in England had achieved a 62% reduction. In 2008, a national target was set for CDI of a 30% reduction by 2010/11. In the first year, a 35% reduction was achieved.

The reductions in HCAI have been achieved by a raft of measures. Crucially, the targets focused a management emphasis on infection prevention and control. This was supported by enhanced surveillance through the Health Protection Agency. Clinical practice protocols were implemented through the high impact interventions in the Saving Lives and Essentials Steps packages to improve performance in the clinical activities that put patients at risk of developing infections, and there was a major emphasis on cleanliness and hygiene (particularly hand hygiene for clinical staff and environmental cleaning in patient areas). All of this needed to be supported by mandatory training programmes for all staff and the audit of implementation of the protocols reviewed at all levels from individual ward and unit to the chief executive and chair of the board.

Achievement of the targets is not the end of the road. There is still more to be done to achieve zero tolerance of avoidable infections and inadequate practice. The targets are to be transformed into objectives that will act as benchmarks or ceilings for all NHS bodies to get below and continue the pressure to reduce the risks of HCAI. The recommendations of the 2009 National Audit Office report and Public Accounts Committee are likely to see an extension of the mandatory surveillance to include other causes of HCAI and to encompass the monitoring and audit of antibiotic prescribing.

Declaration of interests None declared.

NEW TECHNOLOGIES IN INFECTION CONTROL

Professor Hilary Humphreys, Professor of Clinical Microbiology and Head of Department, Royal College of Surgeons in Ireland, and Beaumont Hospital, Dublin, Ireland

With the increasing interest in HCAI as a patient quality and safety issue, developments have taken place in industry and elsewhere to provide new technologies with the potential to prevent or control spread. These include evaluating the cleanliness of environmental contamination, novel methods for decontamination, changes to the physical and chemical composition of medical devices and the use of information technology across a range of areas, such as improving hand hygiene and reminders about best professional practice.

Many of these initiatives have been developed outside the healthcare arena and in some cases are commercially driven but have potential in addition to conventional approaches, such as the use of standard precautions. Regrettably, many are without a sound evidence base and or have not been fully evaluated. However, some, such as silver-impregnated intra-vascular or endotracheal tubes, have been studied in clinical trials, but many others have not been assessed in the clinical arena, partly because of the absence of significant funding from commercial or other sources. There is a need for the full evaluation of new technologies combined with conventional approaches on further reducing HCAI. Consequently, this should be a focus for funding agencies, and health services should support research in this area, while not forgetting the importance of implementing best practice.

Declaration of interests Professor Humphreys has received research grants from Pfizer and Inov8 Science. He has collaborative arrangements with Steris, 3M and Ceheid with reduced consumable costs.

IMPROVEMENT/IMPLEMENTATION APPROACH AS A NATIONAL PROGRAMME IN SCOTLAND

Dr Peter Christie, Consultant in Public Health Medicine, NHS Quality Improvement Scotland, Edinburgh

Quality improvement in healthcare has had a chequered history, with a series of failed projects well documented. However, to quote GK Chesterton, the improvement approach 'has not been tried and found wanting. It has been found difficult, and left untried.' The Scottish Patient Safety Programme (SPSP) is now well established as the first nationally co-ordinated improvement programme of its kind in the world, predicated on engagement with frontline staff, use of local data for improvement (as opposed to judgement), the implementation of evidence-based 'care bundles', and with clear and measurable aims and timescales. The SPSP plan incorporates many HAI prevention elements, such as hand hygiene, ventilator-associated pneumonia, preoperative antibiotic prophylaxis and reduction of *Staph. aureus* bacteraemias through better vascular line management.

In February 2010 NHS QIS is launching the Infection Improvement and Implementation Programme (iiiP), which aims to develop capacity within infection prevention and control teams – the subject matter experts, as opposed to front-line staff – in terms of improvement methodology awareness and skills. The iiiP will be closely aligned with SPSP so that there will be no conflict of approach, and with the new Scottish Healthcare Quality Strategy. Developing skills to maximise use of local data is key to iiiP, as is the approach of targeting and facilitating improvements in high incidence wards rather than in 'early adopter' wards as targeted by SPSP. Early piloting of this approach with NHS boards has demonstrated the real possibility of widespread transformational change in how we prevent and manage HAIs in NHS Scotland.

Declaration of interests None declared.