

# Antimicrobial Stewardship: A Quality Improvement Project to Reduce Overuse of the ‘4C Antibiotics’ In Primary Care

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**Abstract—Introduction:** The World Health Organisation recognises antimicrobial resistance (AMR) as a significant threat to global health. Studies have shown that the ‘4C antibiotics’ (clindamycin, ciprofloxacin and other quinolones, co-amoxiclav and cephalosporins) are associated with an increased risk of *Clostridium difficile* infection. A Care Quality Commission (CQC) inspection of a Medical Centre in Berkshire, UK found a culture of immediate antibiotic prescribing for acute minor illness.

**Methods:** An audit was conducted to assess how many patients were prescribed a course of one of the ‘4C antibiotics’. An intervention was implemented to improve antibiotic stewardship. Posters were displayed in consultation rooms; General Practitioners were reminded of the ‘Antimicrobial prescribing and stewardship competencies’ guidance published by Public Health England; and staff members were reminded of the importance of antimicrobial stewardship at a team meeting.

**Results:** The total number of ‘4C antibiotics’ prescribed during the first period audited was 87. During the second period audited, this decreased by 14.9% to 74 prescriptions. Out of the 74 patients prescribed one of the ‘4C antibiotics’ in the second period, only 49 had a reason for the prescription documented on the electronic record system. One of these patients who was prescribed antibiotics without a documented clinical indication went on to develop a *Clostridium difficile* infection nine days later, potentially as a result of taking unnecessary antibiotics.

**Conclusion:** This study is limited by a relatively small sample size and the COVID-19 pandemic as a significant confounding factor. However, this quality improvement project demonstrates that a small-scale, low-cost intervention has the potential to have a positive impact by raising clinician awareness of antimicrobial stewardship and reducing overuse of the ‘4C antibiotics’.

**Index Terms—**Antimicrobial stewardship, primary care, ‘4C antibiotics’, *Clostridium difficile*

## I. INTRODUCTION

Overuse of antibiotics is a well-recognised problem in the UK and globally<sup>[1]</sup>. Antimicrobial resistance (AMR) is accelerated by inappropriate antibiotic prescribing. It is a significant threat to patient safety and is associated with longer hospital stays and increased mortality<sup>[2]</sup>. At a recent audit of antibiotic use at this Medical Centre, the practice fell short of all standards set. Of note, the practice had been found to issue immediate rather than delayed prescriptions. A CQC inspection of the Medical Centre found that there appeared to

be a culture of immediate antibiotic prescribing for acute minor illness.

Studies have shown that the ‘4C antibiotics’ (clindamycin, ciprofloxacin and other quinolones, co-amoxiclav and cephalosporins) are associated with an increased risk of *Clostridium difficile* infection (CDI). *C. difficile* is a significant cause of healthcare-associated diarrhoea, with 15-33% of all antibiotic-associated diarrhoea due to CDI. Complications of CDI can include toxic megacolon, sepsis and death<sup>[3]</sup>. Although guidelines are available on diagnosis and treatment, the rate of CDI continues to increase in both Europe and the US.

The COVID-19 pandemic has had a significant impact on patient behaviour and the ways in which patients are accessing healthcare services<sup>[4]</sup>. It is useful to reflect on how antibiotic prescribing has been impacted by this period of change and whether prescribing behaviours should be modified.

Antibiotic prescribing may have increased due to the COVID-19 pandemic and subsequent nationwide ‘lockdown’. This may be due to an inability to see patients ‘face-to-face’ or increased patient health anxiety.

## II. AIMS

- To remind medical practitioners of the importance of *antimicrobial stewardship* and ensure they are aware of the ‘Antimicrobial prescribing and stewardship competencies’ published by Public Health England.
- To reduce the total number of prescriptions of ‘4C antibiotics’ with a view to reducing antimicrobial resistance and minimising the risk of complications, including *Clostridium difficile* infections.

## III. STANDARDS

‘Antimicrobial prescribing and stewardship competencies’ is guidance published by the Expert Advisory Committee on Antimicrobial Resistance and Healthcare-associated Infections (ARHAI) and Public Health England (PHE)<sup>[5]</sup>. It provides an example of ‘gold standard’ antimicrobial stewardship and highlights key points for clinicians to be aware of.

Clinicians were encouraged to follow the following standards outlined in competency 4:

1. Use local guidelines to initiate antimicrobial treatment
2. Avoid the unnecessary use of broad-spectrum antimicrobials

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3. Document the indication, route, dose and duration of antibiotics in the clinical records
4. Switch to the correct antimicrobial when susceptibility testing indicates resistance
5. Educate patients and their carers as to when antibiotics are not required and the importance of complying with the duration/frequency of prescribed antibiotics<sup>[5]</sup>

#### IV. METHODS

Two year-long periods were audited to minimise confounding factors such as seasonal changes.

The population report on our electronic record system, EMIS was defined as:

- ‘Include Patients with Medication Courses where:
- The Drugs are 4-quinolones, Clindamycin and Lincomycin, Cephalosporins, Cephamycins And Other Beta-Lactam Antibiotics or Clavulanic Acid
- And the Date of Issue is after or on ‘XX’ and before or on ‘XX’.

#### Interventions:

- A. Display posters with information about antimicrobial stewardship and antimicrobial resistance in Consultation rooms
- B. Highlight the standards outlined in competency 4 of ‘Antimicrobial prescribing and stewardship competencies’ to staff<sup>[5]</sup>
- C. Discuss the importance of antimicrobial stewardship, including the use of local guidelines and delayed prescriptions, at a team meeting

#### Ethical considerations:

In terms of the ethics of implementing and auditing the intervention, the main concern is that this intervention could potentially reduce levels of appropriate antibiotic prescribing.

For instance, if a patient saw a poster at the GP practice detailing the dangers of antibiotic overuse and the risk of CDI, they might refuse antibiotics which could potentially benefit them and shorten a serious illness.

This risk can be managed by the doctor discussing the patient’s concerns and reassuring them that in their case, antibiotics would be more beneficial than harmful. In this way, it is likely that the benefits of the intervention by reducing the overuse of antibiotics will outweigh potential risks<sup>[6]</sup>.

All patient details were anonymised for the purposes of this audit. There was no indication for a formal ethics review and no declared conflict of interest.

#### V. OUTCOMES

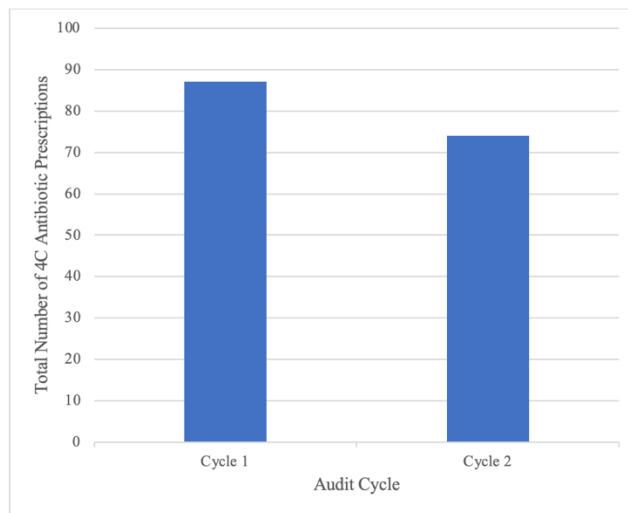
The total number of ‘4C antibiotics’ prescribed during the first period audited was 87. During the second period audited, this decreased to 74 prescriptions.

Out of the 74 patients who were prescribed a ‘4C antibiotic’ within the second cycle, 49 of these were found to

have a reason for the prescription documented on EMIS.

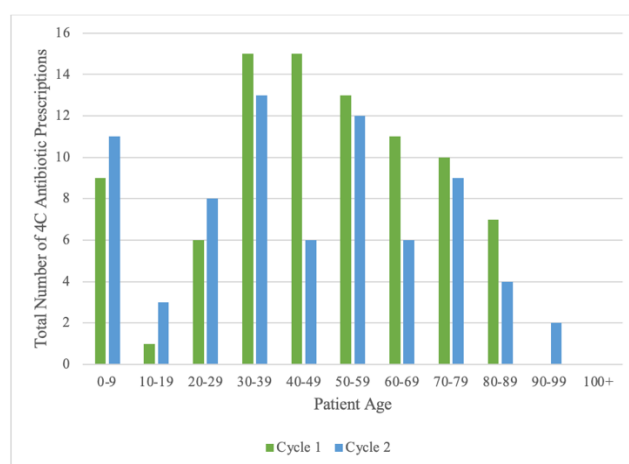
One of these patients went on to develop a C. difficile infection 9 days later, possibly as a result of taking unnecessary antibiotics.

Figure 1: the total number of ‘4C antibiotic’ prescriptions in each audit cycle



Interestingly, the number of ‘4C antibiotics’ prescribed to patients in the younger age groups showed a 37.5% increase in the second cycle. For patients aged 0-29, 16 prescriptions were given in the first cycle compared to 22 prescriptions in the second. By comparison, there was a 27.9% decrease in the number of antibiotic prescriptions in the 29-59 age group (43 to 31 prescriptions). There was a 25% decrease in the 60+ age group (28 to 21 prescriptions). These results are illustrated in figure 2.

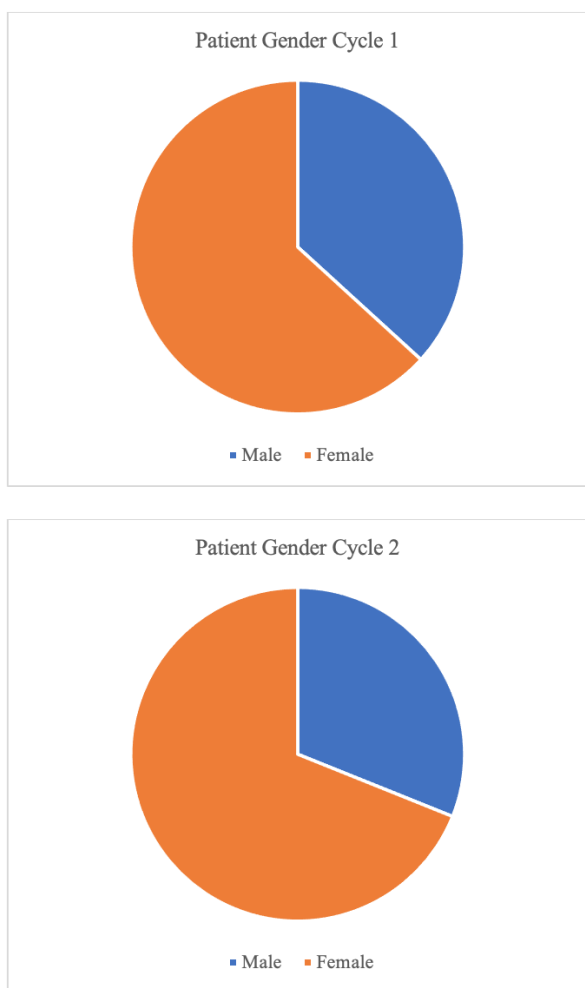
Figure 2: the number of 4C antibiotic prescriptions within each age group in each audit cycle



A review of the number of 4C antibiotics prescribed to each gender over the audit period demonstrated that while the number of prescriptions decreased in both groups, there was a larger decrease in the male patient population. The number of antibiotics prescribed to female patients decreased by 7.3 % from 55 to 51, while the number of antibiotics prescribed to

male patients decreased by 28.1% from 32 to 23. This is illustrated in figure 3.

Figure 3: the proportion of '4C antibiotics' prescribed to patients of each gender in each audit cycle



## VI. DISCUSSION

These results demonstrate that the Medical Centre successfully reduced antibiotic prescribing over a two-year period. Although this audit is limited by the relatively small scale of the intervention, the results support the use of guidance from Public Health England<sup>[5]</sup> to promote clinician awareness of the importance of antibiotic stewardship.

One key limitation is the COVID-19 pandemic, which is a significant confounding factor. The audit took place during a period of intermittent national lockdowns which had an impact on how patients accessed primary care<sup>[7]</sup>. This could explain the 37.5% increase in antibiotic prescriptions in the 0-29 age group. Is it possible that younger patients were more familiar with the use of technology such as 'eConsults' and telephone consultations to access medical care. Conversely, older patients may have struggled with this transition. This could explain the 25% decrease in prescriptions for the 60+ age group.

This quality improvement project demonstrates that a relatively small-scale, low-cost intervention has the potential to have a positive impact by raising clinician awareness of

antimicrobial stewardship and reducing overuse of the '4C antibiotics'. Ongoing efforts are required to ensure that antibiotic stewardship is maintained by the Medical Centre in the long term.

## VII. RECOMMENDATIONS

These results have been presented to the team at the Medical Centre. Staff have been reminded to follow the standards outlined by Public Health England<sup>[5]</sup>. In particular, the risk of *Clostridium difficile* was highlighted and staff were informed of the patient at the Medical Centre who developed this, possibly as a complication of taking unnecessary antibiotics.

### Key recommendations:

- Use local guidelines such as 'Microguide' to choose antibiotic treatment
- Avoid the unnecessary use of the '4C antibiotics'
- Educate patients as to when antibiotics are not required, and consider prescribing a delayed course of antibiotics when appropriate
- Give safety-netting advice on when to seek medical support if patients have side effects and inform patients of the potential risk of *C. difficile*

## VIII. ACKNOWLEDGEMENT

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