A quality improvement programme to increase compliance with an anti-infective prescribing policy

Kandarp Thakkar1*, Mark Gilchrist1, Edward Dickinson2,3, Jonathan Benn3, Bryony Dean Franklin1,4,5 and Ann Jacklin1,4,5 on behalf of the Anti-infective Policy Implementation Group†

1Pharmacy Department, Imperial College Healthcare NHS Trust, London W12 0HS, UK; 2Department of Elderly Medicine, Imperial College Healthcare NHS Trust, London, UK; 3Centre for Patient Safety and Service Quality, Imperial College, London, UK; 4Centre for Medication Safety and Service Quality, Imperial College Healthcare NHS Trust, London, UK; 5Department of Practice and Policy, The School of Pharmacy, University of London, London, UK

*Corresponding author. Tel: +44-20-331-32684; Fax: +44-20-331-32684; E-mail: kandarp.thakkar@imperial.nhs.uk
†Members are listed in the Acknowledgements section.

Received 5 October 2010; returned 22 December 2010; revised 18 February 2011; accepted 28 April 2011

Objectives: The UK Department of Health has made recommendations on safe and appropriate prescribing of anti-infectives. In response, we reviewed our anti-infective policies to ensure they were in line with best practice. As a result, a new adult anti-infective policy was launched. To help facilitate its implementation, a quality improvement programme was established, with the aim of achieving >90% compliance with the new policy.

Methods: Patients under the care of the medical admissions teams who had been prescribed one or more systemic anti-infectives between January and November 2008 were included in the study. Study pharmacists collected data daily on all patients, including the anti-infective(s) prescribed and indication(s) documented on either the patient’s drug prescription chart or health records. A definition of compliance was developed, which required documented indication(s) and associated anti-infectives to match the anti-infective policy. A baseline compliance level was established; we then implemented a series of interventions using the plan-do-study-act (‘PDSA’) approach to monitor and improve compliance. Three overlapping intervention phases were retrospectively identified: raising awareness; education; and weekly feedback of results in the form of run charts distributed to medical teams.

Results: Over the 11 month study period, compliance with the policy increased from 30% to 71%. Since 2008, we have seen the average compliance increase year-on-year to over 90% in 2010 using a sustainable once weekly data collection model.

Conclusions: This study shows that it is possible to use quality improvement methodology to support antimicrobial stewardship within existing resources and suggests that an improvement in policy compliance can be both achieved and sustained.

Keywords: antibiotic stewardship, anti-infectives, QIP, prescribing

Introduction

We report the results of a programme involving education and feedback of continuously collected data to improve compliance with the local anti-infective prescribing policy in a large hospital in London, UK. The use of multifaceted interventions comprising audit (including continuous monitoring/surveillance) linked to education and feedback to support quality improvement efforts is becoming common practice in national and large-scale initiatives in many health systems to address a variety of service issues.1–3 Systematic reviews of the evidence for the effectiveness of audit and feedback in changing healthcare provider behaviour have shown that these interventions can deliver moderate positive results.4,5 In the area of anti-infective prescribing, studies of the effects of policy implementation have demonstrated significant reduction in the inappropriate use of antibiotics and costs;6 however, further robust evidence is lacking due to limitations in evaluative designs in this area.7 Where feedback on prescribing practices has been used to improve the use of targeted antibiotics, significant positive effects have been reported.8

Within the context of this study, the UK Department of Health recently (2007) published a summary of best practice that made recommendations relating to the prescribing of anti-infectives.9 Its key objective was to provide a framework for NHS Trusts to...
review their anti-infective prescribing practice, in order to ensure safe and appropriate prescribing. In response to these recommendations, key staff at the then Hammersmith Hospitals NHS Trust (HHNT), a large teaching trust in west London, comprising two hospital sites and about 1000 beds, undertook a review of existing anti-infective policies to ensure these were in line with best practice. This review included evaluating the evidence in relation to appropriate use of anti-infective agents, current national and international guidelines, and recommendations to minimize the use of cephalosporins and quinolones, which have been associated with increased risk of *Clostridium difficile* infection. In early January 2008, an updated HHNT empirical adult anti-infective policy was launched to supplement existing specialty area policies. This recommended treatment options and best practice with regard to prescription writing. The expectation was that any deviation from policy would be in exceptional circumstances only and in the patient’s best interest. The main change to the previous anti-infective prescribing policy was a new requirement for prescribers to document the indication for each anti-infective with a high level of precision, including condition severity where applicable. For example, a severity score based on creatinine, urea, respiratory rate, blood pressure (‘CURB’) and age for community-acquired pneumonia was required. Details were requested on patients’ drug prescription charts as well as in their health records. The launch of the new policy provided an opportunity to launch a local project to improve the quality of prescribing. Due to the high rate of anti-infective initiation on the medical admissions units (MAUs), it was felt that focusing on these areas would have a large potential impact on patient care.

To drive this project, an Anti-infective Policy Implementation Group was established, comprising medicine for the elderly, microbiology and infectious diseases consultants together with admissions and infectious diseases pharmacists and nursing representatives. The aim of this quality improvement programme (QIP) was to achieve over 90% compliance with the new policy with regard to the precise documentation of infection diagnosis and choice of anti-infective for any patient on anti-infectives. The target of 90% was adopted as we assumed that some patients would require individualized treatment that differed from predetermined empirical treatment guidelines due to contraindications or diagnostic uncertainty. We used quality improvement methodology and an evidence-based approach to innovation, adopting a plan-do-study-act (PDSA) model, as this is being increasingly used as a tool to deliver immediate and noticeable improvements in patient care.

The objectives were: (i) to determine how many patients admitted to the MAUs were prescribed an anti-infective; (ii) to determine the proportion of patients whose documented indication(s) and prescribed anti-infective(s) matched the new anti-infective policy, hereafter described as compliance; and (iii) to carry out a multifaceted intervention QIP campaign to improve compliance with the policy.

### Methods

#### Setting

The MAUs at Charing Cross Hospital and Hammersmith Hospital (35 and 28 beds, respectively) admit patients from the emergency department. Patients are admitted for diagnosis and initiation of treatment before transfer to a specialist clinical area or discharge. Study pharmacists reviewed each patient’s drug chart daily from Monday to Friday; data on each anti-infective prescribed and the corresponding documented indication were collected over a 12 month study period (December 2007 to November 2008) and entered into a Microsoft Excel® database. Baseline data were collected in December 2007 prior to introduction of interventions.

#### Definition of compliance

The project group deemed an anti-infective to be compliant with the policy if: (i) the documented indication and the prescribed anti-infective matched the empirical adult anti-infective policy or the relevant clinical speciality policy; OR (ii) the documented indication and prescribed anti-infective(s) matched documented recommendations from an infectious disease/microbiology specialist.

#### Intervention phases

We carried out interventions in three overlapping phases: awareness; education; and feedback of results.

#### Phase one: policy awareness

During the first phase (January–May 2008), a multipronged awareness campaign was carried out, which comprised: (i) the distribution of pocket-sized cards presenting a summary of the policy; (ii) the display of policy posters on ward notice boards and health records trolleys; (iii) the provision of online policy information through the organization’s intranet; (iv) a series of announcements at clinical team meetings about the new policy; and (v) the addition of the policy to induction literature for medical staff.

During this phase we began to develop and refine our data handling methods, including training of pharmacists, design of a data collection form, agreement on a results database and design of a system to create a weekly feedback display sheet.

#### Phase two: policy education

During this phase (June–August 2008) an education programme was rolled out. This comprised: (i) teaching sessions for junior doctors; (ii) grand round presentations at each site; (iii) one-to-one coaching sessions; (iv) reminders sent to individual physicians prior to their period of undertaking the post-take (admission) ward round; (v) initiation of inclusion of feedback on compliance rates in educational materials as well as advice on how to increase compliance; and (vi) development of a feedback template.

#### Phase three: feedback

During this phase (September–November 2008) we introduced weekly feedback of policy compliance rates. Weekly feedback comprised a single-page summary showing: (i) the number of patients on the MAUs on anti-infectives; (ii) the percentage of patients prescribed anti-infectives with an indication recorded in the health record; and (iii) the percentage of patients compliant with the anti-infective policy.

The summary was e-mailed to all physicians participating in post-take ward rounds. The summary was discussed at weekly ward-based multidisciplinary team (MDT) bed meetings and monthly MDT quality meetings and was displayed on ward notice boards. In addition, each junior doctor was handed a summary sheet by a project member.
Results

Baseline data (December 2007)
Data were collected on 97 patients prior to launch of the new policy. Compliance was found to be 30% (29/97).

Implementation phases (January–November 2008)
Data were collected on 1381 patients over the three phases (789 from Charing Cross Hospital and 592 from Hammersmith Hospital). Their mean age was 65.8 (range 16–101) years; 52.6% were male. Mean compliance across the sites rose to 71% over the 11 month period. Results by individual phase are presented in Table 1.

Discussion
Our results show that over an 11 month period, there was a large apparent improvement in the quality of antibiotic prescribing in terms of prescribing anti-infectives that were recommended in our clinical policy for the indication documented. The general trend towards increased compliance observed over the course of this QIP, in parallel with escalation in the level of education and feedback, is suggestive of positive impact and is comparable to prior research indicating that audit and feedback are effective in changing provider behaviour in this area, especially where baseline compliance is low and feedback is of a higher intensity.6,8,12

The proportion of patients on anti-infectives at any one time was relatively consistent with previous point prevalence studies, at 30%–44%.13 Anecdotal observations in our clinical practice led us to expect a low rate of documentation of indications. We found that, for 95%–100% of patients, indications were documented (data not presented). However, we found that although indications were recorded, they were often not recorded in the terms used in our policy, making it difficult to confirm the appropriateness of anti-infective choice. This was consistent with views expressed by our clinical teams with regard to the difficulty of reviewing anti-infectives initiated by other prescribers.

Table 1. Results by phase

<table>
<thead>
<tr>
<th></th>
<th>No. of patients on antibiotics</th>
<th>No. of patients compliant with policy</th>
<th>Mean compliance during the phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CXH</td>
<td>HH</td>
<td>CXH</td>
</tr>
<tr>
<td>Baseline</td>
<td>43</td>
<td>54</td>
<td>16</td>
</tr>
<tr>
<td>Phase 1 (policy awareness)</td>
<td>395</td>
<td>273</td>
<td>177</td>
</tr>
<tr>
<td>Phase 2 (policy education)</td>
<td>174</td>
<td>151</td>
<td>85</td>
</tr>
<tr>
<td>Phase 3 (feedback)</td>
<td>220</td>
<td>168</td>
<td>149</td>
</tr>
</tbody>
</table>

CXH, Charing Cross Hospital; HH, Hammersmith Hospital.

Figure 1. Compliance rates from 2008 to 2010.
Phase one demonstrated that compliance can be improved by an awareness campaign alone. Phase two demonstrated the sustained impact of a supplementary education campaign. Phase three coincided with a step-wise improvement following the introduction of feedback. These findings are consistent with other quality improvement projects.\(^\text{14}\)

While our initial work was funded and required a dedicated resource (£288000 per annum for a junior clinical pharmacist), we have been able to sustain weekly feedback by building data collection into MAU pharmacists’ routine work. We estimate that data collection takes 30 min per week and hence constitutes only about 1% of a pharmacist’s working week. At any one time, 40% of our patients are on anti-infectives and so we feel this is a reasonable priority. In addition, it potentially reduces the resources and time spent on current anti-infective auditing via point prevalence studies and potentially decreases the need for other spot check audits within problem areas. Since 2008, we have seen the average compliance increase year on year to >90% in 2010 using this model (Figure 1).

The project benefited from comprehensive engagement of clinical staff across a range of disciplines that helped identify the requirements for our PDSA cycles. Examples included: (i) displaying results in differing formats to improve the key messages in a way those receiving feedback could understand quickly and simply; (ii) the use of feedback from prescribers to develop the content of case-based discussions and teaching sessions; and (iii) making the anti-infective policy link more obvious on the home page of the organization’s intranet.

The involvement of general managers in the project was essential in identifying time for education and supporting feedback messages at medical management meetings and via e-mails. This provided a key link with the existing directorate management structure and reinforced the importance of the subject area.

The project formally reported to the Medicine Quality Patient Safety and Experience Board, which involved a wide range of stakeholders, including all clinical disciplines, managers and patient representation. This provided both feedback on the project and a communication route for the work of the project. Quality assurance was provided by medical representation on the project team. While auditing can adversely affect relationships initially, we found it strengthened them in the long run as compliance improved.

**Limitations**

As a practical QIP in an applied service setting, it was not possible to exert experimental control over extraneous factors that may have contributed to the observed effects. The evaluation was effectively planned around the intervention, resulting in an uncontrolled before and after study, and caution should therefore be used in making causal inferences concerning the effects of the intervention.\(^\text{15}\) The compliance rates in the phased results may have been due to a lag effect of earlier stages of the intervention, for example, making it difficult to separate out the unique effects of different types and levels of education and feedback. Comparing data aggregated over a small number of phases with a single baseline measure is additionally not ideal, in the absence of sufficient data for interrupted time series analysis.\(^\text{7}\) However, taken as a whole, the dramatic increase in compliance observed over the duration of the programme suggests that interventions consisting of the monitoring of compliance with local policy, linked to education and feedback, may be instrumental components of a comprehensive hospital strategy to promote appropriate anti-infective prescribing practice. Future research using robust study designs is needed to strengthen the evidence base for the effectiveness of this model within anti-infectives and other clinical areas and to establish the relative importance of the various features of feedback programmes.\(^\text{16,17}\) Finally, examining the appropriate indication and choice of anti-infective is only one aspect of prudent anti-infective prescribing and overall anti-infective stewardship; future work in this area could be considerably strengthened by the inclusion of clinical outcome data such as length of stay, mortality or readmission rates to provide reassurance that increased compliance with hospital prescribing policy has not resulted in untoward effects.

**Conclusions**

This study reports preliminary work to apply quality improvement methodology including monitoring, education and feedback to support antimicrobial stewardship within a UK hospital department using existing resources. The results suggest that an improvement in compliance with policy is achievable using this approach and provide a basis upon which to develop future evaluative research. It remains for future work to establish the applicability of this model to other clinical areas and additional areas of compliance, such as assessment of length of course, duration and intravenous to oral switch. With the advent of electronic prescribing systems, further data collection and feedback should become easier due to automated reporting functions.

**Acknowledgements**

**Members of the Anti-infective Policy Implementation Group**


**Funding**

This work was supported financially by Imperial College Healthcare NHS Trust, formerly Hammersmith Hospitals NHS Trust. The Centre for Medication Safety and Service Quality is affiliated with the Centre for Patient Safety and Service Quality at Imperial College Healthcare NHS Trust, which is funded by the National Institute of Health Research.

**Transparency declarations**

None to declare.

**References**


