

# Audit and feedback of antibiotic use

## Utilising electronic prescription data

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### Keywords

Antibiotic, compliance, audit and feedback, electronic prescribing

### Summary

**Background:** There is now little doubt that improving antimicrobial use is necessary for the containment of resistance.

**Objective:** To determine whether providing individualised feedback to doctors about their recent compliance with the hospital's antibiotic policy improves compliance with the policy.

**Methods:** This study was conducted at a teaching hospital in Sydney, Australia. Computerised alerts integrated into the electronic prescribing system (ePS) inform prescribers of the local antibiotic policy. We utilised prescribing data extracted from the ePS for 'audit and feedback'. Thirty-six prescribers were sent feedback letters via email. We also interviewed doctors who had received letters to explore their views of the feedback and the policy in general.

**Results:** There was no significant change in compliance with the policy following implementation of the feedback intervention (0% compliant vs 11.9%;  $p = 0.07$ ). Several problems with the policy and the approval process were identified by researchers during auditing and by prescribers during interviews. Some problems identified made it difficult to accurately assess compliance and for doctors to comply with the policy.

**Conclusions:** Our intervention did not result in improved compliance with the antibiotic policy but revealed practical problems with the policy and approval process that had not been identified prior to the trial. Greater support for the policy by senior doctors and the assignment of more clearly defined roles and responsibilities associated with antibiotic use and approval may result in improved compliance. Harnessing the full potential of technology would streamline the antimicrobial approval process and allow more efficient and reliable monitoring of antibiotic use and compliance.

Many of the problems we identified are generic issues of importance to all organisations seeking to integrate antimicrobial stewardship into ePS.

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## 1. Introduction

The World Health Organisation described antimicrobial resistance as a global problem requiring urgent action and adopted “Combat antimicrobial resistance” as its theme for World Health Day in 2011. There is now little doubt that the inappropriate use of antimicrobials contributes to the emergence of resistance [1, 2] and that improving antimicrobial use is necessary for the containment of resistance [3].

Considerable research has been undertaken on identifying effective strategies for improving antibiotic use both in acute and primary care settings [4-8]. Based on this work, The Australian Commission on Safety and Quality in Health Care (ACSQHC), an Australian government agency who leads and coordinates national improvements in safety and quality in healthcare, recommends that all hospitals adopt an antimicrobial stewardship program [9]. The established, essential components of a stewardship program are clinical guidelines, formulary restriction and approval systems, audit and feedback, monitoring of antimicrobial prescribing, and selective reporting of susceptibility testing results. The ACSQHC also recommends the implementation of information technology, including electronic prescribing with decision support and on-line approval systems [9].

Previous research has shown that computerised decision support (CDS) is an effective strategy for improving antibiotic use [10-13]. As medication management in Australia shifts from paper to electronic formats, the potential now exists to integrate formulary restriction, approval systems and CDS into electronic prescription processes. This represents an alternative to adopting stand-alone computerised antimicrobial approval systems [14-16] and CDS [17].

At our study site, many of ACSQHC's recommended stewardship components are in place, including a local antibiotic policy (comprising a guideline, formulary restriction and approval process), monitoring of antibiotic prescribing (annual snap-shot audits) and CDS (computerised alerts integrated into the electronic prescribing system (ePS) informing prescribers of the local antibiotic policy). Despite the adoption of these stewardship strategies, compliance with the antibiotic policy at the site has been variable with significant misuse of some antibiotics (e.g. ceftriaxone) [18].

In addition to facilitating integration of the antimicrobial policy into the prescription process, electronic prescribing allows streamlined, real-time auditing of antibiotic use. In this study we undertook an innovative approach to utilise the availability of near real-time prescribing data extracted from an ePS to trial an ‘audit and feedback’ intervention. Despite ACSQHC's recommendation to implement audit and feedback, there is limited research assessing the impact of individualised feedback to prescribers about individual compliance with antibiotic guidelines. The bulk of research in this area has involved the use of multi-faceted interventions where feedback is one of multiple strategies introduced simultaneously to improve antibiotic prescribing (e.g. academic detailing, education) [19, 20].

## 2. Objective

In this study, we set out to determine whether providing timely, individualised feedback to doctors about their recent compliance with the hospital's antibiotic policy improves compliance with the policy.

## 3. Methods

### 3.1. Local antimicrobial policy

The study was conducted at a teaching hospital with approximately 320 beds in Sydney, Australia. Local policy restricts the use of certain antimicrobials based on recommendations made in the Australian Therapeutic Guidelines and local resistance patterns. All antimicrobials are classified according to a ‘traffic light system’- red, orange or green. ‘Green’ antimicrobials are not restricted in their prescription and do not need approval for use. ‘Orange’ antimicrobials need approval where use is outside pre-specified indications, while all ‘red’ antimicrobials require approval. Some examples of

red, green and orange antimicrobials are shown in ► Table 1. Requests for approval are lodged by prescribers with the microbiology or infectious diseases (ID) registrar and where granted, an approval number is issued. The policy stipulates the approval number be documented in the electronic prescribing system (ePS) while the microbiology and ID registrars catalogue approval numbers in an Excel spreadsheet. After-hours antimicrobial decision support is available via the microbiologist on-call. However approvals for both red and orange antimicrobials are only provided when individuals authorised to give approval are on duty. The daytime clinical team must follow up to gain approval numbers during normal business hours.

The Antimicrobial Stewardship (AMS) Committee, a sub-committee of the hospital Drug and Therapeutics Committee is responsible for the antimicrobial policy's administration and review. New iterations of the policy are typically communicated to prescribers at Grand Rounds, via email, at junior medical officer (JMO) information and education sessions and through one-on-one interactions. The ePS informs prescribers of antibiotic restrictions via the presentation of computerised alerts at the point of prescribing (e.g. "This is a red antibiotic") and the policy is available on the hospital intranet.

Over the past four years, annual antimicrobial audits, comprising a single day audit of all inpatient medication charts, have been used to ascertain compliance with the antimicrobial policy. While compliance with red antimicrobial policy has been high, these snapshot audits indicate compliance with the policy for orange antimicrobials is poor, with for example, only 4% of orange antimicrobials requiring approval given an approval number in 2011.

### 3.2. Study procedure

Use of orange antimicrobials was audited on a weekly basis for 12 weeks. Each week, all orange antimicrobial prescriptions (and associated information, including medication prescribed, dose, duration, patient and prescriber details) ordered in the week prior were retrieved using the 'report module' within the ePS. Project resources enabled us to audit on two days each week and as it was not possible to review all orange antimicrobial prescriptions in two days, a systematic approach was used to select which prescribers would be audited. This involved initially selecting prescribers who had prescribed ceftriaxone, azithromycin and ciprofloxacin, as annual antimicrobial audits at the study site showed high levels of use of these medications without approval compared to other orange antimicrobials. Prescribers who formed part of the ICU team were excluded from audit because the microbiology registrar routinely attends and is consulted during daily rounds of ICU.

During audits, additional data such as renal function tests and culture sensitivities were collected from the hospital's pathology system while the ePS was used to confirm patient allergies and administration of the antimicrobial. Patient notes were reviewed when the antimicrobial indication was not documented in the ePS (either by the prescriber or the clinical pharmacist). The Clinical Pharmacology registrar (advanced trainee in clinical pharmacology) was consulted in cases where the indication was unclear.

Compliance with the hospital policy was subsequently assessed by determining whether each orange antimicrobial had been prescribed for a pre-approved indication, and in cases where it had not, whether microbiology/ID approval had been granted. All policy requirements had to be met for prescriptions to be classed as not requiring approval. For example, the provision of ceftriaxone in patients with community acquired pneumonia requires a documented Pneumonia Severity Index (PSI) score (>90). If no PSI was documented in patient notes or charts, the prescription was classed as requiring approval. The microbiology and ID registrar's spreadsheet of approval numbers was consulted regularly to find all corresponding approvals issued. During the auditing period, the microbiology and ID registrars also documented if approval had been sought by a prescriber but not granted.

When all of a prescriber's orange antimicrobials had been audited, and at least one prescription required approval from microbiology/ID, a pre-formatted feedback letter (► Figure 1) was sent to that prescriber via email. Prescribers were informed about all cases requiring approval (those with and without approval numbers). Feedback was sent to the doctor whose name appeared on the prescription (i.e. the doctor who ordered the medication in the ePS). Feedback commenced in Week 3, following a 2-week baseline data collection period. Feedback letters were collated by the principal

researcher (MB) and distributed to prescribers from the Professor of Clinical Pharmacology and Toxicology's email address each week.

### 3.3. Post intervention interviews

One month after completion of the audit, prescribers who had received a feedback letter were invited to participate in a short interview about the feedback they had received. The semi-structured interviews were used to explore prescriber views of the feedback and the hospital antimicrobial policy and approval process more generally. Seven prescribers participated in an interview and a further seven prescribers provided feedback about the intervention via email.

## 4. Results

Determining the indication for each orange antimicrobial proved to be an extremely resource intensive process because prescribers rarely documented indications for use. The study auditor was required to refer to multiple sources and consult extensively with the Clinical Pharmacology registrar to obtain an in-depth understanding of each patient's case.

### 4.1. Compliance with the policy

1260 orange antimicrobials (Abx) were prescribed during the 12-week study period and approximately 20% ( $n = 258$ ) of these prescriptions were audited to determine compliance (► Table 2). In the two weeks prior to implementation of feedback, 207 orange Abx were prescribed. Of the prescriptions audited, 20 (52.6%) required approval but no approvals were sought or granted in this period.

Of the prescriptions audited after the introduction of feedback ( $n = 220$ ), nearly half ( $n = 101$ ) were prescribed for non-approved indications and thus required microbiology/ID approval. In 15.8% (16/101) of these cases, approval was sought. In 75% (12/16) of these requests, approval was granted. There was no statistically significant change in compliance with the policy following implementation of the feedback intervention ( $p = 0.07$  using Fisher's exact test). Thirty-six prescribers (all junior doctors, 1–9 years post-graduate) were sent feedback letters during the intervention period, with some doctors ( $n = 7$ ) receiving multiple letters, but this feedback appeared to have little impact on policy compliance for orange antimicrobials. No doctor who received a feedback letter was observed to gain microbiology/ID approval for non-approved uses in the weeks following their feedback.

### 4.2. Issues identified by researchers during auditing

Several problems with the policy and the approval process were identified by researchers during the auditing period (► Table 3). These problems often made assessing compliance with the policy difficult. Doctors raised some of these issues during interviews, indicating that complying with the policy was also often difficult for prescribers.

### 4.3. Feedback from prescribers

Doctors generally expressed positive views about the hospital antimicrobial policy. The traffic light system was seen to be easy to follow and understand. Some said that the policy was useful for simple cases, but not very useful for complex clinical scenarios or specialty-specific cases. Several doctors felt that their teams adopted a 'better safe than sorry' approach to prescribing antimicrobials, rather than referring to the policy for guidance (see *Quote 1* in ► Table 4).

When asked about the feedback letters, all doctors liked the format and phrasing of the letters, and in some cases, it was clear that the feedback had prompted prescribers to reflect on their practice and the hospital policy (*Quote 2*). Although most doctors claimed to understand why they had received a letter, during interviews it became clear that some had in fact misinterpreted the reason

for their feedback. This was especially the case for prescribers who were sent feedback because they had failed to document a pneumonia severity index score. The prescribers who were uncertain about why they had received the feedback felt that the letter should have been more tailored to reflect each individual case (*Quote 3*).

Most doctors said that the feedback hadn't been helpful because they felt justified in their decision to prescribe the orange antimicrobial without an approval number. The main reasons for doctors not seeking approval were reported to be:

- Conflict between policy recommendations and senior doctor instructions
  - Many junior doctors explained that it had ultimately been their senior doctor's decision to prescribe the orange antimicrobial. Several doctors mentioned the practical difficulties of trying to satisfy their consultant's wishes while also complying with hospital requirements. This was particularly difficult when, as a junior prescriber, they were not always certain of the reasons for a prescription (*Quote 4 & 5*).
  - Junior doctors explained that because they rarely made prescribing decisions independently, the feedback letters should be sent to all team members, including the senior doctors. Some doctors suggested that a discussion with the senior doctor would be more effective than feedback in an email.
- Antimicrobial had been prescribed after-hours
  - Several doctors explained that they had prescribed the orange antimicrobial while working after-hours and so felt that it was not their responsibility to gain approval from microbiology/ID. This was seen as the responsibility of the daytime team. Doctors felt that it was just not practically possible to comply with the policy when prescribing after hours (*Quote 6*).
- They had consulted with microbiology/ID
  - Several doctors reported that they had consulted with a member of the microbiology or ID team and had followed the recommendation provided, but they had not requested an approval number and were not issued with a number (*Quote 7*).
  - Some doctors also believed that the information collected by auditors and included in the feedback letter had been incorrect or out-of-date. For example, several prescribers said that they had been issued with an approval number, even though the auditor could not locate this number on the microbiologist/ID approval list (*Quote 8*).

## 5. Discussion

The greatest benefit of trialling our intervention was that it required detailed review and scrutiny of the policy and the accompanying process a prescriber must undertake in order to comply with the policy. The primary researchers (MB & KO) were not members of the AMS committee and not prescribers at the intervention site, so held an unbiased view of the policy and approval process. The trial allowed us to identify clear areas where compliance with the policy was difficult for doctors. This was extremely valuable and we recommend that all organisations undertake a similar 'external' review process.

The most prominent theme that emerged from our audit of charts and from our interviews with prescribers was that of *responsibility*. It became clear that significant uncertainty surrounded the approval process at the intervention site. A key lesson for the hospital, and for all organisations with or contemplating implementation of an antimicrobial stewardship program, is to clarify responsibility and accountability for clinical staff in the antimicrobial approval process [9]. What roles do prescribers, ID staff, microbiologists, but also pharmacists and nurses play? Some clear areas where responsibility should be defined are listed in ► Table 5.

Our findings also indicated that the full potential of electronic prescribing is not currently being realised at the study site. Although prescription data are electronic, data extraction is not easy. Hospitals have a role in demanding greater functionality within these systems from vendors to be able to utilise the data stored to support real-time review and feedback. Ensuring systems are designed so that users enter relevant data and these data are easily extractable is necessary for efficient monitoring of antimicrobial prescribing. One obvious improvement would be to make it a requirement for doctors to record an indication in the ePS when prescribing orange antibiotics (a change that has



since been made at the study site). To harness the full advantage of technology, the site could also consider incorporating the antimicrobial approval process into the ePS. Allowing microbiology/ID to review cases, approve prescriptions and issue approval numbers via the ePS would streamline the approval process and improve visibility and accountability of all participating staff members.

Our discovery that some of the information contained in the hospital policy was inconsistent with information presented to prescribers in computerised alerts highlights a lesson for all sites with or contemplating introduction of CDS: as hospitals move from paper to electronic prescribing, ensuring consistency between hospital policies and embedded CDS is crucial. It has been recommended that decision support content be reviewed periodically to keep content up-to-date [21]. Our findings suggest that detailed review is also needed to ensure content is in-line with other information sources available at the site.

Another central theme that emerged from our data was that of the *medical hierarchy*. Junior doctors did not obtain approval for antimicrobial use because their senior doctors were not seen to gain approval or to endorse the local policy. In the same way, senior doctors did not calculate or document pneumonia severity. 'Hierarchies' as a barrier to compliance is well documented in the literature [22-24] and is difficult to overcome. Greater support and advocacy for the policy by senior prescribers is clearly needed but this may be challenging when the majority of prescribers are adopting a 'better safe than sorry' approach to prescribing. It has been shown that *uncertainty* is an important factor contributing to the misuse and overuse of antimicrobials [22].

Our discussions with each participant about their prescribing and the policy requirements during interviews appeared to be much more effective in improving awareness and understanding of the policy than the feedback letters. Although time consuming and resource intensive, feedback in the form of a conversation with prescribers (including senior doctors) who consistently prescribe restricted antimicrobials without obtaining approval would appear to be the more effective approach for improving prescribing practices. A comparative study, assessing feedback delivered via email vs. feedback delivered in-person would confirm this. However, to identify the prescribers in need of this feedback and education, a reliable and efficient method for monitoring compliance is required. Various issues were uncovered in the process of trialling our intervention that made assessing compliance at this site problematic (see ► Table 3 and ► Table 5). Fulfilment of the responsibilities listed in ► Table 5 would enable more streamlined monitoring of antibiotic use and policy compliance.

## 6. Limitations

Our study had several limitations. During data collection, we intentionally selected prescribers who had prescribed ceftriaxone, azithromycin and ciprofloxacin, as these were often ordered without approval at the study site. A consequence of this selection approach was the high level of non-compliance we observed. The selection approach may have also contributed to the failure of feedback to influence prescribing, as prescribing these medications without approval may have become a routine or habitual process for prescribers. A limitation of the study design was our failure to separate non-compliance due to non-approval from non-compliance due to poor documentation (i.e. PSI score) in the feedback letters. This was an obvious source of confusion for prescribers and likely limited the impact of the feedback letters on prescribing. Finally, we did not monitor whether feedback letters were actually read by prescribers. Failure of feedback to influence prescribing may have resulted from doctors simply not reading their emails.

## 7. Conclusion

Our audit and feedback trial did not result in statistically significant improved compliance with the antibiotic policy but revealed practical problems with the policy and approval process that had not been identified prior to the intervention. The issues we identified were communicated to the AMS committee and this resulted in a number of changes to the information contained in the paper policy and alerts. Greater support and advocacy for the policy by senior doctors and greater collaboration with senior doctors may result in improved policy compliance, as would the assignment of

more clearly defined roles and responsibilities associated with antibiotic use and approval. Harnessing the full potential of technology would streamline the antimicrobial approval process and also allow more efficient and reliable monitoring of antibiotic use and compliance.

#### **Clinical relevance statement**

Our study revealed that as hospitals move from paper to electronic prescribing, ensuring consistency between hospital policies and embedded clinical decision support is crucial. Hospitals have a role in demanding greater functionality within electronic systems from vendors to be able to utilise the data stored to support real-time review and feedback. Ensuring systems are designed so that users enter relevant data (e.g. indications for antibiotic use) and these data are easily extractable is necessary for efficient monitoring of prescribing.

#### **Conflict of interest**

The authors declare that they have no conflicts of interest in the research.

#### **Human subjects protections**

The study was approved by the Human Research Ethics Committee of the University of New South Wales and the participating hospital.

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Dear Dr X,

XXXXX has an antimicrobial policy in place (the traffic light system) to reduce inappropriate use of antimicrobials.

We are currently conducting an 'Audit and feedback' trial to draw attention to this important hospital policy and to provide useful feedback to allow doctors to monitor their use of orange antimicrobials. Orange antimicrobials may only be prescribed according to a list of pre-approved indications. If these drugs are used outside the pre-approved indications, they become Red antimicrobials and require microbiology approval.

An audit of orange antibiotics prescribed for the period of x/x/2012 – x/x/2012 revealed that you prescribed N orange antibiotics that required microbiology approval.

Out of these antibiotics, you gained microbiology approval for x orders but did not gain microbiology approval for x orders.

The details of these prescriptions appear below:

Patient MRN	Ward	Date	Antibiotic	Dose/duration	Indication	Microbiology approval
						Y
						Y
			Drug Y			N

This data is based on what was documented in patient notes and in MedChart.

A reminder that the hospital antibiotic policy can be found here: [Antibiotic policy](#)

We hope that you will find this information useful to inform your practice. Your individual data will remain confidential and will be aggregated for analysis. Cumulative comparative data will also be presented to you at the end of the study.

Kind regards,

Professor XXXXX, Director of the Department of Clinical Pharmacology & Toxicology

and

The Antimicrobial Stewardship Committee

Fig. 1 Format of feedback letter distributed to doctors



**Table 1** Hospital antimicrobial policy

Antimicrobial	Description	Examples
Red	These antimicrobials require microbiology/ID approval before they are dispensed by pharmacy	<ul style="list-style-type: none"> <li>• Caspofungin</li> <li>• Daptomycin</li> <li>• Voriconazole</li> </ul>
Orange	These antimicrobials can be used without approval for specific indications but require microbiology/ID approval if prescribed for other types of infections	Clarithromycin is pre-approved for treatment of MAC in HIV patients and for use by gastroenterologists as part of combination <i>H. pylori</i> eradication, but all other indications require approval
Green	These antimicrobials, prescribed according to the Therapeutic Guidelines, are not restricted	Flucloxacillin for staphylococcal infections

**Table 2** Number of orange antimicrobials (Abx) audited and approvals sought and granted during the trial period

Period	Abx prescribed	Abx audited (n, % <sup>1</sup> )	Abx requiring approval (n, % <sup>2</sup> )	Approvals sought (n, % <sup>3</sup> )	Approvals granted (n, % <sup>3</sup> )
Pre	207	38 (16.4)	20 (52.6)	0 (0)	0 (0)
Post	1053	220 (20.9)	101 (45.9)	16 (15.8)	12 (11.9)
Total	1260	258 (20.5)	121 (46.9)	16 (13.2)	12 (9.9)

<sup>1</sup>Percentage of Abx audited out of all Abx prescribed.<sup>2</sup>Percentage of Abx requiring approval out of all audited prescriptions.<sup>3</sup>Percentage of Abx where approval was sought or granted out of all audited prescriptions which required approval

**Table 3** Examples of problems identified by researchers during the auditing process

Problem type	Examples
Inconsistency between hospital policy and external guideline	<ul style="list-style-type: none"> <li>Policy instructs doctors to follow local policy and the Australian Therapeutic Guidelines but the policy recommendations are based on the use of the Pneumonia Severity Index (PSI) to establish severity of pneumonia while the Australian Therapeutic Guidelines recommend use of the CORB or SMART-COP score to determine pneumonia severity</li> </ul>
Inconsistency between hospital policy and information contained in computerised alerts (main avenue for communicating hospital policy to prescribers)	<ul style="list-style-type: none"> <li>Alert for azithromycin lists "Treatment of Community Acquired Pneumonia in lung transplant patients" as a pre-approved indication, but this does not appear as a pre-approved indication in the policy</li> <li>Policy includes different pre-approved indications for different routes of administration (i.e. IV vs. PO) but alerts do not</li> <li>Policy states that ciprofloxacin should be used for serious infection due to Gram-negative organism in patients where gentamicin is contraindicated or the organism is aminoglycoside resistant. Alert specifies contraindication: patients &gt;70 years or with calculated creatinine clearance &lt;70mL/min.</li> </ul>
Ambiguous phrasing/recommendations in hospital policy	<ul style="list-style-type: none"> <li>Policy states fluconazole should be used for "appropriate fungal prophylaxis", but it is not clear what "appropriate" means</li> <li>Policy recommendations are based on the calculation of a PSI score, but there is no requirement for doctors to record PSI scores in patient notes</li> </ul>
Difficulty with antimicrobial approval process	<ul style="list-style-type: none"> <li>Verbal recommendation for use of an antimicrobial is sometimes provided by microbiology/ID but no approval number is issued</li> <li>Approval numbers not always recorded by microbiology/ID in real-time</li> <li>Not clear that approvals issued by microbiology/ID include a duration for antimicrobial treatment</li> </ul>

**Table 4** Doctor quotes demonstrating themes identified during interviews

1	I think to prescribe antibiotics well you really need to understand what you're treating, what the antibiotics cover, the difference between oral and IV antibiotics. I think it's much easier for these infectious disease specialists who have that very good knowledge. But otherwise people have the tendency to go for very broad based, IV, they just feel comfortable... You just feel a bit safer giving something that might not be the first line medication.
2	It was helpful and I was much more aware about the guidelines and the potential for further feedback if I prescribed outside guidelines in the future. I became more hesitant about prescribing certain antibiotics.
3	Um, yeah I guess it was just hard to identify. I, I didn't notice that it was the PSI (pneumonia severity index) thing that was the issue 'cause I just thought it was a dose and indication, which I, I thought were normal. Yeah. So, I guess it's just about highlighting that that was the specific problem, um, 'cause I didn't know that that was the case.
4	A lot of times antibiotics are requested by the consultants without any, really, like, yeah, without real, like the indications are a little blurrier than the guidelines are. And, um it's hard for junior doctors. Junior doctors can't say no to the consultant about, about that. And, for the consultant, it's just an annoyance, I guess. But you have to, to do that and also fulfil the criteria of that antimicrobial colour, thing. Um, yeah. So I guess it's the difficult position we're in. Um, trying to satisfy both.
5	As an intern, I carry out the requests of my seniors. These antibiotics were prescribed without microbiology approval, as per the instructions of my registrars and consultants.
6	It was charted, after hours by myself on a Sunday, at about 8pm. But I don't think that's my responsibility, um, at 8pm on a Sunday, given people are sick. And given that I'd spoken with the consultant and the consultant had agreed with the choice of antibiotic.
7	Um, I think, to be honest, I do understand that you need approval, except I had had approval, just not an approval number. I thought it (the feedback) was pretty pointless, but that's alright.
8	... the wording and everything was fine. But only thing was that we had already obtained approval.

**Table 5** Areas where stewardship responsibilities require further clarification/definition

Role	Responsibility
Prescribers	Documentation of an indication (including pneumonia severity) in patient notes/charts
Microbiology/ID	Distribution of approval numbers (not just 'verbal approval')
Microbiology/ID	Real-time documentation of approval numbers in a database
Prescribers	Real-time documentation of approval numbers in patient notes/charts
Prescribers (daytime)	Attainment of approval when an antimicrobial order is placed after-hours
Prescribers	Attainment of approval for longer use when original approval has expired

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