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**Title Page**

**Enablers and barriers to the use of antibiotic guidelines in the assessment and treatment of community acquired pneumonia – A qualitative study of clinicians’ perspectives**

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## **Disclosures**

None for all the authors of this manuscript.

## **Enablers and barriers to the use of antibiotic guidelines in the assessment and treatment of community acquired pneumonia – A qualitative study of clinicians' perspectives**

### **Abstract:**

**Background:** Community acquired pneumonia (CAP) is a common condition and a number of guidelines have been developed for its assessment and treatment. Adherence to guidelines by clinicians varies and particularly the prescribing of antibiotics often remains suboptimal.

**Objective:** The aim of this study was to elucidate potential barriers and enablers to the adherence to antibiotic guidelines by clinicians treating CAP in an Australian hospital.

**Methods:** Semi-structured interviews were conducted with purposively recruited senior prescribers who regularly treat CAP in an Australian hospital. Thematic analysis identified a number of themes and subthemes related to their knowledge, attitudes and behaviours associated with the use of CAP guidelines.

**Results:** Thematic saturation was reached after 10 in depth interviews. While similar barriers to the use of guidelines as previously described in the literature were confirmed, a number of novel, potential enablers were drawn from the interviews. Clinicians' acceptance and accessibility of guidelines emerged as enabling factors. Generally positive attitudes towards antimicrobial stewardship services invite leveraging what was described as the relationship-based and hierarchical nature of medical practice to provide personalised feedback and updates to clinicians.

**Conclusions:** Adding a social and personalised approach of antimicrobial stewardship to policy and systems based strategies may lead to incremental improvements in guideline adherent practice when assessing and treating CAP.

### **What' known**

The assessment and treatment of community acquired pneumonia (CAP) in hospitals often remains suboptimal in at least 1 of 4 presentations, despite readily available access to guidelines and the introduction of antimicrobial stewardship in many practice settings. A number of barriers to guideline adherence have been described, e.g. lack of awareness or acceptance, time and external pressures on clinicians.

### **What's new**

Clinicians showed high awareness and acceptance of CAP guidelines and positive attitudes towards antimicrobial stewardship (AMS).

Their description of the relationship-based and hierarchical nature of medical practice opens new avenues for AMS services to achieve incremental increases in guideline adherent assessment and treatment of CAP.

Implementing personalised feedback and social learning will potentially support AMS policies, regulatory and systemic strategies.

### **Introduction**

Community acquired pneumonia (CAP) is a common condition associated with significant morbidity and mortality. CAP causes a significant number of deaths worldwide, imposes a major burden on healthcare resources and is one of the most common indications for the prescription of antibiotics in hospitals.[1,2] Evidence-based clinical practice guidelines have been developed to ensure consistent assessment and treatment of CAP. Adherence to these guidelines has shown to improve clinical outcomes, including a reduction in length of hospital stay, morbidity and mortality.[3, 4] The application of these guidelines remains inconsistent, with, for example, a number of studies pointing to suboptimal prescribing and

usage of antibiotics, potentially resulting in poorer outcomes for patients as well as having economic consequences for health systems.[5-7]

In Australia, the Therapeutic Guidelines - Antibiotics™ provide national, evidence-based recommendations and algorithms for the assessment and treatment of CAP.[8] In addition, Antimicrobial Stewardship (AMS) programs have been established in Australia and internationally to support a systematic and organisational approach to the optimisation of antimicrobial usage.[9, 10] AMS programs have demonstrated a reduction in inappropriate antimicrobial prescribing, improvements in patient outcomes and a reduction in adverse outcomes, including antimicrobial resistance, adverse reactions, toxicity and unnecessary costs.[ 11, 12] Even after the introduction of guidelines and AMS programs inappropriate use of antibiotics in CAP remains an issue. Adherence to antibiotic guidelines has been researched in multiple healthcare settings. Despite consistent trends of improvement, it often seems to remain suboptimal in major tertiary as well as smaller Australian hospitals, with similar trends observed globally.[13-17] The Australian Commission on Safety and Quality in Health Care conducts regular point prevalence National Antimicrobial Prescribing Surveys (NAPS), that provide snapshots of antimicrobial usage to monitor adherence to relevant guidelines and identify areas for improvement across Australian hospitals. The 2014 NAPS results showed that CAP is a common indication for the prescribing of antimicrobial agents, with one in four of these prescriptions deemed inappropriate.[2]

A number of barriers and enablers to the application of antibiotic guidelines in general and in the treatment of CAP have been identified. Barriers include a lack of clinician awareness or familiarity with relevant guidelines, a lack of confidence into their interpretation of the evidence base and easy applicability to the majority of patients, but also expectations and influence from other clinicians and patients.[18-21] Most of the studies have been carried out in larger, tertiary hospitals (>350 beds). This study was designed to qualitatively investigate the barriers and enablers to the use and application of CAP guidelines in a 230 bed, outer metropolitan hospital in Eastern Health, Victoria, Australia. Two small retrospective audits of patient records across Eastern Health found that pneumonia severity and mortality risk stratification tools were generally not applied, while patients with mild CAP were deemed to have been frequently over-treated.[22, 23] The study intends to elucidate enablers and barriers to the application of antibiotic guidelines as perceived by senior prescribers involved in the assessment and treatment of CAP, in order to gain insight into how to develop tailored interventions to bridge previously identified practice gaps and improve antibiotic prescribing.[24]

**Method:**

A cross-sectional qualitative study employing semi-structured interviews with senior prescribers was designed, using thematic analysis of interview transcripts to gain a better understanding of the enablers and barriers to improving antibiotic use in the treatment of mild to moderate CAP at a 230 bed, outer metropolitan (Angliss) hospital in Victoria, Australia. Purposive recruitment was conducted to include senior prescribers who at the time were working on the General Medicine (GM) ward or in the Emergency Department (ED). Senior prescribers were either specialists or consultants and doctors training in a specialist program. Prescribers at a more junior level than registrars were excluded from the study as their prescribing is often influenced by senior or supervising clinicians.[19] Prospective participants were personally approached by the interviewer and asked to participate in the study. A convenience sample of consultants and registrars was therefore recruited, based on temporal availability and agreement to participate. Interviews were conducted over a two-month period until the interviewer (AS) and a co-investigator (KL), with experience in qualitative research and thematic analysis, determined thematic saturation was reached. The interview guide was developed and tailored in accord with a review by Cabana et al. who categorised barriers to guideline adherence into three domains (knowledge, attitude and behaviour, acronym KAB). They recognised that for guidelines to facilitate best practice, they must enhance practitioner knowledge and affect attitudes in hope of ultimately changing practice behaviour.[25] The older, sparse KAB framework was chosen over more complex ones, e.g. the Theoretical Domains Framework, to enable easier comparison of results with those obtained in a number of studies conducted before the introduction of AMS services.[18, 19, 26] The interview guide was piloted with GM physicians including an intern, registrar and a consultant, who were then not included in the study group. Feedback was discussed and incorporated into the interview guide. For example, knowledge based questions asked how clinicians would usually assess and treat CAP and which particular resources they draw on for decision support. Questions regarding attitudes probed about situations in which guidelines provided them with sufficient guidance or not, and which past experiences may have influenced their current practice. Behaviours were explored by questions around factors that may influence clinicians' prescribing, and the processes they employ in their practice. All interviews were audio recorded and transcribed verbatim. Participant demographic characteristics including position (registrar, consultant), specialty, years of experience, gender, and work location were collected.

Interview voice files and transcripts were de-identified before analysis. Due to the small study site and group size it was decided to only identify physicians by their specialty when presenting the data, to avoid inadvertent identification of narrative.

Thematic analysis was chosen to analyse interview transcripts.[27] A deductive coding frame based on the interview guide was designed a priori and tested, providing the main categories of themes discussed in the interviews (i.e. knowledge, attitudes and behaviour).[28] Interview transcripts were reviewed repeatedly until an overall comprehension of main and potential subthemes was achieved. Transcripts were then coded under the three main categories via the use of Nvivo 11™ and manual coding. The basic framework was thus expanded inductively, with a number of subthemes emerging under each main category.

To limit study bias, improve breadth and depth of analysis, and ensure consistency two investigators independently coded the transcripts (AS, KL), with any conflict resolved by discussion.

The Human Research Ethics Committees of the School of Pharmacy of the University of Queensland (2016/5) and the participating organisation, Eastern Health (LR42/2016) approved this study. Written consent was obtained from participants prior to interviews.

## **Results:**

Of the 35 registrars and consultants available during the study period working in Infectious Diseases (ID/ 1 consultant, 1 registrar), GM (4 consultants, 9 registrars) or ED (10 consultants, 10 registrars), 15 doctors were invited to participate. Thematic saturation was achieved after interviews with 10 participants. Table 1 describes the participants' characteristics.

Table 1. Participant Characteristics

[Insert table 1 here]

Interviews took between twenty to forty minutes each. Coding under the three main categories (knowledge, attitudes, behaviours) identified the following subthemes.

## **Knowledge**

### ***Familiarity with guidelines***

Clinicians were most familiar with the Therapeutic Guidelines Antibiotic™ and found them easy to use and readily available in Eastern Health.

“Guidelines are very accessible. I really like the Therapeutic Guidelines. They are very user-friendly, very accessible.” (GM).

As could be expected ID physicians were familiar with risk stratification tools to assess mortality risk and severity of CAP.

“I think the CORB Score is what Eastern Health guidelines suggest using. In addition, the other scoring system is the SMART-COP, which is listed in Therapeutic Guidelines as well, that can be looked up quite easily.” (ID).

In contrast, other prescribers seemed less familiar with the use of scoring systems.

“I know there is a criteria ..... sorry, I don't remember it properly” (GM).

The majority of clinicians were familiar with the management of CAP as a common condition, had internalised many aspects of guidelines and regarded accessing them frequently as inefficient use of their time.

“I open of the therapeutic guidelines but for common things like pneumonia I know that hasn't changed much, but recently it has actually. So it is worthwhile every three months to open the Therapeutic Guidelines and look at the guides for the common cases that you see because it may change without us knowing.” (ED)

## **Attitudes**

### ***Confidence in antibiotic guidelines***

Most prescribers described guidelines as trustworthy and perceived them as validated by evidence-based literature.

“I do believe in their evidence. The only thing, as I said before, is they don't exclude the spectrum of people with possibly immunocompromised or having other underlying conditions like COPD and that sort of things.” (GM)

There was a consensus that guidelines are a tool to highlight concerning features, especially to junior prescribers, but do not take into account the overall presentation of the patient and therefore cannot be followed blindly.

“I think for a junior doctor this is pretty good pointing out or flagging that this patient conscious is not right. .... So I think it is a good screening tool” (ED)

When questioned why literature suggests poor adherence to guidelines, a number of interviewees thought that the issue originates with the guidelines, although they previously were generally positive about their evidence base.

“Maybe there is something wrong with the guidelines.” (GM)

“Well what other possibility is there. Why would there be such poor adherence to guidelines. Maybe there is something wrong with the guidelines.” (GM)

### ***One size does not fit all***

Clinicians felt that the antibiotic guidelines provide sufficient information to treat CAP in general but found that treatment of patients suffering from multiple conditions or with complicating factors are not easily accommodated within their framework.

“It does cover the majority of community acquired pneumonias. ... We do have a lot of patients with comorbidities that aren't necessarily accounted for in the Therapeutic Guidelines.” (ID)

### ***Antimicrobial Stewardship***

Although not all clinicians had experience with the AMS team, those who did expressed their positive opinion, welcoming input from ID physicians and regarding the program as effective and beneficial in addressing over- or misuse of antibiotics.

“I think it's really good. I think it's something that helps us curb inappropriate antibiotic usage, and it's necessary in all hospitals, I think, private and public, yeah. Reduce bacteria of resistance.” (GM)



“I think it's great. There are lots of antibiotic choices. ... It's always nice to have expertise that pretty much dedicate their time at looking at these things.” (ED)

The collegial and interpersonal nature of AMS advice was emphasised, with a dislike of a process orientated, chart review only service.

“I think that if ID would like to make decisions about antibiotics they should see the patient in person and not make decisions and recommendations based on a drug chart.” (GM)

## **Behaviour**

### ***Documentation and communication***

Documentation of patient diagnoses in medical notes varied between clinicians with the majority stating that although they would document an admitting diagnosis of CAP after a systematic clinical assessment, they don't routinely document its severity or use any of the recommended risk stratification tools.

“I wouldn't usually write if it's severe or not.” (GM).

The lack of clear documentation of CAP severity was then subsequently identified as a barrier when a patient's antibiotic treatment was reviewed by a different treating team later. When in doubt, the assumption was made that the appropriate antibiotic had been initiated.

“Well I think in principle I would change it over but it all depends on the situation. I don't know whether there would be...because there may be a reason why. They are allergic or something like that. There could be a reason.” (ED)

Patients treated in the ED usually transition within a period of a few hours, whether it is to another ward for admission or for discharge. An ED clinician may start treatment but the overall outcome won't be known when the patient has moved on. Also, they will not be aware of the effect their treatment decision had on the patient, being denied the opportunity to modify it if it was unsuccessful.

“One thing about emergency is that we treat people at their initial presentation, and unless we make the effort to follow-up someone through the ward, we actually don’t know what happens to them” (ED)

### ***Experience and clinical judgement***

Clinicians tended to use a mixture of clinical judgement and advice from guidelines, although with a common condition such as CAP guideline recommendations were often modified in favour of clinical judgement.

“There are number of guidelines but as a general rule I think clinical judgement and instinct always seems to be more practical approach when managing an inpatient with pneumonia.” (GM)

Experience and familiarity with certain treatments may get in the way of adapting or changing prescribing behaviour.

“Because people get used to and comfortable with a narrow group of drugs for any indication. Once they get comfortable with that, that's what they use.” (ED)

### **Influencing prescriber behaviour**

A number of external barriers influenced doctors accessing guidelines, for example time pressure when timely treatment seems pivotal.

”I do feel that we haven't got time to waste [to look for information about antibiotics in the guideline] if a patient deteriorates any further” (ED)

Expectations by the patient or the referring GP may influence hospital prescribers to prescribing an unnecessary antibiotic. Although most doctors try to address these expectations, time constraints in negotiating not prescribing an antibiotic and the thought of a patient being discharged and possibly deteriorating can lead to antibiotics being administered.

“Well there is an expectation. Patient expectation and also a GP expectation. So if they're referred in, I think there is an expectation to be given IV antibiotics and be admitted to hospital.” (ED)

“Most of the time we are constrained with the time so you can't go too far trying to convince a patient that he doesn't need that antibiotic” (ED)

In addition to these barriers expectations of the next team taking over the treatment in hospital later were identified as barriers.

“Part of that does influence the way I prescribe because I do know that the next team that care for this patient will want this this patient to be on these antibiotics. Despite what Therapeutic Guidelines or whatever would say, sometimes I do just follow whatever the admitting team would be recommending.” (ED)

### ***Balancing hierarchy and autonomy***

The hierarchical and apprentice-based nature of medical practice seemed to be a prominent influence on prescribing. Registrars mentioned how they follow the instructions of their consultant physicians and adjust their practice and prescribing accordingly. They described how doctors' medical knowledge and experience is obtained through years of practice and education by seniors. Thereby inappropriate prescribing may be inherited.

“The influence of others is very strong factor. How I practice medicine has really been a combination of how my mentors and my registrars throughout my training, of what other people have done. What I am is a make-up of what everybody else is been.” (ED)

“I think juniors often model the seniors and try and work out why particular things done and perhaps model them. Sometimes there may not be good reasons.” (GM)

These various subthemes illustrate the complex practice environment prescribers experience, even when treating a comparatively uncomplicated conditions, such as CAP.

## **Discussion:**

Inappropriate use of antibiotics for the treatment of community acquired pneumonia has been well documented.[2, 19, 29-32] Adherence to antibiotic guidelines is generally increasing but rates seem to have plateaued at 75-80% for appropriate antibiotic prescribing in CAP in many settings. While many barriers to guideline adherence have been identified in tertiary hospitals this study was conducted in a small, outer metropolitan hospital in Australia, investigating the knowledge, attitudes and stated behaviours of clinicians (practicing in ED, GM and ID) when assessing and prescribing antibiotics for CAP. A qualitative exploration of their perceptions and practice may potentially guide the development of highly targeted strategies to incrementally increase guideline adherence.

Some of the barriers and enablers to guideline adherence identified during semi-structured interviews with prescribers in this study are similar to those described previously. The prevailing knowledge of and positive attitudes towards the Therapeutic Guidelines™ - Antibiotic [8] could be regarded as enablers rather than barriers to good practice in the assessment and treatment of CAP, although positive attitude does not necessarily influence the intention of physicians to follow guidelines.[33] As observed in some previous studies, most clinicians were familiar with the Therapeutic Guidelines™, the most widely distributed guidance for the assessment and treatment of CAP in Australia, and found them useful and easily accessible.[19, 26] Participants had internalised much of the guideline content. This may be due to increasing electronic, multi-modal accessibility of antibiotic guidelines and the introduction of AMS services. Even with positive attitudes towards guidelines all clinicians believed that clinical judgment was essential in modifying treatment of CAP. The prevailing attitude was that strict adherence to guidelines is unworkable as they do not account for all patient characteristics such as co-morbidities, social circumstances and previously trialed or failed treatments.[15, 34] In this context, CAP guidelines may have reached their maximum applicability and utility in many clinical practice settings when considering patient comorbidities and complexity.

Competing interests between adhering to guidelines, desire to individualise patient care and scepticism of certain guideline recommendations affect guideline concordance.[35] This seems to be reflected in the dissonance expressed by some interviewees who articulated a generally positive regard for guidelines but stated that something must be wrong with them when asked why they think adherence rates are low.

In general, barriers to guideline adherence identified during the interviews seem to be related to behaviours, practices and systems rather than prescriber knowledge and attitudes. While policy makers perceived that personal experience, autonomy and lack of awareness of prescribing policies were the main reasons for non-compliance with guidelines, prescribers in this study dismissed a lack of knowledge and awareness of policy or guidelines.[15] Because CAP is a common condition, most prescribers were experienced in its treatment and accessed guidelines less regularly compared to unfamiliar treatment scenarios. Familiarity and complacency in accessing guidelines potentially may reduce knowledge of current advice on managing commonly presenting conditions.

Although all doctors described a systematic approach to assessing the severity of CAP only few employed the guideline recommended risk stratification algorithms. While severity classification formed the basis of antibiotic choice in the treatment of CAP, only a minority of interviewees routinely documented a severity score or detailed how they classified severity, similar to findings described in the literature.[15, 19, 33] This becomes a significant issue when subsequent treating teams try to second guess the primary prescribers' decisions. Clinicians often assumed there must have been a valid reason for the initial choice of antibiotic in the absence of explicit documentation. The lack of detail in documentation and communication may not only affect patient care but also influence results of audits on guideline adherence as patient notes are usually their main source of data. Lack of documentation in patient notes potentially generates uncertainty and ambiguity when auditors classify CAP severity and try to ascertain prescribers' rationales for treatment decisions. As observed in other studies, time constraints, acuity of patient presentation, expectations from patients, general practitioners or future treating teams influence the initial choice of treatment.[19, 25]

Other interview findings add a novel perspective and potential enablers in the effort to optimise assessment and treatment of CAP. This is often initiated in the ED but treatment outcomes are usually unknown to ED physicians as their patients transition elsewhere. The lack of feedback regarding patient outcomes denies the ED prescribers experience and learning opportunities to modify prescribing behaviour. Audits and educational interventions including academic detailing, group discussions, posters and disease severity assessment tools have been shown to be effective at improving CAP management in the ED.[36] The addition of regular discussion of patient outcomes with ED physicians, for example through AMS services, could address potential socio-cultural issues of risk avoidance.[37] This would

form an additional strategy in optimising the initiation of antibiotic treatments of CAP by creating a feedback loop and reducing uncertainty in prescribing.

The hierarchical influence of senior physicians on junior doctors and the apprentice style learning and practice in medicine plays an important part in the management of all aspects of assessing and treating patients, as was identified throughout the interviews.[3] Senior physicians have the final decision regarding the treatment of CAP and function as educational and practical role models for junior doctors, which leads them to adopt or inherit knowledge and determines their future practice.[39, 40] AMS services would have great opportunity to leverage the relationship centred and collegial nature of medical practice and change what has been described as the social world of hospitals in relation to antibiotic prescribing.[41] Engaging AMS services in relationship building feedback and discussion, rather than relying on monitoring of restrictions and policy, will potentially achieve an incremental improvement in guideline concordant antibiotic use and patient outcomes by changing the social context of prescribing. The development and use of persuasive interventions through a personal, educational approach to stewardship may be particularly practicable in smaller hospitals. In person discussions that facilitate interdisciplinary, socio-cognitive and situated learning may add to the final incremental improvements in antibiotic use which procedural or regulatory strategies are not achieving so far.[42, 43]

Continuing education and feedback regarding guideline updates and the importance of documentation may have a positive impact on guideline adherence, as it will promote currency of treatment information for common conditions such as CAP that may not necessarily be reviewed routinely by clinicians. Creating feedback loops for clinicians to readily access outcomes for patients they previously treated may improve the initial prescribing of antibiotics and their continuation throughout a patient's hospitalisation.

Overall, a number of barriers to the use of guidelines in the assessment and treatment of CAP and possible enablers were identified in the interviews, which will guide the design of future strategies to improve guideline compliant assessment and treatment of CAP.

The limitations to this study are convenience sampling which may have introduced selection bias and sampling error, although it is an accepted methodological approach when enrolling participants in qualitative research. The clinical pharmacist conducting the interviews was professionally known to all interviewees which may have influenced their responses and introduced social desirability bias with physicians trying to modify their answers to be seen to exhibit positive attitudes or behaviours, a risk in all interview based research.[44]

Contrastingly, it seemed to permit a degree of candidness which clinicians may not have

shown if the interviewer had been unknown to them. Although thematic saturation was reached, the small sample size of relatively senior doctors may not have been a true representation of the overall medical hospital workforce.

In spite of these limitations, this study confirms that prescriber related barriers to guideline adherence are multifactorial. Insight into these barriers and potential enablers elucidated during the interviews is valuable as they mainly related to aspects of attitudes and behaviour which will influence the design of future interventions to increase the likelihood of best practice.

### **Conclusions:**

Interviews with senior prescribers confirmed a number of previously described barriers to the guideline adherent assessment and treatment of CAP in hospitals, i.e. various external influences on clinicians and gaps in documentation and communication. They also provided insights into enablers to guideline use, i.e. their easy accessibility and trustworthiness, and the generally positive attitude towards AMS services. A number of potential strategies to incrementally improve guideline concordance were identified from the way clinicians described their attitudes and practices, e.g. creating feedback loops and engaging AMS services in personalised, educational discussions.

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### **Author contributions**

AS, MA and KL designed the study, AS conducted the interviews, AS and KL undertook the analysis and drafted the manuscript. All authors contributed to critical revision of the paper and approved the final version.

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Table 1.

<b>Abbreviation</b>	<b>Specialty</b>	<b>Designation</b>	<b>Gender</b>	<b>Years in practice</b>
ID	Infectious Disease	Registrar	Female	7 years
ID	Infectious Disease	Consultant	Female	10 years
GM	General Medicine	Registrar	Female	9 years
GM	General Medicine	Registrar	Female	4 years
GM	General Medicine	Consultant	Male	15 years
GM	General Medicine	Consultant	Male	13 years
ED	Emergency medicine	Registrar	Female	15 years
ED	Emergency medicine	Registrar	Male	20 years
ED	Emergency medicine	Consultant	Male	30 years
ED	Emergency medicine	Consultant	Male	30 years



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