Original Article

Procalcitonin use in Acute Medicine in the United Kingdom: a survey of practice, barriers and facilitators

N Smallwood, LSP Moore, MD Jones, N Murch & N Powell

Abstract

Introduction: Use of procalcitonin (PCT) across Acute Medical Units (AMUs) in the United Kingdom (UK) post-COVID-19 is not well understood. We aim to explore clinician knowledge and behaviours relating to PCT-guided antimicrobial decision making for patients managed in NHS AMUs across the UK.

Methods: A web-based survey was sent via email to members of the Society for Acute Medicine

Results: There were 342 individual responses from 133 organisations, of which half (52.6%) had access to PCT. Self-reported knowledge of PCT was rated adequate or good for most respondents (84.3%), despite the majority of respondents reporting non-availability or unawareness of local PCT guidance (66.2% organisations). The greatest influences of PCT use were previous experience, personal review of evidence, and local culture. A majority of respondents (115/211;54.5%) felt PCT often (≥40% of the time) had a role in guiding antimicrobial decision making in the AMU.

Conclusions: There is widespread variation in practice, driven in part by inconsistency around local guidelines and a lack of national guidance to inform the use of this biomarker. We recommend the development of national, evidence-based guidance around the use of PCT to ensure consistency of approach and high-quality care for patients with suspected infection.

Keywords

Rapid diagnostics, biomarker [MeSH], infection [MeSH], procalcitonin

Introduction

Procalcitonin (PCT) blood levels rise significantly in a number of inflammatory and infective states,[1] with potential as an antimicrobial stewardship (AMS) tool to guide antimicrobial decision-making.[2] The COVID-19 pandemic first wave saw expansion of PCT use in NHS hospitals in England and Wales, with the number using it in emergency/acute admissions increasing from 17 (11%) to 74/146 (50.7%). Alongside this, 45/75 (60%) Emergency Departments (EDs) and 60/83 (72.3%) Acute Medical Units (AMUs) reported their intention to continue using PCT for AMS post-pandemic.[3] Although PCT use in COVID-19 was not supported by the National Institute for Health and Care Excellence (NICE), the majority of surveyed clinicians reported thinking PCT had positive effects on controlling antimicrobial overuse.[3] At a hospital level, Llewellyn et al. (2022) showed PCT testing in EDs/AMUs was associated with an initial, but unsustained, reduction in antimicrobial use during the COVID-19 first wave.[4] At the patient level, PCT was shown to reduce antimicrobial use.[4,5]

For patients without COVID-19 infection, there is evidence PCT can safely reduce antimicrobial use in hospitalised patients with suspected respiratory tract bacterial infections,[6] acute pancreatitis,[7] and Intensive Care Unit (ICU) patients with sepsis.[8,9] The only NICE appraisal on PCT use (NG18, 2015) did not support routine use of PCT,[10] and there are currently no UK guidelines supporting the use of PCT outside of the ED or ICU.

The level of usage and availability of PCT across AMUs in the United Kingdom (UK) post-COVID-19 is not well understood. Similarly, it is unclear what factors guide clinician utilisation of PCT and in what clinical scenarios it's considered to add value. This may lead to unwarranted variation in usage, potentially impacting clinical outcomes. Understanding these factors and decisions may help rationalise PCT use.

Aim

To understand clinician behaviours relating to PCT-guided antibiotic decision making for patients without COVID-19 managed in NHS AMUs across the United Kingdom.

Objectives

1. To determine the extent of PCT availability in NHS AMUs.
2. To understand for which infections/patient pathways PCT is utilised.

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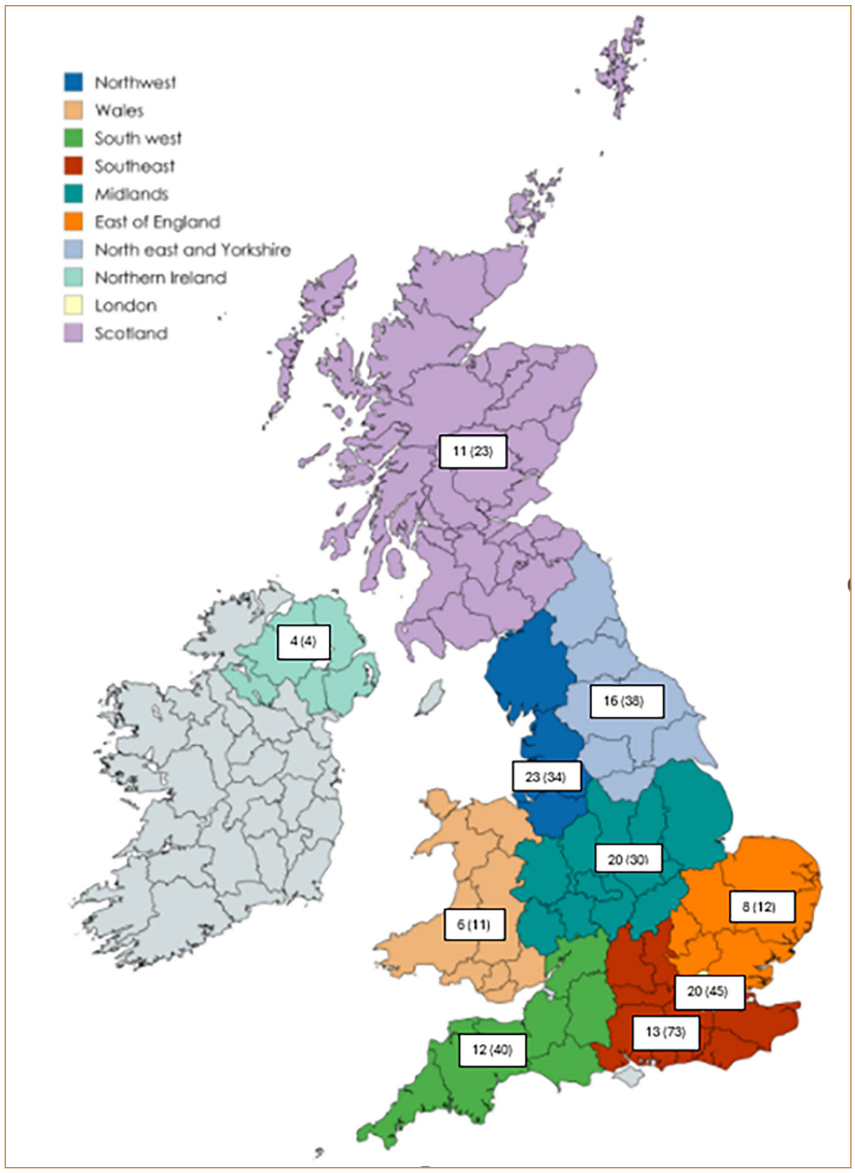


Figure 1. Respondent distribution for UK survey on use of procalcitonin in acute medicine. The number outside parentheses show the number of hospitals represented in each region and the number in parentheses show the number of respondents in total from each region.

3. To explore barriers to PCT-guided antibiotic decision-making.
4. To explore enablers for PCT-guided antibiotic decision-making.

Methods

A web-based survey (SurveyMonkey Inc, California, USA) was developed by the authors. The survey explored the study objectives using 23 questions developed using the behavioural domains of the Behaviour Change Wheel.[9] The survey questions sought information about: use and availability of PCT in AMUs, participant knowledge of PCT, guidelines for, and frequency of use of, PCT, factors which inform participants' use of PCT, beliefs about role of PCT in antibiotic decision-making, and barriers and enablers to PCT use.

The survey was piloted with three acute physicians from different hospitals and refined. The usability and technical functionality of the questionnaire was tested by the study team before distribution via email to members of the Society for Acute Medicine (SAM). Data collection took place between 8th May and 2nd July 2025, email reminders were sent twice during this period. No incentives were provided for survey completion. This study is reported using the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[11]

Ethical approval was obtained from the University of Bath Biomedical Research Ethics Committee (number 10272-11896) on 6th May 2025. Consent for participation was obtained. Respondent identity was blinded.

When analysing organisational-level data and conflicting individual responses were obtained from single organisations, we used the modal answer for that organisation. Recurrent themes in free text responses were summarised by a single author (NS).

Results

Participant demographics

There were 342 individual responses from 133 different organisations, representing all UK regions (Figure 1). The response rate was estimated as 15.5% (342/2200 SAM members), although distribution beyond the initial mailing list was possible. The completion rate of those who consented to participate was 56%.

Of 313/342 (91.5%) respondents who provided their profession, 294/313 (93.9%) were doctors, 9/313 (2.9%) were advanced clinical practitioners, 8/313 (2.6%) were nurses, and there was one 1/313 (0.3%) pharmacist and one physician associate. Of the doctors, 174/294 (59.2%) were consultants, 67 (22.8%) were ST4+/Registrars, 41 (13.9%) were ST1-3/Core level, and twelve (4.1%) were Foundation doctors within two years of graduation. Of 311 clinicians reporting their primary specialty, 236 (75.9%) worked within acute medicine, 32 (10.3%) within general/internal medicine, 9 (2.9%) within care of the older person, 7 (2.3%) respiratory medicine, 5 (1.6%) intensive care medicine, 5 (1.6%) microbiology/infectious disease and the remaining 17 (5.5%) were from ten other specialties including primary care.

Availability of PCT assay

187/311 (60.1%) respondents reported their AMU had access to PCT testing, this corresponds to 70/133 (52.6%) organisations, noting that multiple responses were received from some organisations. In 9/70 (12.8%) organisations, PCT was introduced to

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AMU prior to COVID-19 (2019 or earlier), in 39/70 (55.7%) this was during COVID-19 (2020-22), in 5 (7.1%) AMUs this was since COVID-19 (2023-2025) and in the remaining 17 (24.3%) AMUs the respondents were not sure (Figure 2).

Available guidance for use of PCT

There were 258 respondents to this question, covering 122 organisations (91.7% of organisations in the survey). Of these, respondents from only 45/133 (33.8%) organisations reported they were aware of published hospital guidance on PCT use, either as a standalone policy (n=12, 9.0%) or as part of a wider antimicrobial policy (n=33, 24.8%). Forty-two (31.6%) organisations had no PCT guidance available. The remaining 46 (34.6%) organisations had respondents who did not know, or there was no organisational response (Figure 3). We asked for specific examples of national guidance used, and two (1.5%) responses quoted NICE NG18 and the European Society of Clinical Microbiology and Infectious Diseases. We noted for hospitals with multiple participants there were occasionally differing answers, e.g., for the same hospital some respondents said there were published guidelines whereas others said there were not.

Knowledge of use of procalcitonin

Of 312 respondents, 263 (84.3%) self-reported their knowledge on use of PCT as adequate, good or very good (Figure 4). There was a trend for consultants to self-report very good or good knowledge compared to non-consultants.

Use of PCT

Respondents were asked how often over the past year they had used PCT across various clinical scenarios. There were 162 responses, and these were split into frequently (at least once per week), rarely (once per fortnight or less) and never (Figure 5).

Clinical scenarios where PCT was used most frequently were: in suspected infection to guide initiation of antimicrobials, in suspected inflammation/sepsis/infection where source was unclear, in suspected infections to guide cessation of antimicrobials, and suspected or confirmed respiratory tract infections. PCT was used least frequently in the other scenarios.

Factors influencing PCT usage

255/342 (74.6%) respondents answered about factors influencing their PCT utilisation. Responses (Figure 6) were collated into strongly (very strongly or strongly informs), moderately, or weakly (slightly informs or does not inform). The greatest influences were previous experience, personal review of evidence,

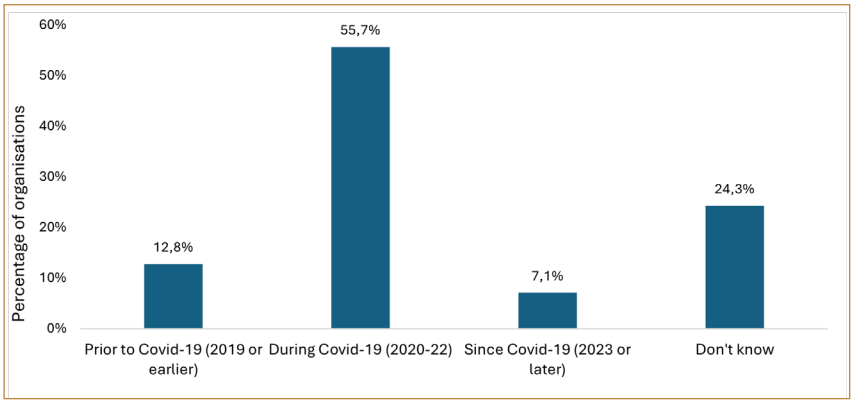


Figure 2. Timing of introduction of PCT reported among respondents in organisations who had access to PCT.

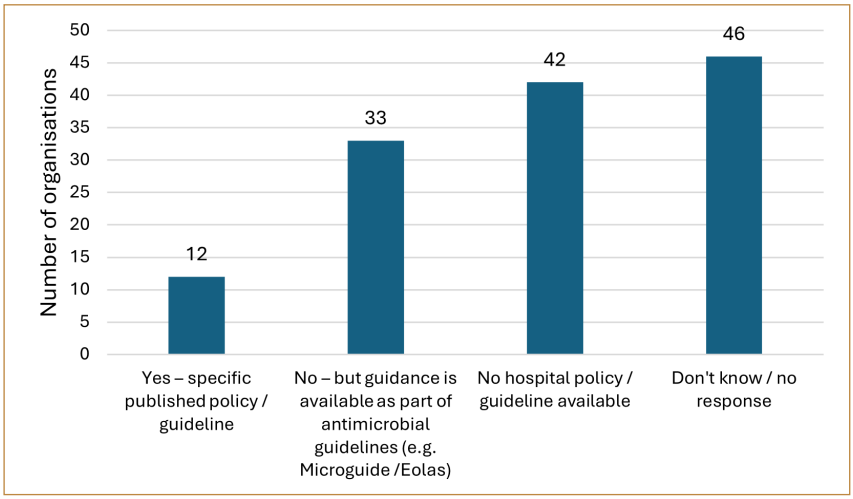


Figure 3. Availability of clinical guidelines for using PCT reported among respondents to UK survey on use of procalcitonin in acute medicine.

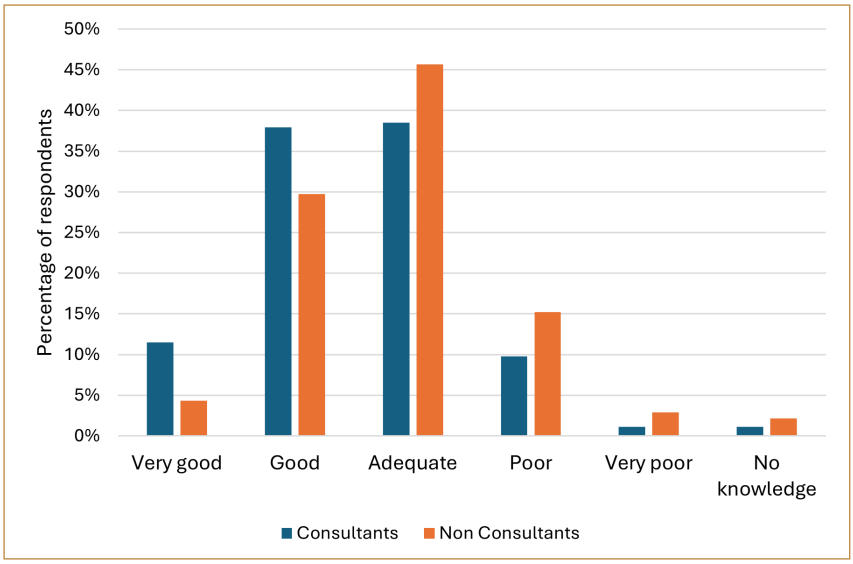


Figure 4. Self rated knowledge on use of PCT among respondents to UK survey on use of procalcitonin in acute medicine.

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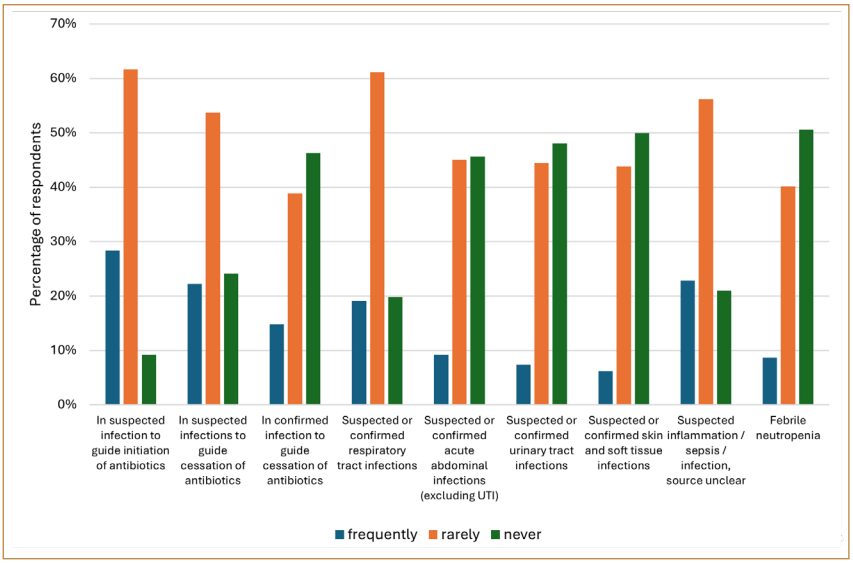


Figure 5. Frequency of use of PCT self-reported among respondents to UK survey on use of procalcitonin in acute medicine Frequently = at least once per week, rarely = once per fortnight or less, or never.

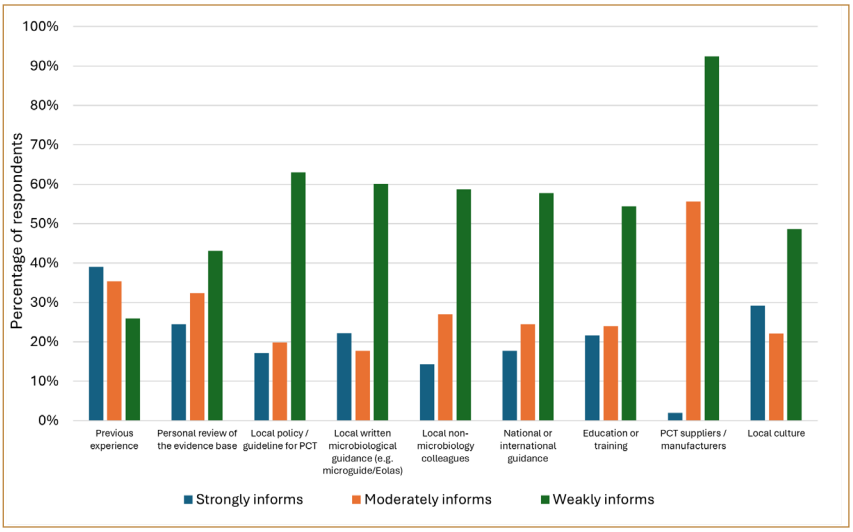


Figure 6. Factors influencing PCT usage reported among respondents to UK survey on use of procalcitonin in acute medicine.

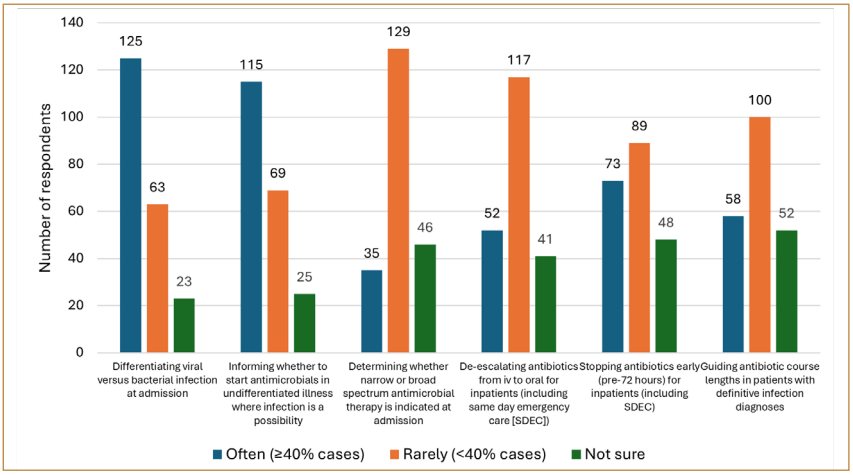


Figure 7. Frequency of use of PCT in medical decision making reported among respondents to UK survey on use of procalcitonin in acute medicine.

and local culture. The least influential factor was PCT suppliers/manufacturers. Additional factors informing PCT decisions (via free text responses) were restricted access outside of critical care and cost concerns.

Beliefs and behaviours around PCT in AMUs

211 of 342 (61.7%) respondents answered how frequently they felt PCT has a role in antimicrobial decision-making for patients admitted to AMUs with suspected bacterial infection (Figure 7). For 115/211 (54.5%) it was felt that PCT often (≥40% of the time) had a role. For 96/211 (45.5%), it was felt PCT rarely, or never (i.e. <40% time), had a role in guiding antimicrobial decision making.

211 of 342 (61.7%) respondents answered how often they felt PCT should be used to guide decisions on AMUs with reference to a number of clinical scenarios. These responses were grouped into often (≥40% time) or rarely (<40% time). The most frequent scenarios where it was felt to be valuable were in differentiating viral from bacterial infection at admission (59.2%) and informing whether to start antimicrobials in undifferentiated illness when infection is a possibility (54.5%). The least valuable scenarios were to differentiate whether narrow or broad-spectrum antimicrobials are indicated (16.6%) and in changing antimicrobials from intravenous to oral in inpatients (24.6%) – see Figure 7.

Respondents were asked whether PCT could be used to either shorten antimicrobial courses (through serial PCT measurements) or withhold antimicrobials, in a number of clinical scenarios. Only a minority of respondents believed that PCT often has a role in shortening antimicrobial course lengths across the four scenarios (Figure 8). For withholding antimicrobials, the highest scoring scenarios were patients with low probability of infection, with 49% of respondents answering that PCT often has a role in withholding antimicrobials for patients with 'low infection probability and low acuity illness' and 40% for 'low infection probability and high acuity illness' (Figure 9). The majority felt that PCT rarely had a role in withholding antimicrobials in high infection probability scenarios.

Enablers and barriers to PCT use

Respondents were asked whether they felt a number of factors were strong or weak enablers or barriers to their use of PCT on AMUs. These results were grouped into strong (strong or very strong enabler) or weak (weak, very weak, not an enabler).

Figure 10 shows the reported barriers. These were cost and local culture, whilst published national guidance was seen as the weakest barrier to utilisation. Free text responses identified time to analyse the

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test, and availability within AMUs specifically (as opposed to Critical Care where availability appeared unrestricted) as the other main barriers.

The primary enablers to PCT usage on AMUs were identified as availability and local culture (Figure 11). Cost and published national guidance were considered weak enablers. Analysis of the free text results suggested that guidance around usage in specific clinical scenarios might be another important enabler.

Social factors around use of PCT

Where participants were aware of their infection specialist colleagues' views, the majority reported they were fully or somewhat supportive of PCT (Figure 12).

62/205 (30.3%) said there was support for PCT from AMU colleagues describing them as either fully supportive or somewhat supportive of PCT. 66/205 (32.2%) said their colleagues were ambivalent, 17/205 (8.3%) said their colleagues were either unsupportive or very unsupportive and 60/205 (29.3%) didn't know (Figure 13).

Discussion

Main findings

We found wide variability in the availability of PCT across the UK. Similarly, there is variation in the perceived utility and clinical indications for the use of PCT, alongside perceived barriers and enablers for its utilisation. Yet self-reported knowledge around the use of PCT was high, with a higher proportion of consultants self-reporting adequate or higher knowledge of PCT compared to non-consultants.

Just over half the respondents felt that PCT rarely (<40% time) had a role in antimicrobial decision making on the AMU, but where used the most frequently reported roles were aiding the differentiation of viral from bacterial infection and informing whether to start antimicrobials in undifferentiated illness. Clinicians felt the most value was in potentially withholding antimicrobials in low infection probability in both low and high acuity illnesses. Clinicians infer the negative predictive value of PCT is sufficient that a negative result reasonably excludes infection only where suspicion of infection is low. If clinical suspicion of infection is high, respondents inferred PCT alone was not sufficient to withhold antimicrobials.

Awareness of, utilisation of, and confidence in local, national,[10] and international guidelines[11] around the use of PCT varied markedly. This is likely a major factor in the variation in PCT usage found in this study. Despite this, a lack of guidance was not felt to be a significant barrier to its use; published national guidance was the weakest reported barrier

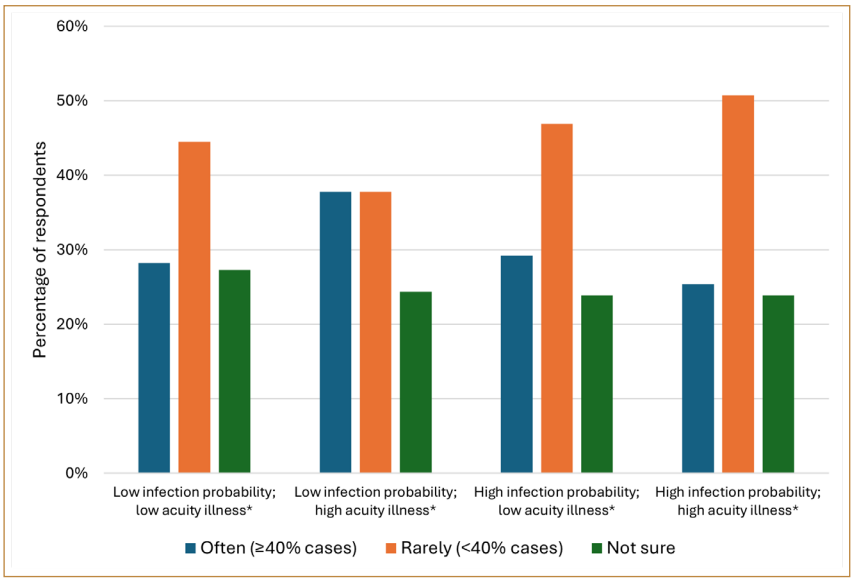


Figure 8. PCT role in shortening antimicrobial course lengths reported among respondents to UK survey on use of procalcitonin in acute medicine.

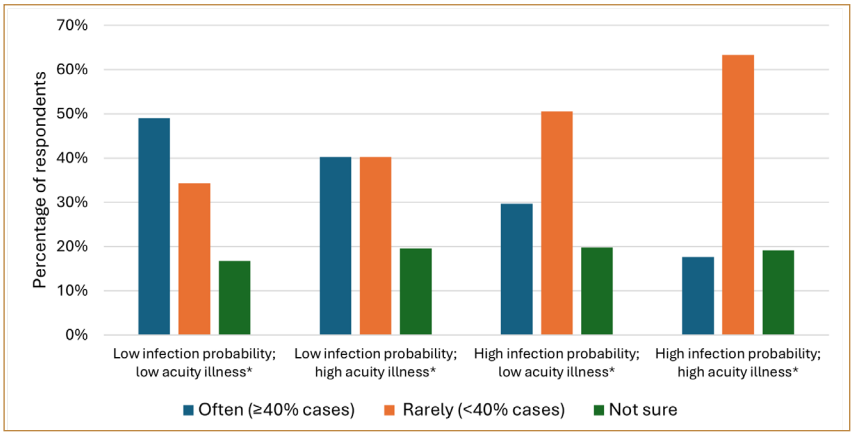


Figure 9. PCT role in withholding antimicrobials reported among respondents to UK survey on use of procalcitonin in acute medicine.

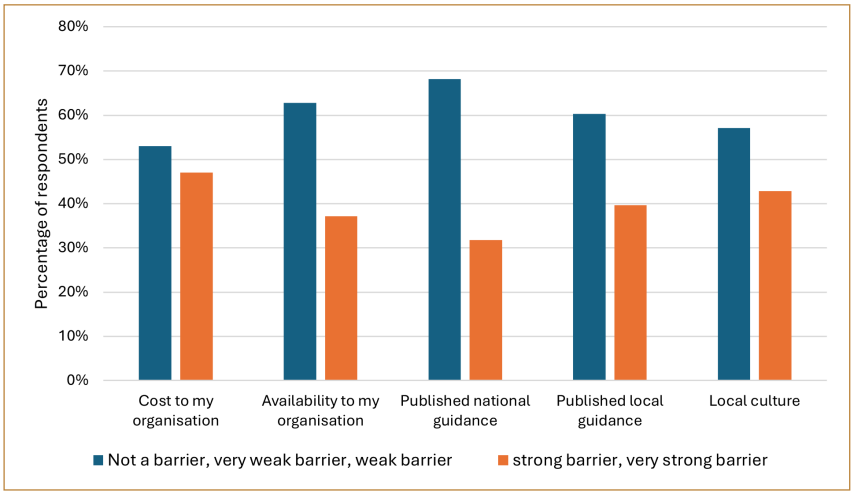


Figure 10. Barriers to PCT use reported among respondents to UK survey on use of procalcitonin in acute medicine.

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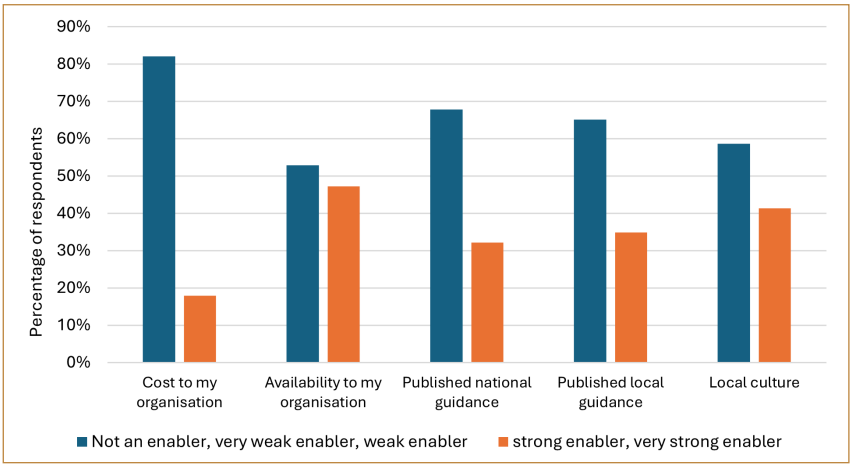


Figure 11. Enablers to PCT use reported among respondents to UK survey on use of procalcitonin in acute medicine.

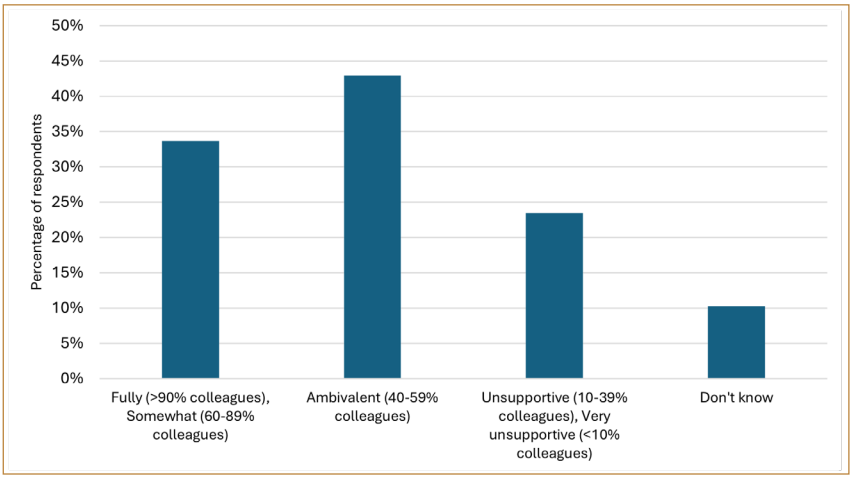


Figure 12. Perceived infection specialist colleague support for PCT use reported among respondents to UK survey on use of procalcitonin in acute medicine.

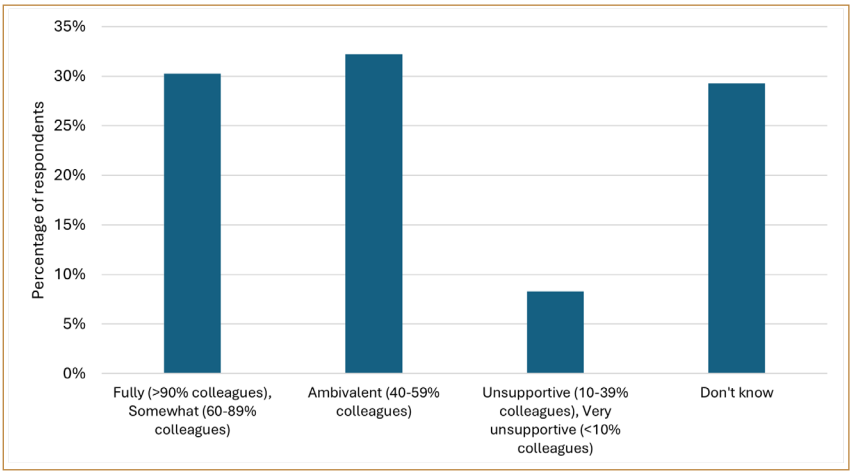


Figure 13. Perceived AMU colleague support for PCT use reported among respondents to UK survey on use of procalcitonin in acute medicine.

to use with less than a third of respondents reporting it to be a strong or very strong barrier. This suggests that clinicians feel that despite the lack of reported guidance they would still be willing to use PCT were there no other barriers. To this end, it was the cost to the organisation and local culture which were reported to be the strongest barriers to use. The most significant enablers were availability of PCT and local culture. Free text answers noted that specific guidance for PCT use in various clinical syndromes would be a strong enabler. Putting these results together suggest that although the lack of current guidance is not seen as a barrier to use, were it to exist then there would be strong inclination to consider further PCT usage.

PCT use was supported by infection and AMU colleagues with a third of respondents responding that their colleagues were supportive of PCT, a minority unsupportive and the rest either thought colleagues were ambivalent or didn't know.

Strengths and weaknesses

These results provide the first insights into the attitudes and use of PCT amongst AMU clinicians. This multi-centre study, with nationwide coverage, and responses from a breadth of levels of seniority suggests the findings are generalisable across the UK.

There are limitations with the integrity of survey data, which we acknowledge may limit the strength of our conclusions.[15] The relatively long questionnaire, with 31 questions, may have contributed to the moderate completion rate. We allowed clinicians to answer the majority of questions even if they didn't have access to PCT, which may have impacted their views given the lack of availability to them at that current time (possible availability bias). However, we felt the importance of gathering overall views on attitudes, barriers and enablers regardless of current availability were important. Finally, we acknowledge that this survey was not restricted to the initial target audience (SAM members) and so could have been filled in by anyone with the link. This presents advantages and disadvantages; it somewhat limits the generalisability to acute physicians, but we felt it important to be able to capture the views of those working at the front door who may not identify as acute physicians or similarly may not be SAM members. It will have allowed a broader overview of acute clinicians regardless of specialty, and the fact the over 75% respondents identified as acute physicians suggests the drift beyond the initial cohort was not profound. Non-doctor respondents were not well represented.

Comparison with the literature

A previous survey of PCT use in AMUs in England and Wales[3] found that half had access to PCT by

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the end of the first wave of COVID-19 and we have found access to PCT remains similar. In the same survey[3] half of hospitals reported having a guideline for PCT use in COVID-19 patients, yet we found a third of respondents have access or were aware of current PCT guidelines in their hospitals. It is of course possible that this figure is artificially low and hospitals do have guidance but awareness may be low, which may be supported by the variation in answers around guideline availability even within organisations.

Several clinical trials support the safety and efficacy of PCT guided antibiotic decision making in several clinical scenarios in the inpatient setting.[6] Schuetz *et al.* (2018) developed PCT algorithms for different types of acute respiratory infections (Community acquired pneumonia (CAP), bronchitis, COPD, asthma) and suspected sepsis treated in different clinical settings (primary care, ED, inpatient and ICU) based on these clinical trials.[11] Bartoletti *et al.* (2018) produced some expert consensus guidelines on the use of PCT in different clinical settings which included ED and general medicine.[12] In ED, this guidance suggests PCT should be used to differentiate bacterial from non-bacterial infections or from non-infectious processes, and for inpatients outside ICU, PCT can be used to aid diagnosis of bacterial infection in CAP and COPD to support antibiotic initiation, and to guide treatment escalation and aid antibiotic discontinuation.[12] The current NICE guidelines for PCT considered its cost effectiveness in both the ED and ICU.[10] Evidence from ten randomised controlled trials showed that PCT in the ED setting, when compared to standard care without PCT testing, significantly reduced antibiotic consumption, significantly reduced antibiotic-related adverse events, had a modest impact on shortening length of hospital stay, no impact on re-admission rates and no impact on mortality.[10] However, PCT use with standard clinical practice resulted in only a small Quality Adjusted Life Year (QALY) gain compared with standard clinical practice and the committee concluded that in the ED setting it was uncertain whether the benefits shown in these studies, all from outside the UK, were applicable to the NHS and therefore were not able to recommend the use of PCT in the ED.[10] There are no nationally endorsed guidelines that have considered the use of PCT outside of ED or ICU and therefore currently PCT is not recommended for use. Three UK PCT trials were set up to explore its role in antibiotic decision making in ED (PRONTO), ICU (ADAPT-SEPSIS) and paediatrics (BATCH).[13-15] ADAPT-SEPSIS showed a daily PCT-guided protocol reduced antibiotic duration safely compared with standard care, whereas BATCH showed that a PCT-guided algorithm did not reduce duration of intravenous antibiotics treatment with outcomes comparable to standard care. PRONTO is yet to report.[14]

Implications for practice

Variation in practice is large, and there is therefore a need for evidence-based, national guidance to inform consistent usage of PCT; the upcoming PRONTO trial may inform these.[14] Clinicians should review available data around PCT use to ensure their practice aligns with the best currently available evidence, and is not merely informed by availability or local culture.

Individual AMUs should review their guidance around PCT use and should work closely with infection specialists to standardise local / regional approaches. These measures may help reduce unwarranted variation in PCT usage and encourage consistent practice according to best available evidence.

Conclusions

PCT remains widely available in AMUs although there is inconsistent use; primarily driven by local culture and cost / availability. Clinicians using PCT in the AMU setting consider their knowledge to be good, despite an apparent lack of guidelines. Many felt PCT had a role in guiding antimicrobial decision making for specific patient groups. There is a need for national evidence-based guidance to standardise the approach to PCT use.

Availability of data and material

Data requests can be made to the corresponding author, as long as data sharing agreements are in place.

Competing interests

NS has nothing to declare

LSPM has consulted for or received speaker fees from bioMerieux (2013-2026), Eumedica (2016-2025), Pfizer (2018-2026), Sumitovant (2021-2023), Shionogi (2021-2025), Qiagen (2023-2025), BioNTech (2024), Insmed (2024), Advanz (2024-2025), Gilead (2024-2025), and ThermoFisher (2026) and received research grants from the National Institute for Health and Care Research (2013-2026), CW+ Charity (2018-2026), North West London Pathology (2022-2024), LifeArc (2020-2022), Shionogi (2024-2025), the Joint Programming Initiative for Antimicrobial Resistance (2023-2025) and the Healthcare Infection Society (2024-2026).

NP has consulted for or received speaker fees from bioMérieux, Thermofisher, Pfizer and GSK and received research grants from National Institute for Health Research, Pfizer and Exeter BRC.

NM has received honorarium from Abbott diagnostics, Boston scientific and Inari Medical (Stryker).

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Contributions

Conceptualization, Methodology - NS, NP, MJ, NM
Formal analysis, Data Curation, Writing - Original Draft - NS, NP
Writing - Review & Editing - NS, NP, MJ, NM
Funding acquisition - NS
NS, NP, MJ, NM

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