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Factors influencing implementation and adoption of direct oral penicillin challenge for allergy delabelling: a qualitative evaluation

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ABSTRACT

Background Over 95% of penicillin allergy labels are inaccurate and may be addressed in low-risk patients using direct oral penicillin challenge (DPC). This study explored the behaviour, attitudes and acceptability of patients, healthcare professionals (HCPs) and managers of using DPC in low-risk patients.

Methods Mixed-method, investigation involving patient interviews and staff focus groups at three NHS acute hospitals. Transcripts were coded using inductive and deductive thematic analysis informed by the Theoretical Domains Framework.

Findings Analysis of 43 patient interviews and three focus groups (28 HCPs: clinicians and managers) highlighted themes of 'knowledge', 'beliefs about capabilities and consequences', 'environmental context', 'resources', 'social influences', 'professional role and identity', 'behavioural regulation and reinforcement' and a cross-cutting theme of digital systems. Overall, study participants supported the DPC intervention. Patients expressed reassurance about being in a monitored, hospital setting. HCPs acknowledged the need for robust governance structures for ensuring clarity of roles and responsibilities and confidence.

Conclusion There were high levels of acceptability among patients and HCPs. HCPs recognised the importance of DPC. Complexities of penicillin allergy (de)labelling were highlighted, and issues of knowledge, risk, governance and workforce were identified as key determinants. These should be considered in future planning and adoption strategies for DPC.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Many patients report an allergy to penicillin that is documented in their medical record. The majority of these allergy label records are inaccurate or inappropriate and may be removed using a systematic and structured approach.

WHAT THIS STUDY ADDS

⇒ A deeper understanding of factors that lead to patient acceptance of the penicillin allergy record.
⇒ Highlighted limited patient awareness of the clinical impact of having the allergy record.
⇒ Healthcare professional perspectives on the potential risks to patients and their own professional practice and accountability.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Current national guidelines recommend structured review and delabelling of penicillin allergy in low-risk groups. The study provides insights into factors that may impact implementation and adoption of the guidelines in practice.

BACKGROUND

Inappropriate penicillin allergy labels (PALs) labelling is a significant problem for patients and health systems. As many as one in eight hospitalised patients in the UK report an allergy to penicillin, yet 9 out of 10 individuals with such a label do not have a true allergy on testing.[1 2] An inappropriate PAL may cause significant harm to individual patients and lead to inefficient use of healthcare resources, with increased length of stay, risk of postoperative and serious infections and antimicrobial resistance.[3] The removal of inappropriate PALs could have an important clinical and financial impact for health systems as well as improving antimicrobial stewardship.[4] National and global guidelines advocate delabelling, using a direct oral penicillin challenge (DPC) without undertaking allergy skin tests in patients who are considered to be at low risk of having a true allergy or hypersensitivity reaction.[5–9]

Penicillin allergy de-labelling (PADL) protocols have been shown to be safe and effective, even when undertaken by a non-allergy specialist.[10] However, implementing

PADL continues to pose challenges and the perceptions of patients and healthcare professionals (HCPs), and the wider determinants for adopting and embedding the intervention across different clinical environments are not well understood.[11 12] This study explored the behaviour, attitudes and acceptability of patients, HCPs and managers regarding the use of DPC to remove PALs in low-risk patients.

METHODS

This was an implementation study nested within a mixed-method, multicentre investigation of the feasibility of delivering DPC in a routine NHS secondary care setting, conducted at three acute care hospital organisations in England.[13] We follow the reporting guidelines for consolidated criteria for reporting qualitative research.[14]

All 155 patients stratified as low risk, based on standardised history using a study proforma and review of clinical records, and deemed suitable for DPC[1] were provided an information sheet and invited to participate in the interview study at the time of overall study recruitment. Patients were sampled purposively, with a minimum target of 10–15 interviews per site, subjected to saturation checking,[15] to ensure wide representation of gender, age and ethnicity, and a mix of patients who completed or declined the DPC. One-to-one semistructured interviews were conducted in March 2022 by two of the authors (MM, a female research pharmacist and YHJ, an experienced female clinical academic pharmacist), 8 weeks after the intervention started, by telephone using a prespecified interview schedule. Interview questions were informed by risk perception theories[16] and piloted with patient and public partners to ensure face validity. Interviews were conducted between 8:00 am and 6:00 pm.

HCPs were invited to participate in the focus groups by email and using poster advertisements at each site. Focus groups were conducted in person in November 2022 (sites A and C) and online via Microsoft Teams in January 2023 (site B), involving 7–12 participants from a range of professional backgrounds. Each discussion lasted between 90 min and 120 min. Two members of the research team (YHJ and IW, a male Professor of Health Policy and Management) facilitated the discussions using a prespecified topic guide, underpinned by risk perception theories[16] and made field notes. Focus group participants were requested to complete an optional online form to provide basic demographic data.

Audio recordings of interviews and focus groups were collected on a secure digital voice recorder and transcribed by a professional transcribing service. Transcripts were not returned to participants for comment or correction. MAXQDA Plus 2022 (VERBI Software) was used to analyse the raw data transcripts. One author (MM) coded the transcripts and summarised the findings. Cross-validation of coding and analysis was performed independently by two authors (YHJ and IW) who each reviewed half of the coded transcripts and summaries. The final codebook was agreed by all authors. Thematic analysis was undertaken using inductive and deductive approaches and was informed by the Theoretical Domains Framework,[17] to understand the cognitive, affective, social, environmental, organisational and professional influences on behaviours relating to PADL. The themes and initial findings were presented to the study patient and public involvement and engagement advisory group.

The funder of the study (National Institute for Health and Care Research) had no role in study design, data collection, data analysis, data interpretation or writing of the report.

RESULTS

We conducted 43 patient interviews and three focus groups involving 28 HCPs. Participant characteristics and further details are stated in tables 1 and 2.

The results of the qualitative analysis are presented according to the intervention pathway: pre-DPC, during DPC and post-DPC. Further cross-cutting themes are then described.

Overall, the theoretical domains of 'knowledge', 'beliefs about capabilities and consequences', 'environmental context', 'resources', 'social influences', 'professional role and identity' and 'behavioural regulation and reinforcement' were found to be strong influences in both patient and staff groups.

Preintervention phase

Ensuring appropriate knowledge levels was identified as being critical to the DPC intervention adoption. For example, knowledge of the clinical history and origins of the PAL were considered an important foundation for HCP professionals implementing the DPC as well as patients' willingness to accept the intervention. Patients typically reported little or no knowledge regarding penicillin allergies. A consistent message was, therefore, that patients were inclined to accept the label as valid, had not sought out any more information and were unaware of the potential for delabelling.

> I was 6 years old. This was 34 years ago and since then everyone's been scared to check. You were the first one to actually check (Site-C, Patient code: 3057)

Most patients were able to provide some information on the origin of their own allergy label. However, this was relayed with varying degrees of certainty, depending on whether the label was received as a child or adult, and their own or others' (eg, parents) recollection of the circumstances or associated symptoms. This uncertainty was recognised as a challenge by HCPs in determining the risk of proceeding with delabelling, especially for those who may be less experienced in taking drug allergy histories.

The perceived impact of the PAL was low, reflecting a patient perception that equally effective alternatives are available. Patients who had personal experience of where

Table 1 Characteristics of interview participants (patients)

	Site A	Site B	Site C	Total
Number invited	28	20	25	73
Number lost to follow-up	13	8	9	30
Number interviewed	15	12	16	43
Of the participants interviewed:				
Number of interviews recorded	11	12	14	37
Median duration in minutes (IQR)	11 (9–15)	7 (6-10)	8 (7-10)	8 (7-11)
Number of non-recorded interviews with notes available	1	N/A	1	2
Agreed DPC	14	11	15	40
Declined DPC	1	1	1	3
Mean age, years (SD)	62 (13)	65 (11)	56 (16)	61 (14)
Gender				
Female	8 (53%)	5 (42%)	7 (44%)	20 (47%)
Male	7 (47%)	7 (58%)	9 (56%)	23 (53%)
Ethnicity				
White British	9 (60%)	11 (92%)	13 (81%)	33 (77%)
Pakistani	0 (0%)	1 (8%)	0 (0%)	1 (2%)
Mixed background	1 (7%)	0 (0%)	0 (0%)	1 (2%)
Other	0 (0%)	0 (0%)	3 (19%)	3 (7%)
Not specified	5 (33%)	0 (0%)	0 (0%)	5 (12%)
Specialty				
Acute medical and infectious disease units	0 (0%)	0 (0%)	3 (19%)	3 (7%)
Haematology-oncology unit	4 (27%)	1 (8%)	4 (25%)	9 (21%)
Pre-surgical unit	11 (73%)	11 (92%)	9 (56%)	31 (72%)

DPC, Direct Oral Penicillin Challenge.

alternative antibiotics were less effective had an increased awareness of the adverse impact of the label. The information received during recruitment to the study was valued by patients, and this increased their willingness to accept the DPC intervention.

> I hadn't a clue as regards the effectiveness either of penicillin or their substitute. The substitutes that they gave me always seemed to work actually so it didn't bother me. (Site-B, Patient code: 745)

In three instances where patients declined to undergo the DPC, reasons related to poor health, inconvenience or a combination of both. Reasons for agreeing to the DPC varied (eg, 'I've no idea. I just did it'). Patients cited a range of factors, often in combination, such as perceived benefits to themselves and others, curiosity, altruism and opportunism (ie, taking advantage of an episode of hospital care).

HCPs also acknowledged that they often did not always question the reported PAL. Reasons included lack of confidence in assessing and handling risk, feeling unsupported if anything was to go wrong, or not considering this to be part of routine practice. Their own knowledge of penicillin allergy and professional skills relevant to (de-)labelling were crucial factors. There was some divergence of opinion as to how much knowledge could be codified into a 'tick box' or checklist approach. These knowledge and skill deficits were considered most challenging in clinical settings with high volumes or turnover of staff, who were less likely to have sufficient time and resource devoted to allergy history taking, or to building up the experience in delivering the DPC.

> …And there's no foundation doctor who's ever going to think, 'oh it's low risk, [give] Amoxicillin.'… (Site-C, Consultant Anaesthetist)

> … confidence is the key, … the correct people who have had the correct training…the worst thing would be that somebody does something and it goes wrong… (Site-C, Consultant Pharmacist)

Specialists felt that they had a professional role in encouraging and promoting the appropriate assessment and review of PALs across all sectors. In view of the challenges of general practice (including limited time appointments and opportunities to monitor), the secondary care setting was thought to be more appropriate than intervention by primary care colleagues. A long-term strategy

Table 2 Characteristics and roles of focus group participants (HCPs)

	Site A	Site B	Site C	Total
Number of stakeholders	13	8	7	28
Roles (self-reported)				
Administration manager			1	1
Commissioner representative	1			1
Consultant acute medicine	1			1
Consultant anaesthetist	1	1	1	3
Consultant haematologist		1		1
Consultant infectious diseases	1	1		2
Consultant microbiologist	1			1
Consultant pharmacist			1	1
Consultant respiratory medicine	1			1
Foundation trainee doctor	1			1
General practitioner	1			1
Research consultant anaesthetist		1		1
Research consultant immunologist	1		1	2
Research nurse		1		1
Research pharmacist	2		1	3
Research practitioner		2		2
Specialist nurse			2	2
Specialist trainee doctor	1			1
Staff nurse	1	1		2
Gender				
Female	4 (31%)	6 (75%)	6 (86%)	16 (57%)
Male	9 (69%)	2 (25%)	1 (14%)	12 (43%)
Ethnicity				
Arabic	1 (8%)	0 (0%)	0 (0%)	1 (4%)
Asian or Asian British—Indian	4 (31%)	0 (0%)	1 (14%)	5 (18%)
Asian or Asian British—Pakistani	2 (15%)	1 (13%)	0 (0%)	3 (11%)
White—British	2 (15%)	4 (50%)	4 (57%)	10 (36%)
White—Irish	1 (8%)	0 (0%)	1 (14%)	2 (7%)
White—Any other White background	0 (0%)	0 (0%)	1 (14%)	1 (4%)
Did not state	3 (23%)	3 (38%)	0 (0%)	6 (21%)
Age, years				
20–29	1 (8%)	0 (0%)	0 (0%)	1 (4%)
30–39	2 (15%)	2 (25%)	1 (14%)	5 (18%)
40–49	4 (31%)	1 (13%)	2 (29%)	7 (25%)
50–59	2 (15%)	2 (25%)	2 (29%)	6 (21%)
≥60	1 (8%)	0 (0%)	2 (29%)	3 (11%)
Did not state	3 (23%)	3 (38%)	0 (0%)	6 (21%)

would require raising awareness and training, generally and in primary care, to shift the culture and approach to assigning PALs in the first place. A broader societal and ethical imperative for all HCPs was also outlined to promote and practice antimicrobial stewardship.

Intervention implementation phase

'Environmental context' and 'beliefs about capabilities and consequences' significantly influenced the experience and delivery of the DPC. At the macrolevel, participants noted relevant national resources and policies—from shortages of specialists to the national antimicrobial

stewardship agenda. Meso-level factors included the use of guidelines, electronic decision support tools and governance frameworks within organisations. At the microlevel, availability of dedicated space (eg, treatment room or clinic), equipment (such as blood pressure monitoring) and medications (for the intervention as well as rescue or supportive medicines in case of adverse events) were considered essential to successful implementation. Choosing the optimal timepoint to carry out the intervention, in terms of both care pathways and the clinician workflows, was seen as important. Clinical areas with the facility for close monitoring and conditions, where there was a need to prescribe antibiotics, such as acute medical units or theatres, were reported as facilitators.

HCPs' concerns regarding their own capabilities and the consequences of making decisions related to PAL status were influenced by environmental context and resources, which influenced their willingness and ability to implement the intervention. The combination of knowledge, skills, professional role, clinical expertise and level of experience contributed to the level of confidence they held in their own and others' capabilities. An interesting dynamic was noted between allergy specialists and generalists; while the former considered the intervention to be relatively straightforward and easy to implement, non-allergy specialists and junior staff indicated that their role and confidence levels would inhibit their willingness to implement DPC for fear of adverse outcomes. Similarly, the research pharmacists and nurses noted that in case of any ambiguity at the risk stratification stage, a full consultation would take place with senior colleagues before progressing to the DPC. Although non-specialist delabelling was a key principle of the DPC intervention, senior clinician and if necessary, the option to seek allergy specialist input remained an important element of variability across the three sites. Research pharmacists who delivered the DPC reported that the level of allergy specialist input was relatively minimal and reduced over time with a transferral of responsibility to non-specialists. However, this was more gradual and observed to a lesser degree in one of the sites.

> I've never yet seen a [penicillin de-labelling] study that's genuinely completely led and delivered by non-allergists. There's always someone right there in the middle of it who's got a lot of expertise, who answers a lot of questions. (Site-B, Consultant Anaesthetist)

Few patients expressed doubts about undergoing the DPC and, in many cases, they were reassured by the DPC being conducted in a hospital setting as well as from their 'total confidence' in the staff involved. Some patients recounted anxiety immediately before or during the DPC, expressed as being 'scared' or recalled symptoms associated with their initial label and concerns at these being repeated.

> I think it depends on how severe it is, and if it's very mild which I presume mine was, then you should take the test, but if you've got problems like you know, life threatening ones, like your tongue is swelling up or something like that, then I don't think you should risk it. (Site-A, Patient code: 1077)

> I would have had concerns if they'd have sent me away outside of hospital because obviously if I did start having a rash or have a severe reaction to it then obviously, I'd be, I wouldn't be in healthcare hands. (Site-C, Patient code: 3038)

However, all those who underwent DPC reported positive experiences, indicating that the process was well managed, with clear communication and advice. Facilitators of participation included reassurance of being observed, ease and simplicity of the DPC, use of oral formulation and travel reimbursement. No negative experiences or feedback comments were reported. Patients advocated raising awareness and increasing access to the risk stratification and, for those stratified as low risk, undergoing DPC to remove the PAL, recognising that …it is personal choice, but who'd want to keep a label that you know was perhaps incorrect at the time? (Site-A, Patient code: 1061)

Postintervention phase

In the post-DPC phase, 'behavioural regulation' relating to future communication about allergy status and reinforcement through updates to the medical record were reported as important. For example, all patients expressed a preference and expectation that the change in their PAL status would be communicated to their GP by the team conducting the DPC. This was partly linked to the logistics of arranging an appointment with their GP and partly due to uncertainty about how to respond if asked about their allergy status in future. Some indicated that they would still mention the historical label to make the HCPs aware in case of any reactions or need for close supervision if penicillin antibiotics were prescribed.

> I think it depends on the circumstances… if it was something you know… like sepsis… I would explain that I for years was under the impression I was allergic to penicillin but I'm not anymore, you know? (Site-A, Patient code: 1044)

HCPs at all sites recognised the importance and value of the intervention in improving antimicrobial stewardship and patient outcomes. They also acknowledged the extensive changes to clinical behaviours, systems and practice that were necessary for implementation. Key determinants to simulate and reinforce changes to increase adoption, spread and sustainability included published evidence, incentives and alignment with national initiatives such as specialist society recommendations. Organisational policy and governance frameworks were considered essential to support individual clinician decisions and practices.

> …if something goes wrong here, another clinician has said they've got a Penicillin allergy, I've completely ignored it and given them Penicillin anyway. So having that framework and guideline so that you're

backed by the organisation is absolutely critical… (Site-A, Consultant Respiratory Medicine)

Financial implications, in terms of incentives or penalties, leveraging existing mechanisms for clinical quality improvement, such as local and national clinical quality indicators,[18] resources and cost of services were also mentioned as ways to influence individual behaviour and organisational change. Other initiatives, such as incorporating allergy history into national training and membership programmes, were identified as ways of embedding this into existing professional development pathways. All participants noted that recognition of the wider, public health implications of spurious PAL at a global level would also reinforce the importance of the intervention.

Emergent cross-cutting themes

Digital systems and socioprofessional influences were central to all stages of implementation, from screening patients with a PAL to communication of the outcome. The impact of digital systems on documentation, and general quality of documentation of allergy was noted as an enabler as well as a barrier to accurate allergy labelling, within and across care sectors. A recurring theme from the focus groups was the knowledge gaps caused by poor medical record keeping; once recorded, the information influenced decisions made by others involved in the medicines management process. In the case of electronic health records, there was an added layer of complexity from any resulting clinical decision support rules that were triggered.

Social influences were also identified between professionals working in the sites. In some cases, these had a long history and high levels of trust, which was seen as predisposing colleagues to support the intervention. In the absence of this, the need to actively influence other colleagues was seen as crucial, and overcoming resistance through peer-to-peer social influence was acknowledged to be challenging.

…it's not so easy to … be like 'no actually I want this patient to have a penicillin for their cellulitis'. … You need everyone to be on that page with you … Going against the clinical team sometimes is difficult and I've felt that resistance. But most of the time you're okay and, you know, people see what you're saying. (Site-A, Research Pharmacist)

DISCUSSION

This study identified important insights for the implementation and adoption of PADL. Patients generally reported high levels of trust and belief in the health system and HCPs, which predisposed them to accepting the intervention, especially in a hospital setting with close monitoring. Some expressed curiosity about their allergy status and others consented to the DPC primarily as a means of advancing research and patient care. Patients with chronic or recurrent interactions with healthcare or need for antibiotics were more likely to have considered impact and implications of having a penicillin allergy. Staff perspectives were more nuanced. The value of the intervention was well understood and supported but balanced by concerns related to the skills, resources and governance requirements for implementation. For example, there was a wider range of views about the level of training and specialist input required for effective allergy history taking, appropriate risk stratification and documentation. Other factors for scaling and sustaining the intervention in routine care were resource and appropriate clinical governance including organisational policy and a protocol to reduce the perceived risks to staff involved in the delabelling. Similar challenges and views have been noted from HCPs in other countries when delabelling in the inpatient and outpatient settings.[19 20]

In recent studies of drug allergy evaluations and delabelling, the importance of accurate allergy history and documentation by clinicians, awareness of PADL services among HCPs for appropriate referrals and the need to engage and address patient (and parent/carer) perspectives and understanding of medication/antibiotic allergies were demonstrated.[21–24] As noted previously in primary care,[25] the role of current digital health record systems was considered to be more constraining than facilitative, in particular, the ability to differentiate and document an intolerance or adverse effects compared with a true allergy.

Overall, we were able to elicit contextual factors across the three specialty areas and the different organisations. The potential for hospital-based non-allergy specialist (such as pharmacists) led PADL services has been studied in other countries, with similar conclusions,[21] providing evidence that pharmacist's knowledge and transferable skills make them suitably qualified to deliver this type of service, with input from a senior or specialist clinician as needed. Our work has shown that a combination of initial specialist input to set up the training and governance infrastructure, with support from senior non-allergy clinicians, offered appropriate oversight to a PADL service that may be delivered by pharmacists or nurses.

Implications for practice and recommendations

Our study suggests that the DPC intervention does not contain any inherent characteristics that would prevent or significantly impede its adoption into clinical practice, and it demonstrated high levels of acceptability, especially among patients. However, it is likely that some adaptation to local context is required.[11] Appropriate variation may include determining the balance of focus on therapeutic versus opportunistic delabelling, determining optimal time points within patient pathways, the staff mix involved with delivering the intervention and mechanisms to record and communicate the outcomes of the de-labelling to all stakeholders.

According to established behavioural theories, there are three main requirements of behaviour change: motivation, opportunity and capability.[26] Each of these

can be mutually reinforcing and interact to produce a 'behavioural system' which in turn influences receptiveness to new ways of working. An intervention such as the DPC can impact on one or more elements of the behavioural system and these impacts will not always be predictable. Using this as our theoretical lens, we can infer from the implementing sites that motivation for PAL review may be influenced through opportune discussions between interested patients and HCPs with capability to conduct DPC. Future research should extend this to the full range of patient subpopulations, including those with different ethnic and sociodemographic profiles. It will also be necessary to address motivation among organisational leaders and professional staff who are most likely to refer into a DPC service. Our findings underscore the infrastructure required to introduce and embed the DPC intervention, including trained staff, suitable locations, appropriate equipment, access to patients, referral pathways and associated business models. Delivery of the DPC also requires initial expertise and capability among HCPs. The optimal blend of core capabilities and responsibilities between the immediate delabelling team and input from senior and/or allergy-specialist colleagues will vary according to local circumstances and implies the need for additional cross-organisational focus in future studies.

Limitations

The majority of patients interviewed had accepted DPC and, therefore, we were unable to fully explore the views of those that declined DPC. Owing to the study design we could not interview those patients who did not consent to risk stratification or those who declined to participate. Common reasons for failure to progress in the study included difficulty, in reaching patients, clinical instability/medical reasons, lacking capacity to consent and psychological factors.[1] It is possible that those patients who declined to be involved in the study would be less receptive to the intervention, thereby biasing our results. The role of English language skills and other communication difficulties were not considered in the delivery of the intervention due to inclusion criteria that required interviewees and focus group participants to have English language fluency. Future research should incorporate these patient groups and consider the option for interviews in other languages. Additionally, as patient interviews were conducted via telephone, there was no opportunity to capture non-verbal cues from the interviewees.

Our fieldwork was confined to the secondary care setting; however, GP referrers and commissioners were included in the focus groups. Nevertheless, owing to the email and poster advertisement method of recruitment used for HCPs, there may have been bias in the HCPs who participated. We did not fully elucidate health system models, such as administrative support or business models required to sustain such services in the long term.

In keeping with qualitative research of this kind, our sample size was not intended to be statistically representative of either patient or professional groups, however, we obtained thematic saturation and noted high levels of acceptability among low-risk patients, which was the targeted patient population of the study.

CONCLUSIONS

There were high levels of acceptability for DPC as part of routine care, among low-risk patients that participated in the interviews. The study highlighted complexities associated with DPCs in acute and elective secondary care settings, and the need for appropriate governance frameworks, infrastructure and time to risk stratify. Overall, patients experienced the DPC as largely straightforward, whereas HCPs identified some important implementation determinants relating to issues of risk, organisation, governance and workforce for consideration in any future adoption of the intervention.

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Contributors YHJ, IW, RD, SM, NP, JATS, AW, RMW, LS, MTK: conceptualisation, funding acquisition, study protocol. YHJ, IW, MM: data collection, analysis, interpretation, manuscript writing and finalising. YHJ and IW are guarantors for the reported study. All other authors: patient screening, critical review and final approval of the manuscript.

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Competing interests MTK received research funds from NIHR RfPB, MRC CiC, GCRF, FSA and University of Birmingham outside this work. His department at UHB received educational grants for PracticAllergy Course from ALK Abello, Allergy Therapeutics, MEDA, Thermo Fisher Scientific and other pharmaceutical companies over the years. He is Chair of Equality, Diversity and Inclusion working group of BSACI, co-author for BSACI guidelines on penicillin allergy and an associate editor for Clinical Experimental Allergy. RD delivered paid consultancy services to Baxter medical. He has a salaried position as chief executive of UK Sepsis Trust. RB

received funding or honoraria for conference attendance, Advisory boards, lectures and training from Pfizer and Menarini. Senior Editor for JAC-AMR (BSAC journal). NP is a NIHR/ HEE CDRF studying non-allergist penicillin allergy de-labelling in secondary care (Clinical Doctoral Research Fellowship). He is co-lead on the BSAC MOOC on non-allergist penicillin allergy de-labelling (British Society Antimicrobial Chemotherapy Massive Open Online Community). SAM is National Clinical Director for the Blood and Infection Programme of Care, NHS England. JATS has research funding from the NIHR and Wellcome Trust in relation to penicillin allergy. He is a member of the British Society for Allergy and Clinical Immunology allergy working party. He is co-lead on the BSAC MOOC on non-allergist penicillin allergy de-labelling (British Society Antimicrobial Chemotherapy Massive Open Online Community) and a BSAC council member.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patients.

Ethics approval The study was approved by The London Bridge Ethics Committee (REC Reference 21/PR/0814; IRAS project ID: 293544) on 23 July 2021. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer-reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

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