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A UK hospital survey to explore healthcare professional views and attitudes to patients incorrectly labelled as penicillin allergic: an antibiotic stewardship patient safety project

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ABSTRACT

Objectives

To ascertain the views, beliefs and attitudes of hospital staff to incorrect penicillin allergy records in order to determine healthcare worker motivation for the implementation of a penicillin de-labelling antibiotic stewardship intervention at the study hospital.

Methods

An electronic questionnaire (Survey Monkey®) was distributed to medical, nursing and pharmacy staff at a 750 bed teaching district general hospital with no specialist allergy service.

Results

193 staff responded (58% medical, 31% nursing 11% pharmacy). Virtually all staff had encountered patients who believed themselves to be penicillin allergic, but felt the patient's belief to be erroneous. The potential negative consequences of an incorrectly assigned penicillin allergy label were acknowledged by the majority of respondents. In total 188/190 (99%) of staff thought patients having an incorrect allergy status to penicillin was a problem, and required a solution. Staff reported they would feel confident using a validated evidenced based question tool to de-label patients incorrectly labelled as penicillin allergic if the process was supported by Trust management, although many still felt apprehensive about de-labelling patients for fear of patient harm through inappropriate de-labelling.

Conclusions

A penicillin allergy de-labelling intervention would be well supported by healthcare workers at the study hospital; demonstrating a receptive environment for this behaviour change intervention. Further exploration of the barriers and levers to introducing an intervention are required using behaviour change methodology in order to design a successful de-labelling intervention.

Keywords: antimicrobial stewardship, behaviour change, beta-lactam antibiotics, penicillin allergy, quality improvement,

Key Messages

What is already known on this subject

- Antimicrobial resistance is a global problem
- Reported penicillin allergy rarely reflects penicillin intolerance
- Antimicrobial stewardship programmes should consider the use of structured clinical history taking to exclude erroneous penicillin allergy label

What this study adds

- Hospital staff (doctors, nurses, pharmacy team) recognise the negative consequences of an incorrectly assigned penicillin allergy label
- A suitably designed penicillin allergy de-labelling intervention would be well supported by hospital staff

INTRODUCTION

The emergence of antimicrobial resistant (AMR) bacteria is a global challenge which endangers the efficacy of antibiotics and limits treatment choices.[1] One way to combat antimicrobial resistance is to identity barriers to optimal use of currently available antibiotics. Antibiotic allergies are such a barrier, particularly in penicillin allergic patients, as penicillin-based antibiotics are often first-line treatment for common infections. A record of 'penicillin allergy' generally precludes use of penicillins in hospitals, necessitating the utilisation of second-line agents such as quinolones or macrolides. Cephalosporin and carbapenem prescribing are also increased in penicillin allergic patients. These second line antibiotics are often more costly,[2] can be less effective in certain clinical circumstances,[3] and possess a broader spectrum, increasing a patient's future risk of infection with AMR pathogens and Clostridioides difficile-associated diarrhoea.[4] Compared to patients without a penicillin allergy record, those with such a penicillin allergy record are exposed to a greater number of antibiotics, experience increased length of hospital stay, increased hospital readmission rates and increased risk of dying.[5,6] An additional concern is that many of the new antibacterial agents in development are beta-lactams and a patient inappropriately labelled as penicillin allergic may be denied these new agents unnecessarily.

Approximately 10% of the general population have a record of penicillin allergy but, importantly, only 10 to 20% of these patients have a true allergy after formal testing.[7,8,9] This means that many patients are unnecessarily denied penicillins and removing incorrect records has potential to improve outcomes. An added complication is that a patient's recollection of their allergy often does not tally with their medical records.[10,11]

Spurious or incorrect penicillin allergy records can arise for several reasons: often, side effects from a previous course of treatment end up recorded as an "allergy" in a patient's record. The prevalence of penicillin allergy records that were attributable to non-allergic side effects has been reported to be between 16-50%,[12,13] with many of these patients able to safely tolerate the first line penicillin antibiotics after appropriate investigation. Undertaking a proper history should allow re-categorisation in some patients

from an “allergy” record to “non-allergic side effects”, enabling safe administration of first line penicillins.[14]

Guidelines suggest that antibiotic stewardship programmes should promote allergy assessment and skin testing where appropriate due to the potential impact such a programme could have on the increased utilisation of first line agents.[15] However, it is acknowledged that penicillin allergy assessment is largely unstudied as a primary antibiotic stewardship intervention, and, in the UK, few hospitals provide a formal testing service as recommended in national guidelines.[16]

A pragmatic solution involves de-labelling, i.e. removing an incorrect penicillin allergy record in patients who clearly report side effects rather than allergic reactions.[1,17] Problems with this approach include validation of the structured questions necessary to obtain an accurate medical history from the patient; when and how best to adopt such an approach in the patient’s hospital journey; and how hospital staff would feel about the process of explaining that the patient’s belief or conviction of being penicillin allergic is in fact incorrect and ill founded. Though healthcare staff have been surveyed about their knowledge of penicillin allergy,[18] and asked about the benefits of de-labelling,[19] there appears to be little reporting in the literature of how staff perceive the importance of the de-labelling process.

The aim of this study was to ascertain the views, beliefs and attitudes of hospital staff to incorrect penicillin allergy records in order to determine healthcare worker motivation, a key component of successful behaviour change, for the implementation of a penicillin de-labelling antibiotic stewardship intervention at the study hospital.

METHODS

Study Design and Setting

An electronic questionnaire was distributed to medical, nursing and pharmacy staff at a 750 bed teaching district general hospital with no specialist allergy service. Eligible participants had approximately 20 days to voluntarily complete the questionnaire. The hospital has a comprehensive antimicrobial stewardship programme which includes

implementation of the national stewardship guidelines (start smart then focus); participation in the NHS England antibiotic stewardship CQUIN;[20] a restricted antimicrobial system requiring medical microbiologist authorisation for use of restricted antibiotics for non-pre-approved indications;[21] daily antibiotic pharmacist antimicrobial stewardship ward rounds; daily ward pharmacist ward rounds in which antibiotic stewardship is one of their duties and periodic medical microbiology ward rounds in haematology and intensive care. In addition, the study hospital contributes to the wider One Health antibiotic stewardship work in Cornwall.[22] These components of antimicrobial stewardship mean that the hospital performs well when mapped against NICE AMS guidance,[23] though we perform less well in relation to aspects of the NICE allergy guidance.[7] This study did not require ethics approval.

Questionnaire

The questionnaire was designed using an electronic website (Survey Monkey®). Most of the questions were closed multiple-choice questions (MCQs) with the exception of two open questions with opportunity for free text. Questions were developed to explore views, beliefs and attitudes towards penicillin allergy and de-labelling. The survey was piloted resulting in minor modifications. It was delivered electronically by email twice over a two-week period via the hospital bulletin, and was also cascaded out to medical, nursing and pharmacy staff via email groups. The survey responses to closed MCQs were collated and summarised as number and percentage of responding staff using Survey Monkey® and Microsoft Excel® 2013. The open questions were analysed by looking for major themes.

RESULTS

193 staff responded (58% medical, 31% nursing 11% pharmacy – see Table 1). Not all staff answered all the questions.

Table 1 Respondent's professional grade

Professional grade	**Response rate N = 193**
Junior doctor	21.2% (41)
Senior doctor (associate specialist/consultant)	36.3% (70)
Nurse/midwife band 7 or above	7.8% (15)
Nurse/midwife band 6 or below	23.8% (46)
Pharmacist	9.8% (19)
Pharmacy technician	1.0% (2)

When asked from their knowledge and/or experience how many patients in this hospital claim to have a penicillin allergy, 60 (32%) responded less than 10%, 65 (34%) answered more than 10% but less than 20%, and 65 (34%) more than 20%. Virtually all staff had encountered a patient who believed themselves to be penicillin allergic, but felt the patient's belief to be erroneous - 112 (58%) frequently, 78 (40%) occasionally, whereas 4 (2%) responded they had never encountered such a patient. One hundred and five (70%) respondents answered that they had discussed with patients the possibility that they may not be allergic, 35 (18%) had not discussed this, and 23 (12%) were not in a position to do so. When asked why they did not discuss a mistaken penicillin allergy belief with a patient they were caring for, responses (ticking all that apply) are shown in Table 2.

Table 2 Reasons for not discussing a mistaken penicillin allergy belief with a patient.

	Response rate N = 146
Patients are unlikely to be convinced by my explanation that they do not have a penicillin allergy	37.0% (54)
I have come across such a patient but feel I do not have the necessary time to explain about allergies and reactions	30.8% (45)
It is not my role to discuss this with patients	11.6% (17)
I have come across such a patient but feel I do not have the necessary knowledge to explain about allergies and reactions	9.6% (14)
I have come across such a patient but feel I don't have the necessary communication skills to explain about allergies and reactions	1.4% (2)

Other	34.3% (50)

The 50 'other' free text responses described main themes of: 1) risk to the patient or staff if the patient was in fact truly allergic and the staff member got it wrong (10 responses), and; 2) cognition or communication difficulties with the patient (5 responses). Thirteen respondents did comment that they do discuss this with patients and medical staff, four comments emphasised lack of time to investigate the supposed allergy with the patient and any medical records, and three related to the difficulty in convincing patients that they are not allergic.

In total 188/190 (99%) of staff thought patients having an incorrect allergy status to penicillin was a problem, 124/190 (65%) staff perceived this as a problem needing an easy to implement solution, and 64/190 (34%) perceived this to be a significant problem requiring lots of time and effort devoted to resolving, with 1% perceiving it to be a minor inconvenience for healthcare staff and not worth worrying about. When asked what percentage of those patients who claim to have a penicillin allergy could safely be given a penicillin-type antibiotic without the patient coming to any serious harm, 64/189 (34%) felt that this to be more than half of these patients.

Regarding the implications of penicillin allergy records on antibiotic treatment choices, the majority of staff identified many potential harms that may result from using alternative antibiotic choices, including a high proportion that were concerned about treatment failure (Table 3).

Table 3 Statements indicated by staff to be true of patients with penicillin allergy labels when compared to those that do not have such a penicillin allergy label

Answers	**Response rate N = 194**
Have an increased risk of Clostridioides difficile-associated diarrhoea. This is true	51.8% (88)
Are prescribed antibiotics that cost less. This is false	2.4% (4)
Have lower re-admission rates to hospital. This is false	2.4% (4)
Have higher incidence of treatment failure. This is true	72.4% (123)
Have increased inpatient length of stay. This is true	59.4% (101)

Have similar rates of mortality. This is false	18.8% (32)
Have increased rates of multi-drug resistant infections. This is true	78.2% (133)
Experience less antibiotic side effects. This is false	4.7% (8)

One hundred and two (53%) of 194 staff felt they would be very confident using validated evidence based questions to determine if a patient with a penicillin allergy record could be prescribed a penicillin antibiotic if such a process had Trust approval; almost half of respondent had concerns: 70/194 (36%) would still feel a little apprehensive, 18/194 (9%) would feel very worried about what might happen to the patient, and 4/194 (2%) respondents would not follow this process.

Thirty-two respondents provided additional free text comments on this topic: thirteen (41%) expressed support for a process that would assist in de-labelling patients who are not likely to be penicillin allergic; three (9%) identified problems and difficulties with the process (one related to the patient not knowing if they have an allergy or intolerance, another identified lack of time to differentiate between allergy and intolerance, whilst the third bemoaned the potential role of electronic prescribing and recording in this process); and two (6%) commented on the potential risks if a true allergy label is incorrectly removed.

DISCUSSION

Assessing all hospital inpatients with penicillin allergy records and delabelling those with incorrect records is not currently part of routine clinical care. To establish this practice will require new procedures and a change in the behaviour of healthcare professionals. It is increasingly recognised that behaviour change theory needs to be considered when attempting to design and implement new healthcare interventions; our work begins to explore potential barriers and facilitators to establishing delabelling procedures.

The Behaviour Change Wheel is a useful tool that uses the COM-B ('capability', 'opportunity', 'motivation' and 'behaviour') model to direct and prioritise elements of an intervention that requires a change in behaviour.[24] This model can be further divided into physical and psychological capability, physical and social opportunity, and automatic and

reflective motivation. Behaviours result from interactions involving all these components, and changing behaviour requires a change in one or more of them. In terms of psychological capability, our study found that representatives of all grades of nursing, pharmacy and medical staff were aware of the problem of incorrect penicillin allergy records and the potentially negative effect they have on patients. We found that nearly all staff had come across a patient who might have an incorrect penicillin allergy record and the majority of respondents felt this was a frequent occurrence, confirming that locally the problem is widely appreciated and this element would not be a major barrier to change.

In terms of physical capability, significant numbers of staff did not feel they had the necessary knowledge or skills to advise patients so equipping staff for the task would be an important component of any planned intervention.

Nearly all respondents (99%), which included senior medical staff, believed this to be a problem requiring either an easy to implement solution (65%), or lots of time and effort devoted to resolving (34%). Free text comments also identified this as a long standing issue. The survey has demonstrated that respondents are motivated to tackle the issue of incorrect penicillin allergy labels; an important finding if a penicillin allergy de-labelling initiative is to be established. However, we elicited some preconceived ideas that might be barriers to motivation to embark on a delabelling process with 37% staff expressing the view that they would have difficulty in convincing patients that they are not penicillin allergic, and 11.6% of staff believing this is not part of their role. Such concerns negatively impact the motivation of healthcare workers to tackle the issue of a spurious penicillin allergy label and need to be addressed and overcome if a successful intervention is to be introduced. We recognise that this survey has not explored how a trust-led de-labelling initiative would ensure that any necessary changes to a patient's allergy status are conveyed to other relevant NHS staff, such as the patient's general practitioner, and community pharmacy.

In terms of the "opportunity" component of behaviour, 70% of our respondents indicated that they had already discussed the possibility with patients that they may not be allergic to penicillin, demonstrating a willingness to address this issue. Those that had not

discussed this possibility gave a variety of reasons, including lack of time. A previous survey of healthcare staff found that most practitioners (197/274, 72%) spend less than two minutes to assess a penicillin allergy history.[18] In this context it is the structured, detailed history taking that can distinguish a true penicillin allergy from a false positive report of allergy, and hence allow clinicians to use this important class of antibiotics when truly indicated.[25] Ensuring that staff are supported by the environment, time, and resources, including education and training, should increase the capability of the workforce to adopt the desired behaviour by impacting on physical opportunity, physical capability, and psychological capability.

The majority of staff (53%) report they would feel confident using validated evidence based questions to determine allergy status and would be confident prescribing penicillin in a de-labelled patient if such a process had approval from the organisational management. Thirty-six percent would feel apprehensive about such a process and 9% very worried about patient harm with the remaining 2% not prepared to follow this process. Providing staff with validated tools to identify, as described by NICE,[7] and de-label patients with an incorrect penicillin allergy label would provide physical opportunity, as well as capability through adequate training, to use the tool enabling the desired behaviour change. A validated tool would provide healthcare workers with the reassurance they need that patients will not come to harm as a result of the intervention. Personal experience of operating the validated tool and demonstrated safety of the intervention will provide positive reinforcement and motivation to perpetuate the behaviour.

It is recognised that interventions targeting junior doctors with the aim of improving patient care are likely to be ineffective if they are expected to undertake prescribing tasks that run against the local prescribing etiquette endorsed by their seniors.[26] Social cues and cultural norms are what the behaviour change wheel refers to as social opportunity. Our study has demonstrated that a penicillin allergy de-labelling initiative would be supported by senior clinicians, but there is a need to engage senior clinicians to ensure that the new behaviour became part of organisational culture. This top down and bottom up support is

postulated to be required to improve antimicrobial prescribing practice,[27] and demonstrates the social opportunity afforded by interpersonal influences, social cues and cultural norms,[24] that influence how staff perceive current behaviour around managing patients with spurious penicillin allergy labels and how this might change.

There is a need to educate staff about the potential benefits to patient care, including reduced treatment failure, length of stay and readmission, of using penicillin antibiotics over second line agents to motivate staff. There is also a clear need to convince staff of the safety of such an intervention. Providing education that promotes a wider understanding of the negative consequences of retaining an incorrect penicillin allergy label would achieve reflective motivation in the workforce through increased knowledge and understanding of the implications of retaining an incorrect penicillin allergy, and the low likelihood of harm through de-labelling.

Though both the consequences of having an incorrect penicillin allergy label, and possible approaches to de-labelling have been described both in a secondary and primary care setting,[28] as far as we are aware this is the first study asking hospital staff for their views on this 'malady' or problem.[29] Limitations of this survey include being based solely in one acute hospital setting so results are not necessarily generalizable. It was not possible to calculate the response rate as we do not know how many staff saw the survey link and chose not to respond. As with all voluntary surveys, there is a potential for selection bias because those interested in the topic of antibiotic allergy may be more likely to respond. We acknowledge that respondents might have given false answers aiming to fulfil certain expectations, though to mitigate this response bias, questionnaires were anonymised. In addition, the chosen survey items have not been validated though they were based on the published literature, and our survey did not delve into staff views and knowledge on the various forms, and severity of, allergies and hypersensitivity reactions.

Conclusions

We have identified a number of areas, utilising behaviour change theory, which would need to be targeted in the design of a de-labelling intervention. Respondents perceived having an incorrect penicillin allergy label to be a problem requiring a solution demonstrating motivation to tackle the issue of incorrect penicillin allergy labels. However, we also identified potential barriers to healthcare motivation to enacting the desired behaviour e.g. time. Opportunity to enact the behaviour is partially met with social opportunity evident and already in place but deficiencies in physical opportunity are evident. Capability was briefly touched upon with evidence on staff capability to enact the behaviour but this is not widespread and a requirement to explore this further is necessary if successful behaviour change is to happen. In conjunction with staff focus groups we will delve further into how best to plan and deliver an intervention to develop a de-labelling initiative for patients reporting an obvious non-severe side effect to penicillin rather than an allergic reaction with exploration of the nine intervention functions targeting the COM-B components of the behaviour change wheel and the wider seven policies that facilitate or enable these interventions.

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