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Letter to the Editor

Bacterial Tree of Life: assessing the efficacy of microbiology teaching for foundation year doctors

Dear Sir/Madam,

We tested whether we could practically improve the microbiological knowledge of junior doctors within a district general hospital. Hence, we designed an interactive teaching session called 'The Bacterial Tree of Life' (BTOL) with a recapping PowerPoint using quality improvement methodologies, hoping that the interactivity and the recapping together can bring a new approach to teaching.

Antimicrobial resistance (AMR) is internationally acknowledged as a threat to the future of modern healthcare with antimicrobial consumption being a fundamental driver of AMR. [1] The UK 2013–2018 AMR strategy identified professional education in the appropriate use of antimicrobials as a key action, [2] and there is a growing understanding that prescribers with poor microbiological knowledge over-prescribe antimicrobials. [3] Despite this, a prescriber's knowledge is often left wanting thanks to poor training in both undergraduate and postgraduate education. [4] In the UK, as few as five per cent of surveyed junior doctors describe feeling they have had effective antimicrobial education, with 74% wanting more opportunities to learn. [4].

We designed the BTOL interactive teaching session, creating a flow chart of bacterial classification, Gram staining and morphology (with an emphasis on staphylococci, streptococci, Enterobacterales and *Pseudomonas aeruginosa)* including common infective syndromes, and antimicrobial treatment options along with local rates of resistance. A facilitator helped the participants (foundation year doctors, FYDs) to build the flowchart, using preprepared A4 sheets at each step, expanding on the content step by step. Participants were responsible for adding their A4 sheet to the tree, ensuring engagement in the session.

A PowerPoint virtual 'handout' was sent to the participants approximately 4 weeks after the session, which recapped knowledge of the session (see Figure 1). This allowed a spaced-learning opportunity, which is known to be beneficial. [5] They were asked to complete an anonymous questionnaire, self-assessing what they believe their knowledge of the topic was before the session, after the session, and after the PowerPoint, using a 1–10 scale. We used paired t-test analyses of these scores to judge the efficacy of the session and the recapping PowerPoint individually as our primary outcomes. The secondary outcome, compared participants' self-reported confidence in antimicrobial prescribing thanks to their undergraduate medical education as a comparison between medical schools, using ANOVA. Finally, we asked the participants whether they found the teaching useful, engaging, and at an appropriate level (see Figure 1).

We received 17 questionnaire responses in total, 11 of which had attended the teaching session. 13 of the responses were from FY1 Doctors, and 4 were from FY2 Doctors. There was a significant improvement in the self-assessed scores of their knowledge after the teaching session (3.64 v 6.27, t=6.76), and after review of the electronic handout (5.71 v 7.18, t=3.36). Ten participants obtained their medical degree from the organisation's closest medical school, and seven were from other universities. FYDs from our closest university felt less prepared for antimicrobial prescribing (3.7 95% CI: 3.16, 4.46) than from other universities (5.57 95% CI: 3.82, 7.33), although this was not statistically significant (P=0.07). For the teaching session, the participants' median and modal responses were that they strongly agreed that the session was useful, engaging and at an appropriate level. For the electronic handout, the median and modal responses were that they agreed that the session was engaging and at an appropriate level, and they strongly agreed and agreed that the session was useful.

We have shown both an interactive face-to-face session and recapping in the form of an electronic handout significantly increased FYDs' knowledge of microbiology. Furthermore, subjective feedback confirmed that participants found the session useful, engaging and at an appropriate level. It is expected that this training will improve clinical practice; firstly, in building confidence when appropriately identifying patients for referral to an infection specialist consult. [4] Secondly, individual prescriptions for antimicrobials completed by FYDs are expected to improve, with greater attention to the principles of 'Start Smart and Focus', which should improve patient outcomes, length of hospital admission, exposure to broad-spectrum antimicrobials and healthcare-associated costs. [2].

Key limitations for this study were that the data was gained retrospectively, self-assessed scoring was used, and our sample size was small, however, further sessions and subsequent additional evaluation is planned for future FYDs.

Given the growing complexity of patients living with, or at risk of complex infections, and increasing global AMR alongside competing demands for infection specialists, urgent attention in education for doctors at all stages of training in clinical

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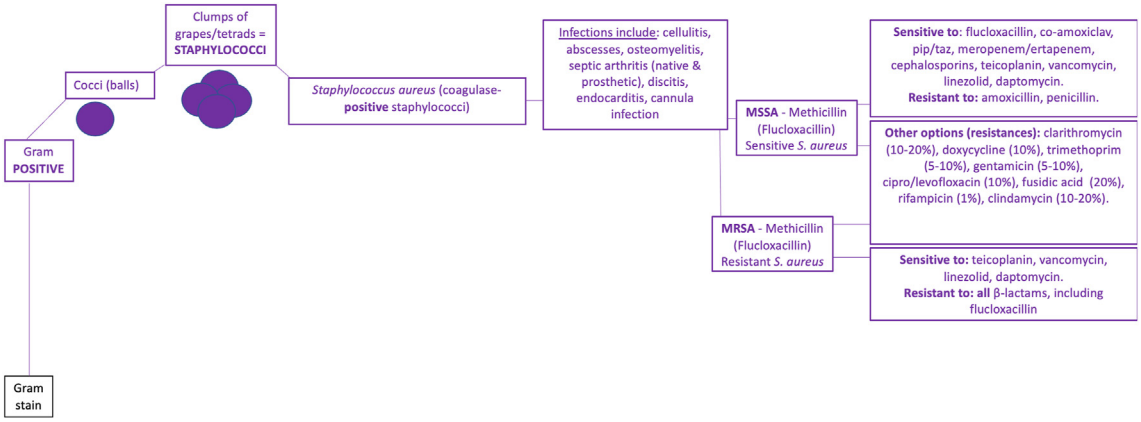

Figure 1. An extract of the BTOL.

microbiology is essential. We have demonstrated that undergraduate medical education in clinical microbiology is insufficient, with newly qualified doctors feeling dissatisfied with their practical knowledge from medical school. However, we have demonstrated how this can be improved by combining a brief but engaging face-to-face, interactive teaching session alongside an electronic handout for trainees to complete in their own time, which should be considered by all UK medical schools and foundation schools as a priority.

Conflict of interest statement

None.

Funding statement

None.

Ethics statement

We believe that the ethics of this study were considered greatly. The premise of the survey was explained to everyone before commencement and in detail on it, to ensure informed consent was obtained. This ensured transparency throughout the study.

The information was kept anonymised, to ensure that the participants' answers were kept confidential. The data was kept only by researchers on password-protected accounts to promote its security.

The use of this data is beneficial to teach further foundation doctors, so it was justified to be collected. The questions were ensured to not mislead or bias people's answers.

For the aforementioned reasons, and given this was a small QIP at a local DGH, we believe that ethical approval was not warranted.

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