



Experiences in Teaching and Learning

Evaluating a health education intervention to improve pill swallowing for trainee doctors, nurses, physicians' assistants and pharmacists in Europe, the Middle East and Asia – KidzMed Goes Global



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ABSTRACT

Background: All healthcare professionals (HCPs), have a role in ensuring patient understanding and optimal medication use. Solid oral dosage forms (SODFs) or pills are commonly prescribed; however, some patients struggle to take these and there is minimal reference to this in HCP education. KidzMed is a validated training programme that can support this in children and adults. We explored student views on its application in undergraduate medical, nursing, physician assistant, and pharmacy programmes in the United Kingdom (UK), Malaysia, and Jordan.

Methods: University ethical approval was granted. HCP students from four universities in Europe, the Middle East, and Asia participated. This involved completing the pre-work of the KidzMed e-learning followed by its application in a simulated 90-min workshop at their university. Students were invited to evaluate the training and its potential application in their future practice via completion of e-questionnaires. Data was analysed using descriptive statistics to infer findings. Free-text comments were thematically analysed.

Results: A total of 327 HCP students completed evaluation questionnaires. They viewed the training favourably describing the content and length as “about right”. They described the interventions as ‘edutainment’ - a fun activity that was also educational. Participants felt comfortable to counsel parents or patients to swallow pills and saw the relevance of this skill to everyday lived experiences of using pills. They expressed a desire to do more activities like this.

Conclusions: All HCPs will encounter patients using pills in their clinical practice. Training at the undergraduate level to seek information about SODF use will allow the identification and

Abbreviations: HCPs, healthcare professionals; SODFs, solid oral dosage forms; LJMU, Liverpool John Moores University; NCL, Newcastle University; NUMed, Newcastle University Medicine Malaysia; HU, Hashemite University.

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rectification of poor pill use. KidzMed is a useful training tool to teach undergraduate HCPs from various professional backgrounds across different global jurisdictions, providing them with a fun, practical and educationally relevant session that they can apply to patients of all ages in their future practice.

Background

Healthcare services are constantly evolving to meet patient needs, with increasing cross-over in disciplinary roles and responsibilities between traditional members of the healthcare team. Pharmacy is a good example of this, what was a relatively non-patient facing (dispensary-based) role now involves more clinical and patient engagement activities.¹ Physician's assistants were introduced to the UK in 2003 and are increasingly being used to meet skills gaps and manage the demands on stretched healthcare services.² There is a need, therefore, to adapt healthcare professionals' (HCPs) education to ensure readiness for future clinical practice and patient engagement.³ This includes ensuring that patient interactions are time and cost-efficient (under 30 min) if they are to be feasible and repeatable in everyday practice.⁴ From a training perspective, these skills can be developed during undergraduate degree programmes, then applied and assessed in simulated or real-life environments. However, there are several educational activities that are applicable across professional training programmes. Examples include mental health first aid training,⁵ and running health screening and counselling outreach events.⁶ More ambitious activities include that of Brock and colleagues who have demonstrated the possibility of teaching medical and pharmacy students about a shared topic (management of a patient with asthma) across university campuses in Australia and Malaysia.⁷

Counselling on medication use is a standard example of patient interaction for HCPs involved in medication use e.g., those disciplines involved in this study. Many consultations focus on providing information about using medical devices such as inhalers, complex dosing regimens, or even the timing of medications. However, evidence shows that up to 10–40% of adults,⁸ and 10–70% of



Fig. 1. The KidzMed comic strip outlining the key steps for pill swallowing.

children⁹ struggle to swallow solid oral dosage forms (SODFs) or pills, despite no underlying medical cause for this (i.e., dysphagia). When considering the most appropriate medication for a child, liquids are often the default choice. Despite their perceived ease of administration, swallowability, and rapid onset of action, they also have several disadvantages including calculations for dosing and administration leading to a risk of error, many need refrigeration, and they are often more expensive and have a higher carbon footprint than their pill equivalents.¹⁰ SODFs are increasingly being explored in research and endorsed by the European Medicines Agency who states that pill swallowing is a skill that can be taught to all patients aged 3 years and older.¹¹ This includes adopting techniques regarding the correct head position (neutral or lean forward),^{12,13} considering the optimal volume of liquid required to effectively swallow a pill (minimum of 60 ml),¹⁴ or using special receptacles such as pill swallowing cups to aid this process.^{15,16} Although pills are commonly prescribed, less than 10% of patients have been asked about difficulties swallowing these by their HCP.¹¹

Patients are reluctant to bring up their concerns, preferring to discuss these with their friends and family, and often, adopting coping mechanisms such as skipping doses or modifying the medication by crushing or chewing it.¹¹ This is problematic, as missed doses may reduce the efficacy of the medication, and modifying the formulation may render the product unlicensed and or affect its absorption. This is especially important for extended / delayed release formulations. It is therefore imperative that HCPs, from all training backgrounds particularly those involved in the prescribing, dispensing and administration process such as the disciplines explored in this study, can identify and support patients who struggle to swallow pills. Part of this is acknowledging the patient's pill swallowing experience. Jones et al., highlight that younger paediatric patients require less training and in-patients are more likely to be able to swallow larger pills.¹⁷ Our review on this topic in adults also demonstrated that pill naivety influences swallowing ability.¹⁸ Other notable factors include size (too small creates handling problems / lack of mouth feel, too large may pose difficulties swallowing the pill), shape (patients may struggle with round tablets or capsules), and texture (coated pills have perceived ease of swallowability over uncoated formulations).

In terms of supporting HCPs through these conversations, there is no gold-standard screening tool to identify pill swallowing difficulties if patients do not disclose this. There is minimal reference to pill swallowing training in healthcare curriculum. For example, in the UK the pharmacy, medical and nursing councils' standards for education and training of their undergraduates refer to "safe and effective use of medicines",¹⁹ "prescribing medicines safely"²⁰ and "supporting patients and administration via different routes"²¹ respectively. The National Health Service (NHS) website has key tips to aid pill swallowing including outlining the steps involved in the lean forward technique of Schiele et al.,¹² and the pop-bottle method used by Tse et al.,¹³ but no formal training package for HCPs or patients.²²

A multidisciplinary team of HCPs at the Great North Children's Hospital Newcastle-upon-Tyne has as such developed a bespoke educational intervention, called KidzMed, to upskill HCPs and teach patients 3 years+.¹³ There is an e-learning programme which takes approximately 20 min to complete, with supporting materials including a comic strip outlining the steps involved to teach pill swallowing using the 'pop bottle' method where a sports capped water bottle and dummy pills facilitate the process (Fig. 1). It is designed to up-skill HCPs from all training backgrounds to teach patients about how to swallow pills, optimising their use in preference to oral liquid formulations. Although designed with paediatric patients in mind, the technique involved is equally applicable and translatable to adults.¹² The programme has been successfully used to teach qualified HCPs,¹⁵ patients and patient representative groups¹⁶ and has been implemented in other children's hospitals in the UK, such as Alder Hey Children's Hospital in Liverpool.²³

The KidzMed e-learning programme was also introduced to three UK Schools of Pharmacy during the height of the COVID-19 pandemic as an optional self-directed learning component.²⁴ Participating student pharmacists enjoyed the e-learning but expressed a desire for hands-on practice. Additionally, this work did not consider undergraduate students from other healthcare backgrounds, such as those from medical, nursing, or physician assistant programmes. Furthermore, the work was done entirely in one geographical location (the UK) which means student experiences of the intervention in different educational settings, across different professional boundaries and in different cultural contexts were not explored. The aim of this study then is to evaluate healthcare student experiences of completing an educational intervention across a variety of healthcare programmes, in different geographical jurisdictions and cultural contexts.

Methods

A mixed-methods post-intervention cohort design was used for the study. A research protocol and anonymous e-questionnaires on the Microsoft Forms platform were adapted from our previous study.²⁴ The methods were written in line with the GREET 2016 checklist and TiDIER Guideline.^{25,26}

Study design and population: Students at all university sites were invited to participate in a voluntary research study relating to their learning. This was done via an announcement and provision of the participant information sheet, posted on the university's virtual learning pages familiar to them, 10 days prior to the scheduled workshop. This allowed sufficient time for them to make an informed decision whether to participate.

The participant information sheet outlined the inclusion criteria (students that were final year MPharm at Liverpool John Moores University (LJMU), third-year medical, nursing and physician assistant's at Newcastle (NCL) and Newcastle University Medicine Malaysia (NUMed), and fifth-year at Hashemite University (HU) that had completed the directed KidzMed e-learning pre-work and attended the classroom teaching session). The exclusion criteria were: students in the included years at the study sites that had not completed both the e-learning and classroom session, and students in other years on those courses at the study sites. The purpose of the study and data collection methods was also outlined (all questionnaires would be collected electronically, were anonymous and could not be directly linked to them, and they did not have to answer any question if they did not wish to except for the compulsory first question where they had to select "Yes" agreeing that they had read the participant information sheet or it had been read to them and

that they understood by submitting the questionnaire they were agreeing to participate in the study and once submitted they could not withdraw. It was made clear that willingness to participate in the study would not affect their educational experience and participation in the workshop activity was not reliant on participation in the research study.

Educational principles underpinning the intervention: The Evidence-based practice educational principles were mapped to the intervention (see Supplementary Materials 1). The intervention was also mapped to Millers' Triangle where learners progress from "knows", "knows how", "shows how" and "does".²⁷ The educational strategies used included self-directed, online, asynchronous learning and face-to-face synchronous classroom-based teaching combining didactic delivery, group discussion and roleplay activities. The e-learning was included to position students at the "knows" and "knows how" level by providing background information to the technique with virtual demonstration about how patients could be supported to learn how to swallow pills hypothetically. The purpose of the workshop was to support students to move into the "shows how" and "does" levels of Miller's Triangle by providing hands on experience for students to demonstrate their learning.

The following learning objectives were used i) to describe the *materials* needed to teach someone without dysphagia how to swallow pills, ii) to describe the *steps* needed to teach someone without dysphagia how to swallow pills, and iii) to outline the *benefits* of using SODFs/ pills in preference to oral liquid dosage forms.

Intervention

All students were asked to complete the KidzMed e-learning component (available at <https://www.e-Lfh.org.uk/programmes/kidzmed>) as pre-work and attend a single live workshop in their university regardless of whether they participated in the study or not. The e-learning was accessed via students' own devices using their preferred internet browser (the e-learning programme is compatible with Internet Explorer, Chrome, Safari, and Firefox). The workshop was delivered in local university seminar rooms set up for collaborative learning, with individual tablet chairs (chairs with wheels and a table), providing flexibility for students to move furniture to meet their needs. As the KidzMed e-learning was offered via an external website accessible to both qualified HCPs and the students it was not possible to determine how many students accessed this prior to the workshop. Classroom (workshop) attendance was not assessed. Instructors delivering the sessions were qualified HCPs (doctors, nurses, physician's assistants and pharmacists) working at the university study sites and had completed the KidzMed training prior to delivering the workshops to students.

Students were provided with KidzMed resources, including the comic strip of steps to follow when counselling a patient as shown in Fig. 1, and a parent/ carer leaflet, sports-capped water bottles (to facilitate the 'pop bottle' SODF swallowing technique used in KidzMed),¹³ and candy or hydroxypropyl methylcellulose capsules (HPMC) as placebo SODFs demonstrated in Fig. 2. Regardless of university site, the placebos were closely matched based on local availability to those shown in Fig. 2. All dietary requirements were addressed in advance ensuring that students could participate fully in the workshop. Each student received their own pack of dummy tablets and capsules and range of sizes to try the technique on a range of dosage forms.

Data collection and analysis

At the end of the workshop, students were asked to complete an online questionnaire hosted by Microsoft Forms to explore their

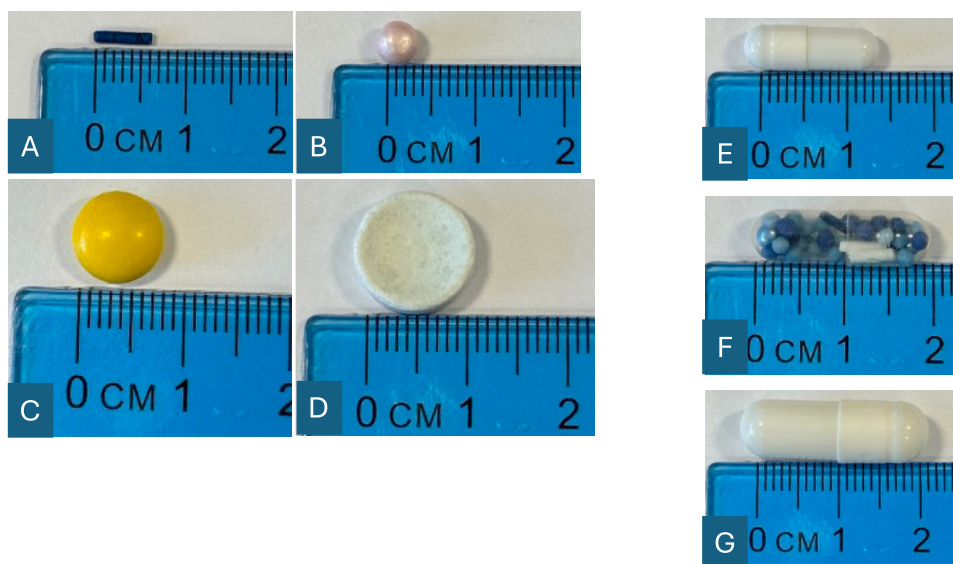


Fig. 2. Examples of candy and HPMC capsules and their sizes used during the training session. The lengths of each placebo are outlined as follows: A) Hundreds and thousands 6 mm, B) cake decoration 3 mm, C) mini chocolate bean 8 mm, D) swizzels® 10 mm, E) HPMC size 4 capsule 14 mm, F) HPMC size 2 capsule 18 mm, and G) HPMC size 0 capsule 21 mm.

views about the e-learning content and in-person face-to-face workshop. Questions were a range of fixed answers where participants answered from a list of options, with additional free-text comments to allow further expression of views. The questions focused on the duration, complexity of the training, as well as perceived confidence for using knowledge gained in the future. Students were provided with a quick response code to complete the questionnaire immediately after completing the workshop and a link was also placed on their university virtual learning pages so that they could complete this at a time of convenience later if they preferred.

Data was exported from Microsoft Forms into Microsoft Excel, and descriptive statistics prepared. Free-text comments were thematically analysed using a reflective thematic approach and sample quotes selected to demonstrate participants views. A narrative synthesis was used to bring together quantitative and qualitative findings to identify findings.

Ethics

Ethical approval was granted for the multi-site study (LJMU NCL NUmed) by LJMU, and HU in their original English language format (LJMU: PBS/2020–21/04, and HU:09/03/2021/2022).

Results

In total, 327 students completed the questionnaire. Their disciplines are outlined in Fig. 3, most were student pharmacists ($n = 242$), with smaller numbers of other disciplines (medical $n = 61$, nursing $n = 22$, and 2 physician assistant students).

The students viewed the pre-session e-learning and classroom-based session positively, with approximately 92% ($n = 248/270$ responses for this question) and 88% ($n = 241/275$ responses for this question) respectively, selecting that content was “about right” as per Fig. 4. Despite this, several had an alternative perspective. Some students felt the content was too basic (7%, $n = 19$ for the e-learning, and 8%, $n = 23$ for the classroom session respectively). In addition, there were a small number that felt the content was too complex (3, 1% for the e-learning and 11, 4% for the classroom session).

Free text responses provided further expansion of these views (the themes are outlined in Table 1 and full comments captured in Supplementary Information 2 and 3) with the e-learning's relevance and concise and informative nature highlighted. The comments reinforced the positive student response to the classroom session. They liked the opportunity for hands-on practice, commented on its usefulness for practice, the benefits of live demonstrations, and the fun and informative nature of the session. One student mentioned that they would prefer trying the technique with more actual placebos rather than sweets and some outlined feeling awkward playing the role of the child or patient with their peers.

Students were asked to state their level of comfort for counselling patients to swallow pills in future practice. Overall, 270 students responded to this question, with 105 (39%) feeling comfortable counselling both adults and children, 4 (1%) selected adults only, and 161 (60%) children only (see Fig. 5).

Discussion

This is the first example of the KidzMed resources being used in its entirety (e-learning plus simulated practice) to train undergraduate healthcare students from four disciplines (medicine, nursing, physician assistants, and pharmacy), across several universities, and in three countries. As detailed in our previous work, there are gaps in healthcare education about counselling patients to swallow pills.²⁴ KidzMed, as a freely available, validated resource, can meet this educational need.

The findings are important because they show KidzMed is relevant to trainees across different HCP groups. There is an increasing emphasis on multidisciplinary working within healthcare, and on making every contact count.²⁸ Teaching techniques to support pill swallowing to a range of HCPs reinforces these principles and broadens the responsibility of counselling for a simple life skill to all

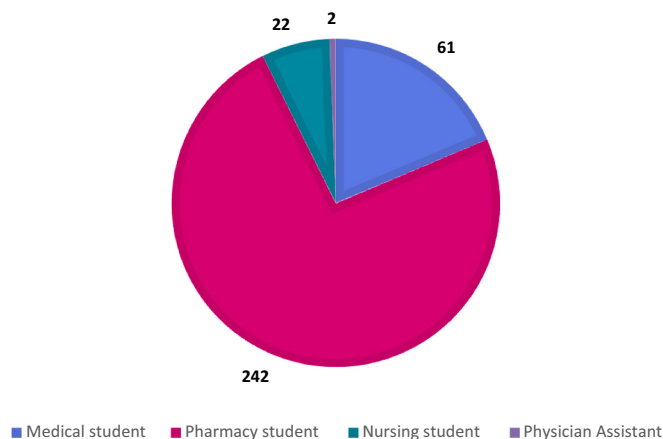


Fig. 3. Participating student demographics based on degree type.

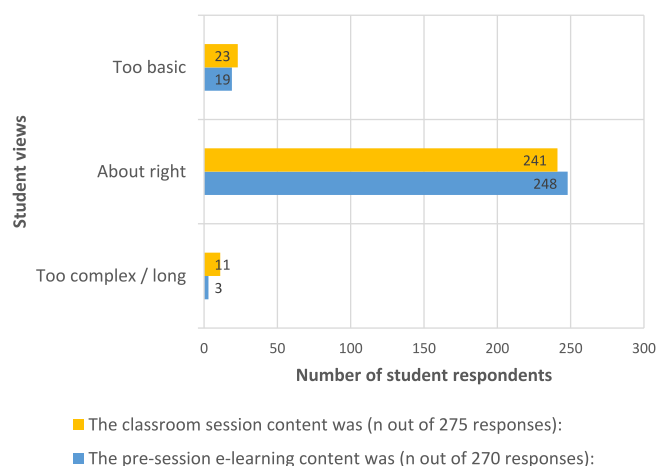


Fig. 4. Student views on the e-learning and classroom content.

Table 1

Thematic analysis of the 223 free text comments about the classroom session.

Theme	Number of comments (%)
Hands on practice	60 (26.9%)
Other – comments with no clear theme matched	58 (26.0%)
Usefulness / informative	53 (23.8%)
Demonstration	28 (12.6%)
Interactive / fun	7 (3.1%)
Technique / tips	7 (3.1%)
Environment / group dynamics	6 (2.7%)
Skill / confidence gained	4 (1.8%)

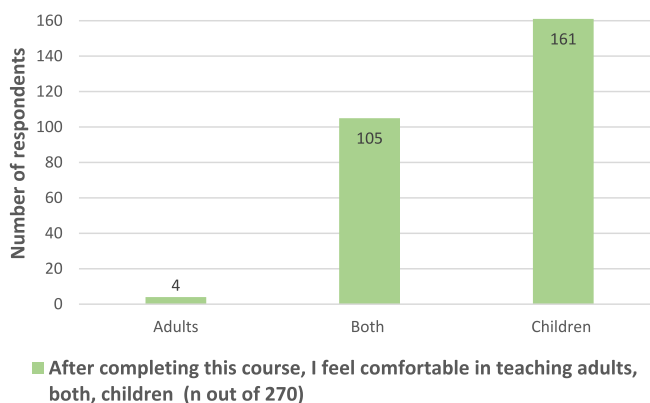


Fig. 5. Student comfort in teaching different patient groups following the classroom session.

involved in medicines use and patient care – across the processes of prescribing, dispensing, and administration. Educational practice for all disciplines involved in this study emphasises the need for patient-centred care, interprofessional working, evidence-based training, and opportunities for applying theory in practice (simulated or real-life).^{19–21} By combining e-learning with in-person simulation, KidzMed is an educational tool that reflects this guidance and provides students with an opportunity to move from the “knows” and “knows how”, to the “shows how” and “does” levels of Miller’s Triangle.²⁷ Although the findings may not fully capture that students move to the “does” level, through the simulated session students are able to practice this life skill and the findings show students are able to contextualise this to their future practice in relation to adults and children. This represents new knowledge that they could see the benefits of learning for future practice and links to the ‘affective domain’ of Bloom’s Taxonomy. The interactive and fun nature of the KidzMed sessions perhaps had a lower cognitive burden than more traditional workshops where students are doing written as compared to hands-on activities. More interactive workshops tend to have increased student engagement. Keyworth et al. show that when learners see the relevance of teaching, they are more likely to engage in the learning activity.²⁸ This supports our

findings that this technique will support learning, as pill swallowing is a life skill and is relevant across different stages of patient care, and to trainees from different disciplines.

The findings are also important as they show the same educational tool can be used to improve SODF use for commonly prescribed medicines across jurisdictions with students in all countries enjoying the teaching sessions indicating its cultural appropriateness for global healthcare training. Medication costs and their impact on health service budgets and prescribing decisions should be considered in HCP training. In England alone (2024–2025), prescribed medicines cost the health service almost £21 billion.²⁹ Medicines also account for approximately 25% of the NHS carbon footprint, demonstrating both a financial and environmental cost.³⁰ Although pills are known to be more cost-effective and more environmentally friendly than other formulations,³¹ as with any medication, they will only work in patients who take them. Non-adherence and failure to use medications as intended result in poorer patient outcomes globally.^{32–34} It is therefore essential that HCPs, from all professional disciplines and in all jurisdictions, enquire about and assist patients of all ages, in all cultural contexts globally, to swallow pills with ease and reduce the likelihood of non-adherence. KidzMed provides them with the skills and confidence to do this, as demonstrated in our findings, where students expressed confidence in applying knowledge gained from the materials.

Our study has several strengths and limitations. Considering the strengths, it is the first example of using KidzMed e-learning along with practical application in undergraduate healthcare curriculum; it demonstrates the relevance of the training to a range of healthcare disciplines, and its applicability to global healthcare training. Despite its usefulness and potential for future impact on HCP practices, our study also has some limitations. Only four Universities participated, we do not have the data regarding number of workshop attendees versus number of questionnaire participants, but it is likely that not all provided feedback. The findings are perhaps from the more incentivised students which may introduce positive bias to the results, and makes comparison of responses difficult. The responses provide insight into student views from a range of healthcare disciplines but may not be representative of the overall cohort as convenience sampling was used. This is particularly the case for physicians' assistants, who were the smallest sample studied, and where findings must be interpreted with caution. Questionnaire design may have contributed to the surprising findings of confidence to teach children only rather than both adult and child patients. The findings fall short of demonstrating student learning at the "does" level of Millers Triangle and although students expressed confidence to teach patients and parents, this was not formally assessed.²⁷ Further work is needed to follow-up in real-life, rather than simulated settings to see how trainees manage to apply their learning in practice once qualified.

Conclusions

Overall, KidzMed was very well received by the healthcare students. The work presented highlights an overlooked training element that can be implemented in a range of undergraduate healthcare programmes either as a core curriculum or as an additional learning session. It teaches learners about an important issue in a fun and safe setting and is time and resource-friendly. Difficulties swallowing pills is a global challenge, therefore KidzMed is relevant to all countries not just the UK. This article shows for the first-time the use of KidzMed in undergraduate settings outside of the UK and the positive student response highlights its generalisability. There was no follow-up to ensure retention of knowledge and oversee its implementation in real-life clinical settings. Future work will explore translation from the classroom to clinical settings.

CRediT authorship contribution statement

Alice P. McCloskey: Conceptualization, Methodology, Resources, Writing – original draft, Visualization, Project administration. **Adam P. Rathbone:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization. **Nicola Vasey:** Resources, Writing – review & editing. **Yincent Tse:** Conceptualization, Methodology, Resources, Writing – review & editing, Supervision. **Ravi Mistry:** Conceptualization, Methodology, Resources, Writing – review & editing, Project administration. **Ailsa Pickering:** Resources, Writing – review & editing. **Mohanad Odeh:** Conceptualization, Resources, Writing – review & editing, Project administration. **Amjad Z. Alrosan:** Resources, Writing – review & editing, Project administration. **Rawan Abudalo:** Resources, Writing – review & editing, Project administration. **Enaam M. Al Momany:** Resources, Writing – review & editing, Project administration. **Eman Harahsheh:** Resources, Writing – review & editing, Project administration. **Emma J. Lim:** Conceptualization, Methodology, Resources, Writing – review & editing, Supervision.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethical approval was sought and approved (LJMU: PBS/2020–21/04, and HU: 09/03/2021/2022).

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Declaration of competing interest

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cptl.2026.102706>.

Data availability

All data generated or analysed during this study are included in this published article and its supplementary files.

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