Evaluation of medical students' teaching skills following participation in Teaching on the Run

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Abstract

Background: *Doctors are expected to teach throughout their careers, yet the majority receive minimal formal instruction in clinical education during medical school. Peer-assisted learning offers a structured opportunity to build teaching skills early. The Teaching on the Run (TOTR) program was adapted for senior medical students at the University of Western Australia to enhance their competence and confidence in clinical teaching.*

Methods: *This prospective observational study evaluated the impact of the TOTR workshops on the confidence of final-year medical students and their self-perceived competence in clinical teaching. Participants completed surveys before, immediately after and four months after the program. Quantitative data included Likert-style ratings across key teaching domains and qualitative feedback was collected through open-ended responses.*

Results: *A total of 42 students completed pre-and post-course surveys, with 26 completing follow-up at four months. Participants reported significant improvements in teaching confidence across all domains, particularly in setting learning objectives (mean increase from 5.24 to 7.54), selecting teaching methods (4.67 to 7.08) and evaluating teaching effectiveness (3.60 to 6.69). These gains were largely sustained at follow-up. Students also reported an increased frequency of teaching and greater use of diverse methods, including bedside and case-based teaching. Qualitative feedback demonstrated the value of microteaching, practical skill development and structured feedback.*

Conclusion: *A brief, structured teaching workshop such as TOTR can enhance the confidence and perceived competence of medical students as clinical educators. Incorporating these initiatives within the medical curriculum may better prepare students for future teaching roles and create a collaborative learning space within clinical practice.*

Keywords: clinical teaching, teaching confidence, final-year medical students, bedside teaching, case-based teaching, collaborative learning

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INTRODUCTION

Doctors often participate in the teaching and supervision of junior medical staff and peers as part of their professional responsibilities. In Australia, the Australian Medical Council (AMC) specifies that graduates should be able to 'apply the principles of effective near-peer teaching, appraising and assessing' (AMC 2024). Increasing recognition is being given to the importance of developing effective teaching skills early, yet formal training in clinical education is often lacking in medical school curriculums (Burgess, McGregor & Mellis 2014).

Peer-assisted learning (PAL) has emerged as a widely adopted strategy to bridge this gap in formal teacher training. PAL is defined as, 'people from similar social groupings, who are not professional teachers, helping each other to learn and learning themselves by teaching' (Topping 1996). PAL provides a structured opportunity for medical students to consolidate clinical knowledge, enhance communication and feedback skills, and build confidence in teaching. The professional benefits of PAL are well-documented, including the development of teaching skills, deeper learning, enhanced confidence and the development of a professional identity as a clinical educator (Burgess & Nestel 2014). Peer tutoring also aligns with professional expectations: in the United Kingdom, the General Medical Council mandates that graduates 'demonstrate appropriate teaching skills', and 76% of medical schools in the United States report integrating some form of peer teaching into their curriculums (Yu et al. 2011).

Recognising the value of PAL, Student Grand Rounds (SGR) was established in 2004 by senior medical students at the University of Western Australia (UWA) to provide junior students with supplemental peer-led teaching. Senior students volunteer as SGR tutors and are supported in this role by participating in the Teaching on the Run (TOTR) program –a teaching skills training program originally developed for healthcare professionals and published in the *Medical Journal of Australia* (Silbert & Lake 2012).

TOTR was adapted for medical students by one of its developers, Professor Fiona Lake, into a two-part workshop series focusing on core competencies in clinical teaching. These include planning lessons, writing learning objectives, engaging learners, involving patients in bedside teaching, providing feedback and self-evaluation. A previous evaluation conducted by Silbert et al. (2012) of the TOTR program assessed its value through participant feedback but did not incorporate structured pre-and post-intervention assessments (Silbert & Lake 2012).

This study aims to evaluate the effectiveness of the TOTR program in improving the confidence and self-perceived competence of senior medical students in clinical teaching. It was hypothesised that participation will enhance teaching confidence and ability in key domains, including setting learning outcomes, choosing effective teaching methods, providing feedback and evaluating both student learning and personal teaching effectiveness.

METHODS

STUDY DESIGN

This was a prospective observational study involving three cross-sectional surveys administered to participants before, immediately after and four months following the completion of their TOTR workshops. The study aimed to assess changes in self-perceived teaching confidence and ability over time. Ethics approval for this study was obtained from the UWA Human Research Ethics Committee (reference 2024/ET000230).

SETTING AND PARTICIPANTS

The study was conducted at UWA, with participants recruited from the SGR program, a PAL initiative coordinated by the Western Australian Medical Students' Society (WAMSS). All participants were final-year medical students who volunteered as tutors within the SGR program. Participation in the study was voluntary and independent of any ongoing involvement with SGR. Inclusion criteria comprised active participation as an SGR tutor and attendance at both TOTR sessions. Students who declined consent or later withdrew from the study were excluded from analysis. Participants were informed of their right to withdraw from the study at any point without penalty or replacement.

PROGRAM STRUCTURE

The TOTR program consisted of two structured workshops, each lasting three hours, delivered in a small group format. Adaptations included an emphasis on practical, student-led teaching scenarios reflecting SGR tutorials; examples drawn from the clinical curriculum; and a focus on developing confidence and communication skills for peer-to-peer settings. The workshops focused on foundational skills in clinical teaching, including planning structured lessons, defining learning objectives, optimising educational opportunities, involving patients in teaching, giving feedback, self-evaluation, and managing group dynamics.

EVALUATION INSTRUMENT

To assess the effectiveness of the training, participants completed three surveys administered through the secure online platform Qualtrics. The pre-intervention survey (Survey 1) assessed baseline self-perceived confidence and competence in core teaching domains, including lesson planning, communication, feedback and learner engagement, and collected demographic information, as well as information on prior teaching experience and current teaching activities. The immediate post-intervention survey (Survey 2) reassessed confidence and competence in the same domains and gathered feedback on satisfaction with the workshop content, structure and delivery. The four-month follow-up survey (Survey 3) again evaluated confidence and competence, and collected data on the frequency, format and characteristics of teaching activities undertaken since completing the workshops, to assess the application and retention of learning over time. The surveys gathered quantitative data primarily through Likert scale items, which used a 10-point scale to ask participants about their self-perceived competence in key teaching domains such as lesson planning, communication and the ability to provide constructive feedback in bedside teaching, as well as their overall satisfaction and

communication skills. Qualitative data was collected through open-ended questions at the end of both post-intervention surveys (Surveys 2 and 3), which explored participants' reflections on the TOTR program, including the perceived usefulness, suggestions for improvement and intended application of learning in their teaching practice. Not all participants completed the qualitative items, and responses were optional.

DATA ANALYSIS

Quantitative data were analysed descriptively using Microsoft Excel. Means and standard deviations (SDs) were calculated for each domain across the three survey time points. Qualitative responses were reviewed independently. Although a formal thematic analysis framework was not applied, key themes were identified through iterative reading and the grouping of recurrent ideas. Anonymity was maintained using a code-based identification system, and participants were instructed not to include any personal identifiers. To minimise bias and reduce social desirability effects, participants were asked to complete the surveys privately. Investigators were present at the workshops to answer questions and to prompt survey completion without exerting pressure.

RESEARCHER REFLEXIVITY

All members of the research team have previously participated in TOTR and share a strong interest in medical education. We recognise that our positive experiences with TOTR and our enthusiasm for teaching may have influenced the way we interpreted participants' views and the value we ascribed to the program. To mitigate this bias, we engaged in regular team discussions to reflect on our assumptions, and aimed to ensure that participant voices were represented authentically.

RESULTS

Of the 44 final-year medical students invited to participate in the study, 42 consented and completed the pre- and post-course surveys (response rate 95.4%). Of the 42 initial participants, 26 (61.9%) completed the four-month follow-up survey. No participants actively withdrew after enrolment, although 16 did not complete the final survey. A summary of participant characteristics and baseline teaching experience can be found in Table 1.

PARTICIPANT DEMOGRAPHICS AND TEACHING BACKGROUND

The mean age of participants was 23.9 years (SD 1.37), with the majority identifying as female (n = 25, 59.5%). Most participants had limited formal teaching experience, with mean years of experience in various settings ranging from 0.67 years (undergraduate) to 2.65 years (high school). Prior formal training in clinical teaching was reported by only 21% of participants. The participants included in the final analysis were representative of the broader SGR tutor cohort in terms of gender, age and prior teaching experience, based on program registration data.

Table 1: Participant demographics and teaching experience

	Mean (± SD), n (%)
Age	23.9 ± 1.37
Gender (F)	25 (59.5%)
Years of teaching experience by setting	
Primary school	0.91 ± 1.64
High school	2.65 ± 2.29
Undergraduate	0.67 ± 1.21
Postgraduate	0.76 ± 0.76
Workplace	0.98 ± 2.09
Years of experience teaching in clinical medicine	0.68 ± 0.70
Prior training in clinical teaching (Y)	9 (21%)

CHANGES IN TEACHING PRACTICE

Following the TOTR course, participants reported increased engagement in clinical teaching. Although only 12.5% of participants taught at least weekly before the course, this rose to 34.6% by the four-month follow-up survey (Table 2), suggesting greater consistency and confidence in regular teaching after the TOTR course.

Teaching formats also diversified. The proportion of participants engaging in one-on-one teaching increased from 7.9% to 23.1%, while large-group teaching decreased correspondingly. Case-based teaching remained the most common approach, increasing from 30.4% to 36.2%. There were also observed increases in bedside teaching (3.8% to 12.8%) and clinical skills workshops (11.4% to 14.9%), and modest reductions in lecture-style and student-led discussion formats (Table 2).

Table 2: Teaching practice and confidence before, after and four months after the TOTR course

	Pre-course Mean (± SD), n (%)	Post-course Mean (± SD), n (%)	4 Months Post-course Mean (± SD), n (%)
Frequency of delivering clinical teaching activities			
Daily	0		0
Few times a week	0		2 (7.7%)
Once a week	5 (12.5%)		7 (26.9%)
Few times a month	10 (25%)		10 (38.5%)
Once a month	25 (62.5%)		7 (26.9%)
Typical methods of delivering clinical teaching*			
Lectures	11 (13.9%)		6 (12.8%)
Bedside teaching	8 (3.8%)		6 (12.8%)
Case-based teaching	24 (30.4%)		17 (36.2%)
Student-led case discussion	14 (17.7%)		6 (12.8%)
Clinical skills workshop	9 (11.4%)		7 (14.9%)
Other	13 (16.5%)		5 (10.6%)
Typical group size for teaching*			
One on one	3 (7.9%)		6 (23.1%)
Small group (2–4 learners)	33 (86.8%)		18 (69.2%)
Medium group (5–10 learners)	2 (5.3%)		1 (3.8%)
Large group (>10 learners)	0 (0.0%)		1 (3.8%)
Typical student level taught*			
Pre-clinical students	11 (21.2%)		3 (9.1%)
Junior clinical students	35 (67.3%)		22 (66.7%)
Peer-level clinical students	6 (11.5%)		8 (24.2%)
Other	0 (0.0%)		0 (0.0%)

	Pre-course Mean (± SD), n (%)	Post-course Mean (± SD), n (%)	4 Months Post-course Mean (± SD), n (%)
Factors considered when planning teaching*			
Learning outcomes	20 (20.0%)	20 (20.0%)	15 (20.3%)
Teaching methods	31 (31.0%)	31 (31.0%)	17 (23.0%)
Feedback methods	21 (21.0%)	21 (21.0%)	16 (21.6%)
Assessment methods	14 (14.0%)	14 (14.0%)	16 (21.6%)
Teaching evaluation methods	14 (14.0%)	14 (14.0%)	10 (13.5%)
Confidence ratings			
Formulating learning outcomes	5.24 ± 1.65	7.54 ± 1.14	6.84 ± 1.46
Using effective teaching methods	4.67 ± 1.85	7.08 ± 1.53	6.48 ± 1.73
Providing feedback	5.38 ± 1.87	6.60 ± 1.44	6.96 ± 1.40
Developing assessments	4.29 ± 1.87	6.65 ± 1.95	6.04 ± 1.74
Evaluating teaching effectiveness	3.6 ± 1.53	6.69 ± 1.95	5.72 ± 1.95
Overall confidence in clinical teaching	4.7 ± 1.89	7.74 ± 1.35	7.24 ± 1.42
Confidence in communication skills	6.0 ± 1.86	7.44 ± 1.37	7.48 ± 1.39
Overall effectiveness as a teacher	5.49 ± 1.57	7.36 ± 0.96	7.44 ± 1.12
Perceived relevance of TOTR program		8.22 ± 1.31	

*some participants selected more than one choice

CONFIDENCE IN TEACHING SKILLS

Across all domains, participants demonstrated significant improvement in self-reported teaching confidence immediately after the course, sustained at four months (Table 2) Confidence was rated on a scale from 1 to 10, where 1 indicated 'not confident at all' and 10 indicated 'extremely confident'. The largest gains were seen in confidence with formulating learning outcomes (an increase in average self-reported rating of 5.24 to 7.54), using teaching methods (4.67 increasing to 7.08) and evaluating teaching effectiveness (3.60 increasing to 6.69). The perceived relevance of the TOTR program was rated highly, with a mean score of 8.22 (SD 1.31) out of 10.

At the four-month follow-up survey, within-person comparisons (n = 26) demonstrated sustained improvements, particularly in confidence relating to lesson planning and provision of feedback. It must be noted, however, that slight declines were observed at the four-month mark, compared to immediate post-intervention scores.

QUALITATIVE FEEDBACK

Participants described the microteaching sessions, which provided participants a safe environment to practice and observe peer teaching and receive structured feedback, as the most valuable aspect of the course. Students appreciated the practical, hands-on approach and the emphasis on feedback and reflection.

Suggestions for improvement included shortening session duration, scheduling sessions earlier in the day and increasing engagement through more interactive activities and structured participation. Content-wise, participants asked for less time on the introductory material and more emphasis on advanced teaching topics and clinical relevance. The provision of consolidated support materials and post-session summaries was also recommended.

DISCUSSION

This study demonstrates that a brief, structured clinical teaching program such as TOTR can significantly improve the confidence and engagement of final-year medical students in teaching. Improvements were observed across all domains of teaching competence, particularly in lesson planning, feedback delivery and overall self-perception as an effective educator. These improvements persisted four months after the program, suggesting the program's lasting impact on participants' attitudes and behaviour.

Our findings align with the substantial body of literature supporting the value of PAL and the importance of preparing medical students to become good clinical educators. PAL has consistently been shown to enhance understanding, communication and feedback skills, while strengthening professional identity formation as educators (Burgess & Nestel 2014; Yu et al. 2011; Ten Cate & Durning 2007). Teaching peers helps senior students consolidate and deepen their own knowledge, identify gaps in understanding and clearly articulate clinical reasoning – processes that both enhance academic learning and mirror the cognitive and communication skills required in clinical practice (Pach et al. 2025). Furthermore, PAL contributes to a collaborative learning culture, enhances confidence and strengthens teamwork skills that are transferrable to the clinical environment (Irvine, Williams & McKenna 2018).

The current study also supports existing evaluations of the effectiveness of the TOTR program, which has been widely implemented across Australian health services to improve clinical teaching confidence, satisfaction and perceived teaching competence among health professionals and students (Hauck et al. 2017; Lake 2004). Previous evaluations have demonstrated that TOTR's structured, practical approach to teaching skill development leads to measurable improvements in participants' self-assessed teaching ability, confidence and engagement with learners (Silbert & Lake 2012).

The positive feedback and sustained self-reported benefits observed in our study support the growing consensus that teaching skills should be introduced early in medical education. Despite evidence that junior doctors may spend over an hour daily teaching medical students, many report little or no formal training in education (Uhomoibhi & Kearns 2024; Hayden et al. 2021). Introducing practical, clinically oriented teaching workshops like TOTR during medical school, particularly during senior years when students are beginning to develop their own clinical style, may offer an effective way to bridge this gap. These programs may also serve institutional needs: as medical schools expand and clinical faculty resources are increasingly stretched, peer-led teaching initiatives offer a scalable solution to maintain high quality clinical education (Alzaabi et al. 2021).

Furthermore, early exposure to structured teaching experiences helps to embed a culture of collaborative learning and prepare graduates for future supervisory and educational roles within the healthcare system. Our findings echo those of prior evaluations of formal teaching training programs, which highlight a range of benefits to participants, including increased confidence in planning and delivering teaching, applying educational principles and giving feedback (Snell 2011). In our cohort, students similarly expressed that the workshop motivated them to contribute meaningfully to the learning experiences of junior colleagues and to view teaching as a professional responsibility integral to their development as clinicians.

LIMITATIONS AND FUTURE DIRECTIONS

There are several limitations to our findings. First, this study was conducted at a single institution with a relatively small and self-selected group of final-year medical students, as this may limit the generalisability of results to other medical schools. Participants who signed up for the course likely had a pre-existing interest in teaching, introducing selection bias and potentially inflating the observed benefits of the program. Furthermore, the study relied on self-reported measures of confidence and perceived effectiveness, which, while useful indicators of self-efficacy, may not correlate directly with objective improvements in teaching skill or learner outcomes. Without external assessment of teaching performance, it is difficult to determine whether increases in confidence translate to improved teaching competence in practice. Finally, although follow-up data at four months provide some insight into the sustainability of impact, a longer-term evaluation would be necessary to assess whether the observed improvements are maintained over time. The attrition at the four-month follow-up survey introduces the possibility of non-response bias as those who continued to engage may differ systematically from those lost to follow-up. Longer-term follow-up beyond four months would help determine the durability of the observed improvements.

To address these limitations and create meaningful curriculum change, future efforts should focus on integrating formal teaching skills modules within the senior medical curriculum, aligned with graduate outcomes such as those outlined by the AMC, which emphasise that graduates should be able to 'contribute to the education of others'. Longitudinal evaluation using objective measures – including observed teaching performance and learner feedback – would provide stronger evidence of sustained impact. Institutional drivers, such as accreditation requirements, faculty development priorities and student-led initiatives, could be leveraged

to promote teaching as a core professional competency rather than an optional activity. Furthermore, the development of national frameworks for peer-teaching training that align undergraduate and postgraduate expectations would help ensure continuity in teaching skill development throughout medical education. Incorporating structured programs such as TOTR across medical schools offers a practical, evidence-based approach to fostering a culture of teaching excellence. Embedding educational skill development early can cultivate future clinicians who are not only competent practitioners but also confident, capable educators committed to lifelong learning and teaching.

CONCLUSION

This study demonstrates that a brief, structured teaching workshop such as TOTR can significantly enhance the confidence of final-year medical students and their perceived competence in clinical education. Improvements were observed across key domains of teaching, including lesson planning, feedback delivery and educator identity, and were sustained over time. These findings support the integration of practical, peer-focused teaching programs within the medical curriculum to equip future doctors with essential educational skills. Moving forward, broader implementation and long-term evaluation would be essential to assess the lasting impact of these initiatives on medical education.

References

Alzaabi, S, Nasaif, M, Khamis, AH, Otaki, F, Zary, N & Mascarenhas, S 2021, 'Medical students' perception and perceived value of peer learning in undergraduate clinical skill development and assessment: mixed methods study', *JMIR Medical Education*, vol. 7, no. 3, pp. e25875.

Burgess, A & Nestel, D 2014, 'Facilitating the development of professional identity through peer assisted learning in medical education', *Advances in Medical Education and Practice*, vol. 5, pp. 403-6.

Burgess, A, McGregor, D & Mellis, C 2014, 'Medical students as peer tutors: a systematic review', *BMC Medical Education*, vol. 14, pp. 115.

Australian Medical Council 2024, *Standards for Assessment and Accreditation of Primary Medical Programs*, viewed 15 December 2025, https://www.amc.org.au/wp-content/uploads/2023/08/AMC-Medical_ School_Standards-FINAL.pdf

Hauck, Y, Lewis, L, Pemberton, A, Crichton, C & Butt, J 2017, ''Teaching on the Run' with Australian midwives in a tertiary maternity hospital', *Nurse Education in Practice*, vol. 22, pp. 47-54.

Hayden, C, Raidan, J, Rees, J & Oswal, A 2021, 'Understanding junior doctors' experiences of teaching on the acute take: a qualitative study', *BMC Medical Education*, vol. 21, pp. 383.

Irvine, S, Williams, B & McKenna, L 2018, 'Near-peer teaching in undergraduate nurse education: an integrative review', *Nurse Education Today*, vol. 70, pp. 60-68.

Lake, FR 2004, 'Teaching on the run tips: doctors as teachers', *The Medical Journal of Australia*, vol. 180, pp. 415-6.

Pach, J, Stoffels, M, Schoonmade, L, van Ingen, E & Kusurkar, RA 2025, 'The impact of educational activities on professional identity formation in social sciences and humanities: a scoping review', *Educational Research Review*, vol. 48, pp. 100704.

Silbert, B & Lake, F 2012, 'Peer-assisted learning in teaching clinical examination to junior medical students', *Medical Teacher,* vol. 34, pp. 392-7.

Snell, L 2011, 'The resident-as-teacher: it's more than just about student learning', *Journal of Graduate Medical Education*, vol. 3, pp. 440-1.

Ten Cate, O & Durning, S 2007, 'Peer teaching in medical education: twelve reasons to move from theory to practice', *Medical Teacher*, vol. 29, pp. 591-9.

Topping, KJ 1996, 'The effectiveness of peer tutoring in further and higher education: A typology and review of the literature', *Higher Education*, vol. 32, pp. 321-45.

Uhomoibhi, C & Kearns, A 2024, 'Bedside teaching – insights into the medical student experience and likely impact on future role as clinical teacher', *BMC Medical Education*, vol. 24, pp. 1448.

Yu, TC, Wilson, NC, Singh, PP, Lemanu, DP, Hawken, SJ & Hill AG 2011, 'Medical students-as-teachers: a systematic review of peer-assisted teaching during medical school', *Advances in Medical Education and Practice*, vol. 2, pp. 157-72.