

SHORT REPORT

## Improving knowledge of quality and safety among general and acute care medicine advanced trainees through a brief quality improvement workshop

A. K. Aung<sup>1, 2</sup>, M. Ryall<sup>3, 4</sup>, S. Davis<sup>5</sup>, A. Shukla<sup>6</sup>, A. Knight<sup>7, 8</sup> & J. I. Lee<sup>9, 10</sup>

---

### Abstract

**Introduction:** Quality and safety is a core competency, yet there are limited formalised quality improvement (QI) courses for physician trainees offered in Australia.

**Methods:** An introductory QI workshop was conducted for trainees at the Internal Medicine Society of Australia and New Zealand (IMSANZ) Conference 2022. The workshop covered principles of improvement science, QI tools and plan-do-study-act (PDSA) cycles. The contents were delivered through a small-group experiential learning format. Pre- and post-workshop surveys were administered to evaluate the participants' perceptions and improvement in QI knowledge domains.

**Results:** Thirty-five trainees attended the workshop. Of all respondents, none had received formal QI training previously. Statistically significant improvements in nearly all QI knowledge domains were noted in the post-workshop evaluation along with improvement in participants' motivation to further learn QI processes relevant to their vocation.

**Conclusion:** An introductory workshop can significantly improve knowledge and motivation to further learn QI amongst physician trainees.

**Keywords:** Internal Medicine Society of Australia and New Zealand; quality improvement; quality and safety; medical education

---

<sup>1</sup> Department of General Medicine, Alfred Health, Victoria, Australia

<sup>2</sup> School of Public Health and Preventive Medicine, Monash University, Victoria, Australia

<sup>3</sup> Department of General Medicine, Wyong Hospital, Central Coast Local Health District, New South Wales, Australia

<sup>4</sup> School of Medicine and Public Health, University of Newcastle, New South Wales, Australia

<sup>5</sup> Department of General Medicine, Shoalhaven Hospital, Illawarra and Shoalhaven Local Health District, New South Wales, Australia

<sup>6</sup> Department of General Medicine, Liverpool Hospital, South Western Sydney Local Health District, New South Wales, Australia

<sup>7</sup> Department of General Medicine, Manning Base Hospital, Hunter New England Local Health District, New South Wales, Australia

<sup>8</sup> Department of Rural Health, University of Newcastle Department of Rural Health, New South Wales, Australia

<sup>9</sup> Weill Department of Medicine, New York Presbyterian Hospital/Weill Cornell Medicine, New York, USA

<sup>10</sup> Quality Improvement Academy, Weill Cornell Medicine, New York, USA

**Correspondence:** A/Prof Ar Kar Aung [A.Aung@alfred.org.au](mailto:A.Aung@alfred.org.au)

## Introduction

Quality and safety has been identified by the Royal Australasian College of Physicians (RACP) as one of the core competency domains of professional practice for all physicians (Udemans et al., 2018). Quality improvement (QI) methodology enables improvement of the systems in which healthcare professionals work to provide safe, timely, evidence-based, equitable, efficient and patient-centred care (Choudry et al., 2016). As such, incorporation of formal QI methodology teaching into traditional medical training programs has become a standard educational framework across many countries (Boonyasai et al., 2007; Choudry et al., 2016; Dean, 2018; Vinci et al., 2010; Wong et al., 2010). Yet in Australia, very few formalised QI training programs directed towards medical specialist trainees or academic scholarship are currently available to physician trainees.

Internal Medicine Society of Australia and New Zealand (IMSANZ) is a professional body that represents general physicians across Australia and Aotearoa New Zealand. The society holds biannual scientific conferences in both countries and dedicates 1 day of the meeting program to general and acute care medicine (GACM) advanced trainees. The Trainees Day program is designed to deliver a series of workshops or tutorials that aim to provide professional development opportunities. Hence, an introductory workshop to the QI methodology had been identified as one of the key initiatives for the 2022 Trainees Day at Manly, New South Wales. This plan also aligned with the top research priorities for general medicine as identified in the recent scoping survey conducted by IMSANZ Research Network (IMSANZ-RN)(Aung et al., 2022).

The Quality Improvement Academy at Weill Cornell Medicine (QIA-WCM) in New York, United States, was first established in 2016 to provide mentorship and an academic scholarship pathway for trainees and junior faculty members interested in undertaking scholarly projects that result in the improvement of patient care quality and safety in the hospital and ambulatory patient care settings.

Inaugural partnership between the QIA-WCM and IMSANZ has led to the delivery of the first QI workshop at the IMSANZ Trainee Day. The introductory workshop was held on 7 September 2022 and condensed into a 90-minute hybrid session of in-person and virtual attendance. Content covered a range of topics identified through a pre-workshop survey of attendees. These included the principles of improvement science; tools for root cause analysis, including process maps and fishbone diagrams; writing a “SMART” (specific, measurable, attainable, relevant and timely) aim and project charter based on the “model for improvement” (Langley et al., 2009); determining family of measures (outcome, process and balancing measures); and designing PDSA (plan-do-study-act) cycles. SQUIRE (Standards for Quality Improvement Reporting Excellence) guidelines for QI manuscripts were also introduced (Ogrinc et al., 2015). Experiential learning through small group workshops allowed for direct application of QI tools to a real-life clinical case—constructing process maps and fishbone diagrams and applying PDSA

cycles using “marshmallow tower” exercises (Garbarino & Monforte, 2019). Relevant to the trainee audience, the course content emphasised and provided a conceptual framework for integrating QI methodology into an audit cycle, one of the acceptable research project types stipulated by the RACP as a requirement for advanced training programs.

### ***Aims***

This study aimed to evaluate improvement in QI knowledge resulting from the workshop as well as the experience and perceptions of the attendees.

### **Methods**

Approval to conduct the survey was granted by Monash University Human Research and Ethics Committee (project number: 34534). The survey was designed by the organising faculty members and disseminated via REDCap™ hosted by Monash University (Harris et al., 2019). An invitation to participate was emailed to all trainees registered for the Trainees Day program held on 7 September 2022 by the conference manager on two separate occasions before the event for the pre-workshop component (mid to late August 2022). Survey completion was also conducted on the day of the workshop prior to the start of the session for attendees who had not responded to previous email invitations. The invitation to participate in a post-workshop survey was disseminated at the end of the workshop, and a reminder sent a week after the event. Participation in the survey was taken as implied consent. Repeat participation was not permitted.

### ***Analysis***

The pre-workshop survey explored participants’ characteristics, their previous experience with QI training, their motivation for attendance and confidence in their ability to identify their learning needs, and their knowledge in specific QI methodology domains. Responses helped to inform the investigators of the audience’s familiarity with QI methodology to refine the course content. The post-workshop survey was designed to assess improvement in knowledge domains as well as feedback on the workshop. Assessment of QI knowledge domains utilised a mix of multiple-choice questions (MCQ) and self-rated scales between 0 and 100.

Results were analysed using GraphPad Prism 9™ (La Jolla, CA, USA). Descriptive statistics were provided as counts and proportions or median and interquartile ranges. Differences between the pre- and post-workshop knowledge were analysed using Fisher’s exact tests for the proportions of correct answers for MCQ questions and Mann-Whitney U tests for aggregate data on self-rated scales. Paired statistical tests were not employed, as given the anonymity of the survey, individual level data for pre- and post-workshop results were not available. A two-tailed *p*-value of < 0.05 was considered statistically significant.

## Results

A total of 51 trainees registered for Trainee Day. Of these, 20 (39.2%) attended the workshop in person and 15 (29.4%) virtually (total 35 attendees). Thirty-one trainees completed the pre-workshop survey (60.8% responses from 51 email invitations), and 19 completed the post-workshop survey (54.3% of workshop attendees). Of the 19 who completed the post-workshop survey, 14 (73.7%) attended in-person and 4 (21.1%) virtually. Attendance type could not be determined in one survey.

Table 1 provides information on characteristics, previous experience with QI training, motivation for attendance and learning needs analysis in pre-workshop survey respondents. Almost a quarter of the respondents were at or near completion of their training. Interestingly, none had received formal QI training previously, and 74.2% believed that QI training would improve their clinical practice. Nearly 50% did not feel confident to identify their own learning needs in the QI domains.

**Table 1**

*Pre-Workshop Survey Respondents' Characteristics and Learning Needs Analysis*

Characteristics (n = 31)	n (%)
<b>Current advanced trainee status</b>	
Single specialty trainee in GACM	21 (67.7)
Dual specialty trainee	9 (29)
Not yet an advanced trainee	1 (3.2)
<b>Current advanced trainee year level</b>	
Year 1	10 (32.3)
Year 2	9 (29)
Year 3	4 (12.9)
Year 4/4+	7 (22.6)
NA	1 (3.2)
<b>Previously attended a formal QI training program</b>	
No	31 (100)
<b>Previously received informal QI training at workplace</b>	
No	14 (45.2)
Yes	7 (22.6)
Unsure	10 (32.3)
<b>Motivation for attending the workshop</b>	
My workplace expects that I attend some training in quality and safety.	6 (19.4)
The curriculum in GACM contains learning outcomes related to quality improvement.	15 (48.4)
Completing the workshop may help me progress with my compulsory research project.	14 (45.2)

Characteristics (n = 31)	n (%)
<b>Motivation for attending the workshop</b> <i>(continued)</i>	
Completing training in quality improvement will improve my clinical practice.	23 (74.2)
I have a special interest in learning more about this area.	11 (35.5)
None of the above	2 (6.5)
<b>Level of confidence to independently identify own learning needs in QI domain</b>	
Very confident	0 (0)
Somewhat confident	3 (9.7)
Neutral	13 (41.9)
Somewhat not confident	5 (16.1)
Not confident at all	10 (32.3)

Legend:

GACM: general and acute care medicine

NA: not applicable

QI: quality improvement

Statistically significant improvements in all QI knowledge domains were noted in the post-workshop evaluation compared to pre-workshop scores, except for the question on process measures (Table 2).

**Table 2**

*Performance on Quality Improvement Knowledge Domains Pre- and Post-Workshop*

	Pre-workshop (n = 31)	Post-workshop (n = 19)	P-value
Correctly identified process map, n (%)	20 (64.5)	19 (100)	0.0035†
Correctly identified fishbone diagram, n (%)	11 (35.5)	14 (73.7)	0.019†
Correctly identified process measure, n (%)	18 (58)	13 (68.4)	0.56†
Correctly identified PDSA, n (%)	9 (29)	17 (89.5)	< 0.0001†
Writing project charter, median (IQR)	12 (2.5–24.5)	55.5 (29–72.25)	0.0013‡
Conducting root cause analysis, median (IQR)	15 (1–33.5)	50 (27.25–66.5)	0.0007‡
Constructing a fishbone diagram, median (IQR)	10 (0–33.5)	66.5 (47–76.75)	< 0.0001‡
Constructing a process map, median (IQR)	12 (0.5–50)	73 (50.75–77.5)	< 0.0001‡
Writing an aim statement, median (IQR)	30 (9.5–55)	64.5 (50.75–77.5)	0.0018‡
Selecting appropriate measures, median (IQR)	23 (8–50)	65.5 (50–75)	0.0002‡

	Pre-workshop (n = 31)	Post-workshop (n = 19)	P-value
Understanding and application of PDSA cycle, median (IQR)	11 (2–30)	70 (50–81.75)	< 0.0001‡
Knowledge and application of SQUIRE guidelines, median (IQR)	11 (1–28)	53.5 (19.25–74)	0.0011‡

Legend:

PDSA: Plan-Do-Study-Act

IQR: interquartile range

†Fisher's exact test and ‡Mann-Whitney U test. Paired analysis was not undertaken as individual level data was not available for pre- and post-workshop values.

The first four items were measured based on the proportion of correct answers, whilst the remaining items were measured on self-reported rating of knowledge domains from 0–100.

The post-workshop survey also identified increases in participants' motivation to continue further learning in QI processes (84.2%) and improvement in participants' confidence to identify their learning needs (89.4%). All respondents agreed the workshop was relevant to their advanced trainee experience (100%), and a vast majority would recommend a similar workshop to their colleagues (89.5%) or would attend a course that delivers more in-depth knowledge and skills in QI (84.2%).

## Discussion

Improving the quality of health service provision was one of the key missions set by the Australian Commission on Safety and Quality in Health Care when the National Safety and Quality Health Service (NSQHS) Standards were developed in collaboration with multiple jurisdictions and agencies (Australian Commission on Safety and Quality in Health Care, 2024). To support this national mission, the RACP educational framework stipulates that all physician trainees acquire competency in quality and safety during their scholarship journey (Udemans et al., 2018). Resources, tools and educational materials for quality improvement initiatives for health professionals are accessible through certain government jurisdictions in Australia (New South Wales Government Clinical Excellence Commission, n.d.). However, to our knowledge, structured quality improvement training opportunities and educational resources pitched at a level appropriate for specialist physician trainees have not been made widely available in Australia. This is reflected in our results, where the vast majority of respondents, including the trainees who are at or near completion of their training program, have not received any formal or informal QI training previously.

General physicians are often at the forefront of health service improvement initiatives, playing important roles as clinicians, teachers, researchers and health system leaders. Indeed, a recent scoping survey by the IMSANZ-RN identified that the most common type of research projects conducted amongst general physicians in Australia and Aotearoa New Zealand was QI research (Aung et al., 2022). QI was also voted as the top priority

in IMSANZ-RN's research agenda and strategic plans (Aung et al., 2022). Collectively, these highlight the importance of and the need for formalised QI training for physician trainees, especially GACM advanced trainees, who are the future leaders, to better equip them with skills and knowledge required for their vocation.

The QI workshop at Trainee Day was designed as an introductory workshop to provide a broad overview of QI science and methodology. The format was adapted from the QIA-WCM program, which is usually delivered over a 12-month period through engagement in a nominated QI project. Thus, the current workshop's content was heavily modified and condensed in order to fit into a 90-minute session, covering only the essential principles and common QI tools. Constrained by time, certain QI tools, such as run charts and statistical process control charts (Shewhart charts), were not discussed in detail. Previous studies that utilised similar content and workshop structure for QI teaching typically dedicated 8 to 12 hours of total activity time (Shah et al., 2020). Despite the shorter duration of the workshop, we were able to demonstrate meaningful improvements in the objective, as well as self-rated knowledge and skills in most QI domains. The trainees were also more likely to indicate that they had confidence to identify their own learning needs after the workshop. This, together with an increased motivation to pursue skills training in QI, highlights the fact that even a short interactive introductory session can lead to increased likelihood of trainees taking up further learning opportunities for themselves.

Our study has some limitations. First, we measured the differences at an aggregate level, not at an individual level, between the pre- and post-workshop cohorts. Although it is possible that the two cohorts were entirely different, we felt that this was unlikely and assumed that most pre-workshop survey respondents also participated in the post-workshop survey. Second, QI research principles require that changes be measured frequently over time and not only at two time points, pre- and post-intervention, to demonstrate meaningful improvement (Provost & Murray, 2011). Notwithstanding the principles, there was limited opportunity to conduct a longitudinal follow-up survey to demonstrate sustained improvement in QI knowledge.

## **Conclusion**

An introductory QI workshop at the IMSANZ Trainees Day resulted in significant improvement in QI knowledge amongst GACM advanced trainees'. We highly recommend formalised QI methodology training as a requirement of GACM training curricula to promote development of future leaders in quality and safety.

## **Acknowledgements**

We would like to thank Ms Karolina Barry, IMSANZ event manager, for disseminating survey invitations and the IMSANZ conference organising committee for permission to conduct the QI workshop.

## Conflicts of interest and funding

The authors have no conflicts of interest or funding to declare.

## References

- Aung, A. K., Pickles, R., Knight, A., Shannon, L. A., Bowers, A., Donnelly, S., Johnson, D. F., Scott, & Potter, E. L. (2022). Research activities in general medicine: A scoping survey by the Internal Medicine Society of Australia and New Zealand. *Internal Medicine Journal*, 52(9), 1505–1512. <https://doi.org/10.1111/imj.15866>
- Australian Commission on Safety and Quality in Health Care. (2024). *The National Safety and Quality Health Service (NSQHS) standards*. <https://www.safetyandquality.gov.au/standards/nsqhs-standards>
- Boonyasai, R. T., Windish, D. M., Chakraborti, C., Feldman, L. S., Rubin, H. R., & Bass, E. B. (2007). Effectiveness of teaching quality improvement to clinicians: A systematic review. *JAMA*, 298(9), 1023–1037. <https://doi.org/10.1001/jama.298.9.1023>
- Choudry, M. I., Stewart, K., & Woodhead, T. (2016). The Royal College of Physician's Quality Improvement Hub: How can it help physicians to improve patient care? *Future Hospital Journal*, 3(3), 211–216.
- Dean, J. (2018). Update from RCP Quality Improvement: Making quality improvement mainstream for physicians and teams. *Future Healthcare Journal*, 5(2), 86–87. <https://doi.org/10.7861/futurehosp.5-2-86>
- Garbarino, J., & Monforte, K. (2019). Engaging undergraduate nursing students in health care quality education. *Journal of Nursing Education*, 58(5), 315–316. <https://doi.org/10.3928/01484834-20190422-15>
- Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O'Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., & Duda, S. (2019). The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics*, 95, Article 103208. <https://doi.org/10.1016/j.jbi.2019.103208>
- Langley, G. J., Moen, R. D., Nolan, K. M., Nolan, T. W., Norman, C. L., & Provost, L. P. (2009). *The improvement guide: A practical approach to enhancing organizational performance*. John Wiley & Sons.
- New South Wales Government Clinical Excellence Commission. (n.d.). *Home page*. <https://www.ccc.health.nsw.gov.au/>
- Ogrinc, G., Davies, L., Goodman, D., Batalden, P., Davidoff, F., & Stevens, D. (2015). SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): Revised publication guidelines from a detailed consensus process. *American Journal of Critical Care*, 24(6), 466–473. <https://doi.org/10.4037/ajcc2015455>
- Provost, L. P., & Murray, S. (2011). *The health care data guide: Learning from data for improvement*. John Wiley & Sons.
- Shah, K. P., Goyal, S., Ramachandran, V., Kohn, J. R., Go, J. A., Wiley, Z., Moture, A., Namireddy, M. K., Kumar, A., Jacobs, R. C., Stampfl, M., Shah, J. R., Fu, J., Lin, W. V., Ho, B., Wey, G., Lin, S. Y., Caruso, A. C., Gay, L. J., ... Andrabi, S. (2020). Efficacy of quality improvement and patient safety workshops for students: A pilot study. *BMC Medical Education*, 20, Article 126. <https://doi.org/10.1186/s12909-020-1982-3>



- Udemans, R., Stokes, M.-L., Rigby, L., Khanna, P., & Christiansen, J. (2018). Educational renewal of physician training in Australia and New Zealand: Multiple educational innovations in a complex environment. *Medical Teacher*, 40(6), 627–632. <https://doi.org/10.1080/0142159X.2018.1444270>
- Vinci, L. M., Oyler, J., Johnson, J. K., & Arora, V. M. (2010). Effect of a quality improvement curriculum on resident knowledge and skills in improvement. *BMJ Quality & Safety*, 19(4), 351–354. <https://doi.org/10.1136/qshc.2009.033829>
- Wong, B. M., Etohells, E. E., Kuper, A., Levinson, W., & Shojania, K. G. (2010). Teaching quality improvement and patient safety to trainees: A systematic review. *Academic Medicine*, 85(9), 1425–1439. <https://doi.org/10.1097/ACM.0b013e3181e2d0c6>

---

Articles published in *Focus on Health Professional Education (FoHPE)* are available under Creative Commons Attribution Non-Commercial No Derivatives Licence ([CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)).

On acceptance for publication in *FoHPE*, the copyright of the manuscript is signed over to ANZAHPE, the publisher of *FoHPE*.