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Clinical Practice

Measuring the anaesthesia clinical learning environment at the department level is feasible and reliable

D.J. Castanelli[1,2,*] and N.A. Smith[3,4]

[1]Department of Anaesthesia and Perioperative Medicine, Monash Health, Victoria, Australia, [2]Department of Anaesthesia and Perioperative Medicine, Monash University, Clayton, Victoria, Australia, [3]Department of Anaesthesia, The Wollongong Hospital, Wollongong, NSW, Australia and [4]Graduate School of Medicine, University of Wollongong, NSW, Australia

*Corresponding author. E-mail: Damian.Castanelli@monash.edu

Abstract

Background. The learning environment describes the context and culture in which trainees learn. In order to establish the feasibility and reliability of measuring the anaesthetic learning environment in individual departments we implemented a previously developed instrument in hospitals across New South Wales.

Methods. We distributed the instrument to trainees from 25 anaesthesia departments and supplied summarized results to individual departments. Exploratory and confirmatory factor analyses were performed to assess internal structure validity and generalizability theory was used to calculate reliability. The number of trainees required for acceptable precision in results was determined using the standard error of measurement.

Results. We received 172 responses (59% response rate). Suitable internal structure validity was confirmed. Measured reliability was acceptable (G-coefficient 0.69) with nine trainees per department. Eight trainees were required for a 95% confidence interval of plus or minus 0.25 in the mean total score. Eight trainees as assessors also allow a 95% confidence interval of approximately plus or minus 0.3 in the subscale mean scores. Results for individual departments varied, with scores below the expected level recorded on individual subscales, particularly the 'teaching' subscale.

Conclusions. Our results confirm that, using this instrument, individual departments can obtain acceptable precision in results with achievable trainee numbers. Additionally, with the exception of departments with few trainees, implementation proved feasible across a training region. Repeated use would allow departments or accrediting bodies to monitor their individual learning environment and the impact of changes such as the introduction of new curricular elements, or local initiatives to improve trainee experience.

Key words: anaesthesia; educational assessment; graduate medical education; learning environment

The learning environment describes the context and culture in which trainees learn.[1] It is the sum of the "characteristic pressures, stresses, rewards and conformity-demanding influences" perceived by learners[2] and encompasses both the formal and informal components of the learner's experience.[3] It is known to influence learner engagement and behaviour,[4] and there is increasing recognition of the impact of the learning environment on the quality of postgraduate medical education.[5]

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Editor's Key points

- Anaesthesia trainees work in complex and varied environments, which can impact on effective learning.
- Reliable assessment of how departmental environment affects trainees learning experience would be useful.
- This study evaluated a previously developed tool used in a range of anaesthetic departments.
- Effective and reliable assessment was possible apart from in smaller departments (< eight trainees).
- Robust learning environment evaluation would allow objective assessment of the impact of changes.

Given this importance, there is scope for interventions to improve the quality of the learning environment with the aim of achieving better educational and patient health outcomes.[6] In this context, measurement of the clinical learning environment is useful to guide evaluation and provide feedback to education providers.[7]

We previously developed an anaesthesia clinical learning environment measurement instrument and gathered evidence of validity in an Australian and New Zealand context.[8] While the formal postgraduate anaesthetic curriculum is consistent across both countries, training occurs in individual clinical departments with their own distinct characteristics. There is evidence from a study of multiple postgraduate specialties that factors operating at the department level have a greater influence on the learning environment than specialty or institution-specific factors.[9]

If the use of an anaesthesia clinical learning environment instrument is to be feasible at the department level, it is critical to know the number of trainees required as assessors to provide a reliable measure. The primary aim of this study was therefore to determine the reliability of the instrument using generalisability theory in order to provide this information. We also aimed to produce further evidence of validity by re-examining the internal consistency of the instrument. Additionally, we wished to examine feasibility at the individual department level using the overall trainee response rate, the response rate of departments choosing to participate, and the response rate of trainees in individual departments.

Methods

This study was registered as a clinical practice improvement project with New South Wales (NSW) Health, and the University of Wollongong Human Research Ethics Committee deemed ethics approval was not required.

Measurement instrument

The development of the measurement instrument and initial evidence supporting its validity have been described previously.[8] The anaesthesia clinical learning environment instrument consists of 38 items, organised into four subscales: social atmosphere, supervision, workplace-based learning, and teaching (Appendix 1). In this study, after consultation with NSW ANZCA Supervisors of Training, the instrument was used with a four-point Likert scale of agreement: Strongly Disagree – Disagree – Agree – Strongly Agree.

We administered the instrument electronically using the Formdesk platform (www.formdesk.com). IP addresses and identifying information were not collected. After four weeks, an interim tally of responses was provided to hospitals and they were asked to send a reminder; after six weeks the survey was closed.

Sample population

All thirty-four departments in NSW who train postgraduate trainees in anaesthesia were invited to participate. We created individual online surveys for each hospital with distinct internet addresses to collect data on individual hospital departments while maintaining trainee anonymity. Although they were responsible for distributing the invitation for trainees to participate, training supervisors in hospital departments did not see individual responses. Once data collection was finished, departments were supplied with summary results for their hospital, with the overall state results as a comparator.

Given the power differential between trainees and their teachers, who are also their present and future employers, it was important to ensure trainee confidentiality in order to obtain honest responses. We consulted the ANZCA Trainee Committees in NSW and Victoria in devising the structure of the implementation, which ensured that only the investigators saw individual responses.

An additional concern was that summary responses are potentially also identifiable where there is a small number of trainees in a department. To avoid this risk, we aggregated the responses from hospitals with less than four trainees and then analysed and reported them as a single site.

Analysis

In our previous work, we performed exploratory factor analysis on results from a sample of trainees obtained from across Australia and New Zealand.[8] In order to provide further evidence of instrument validity based on internal structure,[10] we analysed the current dataset with exploratory factor analysis using the 34 items in the original factor model from our previous study with the same methods (principle axis factor extraction with promax rotation) (IBM SPSS, version 22). We additionally performed confirmatory factor analysis (IBM SPSS AMOS, version 22). Confirmatory factor analysis uses structural equation modelling to ascertain the degree to which the original factor model fits the current data.[11] Indices selected for the evaluation of model-fit were the χ^2/degree of freedom ratio (χ^2/df), the root-mean-square error of approximation (RMSEA), the comparative fit index (CFI) and the standardised root-mean-square residual (SRMR).[11–13]

We also performed generalizability analysis. This analysis used an unbalanced two-facet design; the hospital was the object of measurement, the facets of generalization were trainees and items, and trainees were nested within hospitals.[14] The variance components associated with variance across hospitals (*h*), trainees nested within hospitals (*t*: *h*), items (*i*), and interactions between these (*hi* and *t*: *hi*) were estimated by urGENOVA using G_String_IV.[15]

The generalizability coefficient, or G coefficient, which is analogous to a reliability coefficient in classical test theory, is the most commonly reported outcome of generalizability studies.[16] For lower stakes decisions such as this situation, a G coefficient of 0.7 is usually considered acceptable.[17]