The great wall of medical school: A comparison of barrier examinations across Australian medical schools

Annabel I Ingham
Associate Editor, AMSJ
Sixth Year Medicine (Undergraduate)
University of Adelaide

From the moment that a medical student receives their university offer until the moment they take the Hippocratic Oath in front of proud family and friends, they will tread a path only taken by a select number before them. However, with medical schools now in every state and territory of Australia, the journey will not be identical for all students. For some, this will be a marathon, with continuous assessment peppering the entire journey, while others will encounter multiple large hurdles, interspaced with periods of calm. Despite this very different experience of medical school, all will ultimately compete for an increasingly competitive pool of internship positions, which represent the key to unlocking their future medical careers.

The 'Barrier Examination' is a common term used for the final set of assessment of a medical student before being allowed to graduate as a doctor. At most medical schools, this is held in the final or penultimate year of study, and often consists of a combination of written (such as Multiple Choice Questions – MCQ) and clinical assessment (i.e. Viva Voce and Observed Structured Clinical Assessment – OSCE). It is known that barrier examination formats vary widely between medical schools, which raises a number of questions: which examination format is the most accurate at predicting future clinical performance? Which format is most accurate at assessing knowledge and skills? And can students from different universities ever be accurately compared? A brief survey conducted in June and July 2011 by the author collated the details of the Barrier Examinations undertaken at each of Australia's medical schools. The results are presented in Table 1. Table 2 provides an example of the different examination formats used at Australian medical schools.

The diversity of assessment methods illustrated in Table 1 is testament to the fact that there is currently no widely-accepted benchmark for a graduating medical student, yet come January, a new brood of fresh-faced interns descend upon public hospitals around Australia to forge ahead for the next twelve months.

With new acronyms being created every year in the search for the best assessment for medical students, it begs the question – what method of assessment will best predict performance as a doctor?

This question is difficult to answer, as there is no consensus on how to measure how 'good' a doctor is. Professor Geoff McColl, of the University of Melbourne has proposed that this could be measured by intern readiness tests, performance in vocational assessments (such as college assessments), vocational and geographical destinations or even possibly Medical Board appearances. [1]

A framework known as Miller's pyramid (Figure 1) [2] goes some way towards attempting to answer this question. This 'pyramid' provides a visual explanation to the complexity of medical knowledge, and Miller advocates the evaluation of learners in the top two cells of the pyramid, in the domains of action or performance, to reflect clinical reality. [3] While MCQs can often only test the lower echelon of the pyramid, a clinical examination, such as an OSCE or Long Case, can inform on the second highest rung. A ward assessment, for example, by a supervising consultant may inform on the highest predictor of clinical competence - the implementation of medical knowledge. It is for this reason that most medical schools will have an OSCE or Long Case as part of their Barrier Examination. Table 1 shows that only one medical school (UWS) did not include a clinical examination as part of their Barrier Examinations, although this decision may be influenced
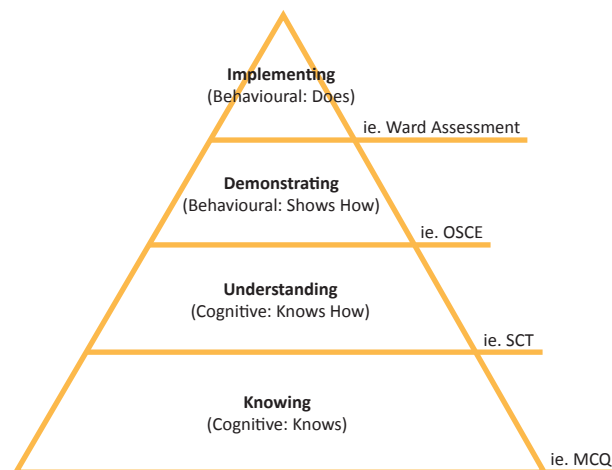

Figure 1: Miller's Pyramid of Clinical Competence with Associated Assessment Methods. Adapted from [2], with permission.

by clinical examinations held in other years of their course.

Research supports the notion that the OSCE is an accurate descriptor of a medical student's future performance as an intern, and does so better than other forms of assessment. [4] Yet a recent review states that between fourteen and eighteen OSCE stations are required for acceptable reliability. [5] The number of OSCE stations undertaken in the Barrier Examinations, according to Table 1, varies between six and eighteen. Some may argue that an OSCE with a lower number of stations may not be accurately assessing the aptitude of medical students.

The anxieties around the results of a Barrier Examination have been felt by any medical student applying for their first job. In France, a final year medical student's Barrier Examination results are the sole determinant of their future specialty choice – fortunately this is not the case in Australia. [6] However, many graduating medical students this year have been faced with the unprecedented effects of the 'medical student tsunami.' The Australian Government's rapid expansion of medical student numbers has led to a bottleneck at the internship level, where exponentially rising graduate doctors must battle for internship positions, which is essential to obtain registration to practice independently. Although states such as South Australia and New South Wales employ a random allocation system to assign graduating students their internship positions, if a situation is reached where some students miss out on an internship position, a merit-based allocation may become necessary. Other states, such as Victoria, already employ a merit-based allocation, and academic results form an important component of the job application process.

When a hospital selection committee reviews your Barrier Examination scores, one would hope that such results would accurately describe your clinical competence, as compared to a student from another university. The survey revealed one medical school that allowed students to resit their OSCE up to three times before failing a student, whereas other medical schools offer only one attempt at passing. With the heterogeneous mix of Barrier Examinations around Australia, many students believe there are vastly different standards for graduating medical school. Some universities grade a student with a number, while others give a letter grade or even a Non-Graded Pass. How can these parameters be used reliably to assess a student's academic

Table 1. *Results of Medical School Barrier Examination Format Survey.*

Name of Medical School	Year in which Barrier Exam is undertaken (year/length of degree)	Month of Year	Type of Examination	If OSCE (or other clinical exam if specified): Number of active stations	If OSCE (or other clinical exam if specified): Number of OSCE testing days
Australian National University	4/4	October	MCQ, Minicase, OSCE	5 (1 x Long case, 4 x Vivas)	2
Bond University	5/5	October	MCQ, SAQ, EMQ, Short OSCE, Long OSCE	15	2
Deakin University	4/4	June	MCQ, OSCE	12	1
Flinders University	3/4	November	MCQ, SAQ, OSCE	14	1
Griffith University	4/4	June	MCQ, SAQ, OSCE	10	1
James Cook University	5/6	November	MCQ, SAQ, OSCE	12	1
Monash University	4/5	November	MCQ, OSCE	16	2
University of Adelaide	5/6	November	MCQ, SCT, OSCE	12 or 18, depending on number of OSCE days	3 (Students who do not achieve a benchmark after 12 stations on Day 1 and 2, must return to complete a further 6 stations on Day 3)
University of Newcastle	Newcastle does not have any Barrier Examination testing the whole medical curriculum. Assessment is only carried out at the end of each rotation, on each specialty.				
University of New South Wales	6/6	September	MCQ, Viva, OSCE, Portfolio	9 for OSCE 8 for Viva	1 day for OSCE 1 day for Viva
University of Notre Dame, NSW	4/4	October	MCQ, SCT, SAQ, OSCE	10	1
University of Notre Dame, WA	4/4	October	MCQ, EMQ, SAQ, OSCE Portfolio	16	1
University of Queensland	4/4	November	OSCE	9	2
University of Sydney	4/4	October	MCQ, EMQ, Long Case (may be chosen from any specialty)*	No OSCE for Barrier Examinations, but for end-of-rotation assessment	
University of Tasmania	5/5	May	OSCE, Prescribing Test (+MCQ, EMQ end of 4th year)	6	1
University of Western Australia	5/6	November	SAQ, EMQ, OSCE	16	1
University of Western Sydney	5/5	June	MCQ, SAQ, SCT, MEQ	N/A – no OSCE	N/A – no OSCE
University of Wollongong	4/4	June	MCQ, SAQ, OSCE	13	1

Test Acronyms: EMQ – Extended Match Questions; MCQ – Multiple Choice Questions; Mini-CEX – Mini Clinical Evaluation Exercise; OSCE – Observed Structured Clinical Examination; SAQ – Short Answer Questions; SCT – Script Concordance Test (for more information, see Table 2).
University staff were emailed and asked to complete a brief survey on their medical school's Barrier Examination. This email was followed up by a phone call. If phone follow-up was unsuccessful, answers were sought from medical students attending the medical school.
* The University of Sydney's final year examinations focuses predominantly on topics covered over the past calendar year, rather than the whole curriculum.

worth and more importantly rank a student for job selection, in such a competitive climate?

It is not just the assessment methods, but also the timing of Barrier Examinations that differs between universities. Anecdotally, some final year medical students who undertake Barrier Examinations very close to their commencement as an intern complain that they find it difficult to cram whilst simultaneously looking for a new house, relocating to a new town and planning for graduation events. Others complain that their Barrier Examinations fall during the same period as internship applications, which may put them at a disadvantage compared to other students applying for jobs who are not facing the same stressors. Yet, having a Barrier Examination earlier in a degree may mean that the examination results may not accurately describe the student's

competence when they present on their first day as an intern.

Currently, the Australian Medical Council (AMC) is the body responsible for ensuring basic standards of medical school assessment. Each medical school undergoes accreditation every ten years, or more frequently for a new school, or a school undergoing major changes to their program. The AMC also provides a pool of MCQ questions for medical schools to draw on for their assessment, which provides a double role of providing good assessment materials, as well as acting as a comparative tool between schools, and International Medical Graduates who undertake the AMC examinations. [1,7,8]

However, the calls for standardised Barrier Examinations have erupted over recent years, in Australia and around the world. [9] A

Table 2. *Examples of different types of Barrier Examinations.*

Test Name	Example of Test
EMQ	Extended Match Questions *Question: Joint Pain* *Options: A – Ankylosing Spondylitis* *B – Gout* *C – Osteoarthritis* *D – Rheumatoid Arthritis* *Instructions: For each patient described below, choose the single most likely diagnosis from the above list of options. Each option may be used once, more than once, or not at all.* *A 70-year old previously healthy farmer presents with pain on weight bearing and restricted movements of the right hip.* *A 66-year-old woman started frusemide two weeks ago and now presents with a red, hot, swollen metatarsophalangeal joint.*
MCQ	Multiple Choice Questions *What is the most common presentation of cancer of the caecum?* *A) Tiredness and fatigue* *B) Abdominal mass* *C) Small bowel obstruction* *D) Change in bowel habit* *E) Bright red PR blood*
MEQ	Modified Essay Question *You are a medical officer in paediatrics. You are asked to review a one-hour-old baby for increasing respiratory rate and subcostal recession. The baby was born at 35 weeks to a 29-year-old mother via elective LSCS. The indication for LSCS was uncontrolled BP. The mother had regular follow-up during her antenatal period. She had gestational diabetes and pre-eclampsia.* *Q1) What are the most likely diagnoses? (name two)* *Q2) What are the preliminary investigations that you would like to perform at this point? (name three)* *Q3) For each of the diagnoses list one primary pathophysiological mechanism.*
Minicase	This type of written examination question begins with a description of a patient's presentation. Students are asked questions in relation to the scenario. New information is given throughout the examination (i.e. physical examination findings, investigation results), with questions relating to the new information, however students are not allowed to go back and alter their initial answers based on new information. *Information: Brian Murphy is a 77 year-old man who presents to your surgery complaining of tiredness and dyspnoea. You note that he is pale and has signs of heart failure. His haemoglobin measures 87g/L (normal range 125-165 g/L).* *Question: Name 3 laboratory test results that would suggest the anaemia is due to haemolysis rather than reduced red cell production.* *More information: On examination you can hear crepitations at the base of each lung (indicative of fluid in the interstitial compartment of the lung).* *Question: How does fluid move into the interstitial compartment of the lung?*
Mini-CEX	Mini Clinical Examination An examiner witnesses the examinee in a clinical situation over 15-30 minutes (i.e. breaking bad news), after which feedback is given in a structured manner, using a number of marking guidelines, grading the student in different domains, such as history-taking, examination skills and communication skills. *John Brown's histology shows a melanoma with Breslow thickness of 1.4mm. Advise this patient what their histology shows and explain options for their treatment.*
OSCE	Observed Structured Clinical Examination Students rotate around a number of stations with different examiners, and standardised patients. Students are asked to demonstrate different clinical skills in each station (i.e. history-taking, physical examination, counselling). The examiner grades the student based on marking guidelines. *Sample station: John Smith is a 60 year-old man who has just returned for the results of his recent fasting lipids blood test. His total cholesterol is 6.0 mmol/L. Please counsel this patient as to the implications of this test and his suitability for statin therapy.*
Portfolio	A collection of pieces of work, including assignments, case reports and short cases.
Prescribing Test	An examination testing the ability to appropriately prescribe. *Write the prescription for a post-surgical patient's pain relief on a drug chart*
SAQ	Short Answer Questions *Outline the steps involved in the healing of a surgical incision to the skin.*
SCT	Script Concordance Testing The correct answers are determined by asking a pool of doctors to take the examination themselves. The most popular answer is awarded a '1', and any other answer is awarded a score based on how many doctors chose that answer. For example, if 20 doctors took the examination, and 15 chose '+2', and the other five chose '+1' then '+2' would received a score of '1', and '+1' would receive a score of 0.25 (= 5/20). *A 25 year-old woman presents with right-sided abdominal pain. She has vomited once today and has a low fever.* <table><tr><td>*If you were thinking*</td><td>*And you found out*</td><td>*This makes your hypothesis*</td></tr><tr><td>*Ectopic Pregnancy*</td><td>*She has been on the oral contraceptive pill for 3 years*</td><td>*-2 -1 0 +1 +2*</td></tr><tr><td>*Appendicitis*</td><td>*She had an appendicectomy last year*</td><td>*-2 -1 0 +1 +2*</td></tr></table>*Answer Key: -2 = much less likely; -1 = slightly less likely; 0 = neither more nor less likely; +1 = slightly more likely; +2 = much more likely.*
Viva (Voce)	A set of questions asked directly to the examinee by an examiner, over a set period of time. *An 82 year-old lady is brought to the Emergency Department by ambulance with a history of falling down in the bathroom. She is unable to stand, and is lying in bed with external rotation of the left lower limb. How would you assess and manage this patient? (5 minutes)*

strong proponent of a national Barrier Examination, the University of Queensland's David Wilkinson, believes "a national assessment (…), that all medical students could undertake, could provide some extra reassurance to the public that a certain standard has been met." [10] European medical schools have been working through the same debate since the formation of the European union which has resulted in an increasingly mobile medical workforce. [11] One author has even proposed an international licensing examination, so that doctors may truly practice anywhere they choose. [12]

This year, a new research group, the Australian Medical Assessment Collaboration, has been tasked with creating a national assessment framework over the next two years. Although this stops short of producing a national examination, it does intend to provide a guide to medical schools on what is appropriate to assess and also to share assessment resources between medical schools (something that is already being undertaken through the sharing of AMC MCQs). [1,13] In May this year, the National Assessment Forum attended by Medical Deans and representatives from the Australian Council for Educational Research (ACER) and the AMC, was held in Queensland to discuss national assessment of medical students. [10] Although a national Barrier Examination was one option discussed, other less restrictive options exist that do not stifle a medical school's opportunity for innovation, including "a scholarly collaboration between interested schools" where "results are shared, enabling generalisability." This would take the shape of a "formalised library of test items" that

teachers share to "build expertise, and enable diversification." [14] Advantages would include increased ability to innovate by sharing ideas from experts in medical educators around Australia, but also economic gains, as assessors would not have to 'reinvent the wheel,' meaning that preparation for assessment could potentially become less expensive. It will be interesting to monitor the progress of this research over the next twelve months.

The Barrier Examination holds a pivotal role in medical education both as a yardstick for the public to rely on in terms of the calibre of a graduating doctor, but also as a ticket for many medical students to gain employment at their preferred hospitals. In this way, a Barrier Examination provides both a performance floor (by forcing poorly-performing medical students to repeat) and a performance ceiling (by allowing potential employers to seek out the most talented young doctors). Yet, if a national Barrier Examination is not to be implemented, further clarification is required to allow employers to adequately be able to compare results in Barrier Examinations between medical schools. Failing that, employers need to reassess the weight they place on results in Barrier Examinations for choosing their new interns.

Acknowledgements

Conflict of interest

None declared.

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