Academic achievement of final-year medical students on a rural clinical platform: Can we dispel the myths?

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Background. There is a growing body of literature relating to the establishment of rural clinical training platforms for medical students describing many positive outcomes, particularly in the case of extended placements. However, students' fears about their academic achievement while at these sites remain a key concern.

Objectives. The study set out to compare the academic achievement in end-of-rotation assessments and final examinations of final-year medical students at a rural clinical school (RCS) with those of their peers at the academic hospital complex (AHC).

Methods. A cross-sectional study, comparing the marks of three successive cohorts of RCS and AHC students (2011 - 2013) using *t*-tests and confirmed with non-parametric rank-sum tests, was conducted. The consistency of the effect of these results across cohorts was assessed by fitting regression models with interaction terms between cohort and group, and tested for significance using F-tests. Independent *t*-tests were conducted to evaluate differences in the mark attained between the two groups. A *p*-value <0.05 was considered statistically significant.

Results. Comparison of student marks attained across six of the disciplines offered at the RCS suggested there was no difference between the RCS and AHC in each of the three cohorts at baseline. A comparison of the end-of-rotation means showed that RCS students achieved significantly better results in some disciplines. A similar trend was observed for the final examination results across all seven disciplines.

Conclusion. Despite small numbers, this study suggests that students who spend their final year at the RCS are not disadvantaged in terms of their academic achievement. Medical students' concerns regarding academic achievement for those placed at rural clinical sites appear to be unfounded. Students who potentially could be placed at these sites should be made aware of this evidence.

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There is a growing body of literature relating to the establishment of rural clinical placements for medical students[1] to create opportunities for senior students to spend time at a training site that is removed from the academic hospital. There are many different models that have been adopted, from short-term (e.g. 2-week rotations) to longer-term placements where students spend an entire year or longer at a rural clinical site. In addition, the nature of the exposure can differ, from those medical schools seeking to replicate the more traditional rotations through the available disciplines, to others that adopt longitudinal integrated clerkships.[1]

The many positive features of a rural clinical training experience across these different models have been described.[1] Students report enhanced confidence, particularly in terms of their clinical skills. Continuity of care is another important theme as students describe being able to work with patients over time. They also develop relationships with their preceptors who are part of their learning experience over an extended period.[2,3] A key area of concern, however, that emerges from many of these studies, particularly where students are more senior and spend an extended period of time at the rural site, relates to the students' fears about academic achievement when they have different learning experiences to their fellow students at the academic hospital.

In a critical review of 72 articles on the rural training experience in the North American context, Barrett *et al.*[4] engaged with the concerns regarding students' academic achievement and found that, contrary to the prevailing perceptions, students on a rural platform appeared to do as well as, or even better than, their peers at the academic hospital. This was confirmed in studies conducted in an Australian context.[5,6] A more in-depth reading of some of the articles in the review shed further light as to sources used to conduct the analysis including the United States Medical Licencing Examination (USMLE) scores.[7,8] A more recent review by Waters *et al.*[6] provides further evidence, but also carries an implicit caution that care must be taken to recognise the range of contexts (rural and urban), approaches (longitudinal integrated clerkships v. traditional disciplinary rotations at a distributed site) and methods (quantitative v. qualitative studies) being addressed or used in the different studies. In their matched cohort study, Myhre *et al.*[9] argued the need for taking the pre-entry academic standing of the students into account. As will be shown, this was an important caveat for our research as well.

Despite this evidence, studies continue to identify student concerns with regard to academic standards at rural sites and, ultimately, the exit level assessment expectations.[10] While students on extended rural rotations emphasise the need to take greater responsibility for their own learning, they often highlight their concerns about the potential disjuncture between their clinical exposure and their final assessments (see Voss *et al.*[11] in this edition). In particular, students following an integrated clerkship in the rural context admit to wanting more specialist contact, this despite acknowledging the richness of their learning experience.[1,3]

Context

At the Faculty of Medicine and Health Sciences at Stellenbosch University, a rural clinical school (RCS) was implemented in 2011. Medical (MB,ChB)

students can elect to spend their final year (6th year) away from the main academic hospital following one of two models: at a regional hospital, according to a traditional disciplinary rotation model, or at a district hospital where they do an integrated longitudinal clerkship (ILC) under the supervision of a family medicine specialist. Participation is voluntary, although students with poor academic outcomes up to that point are typically not accepted. Currently, the numbers of students opting to attend the RCS is quite small. In the first year only 8 students out of a group of about 180 (4%) chose this option. In the intervening years, the numbers have increased to 22 (12%) of the total cohort. From inception, a decision was taken to evaluate the impact of the RCS and a 5-year longitudinal cohort study was embarked on.[3]

The 6-year MB,ChB programme comprises three clinical phases – the early, middle and late clinical rotations. The early clinical rotations cover the third academic year; the middle clinical rotations, the fourth year and first semester of the fifth year, while the late clinical rotations stretch across the final 18 months of the programme. The assessment of the late clinical rotations comprises two key milestones. Firstly, students complete an end-of-rotation assessment across 11 disciplines. The assessments can include objective structured clinical examinations (OSCEs), online multiple-choice tests, orals, clinical cases and so forth. In addition, students at the AHC are given a 'ward mark' (which can comprise anything between 5% and 20% of their rotation mark) by their clinical supervisors. This mark is a reflection of their behaviour and participation in the clinical setting. For each discipline there is a final examination which may also take the form of an OSCE, a written examination, a clinical examination or an oral, or a combination of these, again depending on the discipline.

Students at the RCS are expected to fulfil the same assessment requirements as their peers at the AHC. They complete the same type of end-of-rotation assessment across seven of the disciplines – internal medicine, family medicine, obstetrics and gynaecology, orthopaedics, paediatrics, psychiatry, and surgery, having completed the other four at the AHC during the latter half of their fifth year. This assessment is usually conducted at the rural site by the clinician educators (specialist and family physicians). In place of the ward mark the students at the RCS complete a series of patient portfolios – a specified number per discipline – that are used both formatively and summatively to enhance student learning. This in essence means that the RCS students have an additional hurdle to negotiate, but the 'hurdle' is one that is directly aimed at facilitating their learning. The RCS students complete the same final year-end examinations as their AHC peers, and are required to travel to the AHC to complete these examinations with the larger group. Clinician educators from the rural sites are often asked to form part of the examiner panels, but may not necessarily sit in on the assessment of an RCS student. The end-of-rotation marks and the examinations marks contribute equally (50:50) to the final mark for each discipline.

As part of the ongoing evaluation of the RCS, successive cohorts of students have been interviewed before, during and after their rural exposure. Consistently we have found that prospective RCS students express doubts about the academic standards and their potential to achieve academically if they go to the rural site.[12] In addition, when interviewed during their RCS year, students articulate concerns about their readiness for the examinations at the academic site.[3] However, when interviewed as interns, these same students generally acknowledged how the principle of 'having an approach' to patient presentation, as well as the work that went into the portfolios, stood them in good stead during their final examinations.[3]

The aim of this study was to compare the academic achievements of the students placed at the RCS with those who completed their final year at the AHC. In so doing, we hope to challenge prevailing thinking among the students that the RCS experience will be detrimental to their academic achievement during the final year of their 6-year undergraduate medical studies.

Methods

The academic performance, specifically the end-of-rotation results of the late clinical rotations as well as final examination results, of three successive cohorts of students trained at the RCS and the students trained at the AHC were compared (2011 - 2013). After obtaining ethical approval (N12/03/014), data were drawn from student records by the head of the MB,ChB programme and anonymised before being sent for statistical analysis using Stata version 13.1.

Early, middle and late clinical rotation results, as well as the examination results for the RCS students, were compared with those of the AHC group for each discipline using *t*-tests and confirmed with non-parametric rank-sum tests, particularly in view of the relatively small number of RCS students. The consistency of the effect of the RCS on the rotation and exam results across cohorts was assessed by fitting regression models with interaction terms between cohort and group, and tested for significance using F-tests.

Differences between the end-of-rotation and final examination results of the two student groups and associated 95% confidence intervals (CIs) were calculated. Independent *t*-tests were used to test for statistical significance between groups and a p-value <0.05 was considered to be statistically significant.

Findings

Students who attend the RCS do so only in the late clinical rotations. Baseline academic achievement for six of the seven disciplines used marks obtained from the early and middle clinical rotations. As orthopaedics does not feature in the early and middle clinical rotations, it was excluded from this comparison. Mean differences between the groups in the three successive cohorts were small and not statistically significant. It can, therefore, be concluded that overall there was equivalence between groups in the early and middle phases, and thus on entry into the RCS.

Late clinical rotation: end-of-rotation comparison

Consistency of effect of the RCS on the late clinical rotation end-of-rotation marks was

Table 1. Late clinical rotation end-of-rotation results (2011, 2012 and 2013 combined)

Discipline	AHC mean % (SD)	*n*	RCS mean % (SD)	*n*	Difference (95% CI)	*p*-value
Family medicine	71.38 (5.01)	478	71.13 (7.60)	50	0.25 (-1.80, 1.29)	0.748
Internal medicine	66.93 (5.31)	478	67.34 (5.65)	50	-0.41 (-1.15, 1.97)	0.605
Paediatrics	66.52 (7.30)	480	68.37 (7.73)	50	-1.88 (-0.28, 4.00)	0.089
Psychiatry	60.76 (6.96)	479	63.86 (7.76)	50	-3.10 (1.04, 5.15)	0.003

found across four of the six disciplines and the data for the 3 years (mean results) have therefore been combined (Table 1).

Three of the four disciplines showed that the RCS students' mean percentage was above that of the AHC students. In the case of psychiatry, this difference is significant (p=0.003).

Two disciplines showed a difference of effect, surgery (F=0.028) and obstetrics and gynaecology (F=0.012), and these results are accordingly presented per year (Table 2). Differences in the number of students across the disciplines in the same year can be ascribed to individual students not completing the assessment tasks.

The RCS mean percentages are consistently above those of the AHC group for both surgery and obstetrics and gynaecology with the exception of the 2011 percentages. For both of these modules, the differences in 2012 and 2013 are statistically significant.

Examination results

For each discipline, students complete final examinations during the last year of their MB,ChB programme. These results are again reported as mean percentages and combined over the 3 years for the four disciplines that demonstrated consistency of effect and now including orthopaedics (Table 3). The two modules that did not demonstrate such consistency are again provided per year (Table 4).

The comparison of the means of the examination results show that the RCS students as a group obtained a higher score than their AHC counterparts, with the results in family medicine (p=0.022) and psychiatry (p=0.017) showing a statistical significance.

The results for these two modules showed that the mean results of the RCS group across the 3 years are slightly above those for the AHC group, with the exception of the 2011 surgery and 2013 obstetrics and gynaecology results. None of these difference were, however, statistically significant.

Discussion

Academic achievement represents the 'holy grail' for most if not all educational endeavours. Any assessment that seeks to make a judgement regarding a student's knowledge, skills or attitude is always going to be regarded as 'high stakes', particularly when the assessment is for purposes of final certification. Medical students are traditionally high achievers for whom academic success is particularly important. It is, therefore, not surprising that when students are placed within an unknown environment that creates uncertainty around their potential for achieving academically on the same level as their peers, this may lead to anxiety.[11]

The results of this study suggest that students who spend their final year at the RCS are not disadvantaged in terms of their academic achievement and that in some cases they may even achieve better marks than might have been the case if they had stayed at the AHC. Care, however, needs to be taken in interpreting these data given the limitations of the study. Our numbers are small, there is a potential for selection bias in that students volunteer to attend the RCS, and students with a poor academic record in the early and middle clinical phases are typically not accepted for the placement.

In addition, while the students are all exposed to the same type of assessment task and, where relevant, question papers, the RCS students have the portfolio assessments that contribute to each end-of-rotation mark in place of the 'ward mark' that is given to the AHC students. All of these factors introduce additional variables and, therefore, the potential for information bias.

The comparison has limited statistical value, particularly in the case of the end-of-rotation

Table 2. Late clinical rotation end-of-rotation results for surgery, obstetrics and gynaecology (2011, 2012 and 2013)

Discipline	AHC mean % (SD)	*n*	RCS mean % (SD)	*n*	Difference (95% CI)	*p*-value
Surgery						
2011	64.62 (6.30)	165	65.83 (8.18)	8	-1.21 (-5.53, 3.11)	0.580
2012	64.45 (5.87)	157	71.45 (6.63)	20	-7.00 (-9.80, -4.21)	0.000
2013	65.31 (6.92)	157	73.98 (12.90)	22	-8.67 (-12.26, -5.08)	0.000
Obstetrics and Gynaecology						
2011	65.39 (5.73)	166	64.78 (6.83)	8	0.61 (-3.30, 4.52)	0.757
2012	65.22 (5.94)	157	70.08 (6.20)	20	-4.86 (-7.66, -2.06)	0.001
2013	65.22 (5.11)	155	71.60 (7.36)	22	-6.38 (-8.86, -3.89)	0.000

Table 3. Examination results (2011, 2012 and 2013 combined)

Discipline	AHC mean % (SD)	*n*	RCS mean % (SD)	*n*	Difference (95% CI)	*p*-value
Family Medicine	65.80 (7.50)	477	68.38 (8.40)	50	-2.59 (0.38, 4.80)	0.022
Internal Medicine	62.93 (6.94)	479	63.41 (6.53)	50	-0.53 (-1.48, 2.55)	0.603
Paediatrics	60.45 (7.19)	481	62.18 (5.51)	50	-1.73 (-0.30, 3.77)	0.094
Psychiatry	63.24 (8.86)	479	66.12 (7.44)	50	-3.10 (0.55, 5.65)	0.017
Orthopaedics	62.59 (9.01)	476	64.58 (8.61)	50	-1.99 (-4.61, 0.62)	0.136

Table 4. Examination results for surgery, obstetrics and gynaecology (2011, 2012 and 2013)

Discipline	AHC mean % (SD)	*n*	RCS mean % (SD)	*n*	Difference (95% CI)	*p*-value
Surgery						
2011	63.69 (6.19)	165	63.44 (6.06)	8	0.24 (-3.94, 4.42)	0.910
2012	63.00 (5.85)	155	64.40 (5.27)	20	-1.40 (-4.12, 1.32)	0.310
2013	64.68 (6.34)	157	64.90 (4.13)	22	-0.22 (-3.04, 2.59)	0.876
Obstetrics and Gynaecology						
2011	63.58 (7.92)	166	65.28 (7.89)	8	-1.70 (-7.05, 3.65)	0.532
2012	64.43 (7.51)	157	66.70 (5.54)	20	-2.27 (-5.70, 1.17)	0.194
2013	66.25 (7.98)	155	62.71 (7.48)	22	3.54 (-0.10, 7.18)	0.057

analyses. In addition, examination results can at best serve as a proxy for academic achievement,[5] although they remain the currency with which higher education institutions trade. These are all analytical challenges often faced when conducting research in an educational context. Nevertheless, we would argue that the results point to important trends and provide us with baseline data that can inform future benchmarking and also prompt the need for further discipline-specific investigations, particularly to explore why specifically the surgery, psychiatry, family medicine and obstetrics and gynaecology modules showed statistically different mean results in either the end-of-rotation assessment or in the final examinations.

The year-long rural clinical exposure for final-year medical students offered at the RCS is a unique intervention in the SA context, and we are not aware of any studies that have been conducted on the African continent that have sought to compare the academic achievement between students who complete a year-long placement at a rural site and those at the main AHC. While there is much consensus in the literature as to the value of extended rural placements in preparing students for internship,[1,3,10,13] it appears that the message of positive academic outcomes for these students still needs to find traction among the students themselves. Our aim with this study was ultimately less about comparison and more about generating evidence for our students, our clinician educators and our administrators that will allay ongoing concerns about academic achievement. Our next challenge is to critically review the assessment practices at both sites so as to further enhance our understanding of the findings from this study.

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