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ORIGINAL RESEARCH

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Effectiveness of regional medical schools in attracting and retaining students for early-career practice in the local area: The James Cook University experience

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Abstract

Objective: The regionally based James Cook University medical school in northern Australia has focused its selection processes and curriculum on recruiting, training and graduating doctors to address local workforce needs. This study investigates if James Cook University's regionally based medical school model promotes graduates undertaking internship in local regional hospitals.

Design, setting & participants: Cross-sectional survey of final year James Cook University Bachelor of Medicine, Bachelor of Surgery graduates towards the end of the 2016 and 2017 academic years (n = 207; response rate = 58%).

Main outcome measure: Multivariate (binary outcomes) logistic regression analysis identified the personal and curriculum factors predicting students' choice to do their internship in northern Australia supported by content analysis of free text responses to expand on quantitative associations.

Results: Students applied to medicine at James Cook University because there was: "an undergraduate program" (62%); "reputation for a good course/quality graduates" (59%); and "interest in rural medicine or Indigenous health" (39%). Internship in northern Australian hospitals was predicted by: "familiarity with the hospital in Years 5 and 6"; "having a northern Australia hometown at time of application to medical school"; "an interest in rural medicine or Indigenous health"; and "interns have better learning experiences in regional teaching hospitals".

Conclusion: The findings suggest regionally based medical schools can promote early-career rural practice by incorporating purposive selection, a rurally focused curriculum supported by quality clinical training experiences in local hospitals and a sufficient number of locally available intern places. However, it is likely regionally based medical schools also require locally available specialty training pathways to support rural practice in the longer term.

KEYWORDS

health program evaluation, role of rural medical schools, rural health policy, rural workforce development, undergraduate teaching

1 | INTRODUCTION

In the USA,[1] Australia[2] and other developed and developing countries,[3] there exists both geographic maldistribution of doctors towards practice in urban over rural settings and misalignment between local health system needs and the education and training of the local health workforce.[4] The central purpose of any health workforce supply system should be to produce "fit-for-purpose" graduates with a strong desire to address the health needs of communities in the locality of the training institution and have the relevant competencies for practising in these communities.[5]

Strategies, such as financial support, offering professional development opportunities, recruiting candidates from rural areas and improving living and working conditions in rural areas, have all had some success in addressing geographic maldistribution of doctors.[3,6] More recently, establishing a "rural pipeline" from training institution to rural health facility has been recommended to promote more doctors into rural practice.[7] This rural pipeline involves the institution and its clinical training activities being located in the rural areas surrounding the institution, as well as locally available postgraduate training places and specialty pathways.

In 2000, James Cook University (JCU) became the first Australian medical school established in a regional area when it enrolled its first Bachelor of Medicine, Bachelor of Surgery (MBBS) cohort in north Queensland. By early 2018, the JCU medical school had graduated its 13th cohort of doctors. The undergraduate JCU medical program has oriented its selection processes to preferentially selecting applicants from rural or Indigenous backgrounds or with patient-centred, rural and Indigenous health orientations. Once in the program, students engage in a culture of socially accountable medicine with a rural practice subtheme delivered mostly by faculty members with rural practice experience. In addition, all students undertake a minimum of 20 weeks of clinical placements over the six- year curriculum in small rural and remote towns; mostly in northern Australia. James Cook University's overall mission is to produce graduates appropriate and willing to address northern Australia's regional, rural and remote medical workforce needs.

James Cook University's graduate tracking database has previously shown its medical graduates are choosing rural and remote practice at significantly greater levels to that of other Australian medical doctors.[8] While longitudinal clinical placements in rural areas[9-13] and rural residencies[14,15] both show an increase in students' desire for later rural community service, the literature has repeatedly found a strong association between rural origin with later rural practice.[16-18] Thus, critics of the JCU medical program might dismiss these higher rates of rural graduate practice as merely a by-product of accepting significant numbers of local (rural) students.

What is already known on this subject:

- Significant geographic maldistribution of doctors in urban over rural practice exists within many developed and developing countries.
- Traditional strategies, such as providing financial support, offering professional development opportunities, and recruiting candidates from rural areas, have all had some success in addressing geographic maldistribution of doctors.
- A promising new strategy to promote rural practice is the development of a "rural pipeline"—where training institutions are established in regional or rural areas and their students are provided with extensive rural experiences during training and easily accessible vocational pathways into rural practice after graduation.

What this study adds:

- Regionally based medical schools with a rural and Indigenous health focus can attract students from across the students' country, many of who have positive intentions towards rural practice.
- Providing the entire student cohort with positive rural training experiences in hospitals and primary health facilities across the local region, not just to those students with a positive rural intention at entry to medical school, significantly increases the cohort's overall intention for a rural career and increases the likelihood of them later undertaking postgraduate internship within the local area.

This study investigates if JCU's regionally based model promotes rural practice by identifying the personal and curriculum factors which predict JCU graduates staying in northern Australia to undertake their internship training.

2 | METHODS

2.1 | Setting and study design

A cross-sectional survey was conducted at the JCU medical school towards the end of the 2016 and 2017 academic years. The survey assessed reasons for final year students initially choosing the JCU regionally based medical school to undertake their degree and choosing their internship hospital either in northern or southern Australia (defined as

above or below the Tropic of Capricorn). Analysis determined the predictors of undertaking an internship year in the local northern Australian region.

2.2 | Survey questions

Year 6 students were asked to complete an anonymised survey in a "whole-of-year" session that included the questions: "What was your hometown at the time you applied to medical school?" (free text); "What were your reasons for applying to the JCU medical school? Please tick all appropriate …" (having seven listed categories including "Other"); "At what hospital are you doing your internship?" (free text); "Please rate the most significant factors, from 1 to 4, which influenced your internship hospital location." Place a number from 1 to 4 in the relevant boxes, where 1 = "highest priority" and 4 = "very minor priority" (having seven listed categories including "I was not allocated my first choice of internship hospital" and "other"); and "For internship year, where do you think you would learn the most—in a regional teaching hospital (eg Townsville, Darwin, Cairns) or in a capital city hospital (eg Brisbane, Sydney etc.)?" A free text question also asked: "Why do you feel you learn more or less in a regional teaching hospital for internship year?"

2.3 | Analysis

Data were coded numerically and entered into the computerised Statistical Package for Social Sciences (SPSS) release 22 for Windows (http://www.spss.com). Free text responses were extracted into Excel. "Hometown at the time of application to medical school" was dichotomised into "hometown in southern Australia/overseas" or "hometown in northern Australia" depending on whether or not students came from below or above the Tropic of Capricorn. Similarly, "location of internship hospital" was dichotomised into "northern" or "southern" Australia ("southern Australian" internship included one graduate who undertook an internship overseas).

The question asking "What was the most significant factors, from 1 to 4, which influenced your choice of internship hospital?" was dichotomised into "number 1/most significant reason" vs "not most significant reason" for responses to each of the six listed reasons. Three students gave an "other" response for their most significant reason—"cost of housing," "go somewhere different" and "liked the community and its interesting health presentations"; for each of these, the respondents' second-most significant reason was chosen. In addition, 13 final year students reported not being allocated their first choice of internship hospital—for these respondents, all data on their most significant reasons for choosing their internship hospital were removed from the analysis to avoid potential confusion between reasons for choosing their desired internship hospital or their allocated internship hospital. The question asking "What were your reasons for applying to the JCU medical school?" was dichotomised into "yes" or "no" for responses to each of the six listed reasons; there were no "other" reasons given by respondents.

Data were then analysed via: (i) content analysis of the free text responses, identifying and counting key phrases and general themes about why respondents thought they learnt more or less in a regional teaching hospital in internship year; and (ii) multivariate (binary outcomes) logistic regression analysis to identify independent predictors for choosing an internship hospital in northern or southern Australia. The multivariate logistic regression included prevalence odds ratios (PORs) with 95% confidence intervals. All survey question variables were considered in the analysis, but only independent significant predictors ($P < 0.05$) were accepted into the final model.

2.4 | Ethics approval

Ethical approval was granted by the JCU Human Ethics Committee (No. H5595).

3 | RESULTS

Two-hundred-and-seven MBBS Year 6 students completed the survey of the 358 in the two cohorts (response rate = 58%). Of these, 119 (57%) came from a northern Australian city or town at time of application into medical school, while 88 (43%) came from southern Australia or overseas. One-hundred-and-eleven (54%) had accepted an internship place in northern Australia, while 96 (46%) accepted an internship in southern Australia or overseas (one graduate).

The main reasons students reported for choosing the JCU medical school included: "I did not want to do an extra degree" (129; 62%); "JCU had a reputation for having a good course or producing quality graduates" (122; 59%); and "Interested in rural medicine or Indigenous health" (81; 39%). The most significant reason students reported for choosing their internship hospital included: family/partner (69; 36%); reputation of the hospital with regard to training (56; 29%); access to specialty training/pathways offered at the hospital (54; 28%); familiarity from time spent in hospital during undergraduate training in Years 5 and 6 (28; 15%); and lifestyle or leisure opportunities in the region (27; 14%). Students also stated they would learn the most in their internship year: "at a metropolitan teaching hospital" (7; 3%); "about the same in a metropolitan hospital as would in a regional teaching hospital" (61; 30%); and "at a regional teaching hospital" (136; 67%).

TABLE 1 Results of multivariate logistic regression analysis identifying predictors of James Cook University (JCU) Bachelor of Medicine, Bachelor of Surgery Year 6 students (n = 193[a]) undertaking an internship year in northern Australia (Rockhampton north, west to Mount Isa and Alice Springs) in 2017 and 2018

Predictors	Sample (n = 193)	Northern Australian internship (108, 56%)	POR (95% CI)	*P*-value
My hometown was in northern Australia at time of application to JCU medical school				
No	78	26 (33)	1	<0.001
Yes	115	82 (71)	5.0 (2.5-9.9)	
I came to JCU because of an interest in rural medicine or Indigenous health				
No	116	53 (46)	1	0.007
Yes	77	55 (71)	2.6 (1.3-5.2)	
Familiarity with the hospital from my undergraduate training in Years 5 and 6 was my number 1 reason for choosing my internship hospital				
No	165	82 (50)	1	<0.001
Yes	28	26 (93)	18.9 (3.9-91.7)	
Interns learn				
More or the same in metropolitan hospitals	60	26 (43)	1	0.046
More in regional hospitals	135	82 (62)	2.1 (1.1-4.4)	

[a]Only data of graduates with no missing values for predictors accepted into the model were analysed. POR (95% CI): prevalence odds ratio (95% confidence interval).

3.1 | Content analysis

Four main themes arose from the analysis of the free text question asking in which hospitals would interns learn more:

- Staff in regional hospitals has a reputation for taking greater interest in teaching students.
- Regional hospitals have better intern:consultant and registrar ratios and better intern:patient ratios—thus, interns have less competition with peers and more one-on-one supervision by resident or visiting consultants, which results in more opportunities for developing practical clinical skills and having extra responsibilities in patient care.
- Regional hospitals are less hierarchical than urban hospitals—thus fostering a more supportive learning environment, better relationships with supervisors and active engagement in a multidisciplinary team.
- A larger variety of challenging clinical presentations, more autonomy, combinations of hospital and GP work and less specialisation in regional hospitals—thus providing a broader range of learning opportunities beneficial to the development of junior doctors.

3.2 | Multivariate analysis

Multivariate logistic regression identified that the likelihood of JCU MBBS Year 6 students accepting an internship place in northern Australia was predicted by: "familiarity with the hospital from undergraduate training in Years 5 and 6" (POR = 18.9; $P < 0.001$); "having a northern Australia hometown at time of application to medical school" (POR = 5.0; $P < 0.001$); "choosing the JCU medical school because of 'an interest in rural medicine or Indigenous health'" (POR = 2.6; $P = 0.007$); and believing "interns have better learning experiences in regional teaching hospitals than metropolitan hospitals" (POR = 2.1; $P = 0.046$; Table 1).

4 | DISCUSSION

The present study suggests undergraduate training factors play an important role in influencing graduates from around Australia to apply to JCU and later to undertake their internship in northern Australia. The key undergraduate training factors are JCU's focus on rural, remote and Indigenous health in the curriculum and receiving quality learning experiences in, and familiarity with, local tertiary hospitals. Familiarity results from the JCU medical school's decentralised training program, where the JCU program spreads students across the regional centres of Townsville, Cairns, Mackay and Darwin over the final 2-3 years of the course; as a consequence, they become familiar with local tertiary and rural hospitals.

In addition to the decentralised approach, the JCU medical program has other unique characteristics: a purposive student selection process; students learn in a culture of socially accountable medical practice from faculty members who have significant rural experience; and students experience early, ongoing and extensive exposure to regional,

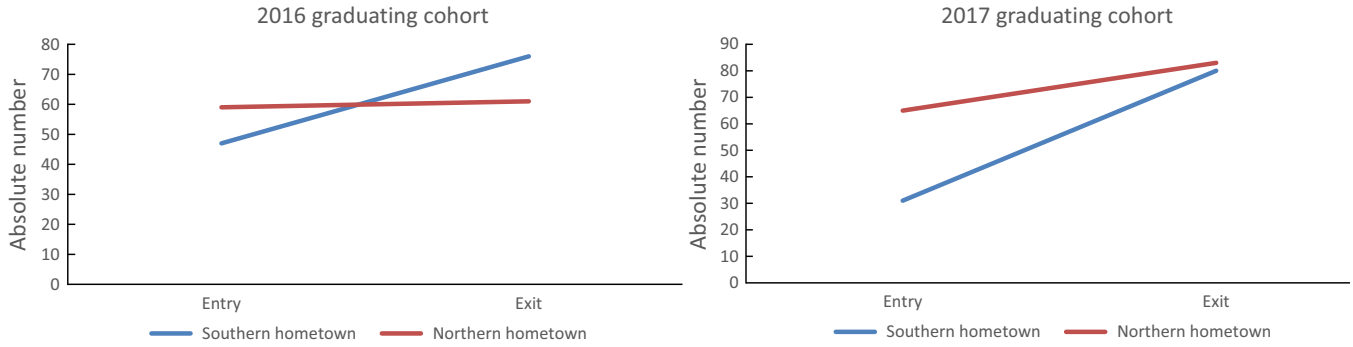

FIGURE 1 Data from the James Cook University medical program's annual Exit Survey of Year 6 students (2016-2017 cohorts) showing graduate trends regarding intentions for a rural career at entry and exit to the medical school, split into graduates who came from a "hometown in northern Australia at application to medical school" (red line) and graduates who came from a "hometown in southern Australia at application to medical school" (blue line)

rural and remote clinical placements. The rural and remote placements for all students are likely very significant, as many JCU medical students from urban backgrounds have previously not spent any time in rural or remote areas.

Graduate statistics over the last decade, collected via the annual Exit Survey of final year JCU medical students, show the overall percentage of JCU graduates intending to work in a rural area at some point in their career increasing by approximately 20% from entry to graduation.[19] More recently, the 2016 and 2017 statistics from the Exit Survey show this increase in rural practice intention is driven predominantly by graduates coming from a southern Australian hometown, with a 40% increase from entry to graduation regarding intention to work rurally sometime in their career (Figure 1). Written responses in the Exit Survey by students coming from a southern Australian hometown often specifically refer to their undergraduate rural placement experiences as the significant factor behind their more positive rural intention.

This finding is probably also driving JCU's medical graduate tracking statistics that show the percentage of medical graduates undertaking internship in northern Australian hospitals has remained steady, at around 50%, since the very first graduating cohort, regardless of the decreasing percentage of student cohorts coming from northern Australian towns (Figure 2). Indeed, the present study found 27 of 88 (31%) Year 6 students in 2016 and 2017 with a southern hometown chose a northern-based internship hospital—showing this increased desire for rural practice in Year 6 students from a southern Australian hometown directly translates into regional internship practice. This increased desire for rural practice in students

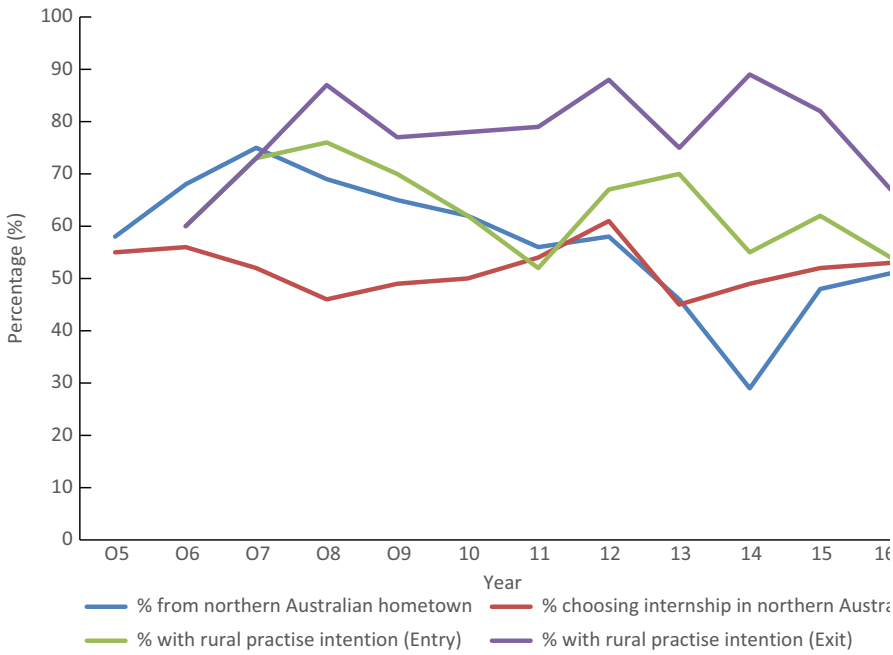

FIGURE 2 Data from the James Cook University medical program's annual Exit Survey of Year 6 students (2005-2016 cohorts) showing graduate trends in: percentage who came from a "hometown in northern Australia at application to medical school" (blue line); percentage who self-reported an intention for rural practice at entry to medical school (green line); percentage who self-reported an intention for rural practice at graduation (purple line); and percentage who later undertook an internship in northern Australia (red line)

from a southern hometown has also likely contributed to the JCU medical school's overall positive postinternship outcomes to date regarding practice in rural, remote[8] and under-served areas.[20]

Thus, the present study's findings regarding JCU's 2016-2017 graduating medical cohorts support the effectiveness of the school's regionally based model in first attracting graduates with a rural intention, then increasing their intentions for a rural career over the duration of the course and later retaining them in the local area for at least their internship year. More specifically, studying at JCU because of an interest in rural medicine was a significant predictor of choosing to undertake an internship in northern Australia, along with familiarity with internship hospital from their undergraduate training and believing interns have better learning experiences in regional teaching hospitals rather than metropolitan hospitals. The present study found two-thirds of JCU Year 6 students believe interns have better learning experiences in regional hospitals than capital city hospitals (which also predicted taking a northern Australian internship).

As evidenced in the content analysis findings, the dedication and collegiality of local hospital doctors and staff from the teaching hospitals and rural clinical schools and the different demographics and cultures of regional vs metropolitan hospitals with respect to training junior doctors, all play a part in graduates choosing to stay and train in northern Australia. The importance of having quality local training cannot be understated: a previous small study of graduates from a rural clinical school cited lack of workplace support and inadequate professional development as major reasons for not interning in a regional hospital.[21]

However, it is also significant that the six regional tertiary hospitals in northern Australia (Townsville, Mackay, Darwin, Cairns, Mount Isa and Alice Springs) are accredited for over 100 intern places. Thus, it would not be possible for medical graduates to undertake their internship in the local region if regional hospitals were not accredited for an adequate number of intern places to accommodate all JCU graduates having rural practice intentions.

Similarly, it is likely that JCU's success in retaining graduates in the local northern Australian region beyond internship is enhanced by the availability of two rural generalist postgraduate training pathways—the Generalist Medical Training program and the Queensland Health Rural Generalist program.[22] The establishment of locally accessible postgraduate training pathways has previously been found to be associated with a significant reduction in graduates leaving the region to practise or undertake training elsewhere.[23]

These three factors might suggest a major disadvantage of the regionally based medical school model—that retaining graduates in the local area might be dependent on local hospitals having a reputation for providing quality clinical teaching experiences, plus a sufficient number of available intern training places and locally available postgraduate training pathways. Thus, even with good local hospital training, establishing a regionally based medical school without also establishing a sufficient number of locally available intern places and postgraduate pathways might not be very effective in retaining graduates in the local area. It is now very much accepted that the more you can train medical and allied health professionals in rural areas, the more likely they will continue to live in those areas.

4.1 | Limitations of the study

While the response rate to the survey is reasonable at 58% and the proportion of students coming from a hometown in tropical Australia in this sample (57%) is similar to that of the overall 2016 and 2017 graduating cohorts (53%; 190/358), selection biases are still possible. The most significant limitations to the study are that the findings are from a single regional medical school only and the main outcome measure being the significant predictors of a northern Australia internship year—not long-term medical practice in northern Australia. However, the JCU medical graduate tracking database shows both rural and remote practice to be strongly predicted by internship in northern Australia.[24,25] Thus, there will likely be many northern-based interns from the 2016 and 2017 JCU cohorts who continue on to a long-term rural medical career, supported by locally available specialty training pathways.

5 | CONCLUSION

The success of the JCU regionally based medical school model in attracting students locally and from around Australia, and then retaining them as rural graduates, is likely assisted by being recognised as a quality undergraduate medical program focused on rural and Indigenous health, as having local training hospitals which provide quality intern training experiences.

The findings also suggest that the principle of establishing regionally based medical schools to promote rural practice is successful in increasing both students' rural intentions and the absolute numbers of medical graduates into rural practice. However, the establishment of any new regionally based medical school would concurrently require sufficient numbers of locally available intern places to promote rural practice in the short term and likely specialty training pathways to promote rural practice in the long term.

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