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ORIGINAL RESEARCH

# Short-term medical student placements completed consecutively at a rural general practice positively impact chronic disease management

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## ABSTRACT:

**Introduction**: Little is known about how medical school placements in rural areas impact key stakeholders such as patients, host organisations and the wider rural community. With engagement from rural communities crucial to the success of rural medical training, this case study sought to demonstrate the benefit that rural clinical placements can have on rural general practices (systems) and likely impacts on communities (health outcomes). Specifically, we describe how a series of consecutive short-term student placements in a single rural practice were the drivers of a series of clinical audits and interventions resulting in improved management of chronic disease.

**Methods**: Data for this project were obtained from student research reports completed as part of a rural and remote medicine rotation at an Australian medical school. For this series of projects, eight consecutive students were based at the same rural medical centre, with each attending for 6 weeks across a 15-month period, completing a report for a quality improvement activity and evaluating the outcomes. Each project related to chronic kidney

disease (CKD), with CKD chosen based on the needs of the medical centre and the higher burden of this disease in rural areas. Each project was developed and delivered in consultation with the practice, taking into account student interest and skills, and related projects completed prior or concurrently. Projects were related to database management (*n*=2), alignment between CKD management and best-practice guidelines (*n*=3), patient health literacy (*n*=3), and a summary and staff perceptions of the preceding quality improvement activities (*n*=1).

**Results**: The combination of student projects led to tangible improvements in CKD management at a rural general practice. All doctors at the medical centre (*n*=4) reported using the database management tools implemented by the students and felt the interventions were sustainable, long-term solutions for ensuring clinical investigations are not being delayed or missed. Following the various interventions completed by the students, clinician knowledge and implementation of best-practice CKD management increased, and some patients became more aware of their condition and how to manage it.

**Conclusion**: This case study provides evidence that short-term rural clinical placements for medical students have the potential to greatly improve health care and clinical practice in rural and remote communities, when designed around a consistent topic within a medical practice. Outcomes of the student projects in combination demonstrate that addressing CKD management longitudinally led to improvements in administrative processes, clinical practices, and patient awareness and accountability, despite each student only being at the medical centre for a short period of time. Similar approaches to structuring rural clinical placements and defining community projects for medical students should be considered more broadly.

Keywords:

Australia, chronic kidney disease, clinical audit, health literacy, medical education, primary care, quality improvement.

## FULL ARTICLE:

### Introduction

In Australia, the geographical maldistribution of the medical workforce has prompted the creation of more opportunities for medical students to train rurally, with evidence consistently demonstrating its association with being more likely to practise in rural and underserved areas after qualification[1-3]. This includes placements in smaller rural communities being associated with future practice in similar rural settings[4-6]. With increased opportunities for medical students to complete some or all of their training rurally, a significant volume of research has been generated that seeks to explore whether rural- and metropolitan-trained medical students are equally competent upon graduation. It is now well recognised that medical students who train rurally receive an educational experience the same or of higher quality than their metropolitan peers, as demonstrated by program evaluations[7], examinations[8,9], and clinical performance[10]. Rural medical education, particularly during clinical years, provides students with more hands-on exposure to patients[11,12], one-on-one access to preceptors[11], and greater continuity of patient care[13] than what they would normally encounter during metropolitan clinical training.

Delivering high-quality medical education in rural areas is of critical importance for producing skilled graduates who may be more inclined to later practise rurally. However, less attention in the literature has been given to understanding how rural clinical training may additionally impact wider groups of stakeholders such as patients, host organisations and rural communities where students undertake their training, despite engagement from these stakeholders being equally important to the success of rural training opportunities. Although this has not been widely investigated, preliminary research has reported that rural clinical training is an equally valuable experience for supervisors/preceptors[14] and is well received by patients[15]. As such, there is scope to better explore the positive impact that medical students can have on rural practices (systems) and rural communities (health outcomes/management) while training in these areas.

To address this evidence deficiency, we present a study describing how a series of consecutive student placements in a single practice of a small rural community have driven a series of clinical audits and interventions that continuously fed into the next placement, resulting in improved management of chronic disease. This evidence is important in demonstrating the impact that rural clinical training can have on health care, while maintaining a high-quality student experience, and for identifying the program elements contributing to its success so that similar strategies can be more widely adopted.

### Methods

Data for this case study were obtained from student reports relating to a rural medicine rotation at a single Australian medical school. As part of the medical program, all domestic students in their first clinical training year, irrespective of whether they are completing rural or metropolitan clinical training, are required to complete a 6-week placement in a smaller rural or remote area that is centred around 'rural generalist' practice models (henceforth termed rural and remote medicine (RRM)[16]). As a requirement of the RRM rotation, students develop and complete a research project during the placement, in consultation with staff at the hosting medical centre. The outcomes of each project are then evaluated by the student in the form of a written research report, which forms the assessable component of the unit. For the present study, finalised student reports were provided to the research team by the practice principal at the medical centre (placement site) with no contact between the students and research team.

With the RRM rotation limited to only 6 weeks across six blocks each year, student projects are generally restricted to simple quality improvement (QI) activities such as descriptive studies, chart audits, simple surveys and other mini-interventions. Most commonly, each student chooses and designs their project with minimal awareness of projects in previous blocks at that location. Within this case study we report on the QI activities undertaken at a single rural medical centre over a 15-month period. During this time, the medical centre hosted eight students from the medical school who completed a project relating to management of the same chronic disease. As a result, this medical centre was chosen as the focus of the report as it allows us to demonstrate how the aggregate of these projects made a meaningful impact on chronic

disease management locally, despite the brevity of each individual placement and associated QI activities.

Based on guidance from the medical centre, eight interrelated student projects investigated chronic kidney disease (CKD). CKD was chosen given the higher disease burden in rural compared to metropolitan areas[17]. In addition, people with CKD in rural areas are more likely to delay treatment due to the distance and associated expenses to travel to metropolitan centres to access care that cannot be provided locally (eg dialysis, nephrologist)[18,19]. CKD was identified as a priority because it is typically more difficult to detect than other chronic diseases. In this regard, CKD patients may be asymptomatic until around 90% of kidney function is lost[19], meaning that the disease has often progressed before patients seek medical attention. Taken together, the difficulties in detecting and treating CKD in a rural context generate a heavy reliance on general-practice-led models for early detection and prevention, managing disease progression in its early stages, and co-managing patients more advanced in their disease progression[19]. As such, improved detection, treatment and management of CKD at the primary care level was a high priority for the medical centre.

***Summary of the projects***

Each CKD project was developed in a similar manner, whereby students consulted with the supervising clinician and other staff at the medical centre (doctors ($n$=4), nurses ($n$=3) and administrators ($n$=1)) to identify a gap in clinical knowledge, patient awareness or clinical practice. Students then worked with staff at the medical centre to develop the project proposal, implement the QI activity and evaluate the outcomes. For each project, the proposal was refined as necessary and approved by the supervising clinician before any further work was undertaken. A critical component of this consultation and project refinement was medical centre staff briefing the students on past research projects on the same topic, including outcomes and limitations. As such, each student was somewhat aware of the finer details of projects preceding them, with guidance from the medical centre staff supporting each project's refinement. Each of the projects is briefly summarised in Table 1, detailing the gaps leading to development of the project, intervention/evaluations completed and the associated outcomes.

**Table 1: Summary of student chronic kidney disease projects**

| Project | Gaps identified in consultation with medical centre | Aim | Intervention | Evaluation of intervention | Project outcomes |
|---|---|---|---|---|---|
| 1. Database management | A CKD audit by the local health services raised concerns regarding a lack of early detection and regular disease review.<br>Concerns were echoed by the medical centre, noting that the clinical software used at the practice lacks functionality to alert staff to CKD reviews that are due and identify that a CKD diagnosis is indicated. | To evaluate and improve CKD reviews (follow-up clinical investigations) according to best-practice guidelines. | Chart audit to compare CKD diagnoses recorded with best-practice guidelines.<br>The chart audit along with staff consultation led to the development of a decision-support tool.<br>The tool generates quarterly reports identifying patients due for review, patients requiring CKD follow-up and patients with indicated CKD but no diagnosis recorded. | No direct evaluation of the decision-support tool (proof-of-concept only).<br>Value/feasibility of the tool are evaluated as part of project 8. | Over 60% of CKD patients were overdue for clinical review.<br>35 patients met CKD criteria but did not have a diagnosis recorded. |
| 2. Clinician knowledge of best-practice guidelines | Perceived lapses in clinician knowledge of best-practice CKD guidelines.<br>A target group of patients (*n*=35) were also identified (project 1) who had a CKD diagnosis that was not recorded in the clinical database, thus leading to a lack of follow-up reviews. | To educate clinicians regarding best-practice guidelines for CKD management and conduct a chart audit to facilitate an update of patient management plans aligning with best-practice guidelines. | Clinician education session: Student conducted a briefing session where they distributed a fact sheet on best-practice CKD guidelines, which covered CKD staging, managing risk factors and clinical action plans (three levels of CKD management depending on severity).<br>Chart audit: Student audited 25 of 35 possible charts to code CKD stages in the database, and to update patient management plans based on best-practice guidelines. | Survey of clinicians 3 weeks after the education session to assess changes in knowledge of best-practice guidelines, number of clinical investigations ordered after the audit and perceived impact of the interventions. | All clinicians felt better informed of CKD risk factors.<br>75% felt their CKD knowledge had increased.<br>On a 10-point scale, clinicians scored the efficacy of the education session (8/10) and chart audits (8.5/10) highly.<br>Following the audit, an average of 2.6 additional investigations were completed per patient (*n*=25). |
| 3. Tertiary-level CKD management | Delayed investigations for CKD aetiology and a low frequency of PTH and vitamin D testing, despite investigations for bone mineral disorders recommended for later stage patients. | To identify the frequency of renal, PTH and vitamin D testing in later stage CKD patients, relative to best-practice guidelines. | Charts audit of later stage CKD patients (*n*=25) to identify recency of prior renal, PTH and vitamin D tests, relative to best-practice guidelines.<br>Based on the audit, clinicians were alerted to tests that were overdue. | Due to the COVID-19 pandemic impacting student placements, the intervention could not be evaluated; however, clinicians were alerted to overdue tests. | Some tests were completed without being recorded in the database while other tests were being ordered at rates well below best-practice guidelines. |
| 4. Management of CKD in general practice during the COVID-19 pandemic | Concerns that the COVID-19 pandemic may further inhibit GPs from being able to manage CKD in accordance with best-practice guidelines. | To determine the impact of the COVID-19 pandemic on meeting best-practice guidelines for CKD management. | Chart audit to compare the number of CKD-related clinical measurements and laboratory assessments taken before and during the COVID-19 pandemic.<br>Survey of medical centre staff regarding their perceived impact of COVID-19 on meeting best-practice CKD guidelines. | No evaluation (descriptive investigation). | Reduction in the number of clinical measures taken during COVID-19.<br>Staff felt that a move to telehealth (ie fewer in-person consults) and closure of health services such as blood collection facilities significantly restricted their ability to obtain the necessary clinical measures. |
| 5. Patient health literacy surrounding CKD (1) | Limited patient awareness regarding modifiable risk factors, the purpose of renal tests, the importance of sufficient water consumption and the role of the nephrologist in CKD management. | To increase patient awareness of CKD testing and management. | An educational pamphlet was developed and delivered to CKD patients as part of an education session conducted by the student, primarily relating to modifiable risk factors. | Patient surveys (*n*=25) before and after reading the pamphlet to determine changes in CKD knowledge. | Understanding of CKD increased in 92% of patients.<br>47% were more aware of dietary impacts/changes they could make.<br>18% were more aware of their fluid and/or alcohol intake. |
| 6. Patient health literacy surrounding CKD (2)† | Low engagement between patients and GPs and a limited understanding of CKD seriousness, contributing to delayed/missing tests needed to monitor disease progression. | To increase CKD patient's awareness of the importance of frequently engaging with their GP and undergoing regular renal testing. | Information brochure delivered to patients with CKD or at risk of developing CKD. | Patient surveys 5 days after receiving the brochure to determine changes in CKD awareness. | Most patients (22 of 26) had a greater understanding of CKD.<br>19 patients were more likely to discuss CKD with their GP.<br>Only six patients planned on making any lifestyle changes. |
| 7. Patient health literacy surrounding CKD (3)† | Low engagement between patients and GPs and a limited understanding of CKD seriousness, contributing to delayed/missing tests needed to monitor disease progression.<br>Database management was again identified as a contributor to delayed/missing tests, noting limitations of the decision-support tool described in project 1. | To increase patient-initiated discussions with their GP via increased awareness of CKD stage and accompanying clinical action plan.<br>The secondary aim was improved database management to facilitate CKD patient recall. | Wallet card delivered to patients with CKD or at risk of developing CKD, which outlined CKD stage, clinical action plan, timing of the next review (3, 6 or 12 months) and contact details for the medical centre.<br>Paper-based recall slips developed to facilitate communication between clinicians and administrative staff (eg updating patient records, identifying follow-up tests required). | Patient surveys (*n*=26) after receiving the wallet card to determine change in CKD awareness and intention to initiate CKD-related discussions with their GP.<br>The recall slip is evaluated as part of project 8. | 62% of patients agreed CKD was more important to them.<br>73% were more likely to initiate CKD-related discussions with their GP. |
| 8. Summary and evaluation of previous CKD projects | Each of the CKD projects had been independently evaluated by the students; however, their combined impact over the preceding 12 months was unknown. | To summarise and evaluate the combined impact of the previous student-led CKD projects. | Summation of the previous student-led CKD interventions and QI activities. | Survey of medical centre staff (*n*=8; 4 doctors, 3 nurses, and 1 administrator) to evaluate the overall impact of the interventions and quality improvement activities, relating to changes in patient presentation and knowledge, clinical management, and administrative management of CKD. | All doctors (*n*=4) used the decision-support tool and or/recall slip and perceived them to be sustainable, long-term solutions which help ensure investigations are not missed or delayed.<br>Clinicians generally agreed that more clinical measurements were being taken (*n*=3), their own CKD knowledge had improved (*n*=3), patients were initiating more CKD-related discussions (*n*=2), and that patients were making more lifestyle changes (*n*=2).<br>Health literacy interventions were believed to have caused an increase in CKD presentations immediately following the interventions. |

† Projects were completed concurrently.
CKD, chronic kidney disease. GP, general practitioner. PTH, parathyroid hormone.

### *Ethics approval*

Each of the student projects was undertaken without ethics approval as they were completed as part of each student's medical training. Retrospective ethics approval to use the student project reports for this research was granted by the University of Queensland Human Research Ethics Committee (project number 2021/HE001085).

## Results

### *Summary of project outcomes*

As shown in the summaries in Table 1, each project was guided by a gap in knowledge or patient care identified by the medical centre and took into account other student CKD projects completed prior or simultaneously. Of the eight CKD projects, two

focused on database management. The first database management project comprised a clinical audit and development of a decision-support tool. With the audit revealing overdue clinical investigations and a lack of CKD diagnoses recorded, the tool served as a way of detecting missing/overdue tests and diagnoses to allow patient management plans to be updated, given that this functionality was not embedded within the clinical management software at the medical centre. While this was effective, it was noted that data were not always entered into the clinical management software consistently and therefore were not being captured in the reports generated via the decision-support tool. As such, the paper recall slip was developed as a complementary measure, which helped clinicians to communicate CKD-related actions taken during the visit and to identify updates that needed to be made to patient data or tests that needed to be ordered.

Three projects investigated clinician knowledge and implementation of best-practice guidelines for CKD management. With strategies in place to better support clinicians from an administrative perspective, it was deemed important to ensure clinicians were properly informed of best-practice guidelines for CKD management. By reminders to clinicians of the importance of various CKD-related investigations this knowledge was able to be applied more effectively, with support from the database management tools. These projects focused on staging and clinical action plans, tertiary CKD management and testing, and effects of the COVID-19 pandemic on CKD management. Within each project, a chart audit revealed a mismatch between clinical practice and best-practice guidelines. Although only one of these projects included an intervention/evaluation, it was found that, by re-educating clinicians on best practice, they became more aware of CKD management, leading to a tangible increase in the number of investigations ordered per patient.

Three projects involved educating patients on various aspects of their CKD management. Although the first four projects addressed CKD management in terms of clinician knowledge and practices within the medical centre, CKD patients themselves are often unaware of their condition and its seriousness. As such, to comprehensively improve CKD management within the medical centre, it was important to address patient awareness to ensure they remained actively involved in managing their condition. These projects targeted increased knowledge of the importance of frequent renal testing, stages of CKD progression and accompanying clinical action plans, and modifiable risk factors. Immediately following the interventions, positive effects were evident for CKD awareness and patients intending to initiate more CKD-related discussions with their GP.

Following the first seven projects targeting various aspects of CKD management, the final project served as an overall evaluation to determine perceptions of medical centre staff on the aggregate impact of the preceding projects. The final evaluation confirmed data in the student reports that the projects had a meaningful impact on CKD management at the medical centre and within the rural community through its patients. Moreover, this impact was strengthened via consecutive projects completed on the same topic. By addressing the problem from varied perspectives, change occurred in relation to staff awareness, patient awareness and clinical practices at the medical centre.

**Discussion**

This case study describes a novel model of medical education whereby students completed simple research projects across a 6-week rural medicine rotation, with multiple projects completed in the same practice and mostly one at a time, relating to the same chronic condition. The project outcomes demonstrate that all were able to generate new knowledge, awareness or practices within patients and staff of the medical centre, which as an aggregate created a meaningful impact on CKD management in a rural primary care setting. All medical and administrative staff at the medical centre agreed that, in some form, the student placements were valuable to the practice. Therefore, our study demonstrates that, if designed effectively, medical student placements in a rural area can positively impact both the medical centre and the health care of patients.

A key component of this case study is the brevity of the placements completed by each student, meaning that the volume of work that can be completed during each project is restricted. For this reason, it is likely that the projects in isolation may have had minimal impact on patient care or practices/processes within the medical centre. However, by encouraging students to complete related projects across consecutive placements and address a complex problem from different perspectives, the outcomes became more notable.

The impacts of the projects as an aggregate are further strengthened by continuous consultation and feedback from the medical centre as each placement began. Commencing students met with staff at the medical centre to discuss potential projects that may have been appropriate to complete during the placement. Considerations discussed when choosing a project related to the needs of the medical centre, interests of the student, feasibility and resourcing. In this instance, students were also briefed on other student CKD projects completed or in progress so that they could understand the nature of the problem and work with the medical centre to consider how the problem had already been addressed and what gaps remained. These discussions can be particularly beneficial to the students by helping them to understand the context that leads to difficulties in treating patients in a rural setting. These discussions are also important in ensuring that projects address the needs of the medical centre, rather than simply meeting the minimum placement requirements for the student.

Although it has been demonstrated that the projects have strong value for the medical centre, only short-term impacts have been assessed. Therefore, in further understanding the benefits of these projects, it would be useful to revisit the various interventions at later time-points to evaluate longer term impacts. When medical centre staff were asked to reflect on the impact of the projects, it was perceived that patient awareness (relating to three of the eight projects) appeared to dissipate after the interventions, making it particularly relevant to evaluate the long-term outcomes of the health literacy interventions and consider strategies for increasing their long-term impact. For example, health literacy interventions all involved providing patients with simple educational material, with patient education shown to be a key strategy in improving CKD outcomes[20]. One strategy to improve patients' health literacy longer term could be to administer this educational material at regular intervals, serving as consistent reminders to patients. Information contained in the educational material came from established guidelines (Kidney Health Australia recommendations), which are freely available and easily accessed online. Therefore,

confirming the currency/relevance of the information and regularly redistributing the material could be an ongoing strategy that could be implemented without medical students present. The outcomes of other interventions such as the decision-support tool and paper recall slip are more likely to have longstanding impacts given they have already been embedded within clinical practice at the medical centre. This assumption is further supported by survey data of medical centre staff (project 8 in Table 1) showing they all agreed that the database management strategies were viable, long-term solutions and is evident in the routine use of these tools at the medical centre more than 12 months after the student placements. Nevertheless, each intervention deals with CKD management from a different perspective and thus all are valuable to the aggregate effect.

Although this case study sought to demonstrate the impact of rural clinical placements through a single healthcare-related outcome, the value of these placements from a student perspective cannot be underestimated. Research experience during medical training leads to improved academic performance[21], helps to guide specialty selection[21] and improves critical thinking skills[22] Additionally, research is widely considered a core skill that all medical graduates should possess[23]. By having students contribute to projects of a more longitudinal nature, their research skills are likely to become better developed as a result. In doing so, students also gain a better understanding of the context of rural medicine and become more familiar with the logistical and practical restrictions that clinicians and administrative staff face in meeting best-practice recommendations in rural and remote areas. Furthermore, prior research experience is generally favoured when junior doctors in Australia apply to specialty training programs and, as such, placements such as those described contribute significantly to the professional development of the students. Nonetheless, it may be useful to further explore the value of this placement model from a student perspective to better understand the overall benefits and consider how similar programs might be developed and implemented more broadly.

**Conclusion**

This case study has demonstrated that short-term rural clinical placements for medical students have the potential to greatly improve clinical practice in rural and remote communities. By having consecutive students contribute longitudinally to improved management of the same chronic condition, they were able to address the problem from different perspectives, leading to improved administrative processes, clinical practices, and patient awareness and accountability. As a result, other medical education programs might consider adopting a similar approach.

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