

Microbiology education for rural nurses: continuing professional development strategies

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ABSTRACT

Nurses play an important role as frontline staff in infection control. Continuing professional development (CPD) in microbiology is key to helping nurses stay up to date with the latest developments in this area. A pilot study was conducted to determine the value of a microbiology laboratory-based workshop to support regional nurses. A team of microbiology academics and clinical microbiologists presented the laboratory-based workshop at Charles Sturt University, Wagga Wagga campus in New South Wales. Pre- and post-surveys were conducted. After the workshop, learners were significantly more confident explaining the process of culturing and identifying organisms from clinical samples ($z = 2.84$, $P = 0.005$), the importance of antimicrobial resistance in relation to common healthcare-associated infections (HAI) ($z = 2.56$, $P = 0.011$), cutting edge technology used in the rapid diagnosis of infectious diseases ($z = 2.69$, $P = 0.007$), and which antibiotics are appropriate for different bacterial infections ($z = 2.72$, $P = 0.007$). CPD opportunities such as workshops are vital for nurses in rural locations, particularly as health professional shortages in rural locations mean that nurses at all levels are required to take a lead role in infection control practices.

Keywords: continuing professional development, infection control, interprofessional, nursing.

Background

Working in a regional town has several implications for nurses. Although there are benefits of increased autonomy, gaining broad clinical skills, and community immersion,¹ one challenge is access to continuing professional development (CPD),² particularly in microbiology. The main reason for microbiology being important in CPD for nurses is that in recent years it has been reported that many nursing programs do not all adequately cover microbiology content. In addition, this can also be an opportunity for participants to re-visit microbiology concepts they may have covered early in their undergraduate study.^{3,4} In this study a microbiology laboratory-based workshop was delivered to a group of nurses working in hospitals in regional New South Wales. In designing the workshop considerations included the overall design of the workshop, role of nurses in infection control,⁵ the significant risk of HAIs for patients^{6–9} and limitations to accessing CPD in rural Australia,² preference for face-to-face training,¹⁰ supporting nurses to gain a greater understanding of microbiological concepts related to their role, and the benefits of interprofessional learning.¹¹ A previous study identified areas of specific interest in CPD and showed that knowledge of HAIs and infection control were the two topics of most interest and this was also taken into consideration.¹²

It was hypothesised that by completing this laboratory-based workshop rural nurses would have:

1. Enhanced awareness of microbiology principles relevant to infection control.
2. Greater levels of confidence in basic microbiological principles related to infection control, antibiotic resistance and diagnosing HAIs.

The laboratory-based workshop

This study was approved by the Charles Sturt University Human Research Ethics Committee, protocol number H19326.

Received: 27 April 2023

Accepted: 16 May 2023

Published: 23 June 2023

Cite this:

Green E et al. (2023)
Microbiology Australia
44(3), 162–165. doi:[10.1071/MA23045](https://doi.org/10.1071/MA23045)

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The laboratory-based workshop and surveys were designed by the authors (microbiologist, nursing educator who was also a registered nurse, sociologist). Advice was sought from local registered nurses regarding content. The laboratory-based workshop was conducted in the microbiology laboratory at Charles Sturt, Wagga Wagga campus.

Participants worked through the case study undertaking microbiological diagnostic techniques including bacterial culture, PCR assay, and pathogen whole genome sequencing to identify pathogens in samples. In keeping with the university laboratory requirements only mock wound swab and urine (spiked) samples were provided to participants. A range of bacteria on culture plates were available. Bacterial genera and species used in the workshop were those that would be used in any microbiology laboratory class at Charles Sturt University.

Conducting the survey

The free laboratory-based workshop was advertised to nurses in local rural and regional hospitals by local health district and hospital networks. A total of 10 registered nurses attended the workshop. Pre- and post-surveys were developed for participants to complete before and after completing the workshop.

Participants were provided with the information sheet, consent form and workshop program. The pre- and post-surveys were coupled with independent identifiers to pair the results because the surveys that were returned on the day of the workshop did not contain participant identifying information. Surveys were returned on the day and no identifiable information was collected.

The surveys used a 7-point ordinal Likert scale focused on confidence in explaining five key concepts to a colleague at a similar level (Table 1), as well as perception on the extent that nurses' participation in a microbiology laboratory-based workshop can influence positive patient outcomes.

In the pre-survey, participants were asked about their professional background, previous training opportunities, and their perception of the accessibility of best practice training. In the post-survey, they were asked to respond to a 7-item Likert scale about their experiences in the workshop.

Data were analysed using SPSS (ver. 25, IBM/SPSS Inc.). Given the ordinal nature of the pre and post-questions, Wilcoxon signed-ranks tests were conducted. Effect sizes (r) were manually computed by dividing the respective z -scores by the square root of the total number of observations ($n = 20$).¹³

Results of this study

The 10 participants had varied backgrounds. Clinical experience ranging from 2 to 20 years (mean 12.60, s.d. 7.66). All were currently working in a rural or regional healthcare facility in New South Wales in at least one of six different specialty areas (acute care, emergency, paediatrics, aged care, intensive care, and gem, stroke and rehab). Only 1 of the 10 reported receiving any previous training in microbiology related topics such as infection control, in the last 5 years and indicated it was only 'partially related' to microbiology. None reported there being any other training in microbiology available where they were worked. Wilcoxon signed-ranks tests indicated that self-assessed learner confidence in explaining key nursing microbiology concepts increased across all four ordinal survey outcomes (Table 1).

After completing the workshop, participants reported feeling more confident explaining the process of culturing and identifying organisms from clinical samples ($z = 2.84$, $P = 0.005$), explaining the importance of antimicrobial resistance in relation to common HAI's ($z = 2.56$, $P = 0.011$), explaining cutting edge technology used in the rapid diagnosis of infectious diseases ($z = 2.69$, $P = 0.007$), and explaining which antibiotics are relevant for different types of bacterial

Table 1. Results from Wilcoxon signed-ranks tests of nurse ratings pre- and post-workshop participation.

Survey item		Mean	Min.	Max.	Median	Negative ranks	Positive ranks	Tied ranks	P	r
Please rate your current levels of confidence in relation to:										
Explaining the process of culturing and identifying organisms from clinical samples ^A	Pre	1.90	1	5	1	0	10	0	0.005	0.635
	Post	5.40	4	7	5					
Explaining the importance of antimicrobial resistance in relation to common healthcare associated infections ^A	Pre	4.10	2	7	4	0	8	2	0.011	0.571
	Post	6.20	4	7	5					
Explaining cutting edge technology used in the rapid diagnosis of infectious diseases ^A	Pre	2.20	1	5	2	0	9	1	0.007	0.602
	Post	5.10	3	7	5.5					
Explaining which antibiotics are relevant for different types of bacteria ^A	Pre	2.90	1	7	2.5	0	9	1	0.007	0.607
	Post	5.00	3	7	5					
Nurses' participation in microbiology education can influence positive patient outcomes ^B	Pre	6.10	4	7	6.5	2	3	5	0.334	0.216
	Post	6.40	5	7	6.5					

Negative ranks, Positive ranks and Tied ranks are based on post- and pre-workshop survey paired ratings for Wilcoxon signed-ranks test procedure.

^ASelf-rated confidence, 7-point scale.

^BRated perception of influence, 7-point scale.

infections ($z = 2.72$, $P = 0.007$). The effect sizes (r) of these differences could be considered large.

There was no significant difference between the pre- and post-survey in learners' rating of the extent they thought nurses' participation in microbiology education could influence positive patient outcomes ($z = 0.97$, $P = 0.334$). All learners rated this as at least a 'moderate influence' in the pre-workshop survey. Nine out of 10 rated it more as than a 'moderate influence'.

Findings and concluding remarks

Participants reported an increase in confidence in their ability to explain basic concepts relating to infection control, antibiotic resistance, and HAIs after completing this laboratory-based workshop. This is important as some nurses who participated in the survey were in senior or supervisory roles and in a position to educate and support junior staff in the workplace as well as lead and engage in discussions with the broader healthcare team. This laboratory-based workshop was also an example of how universities can support industry or practitioners in the local area. Such workshops could also potentially lead to reciprocal learning, shared resources and networking.¹⁴ The face-to-face delivery mode also enabled robust discussion and peer to peer learning.¹⁵ Although the long-term benefits of this workshop, including long-term knowledge gain, have not been evaluated, the approach undertaken in delivering this workshop is likely to have been effective, based upon studies in other health professions.¹⁶

There were challenges associated with running this laboratory-based workshop, some of these have been previously described.¹⁴ One option to reduce cost is to deliver the workshop in the hospital. This would also help with increasing attendance, as four of the nurses who initially signed up withdrew due to competing demands. Based upon feedback future workshops will also include clinical microbiology–pathology laboratory tours. These challenges should be noted by others seeking to undertake similar activities in future. University collaborations are recognised as essential to the progression of Australian health education and research¹⁷ and activities such as the microbiology laboratory-based workshop implemented in this study are an important part of this process. This project also provides an insight into how CPD in microbiology could potentially lead to enhanced engagement of nurses in related areas such as antibiotic stewardship.¹⁸ Participants perceived that this CPD laboratory-based workshop could influence positive patient outcomes. However, these findings may only apply to nurses who perceive microbiology education is important to their overall role and affect on patient outcomes. Those who take this view may also be potentially more driven to engage in CPD activities.

A limitation of this study was the small, convenience sample of participants that may not be representative of the wider rural nursing population. Further larger multi centre studies are required to build upon and fully explore the findings of this study.

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Data availability. The data that support this study cannot be publicly shared due to ethical or privacy reasons and may be shared upon reasonable request to the corresponding author if appropriate.

Conflicts of interest. The authors declare that they have no conflicts of interest.

Declaration of funding. The authors of this research acknowledge the support of Three Rivers Department of Rural Health, funded by the Australian Government under the Rural Health Multidisciplinary Training (RHMT) Program.

Acknowledgements. We thank Wouter Kalle, John Harper and George John from Charles Sturt University and Rebecca McIntyre from the Lavery Laboratory for their help in delivering the workshop. We also thank Lyn Matthews, Ashleigh Van Oosterum, Natalie Allison, Celia Connor and Colette Geier for their help in setting up the laboratory and supporting the delivery the workshop.

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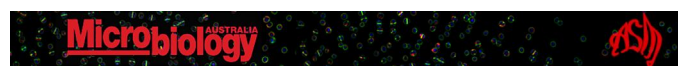
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PUBLISHING

CORRIGENDUM

https://doi.org/10.1071/MA23045_CO



Corrigendum to: Microbiology education for rural nurses: continuing professional development strategies

Elyce Green, Clair Seaman and Thiru Vanniasinkam

Microbiology Australia.

[Published online early 12 May 2023]. doi:[10.1071/MA23045](https://doi.org/10.1071/MA23045)

The author list and affiliations in the above-mentioned paper are incorrect in the Online Early version. These should be as follows:

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We apologise for the error and any confusion this may have caused.

Green E et al. (2023) *Microbiology Australia* **44**(3), 165.

doi:[10.1071/MA23045_CO](https://doi.org/10.1071/MA23045_CO)

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