

Dental students' knowledge of and attitudes towards prescribing medication in Western Australia

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Abstract

Introduction: Dentists can prescribe medications for prophylactic and therapeutic purposes. In Australia, dental graduates can autonomously practise within the scope of their qualifications without needing to undertake an internship post-graduation. Although previous research has identified knowledge gaps amongst dental students in Australia on pharmacology and pharmacotherapeutic knowledge, there has been no published research that qualitatively highlights dental students' knowledge of medication prescribing in Australia. This study aimed to undertake a qualitative analysis of Western Australian dental students' attitudes towards and knowledge of medication prescribing.

Methods: This qualitative case study design employed semi-structured interviews as means of collecting data. It utilised a purposive sampling in penultimate and final year dental students at the University of Western Australia.

Results: Twenty dental students participated in the study. Five key themes were identified in the data: current and previous education, application when delivering pharmacology and pharmacotherapeutics, teaching to ensure patient-centred care, supervision and referral to relevant resources. Participants agreed that having previous knowledge in the area provides students with confidence regarding medication prescribing. Furthermore, students in this study valued having guidance when prescribing medications.

Conclusions: This study highlights the complexity of medication prescribing for dental students. It also highlights their experience with the current pharmacology and pharmacotherapeutics curriculum. All students interviewed valued application-based teaching, making it specific to dentistry. If curriculum were to be redeveloped, considering their perceptions may be a valuable tool.

KEYWORDS

curriculum, dental school, medication, pharmacology, qualitative research

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1 | INTRODUCTION

Dentists can prescribe medications for prophylactic and therapeutic purposes. Most prescriptions are for antibiotics, analgesics and opiates, anti-inflammatories, antifungals, benzodiazepines, anticonvulsants and anti-emetics and emergency medication.^{1,2} In Australia, independent prescribers, including dentists, should adhere to the National Prescribing Service (NPS) MedicineWise Prescribing Competencies Framework.³ Experts in the field of prescribing undertake reviews of frameworks to ensure safe and quality prescribing. According to the Australian Dental Council, a newly qualified dentist should have the practical and theoretical knowledge to provide medications according to the competency standards.⁴ The Australian dental professionals' peak national body, the Australian Dental Association (ADA), published a policy about dental medication prescribing that the dentists are recommended to follow.⁵ The policy recommends utilising therapeutic guidelines and adherence with the NPS MedicineWise Prescribing Competencies Framework, which is an independent body and not an official arm of the government.^{3,6}

In 2020, there were about 2000 general dentists registered in Western Australia (WA).⁷ Only dentists and dental specialists can prescribe scheduled medications. Many dentist-prescribed medications are subsidised in Australia under the Pharmaceutical Benefits Scheme (PBS), in order to provide affordable medication to the public.⁸ A PBS study from 2006 to 2018 highlighted the increasing dispensing patterns and trends of dentist-prescribed antibiotics, opioids and benzodiazepines.² The most commonly prescribed medicines are antibiotics, and there is a strong framework [Antimicrobial Stewardship Clinical Care Standard 2020] for judicious use of antibiotics in Australia.⁹ This is an official publication from the Australian government. From 2005 to 2016, Australian dentists were responsible for approximately 7 million dispensed prescriptions of antibiotics over the age of 12 years. The authors concluded that there were inappropriate prescribing of broad-spectrum antibiotics and that the dentists should follow the national antimicrobial stewardship (AMS) initiatives and guidelines.¹⁰

Within the nine Australian dental schools, there are more than 650 graduate dentists annually.¹¹ Dental students, in the final and penultimate year, are expected to have in-depth pharmacology knowledge. According to a cross-sectional study conducted in Australia, 77% of dental students answered more than half of the questions about medication knowledge correctly.¹² Students performed well in the topics covered broadly in dental schools (e.g. anaphylaxis, medication interaction, local anaesthesia, paediatric medication dosing and antibiotic prophylaxis). In addition, these topics are covered well by the Therapeutic Guidelines.⁶ Therapeutic Guidelines is an independent, evidence-based, resource providing practitioners with decision making with specific diseases and conditions. However, according to the same cross-sectional study, 27% of dental students did not feel confident prescribing safe and effective medications.¹² In terms of knowledge of complementary therapies, 74% of the students reported having little to no knowledge.¹³ The authors suggested that a future research direction was to obtain insights from a student's perspective on a holistic level. This would be particularly useful to help

improve future curriculum design. In addition, the authors also stated that qualitatively assessing whether problem-based learning may be beneficial should be considered when curriculum redesign is advocated. Qualitative research can be helpful as it can create an opening dialogue, stimulate people's individual experiences without judgement and provide in-depth responses necessary for redesign.¹⁴

The University of Western Australia (UWA) Doctor of Dental Medicine (DMD) is a four-year post-graduate dental degree. It is accredited by the Australian Dental Council and approved by the Dental Board of Australia. Until 2021, the course could be as short as 3 years if the candidate's undergraduate degree was a medical science major at UWA, where they can articulate into the second year of the DMD.¹⁵ The DMD has undergone structural changes since its first deliverance in 2013. The second version of the DMD was introduced in 2018.

In 2021, the UWA Dental School decided to restructure again, and a third version of the DMD will be introduced in 2022 as an integrated dental science major.¹⁶ To enable this to happen, pharmacology curriculum as well as the timing of the delivery, within the DMD, also requires restructuring. Basic pharmacology is generally molecular in nature, whereas clinical pharmacology and pharmacotherapeutics is patient-centred, where the medications are used to treat the disease the patient presents with.¹⁷

At the UWA Dental School, DMD is divided into pre-clinical [first and second years] and clinical [third and fourth years]. Majority of the pharmacology was delivered in the first year. In the second year of DMD, students will be assessed whether deemed competent to perform active treatment on patients.¹⁸ DMD students will be primarily be seeing patients in their third to fourth years, where they are deemed competent on a pharmacotherapeutics level. In the current study, the target audience were current clinical dental students. No published research has qualitatively highlighted dental students' knowledge of medication prescribing in Australia.

This study focused on dental students at the UWA and their perspectives on potential ways to help improve the future pharmacology and pharmacotherapeutics curriculum. Therefore, the aim was to undertake a qualitative analysis of UWA dental students' attitudes towards and knowledge of medication prescribing.

2 | MATERIALS AND METHODS

This study followed the consolidated criteria for reporting qualitative research (COREQ). Ethical approval was obtained from the University of Otago Human Ethics Committee [Reference Number: D21/133].¹⁹ Since only a few Australian quantitative publications were available in the literature,^{12,13} the methodological orientation used was a central phenomenon as there was no published work on qualitative analysis on dental students' attitudes and knowledge towards medication prescribing in Australia.²⁰ Attitudes were conceptualised based on the following topics: behaviour, beliefs and effect on pharmacology and pharmacotherapeutics. Then all knowledge and attitudes were grouped with direct relationships to constitute either a conceptual or theoretical framework.

JP is a male, qualified pharmacy graduate and an Australian board-registered dentist who also works as an adjunct research fellow at the time of the interview. JP undertook all one-on-one semi-structured interviewing of UWA dental students. JP had minimal teaching or curriculum involvement with the students at the UWA Dental School. This would have minimised bias. The dental students of interest were in their third and fourth years with no pre-existing knowledge of this research until the interview. Except for the extra year of clinical training for the fourth year, both years had the same level of teaching the pharmacotherapeutics curriculum.

2.1 | Data collection

The questionnaires were formulated after discussing with the co-author, a higher education expert (B.D.). However, the questionnaires were not disseminated to the participants until the authors reached a consensus. During the interview, the following combination of closed and open-ended questions were asked:

- Open-ended: How much pharmacology and pharmacotherapeutics knowledge do you know currently? (Follow up question—Could you explain why YOU believe this is the case?) [can be either undergraduate or dental qualifications]
- Open-ended: How confident are you in prescribing patients safe and effective medications (under supervision)? (Follow up question—Could you explain why YOU believe this is the case?)
- Open-ended: What do YOU think is the best way to address the possible gap in your knowledge of pharmacology and pharmacotherapeutics in dentistry?
- Close-ended: Prompting topic of interest [Quantitative]:^{12,13} Orthodox [quality use of medications, anaphylaxis, dosage, comorbidity, interaction, pregnancy, nervous system, local anaesthesia, antibiotic prophylaxis, paediatrics and safety] and complementary alternative medicine (CAM) [interaction, nutraceutical, dental application, acupuncture and adverse reaction].
- Open-ended: What do you think is the value of understanding medication in dental clinics?
- Open-ended: How do you think we can educate well-rounded clinicians (on a pharmacological and pharmacotherapeutics level)?
- Open-ended: If you were to look back, what do you believe could have benefited you in acquiring the necessary knowledge on pharmacology and pharmacotherapeutics?
- Open-ended: Do YOU have any other comments that you believe may help us?

Interviews took approximately 20–30 min and were delivered either by telephone or Zoom. The recordings were transcribed and de-identified. The principal investigator (JP) and a co-investigator (BD) verified the transcriptions against the audio recordings. A collection period of 1 month was placed. Interviews were conducted voluntarily, and one reminder email was sent to everyone for recruitment, regardless of whether they had completed it or not.

2.2 | Sampling and recruitment

Dental students at the UWA Dental School were recruited using purposive sampling through representative organisations and social networks. With the permission of the head of school (HN) as well as the curriculum head (PA), the students were recruited via email and social media (Facebook and Instagram). After obtaining informed consent from the participants, semi-structured interviews were conducted to inquire about their attitudes and perceptions on medication prescribing. There was no pre-existing relationship, in pharmacology and pharmacotherapeutics teaching between the interviewer and the interviewees. Students had the choice to withdraw from the project at any stage without any disadvantage to them of any kind.

The recording was transcribed then imported to NVivo 12 (QSR International) to analyse the data, which is a qualitative data management programme. A thematic analysis was conducted following the study conducted by Braun & Clarke.²¹ The main themes were coded, and quantitative and qualitative results were generated to determine potential common factors. The initial quality assurance was undertaken throughout the analysis by two investigators (JP and BD). All authors discussed and reviewed the initial analysis and emergence of central themes until a consensus was reached.

3 | RESULTS

Participants entered the DMD programme either through a graduate pathway or an undergraduate medical sciences major pathway at the interview. Twenty dental students [D1 to D20] were recruited [five final year (4th year) and fifteen penultimate years (3rd year)]. As no new information emerged beyond the twenty dental students, it was apparent that data saturation was achieved.

3.1 | Topics of interest

Most students were interested in the topics to be taught, as highlighted in [Table 1](#). Except for pregnancy, complex nervous systems and paediatric medication dosing, 90% to 95% of students were interested in getting taught these topics if they had the opportunity to do so.

Conflicting opinions were highlighted for complementary alternative medications (CAM) ([Table 2](#)). Except for acupuncture, more than half of the students were interested in learning about CAM interactions, nutraceuticals, CAM utilisation in dentistry and CAM adverse reactions.

3.2 | Thematic analysis

Five key themes arose from the interviews: current and previous education, application when delivering pharmacology and

pharmacotherapeutics, teaching to ensure patient-centred care, supervision and referral to relevant resources. Words from the most common phrases recorded are highlighted in Figure 1.

TABLE 1 Count and percentage of students expressing their opinions on pharmacology and pharmacotherapeutic topics

	Yes		No		Maybe	
Quality use of medications	18	90%	0	0%	2	10%
Anaphylaxis	18	90%	1	5%	1	5%
Medication dose	17	85%	1	5%	2	10%
Co-morbidity	19	95%	1	5%	0	0%
Medication interaction	18	90%	2	10%	0	0%
Pregnancy	13	65%	1	5%	6	30%
Nervous system	15	75%	2	10%	3	15%
Local anaesthesia	18	90%	1	5%	1	5%
Antibiotic prophylaxis	18	90%	0	0%	2	10%
Paediatric medication dosing	15	75%	1	5%	4	20%
Medication safety	19	95%	1	5%	0	0%

TABLE 2 Count and percentage of students expressing their opinions on complementary alternative medication topics

	Yes		No		Maybe	
Interaction	10	50%	8	40%	2	10%
Nutraceuticals	11	55%	5	25%	4	20%
Utilisation in dentistry	11	55%	5	25%	4	20%
Acupuncture	9	45%	6	30%	5	25%
Adverse reactions	13	65%	2	10%	5	25%

3.3 | Current and previous education

Participants believed that what they studied in their undergraduate courses helped them understand the concepts needed to understand how medications can be used in clinical dentistry. In addition, students who found pharmacology interesting showed extra initiative to further their knowledge.

I would say probably more than the average student, just probably because I did a pharmacology major as my undergraduate degree and it interests me, so in my own time, I will go read up on my patients' medications and mechanisms of action.

[D7]

Students appreciated that they would have received more value from their pharmacology and pharmacotherapy education if dentistry had been more streamlined.

We had a unit in our first year, but it wasn't ingrained, and there was no clinical application to what I was doing, so I didn't really find it super-relevant, and so I didn't find it interesting enough to hold onto that information.

[D12]

Based on the breadth of topics taught in the pre-clinical phase of their dental curriculum, it was hard for students to understand which aspects were relevant in dentistry.

Because we were just taught names, dosage and frequency and then that's it, like nothing about the



FIGURE 1 Word cloud of the most common phrases

actual antibiotics and how, like for example, antibiotics, like why exactly this one is better than the other one. I'm still confused whether I need to use Penicillin or Amoxicillin.

[D14]

In addition, some students would have preferred to have received a bit more streamlined guidance to their education in pharmacology and pharmacotherapeutics.

I think if I had sound knowledge on at least the top 10 to top 20 most common drugs that I'll encounter, and having good knowledge on those, even if there's a lot of other important ones that I've missed, I think that's always something that I can read up on. But if I just have those things at my fingertips, I can just pick it up.

[D13]

3.4 | Application when delivering pharmacology/ pharmacotherapeutics curriculum

There was a consensus that applied delivery of pharmacology and pharmacotherapeutics curriculum was preferred. Some students would have preferred utilising case scenarios to consolidate what they had learnt in lectures.

I think more hands-on learning or some more interactive sort of discussions around it would be nice, rather than just being told another list that I have to memorise because there's already so much of that. If we could instead of having a list, you could have learning scenarios ...

[D3]

The majority of students believed that when delivering the pharmacology and pharmacotherapeutics curriculum, there should be a degree of relevancy in dentistry.

I feel like being exposed to real-world kind of situations, and that will maybe be a better way to learn about all these kinds of different pharmacological stuff.

[D2]

Furthermore, the same student [D2] raised a point where if the curriculum was dental-specific, it would peak the student's interest.

... if I was taught in like a focus on a dental professional, then maybe I would be more engaged as well rather than just learning about pharmacology in general.

[D2]

This may be because students may find it difficult to conceptualise what they learnt in their didactic lectures into clinical practice.

... we haven't been able to do a trial run or anything like that beforehand. We've been given a couple of lectures on prescribing, and we've been given a list of things that we need to include, but doing it in the clinic is a different story rather than learning about it in lectures.

[D4]

3.5 | Teaching to provide patient-centred care

Most students believed that teaching pharmacology and pharmacotherapeutics would be valuable. Since dentists are prescribers, they should have adequate knowledge to perform such tasks.

...understanding the mechanism of action and the interactions, possible side effects [of medications] are very important. As a dentist, you are legally a doctor, I suppose, so you should have the knowledge to explain how to use all sorts of medications drugs, and confidently dispense anything that's needed.

[D9]

Some students further researched their patients if it was their initial consult. This was to ensure that students were aware of potential complications due to the patient's pre-existing medical conditions.

For my patients, when I meet them for the first time, I'll spend the entire night before going through every single medication that they're on because I don't know what they are, and I'll usually have to remind myself of how they work. But then, if I had to prescribe a new medication, I think that would be difficult.

[D11]

The same student recommended adding a humanistic component to the curriculum to ensure that the learning is patient-centred and still relevant to the everyday context in dentistry.

"This is Sally," they'd make up a person, but they would give some human element to whatever we were learning, so then it made us want to invest our thinking into it, because if it's just general, "This is how antibiotics work," sure, it's the old way of doing it, but it would be so much more, for me at least, I'd apply myself a lot more if I knew that there was a face attached to it. "This is Suzie, she came in and she had these symptoms. She needs these antibiotics. Let's talk about what these antibiotics are and how they work."

[D11]

Participants were in consensus that the teaching of pharmacology and pharmacotherapeutics needs to be tailored to ensure patient-centred care is maintained, as current students said this is lacking in the curriculum as one participant indicated:

I think even though I might have an understanding of the theory behind certain medications; I don't think my knowledge is complete enough to know what is the best choice for my patient, what might be side effects for my patient, what might be contraindications for my patient.

[D7]

3.6 | Supervision

Findings suggest that some students in the clinical settings under the supervision of registered dentists, who are their clinical tutors, still felt uncomfortable prescribing medications for patients with presenting condition.

...we haven't been able to do a trial run or anything like that beforehand. We've been given a couple of lectures on prescribing, and we've been given a list of things that we need to include but doing it in the clinic is a different story rather than learning about it in lectures.

[D4]

Despite having access to guidance, some students stated that they would prepare gaining some degree of autonomy.

If it was under supervision, I think I'd be okay, but I would have to rely heavily on that supervision, and I'd probably have to do a lot of my own reading and preparation on the side before doing anything. I wouldn't be able to just do it on the spot.

[D13]

Even in the later stages of their qualifications, some students felt comfortable relying on their clinical tutors for guidance.

I guess it's just I'm probably just at that stage where I just like having a supervisor guiding me through. And if I am making a mistake, which is more likely because sometimes I'm over cautious.

[D20]

However, the same student mentioned that it was not necessarily due to confidence rather a feeling of security or a safety net to ensure guidance when providing patient care.

It's just nice having someone experienced and guiding me that maybe we don't need so much, or maybe

we do need a little bit more. So that bit of experience is needed, I think which is coming from the tutor.

[D20]

3.7 | Referral to resources

Participants said they approach pharmacology and pharmacotherapy as a logical way of following a set of guidelines prescribing medications for dental-related conditions.

I think it's not too bad because I think that the framework we've been given is pretty simple where you, I guess, follow the therapeutic guidelines as our bible. If I was without the clown book [Therapeutic Guidelines] or the other therapeutic guidelines, if I didn't have that then I would be much less confident, but I guess what we prescribe is pretty limited to occasionally some pain medicine and then the occasionally some antibiotics...

[D3]

Students tended to refer to materials as a safety net to ensure correct medication was being prescribed.

I would still need to refer to other materials or refer to a more senior medical professional to confirm that what I'm trying to, what I'm thinking of prescribing is the correct sort of medication.

[D2]

Some participants perceived referral to resources as a reflection on gaps in their existing knowledge.

...when I would actually need to prescribe, or like if a patient that I have seen like has a significant medical history or anything, I would actually have to like do more study up on that specifically. But in general I don't think I have enough knowledge.

[D8]

While others perceived learning as life-long.

...I feel like I need to update myself more because I only know the stuff we've been taught in school, nothing else from outside.

[D15]

4 | DISCUSSION

Dental students are most interested in pharmacotherapeutics and thus the clinical application of knowledge in the field of

pharmacology, and that including pharmacology with no context around professional practice runs against modern educational theories of adult pedagogy.²² Based on student perceptions, this was the first Australian study to qualitatively highlight the opportunity to potentially improve the pharmacology and pharmacotherapeutics curriculum to promote and engage students to become more confident in prescribing medication to patients. In Australia, dental students can practise dentistry within the scope of their qualifications after registering with the Dental Board of Australia.²³ This contrasts with pharmacy and medical practitioners, where a 1-year internship is required. Therefore, dental schools should ensure that dental students are equipped with the necessary competencies before graduation.

There was a consensus that having previous knowledge in this area provides students with confidence regarding medication prescribing. In addition, students were interested in being taught topics highlighted in Table 1. Conversely, they were not as interested in knowing CAMs. The topics highlighted in Tables 1 and 2 were based on previously published quantitative findings from dental students in Australia.^{12,13} These results were not surprising, as little if any CAM education is provided in dental schools in Australia or internationally.²⁴

All students interviewed valued application-based teaching (making it specific to dentistry). They also highlighted the importance of application-based learning to lean towards more patient-centred care. The reason for this is that, favourable outcomes utilising problem-based learning have been demonstrated in pharmacology teaching.²⁵ Therefore, it has been suggested to integrate didactic theory into clinical practice.¹⁸ In most dental curricula, pharmacology courses cover the basic principles of pharmacology, with lectures on different drug classes as well as their relevance to clinical dentistry.²⁶

Students in this study valued having guidance when it came to prescribing medications. Thematically speaking, knowing what type of resources were available and receiving guidance from practising clinicians was appreciated. This result provided was not surprising as they would not feel confident at this current stage. On a global level, dental students have varying knowledge gaps regarding medications.²⁷⁻³⁴ The most clinically significant aspects of prescribing must be clearly understood by students and are crucial considerations when designing the pharmacology and pharmacotherapeutics curriculum in different dental schools. At present, dental students lack an understanding of drug dosage, allergy consideration and appropriate drug duration.²⁷⁻³⁴ They also have inadequate knowledge of which resources to use to find pharmacological answers. To ensure knowledge gaps are rectified, improvements in pharmacology and pharmacotherapeutics curricula are necessary. Furthermore, there is an agreement that the quality of instructors, assessment type, learning environment and lecture content influence overall learning for dental students.^{17,35-42} Furthermore, it is important to emphasise that supervising tutors may need additional training to ensure that they are competent in the knowledge of modern prescribing frameworks and that they understand

the principles of antimicrobial stewardship and the quality use of medicines.^{9,43}

The current study had several strengths and limitations worth noting. The strengths included the fact that saturation within the dataset was achieved. A single interviewer led all the interviews to maximise consistency, and thematic analysis was undertaken by two independent investigators and then discussed until consensus was reached. The main limitation was a higher number of third-year DMD students than the final year DMD students. Other limitations include that the current data set is only specific to the UWA Dental School, and the data may not necessarily be generalisable to other dental schools in Australia. However, this is unavoidable as delivering pharmacology, and pharmacotherapeutics education will vary due to many factors. Therefore, getting qualitative insight from different dental schools may be an avenue for future research to ensure all graduating clinicians are competent according to the NPS MedicineWise Prescribing Competencies Framework.³ In addition, future studies could explore differences between students according to their background (concerning different entry pathways, domestic and international students) as such potential factors that could influence the students as they enter dental school.

The results could help inform policy and practice within the Australian health system and dental education. Furthermore, the results could potentially be reported to the Australasian Council of Dental Schools (ACODS), the Australian and New Zealand peak body representing tertiary education, training and research in dentistry.⁴⁴ In addition, the findings from this study could create a dialogue across all Australian dental schools to standardise pharmacology and pharmacotherapeutics education in order to comply with the NPS prescribing competencies framework.

5 | CONCLUSION

This study highlights the complexity of medication prescribing for dental students. It also highlights their experience with the current pharmacology and pharmacotherapeutics curriculum. All students interviewed valued application-based teaching, making it specific to dentistry. If curriculum were to be redeveloped, considering their perceptions may be a valuable tool.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

J.P. contributed to conception and design, acquisition of data, drafting the work, revising the work, final approval. B.D. contributed to conception and design, analysis and interpretation, drafting the work, revising the work, final approval. P.W., P.A. and H.N. contributed to conception and design, revising the work, final approval.

DATA AVAILABILITY STATEMENT

The data sets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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