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Research Article

Antibacterial Management Effect for Community Dentistry through Staff Education in the Greater Geelong Region of Australia

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ABSTRACT

Objective: The public dental service within the Greater Geelong region of Victoria, Australia services a growing population. The education of staff on antimicrobial stewardship resulted in the hypothesis that there would be a reduction in use of medicaments.

Methods: Staff education forums occurred biannually until 2020. In 2019, staffs were encouraged to complete three e-learning modules which the British Association of Oral Surgeons has created. Patient information was entered into the Dental Health Services Victoria (DHSV) Titanium clinical record.

Results: In 2009/10, 9% of patients attending the public community dental clinics at BH received medications/medicaments. From 1st July 2012 to 30th June 2020, yearly quantification of medication/medicament administration at BH public dental clinics reduced to 6.8%, 2.5%, 3.0%, 3.1%, 3.2%, 3.2%, 3.8% and 3.9% respectively. Across the state of Victoria, Australia in 2009/10 and 2010/11 medication/medicament administration measured 9.8 and 9.5 services per 100 individuals treated Dental Health Services Victoria (DHSV). From 1st July 2012 to 30th June 2020, yearly quantification of medication/medicament administration in the public dental clinics remained fairly similar Dental Health Services Victoria (DHSV).

Conclusion: Employee training had an impact on the reduction of prescription drugs in public local dental clinics. A reduction in prescribed medicaments in the public community dental clinic was observed.

Keywords: Antibiotic; Community dental clinic; Medicament; Medication; Oral health

INTRODUCTION

Antimicrobial stewardship is the coordinated strategy to educate and encourage prescribers to follow optimal guidelines in order to reduce unnecessary use of medicaments. Expected outcomes are improved patient safety with a decrease in adverse reactions, a reduction in cost and a safeguard of the healthy flora of the body. An antimicrobial stewardship clinical care standard has been developed by the Australian commission on safety and quality in health care [1]. In response, Dental Health Services Victoria (DHSV) developed an oral health antimicrobial stewardship procedure [2].

Antimicrobial resistance occurs when bacteria change and protect themselves from an antibiotic. International and national organizations have recognized the growth of antimicrobial resistance and have published recommendations to reduce this problem [3,4]. A review by Gill et al. [5] recommended that clinicians carefully consider the use of antibiotics with dental extractions and implants because of possible allergic reactions and possible microbial drug resistance. Antibiotic treatment for the prophylaxis of surgical infections related to dental implants does not appear to improve clinical outcomes in healthy patients and therefore may be unwarranted [6]. A recent awareness in the dental community about the risk of resistance towards chlorhexidine and accompanying cross resistance to antibiotics has been reported [7]. Chlorhexidine has been used as an antiseptic and is included in a wide range of oral care consumer products.

Barwon Health oral health service provides public dentistry to patients presenting to community dental clinics within the Greater Geelong region of south-west Victoria, Australia. Barwon Health services a growing population where there are many areas

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of socio-economic disadvantage. In response to the antimicrobial stewardship strategy, Barwon Health oral health service delivered a quantitative audit of prescribed medicaments in the community dental clinic with the hypothesis that there will be a reduction in use.

MATERIALS AND METHODS

The Barwon Health oral health service has community dental clinics at Belmont, Corio and Newcomb in Victoria, Australia. The public oral health service within the Greater Geelong region of south-west Victoria, Australia services a growing population where there are many areas of socio-economic disadvantage.

Staff of the Barwon Health oral health services attended bi-annual face-to-face in-service days (until 2020) for Continuing Professional Development (CPD). Updates on treatment and care are presented within these forums. The National Safety and Quality Health Service (NSQHS) standards [8] aim to protect the public from harm and improve the quality of health service provision. The NSQHS Standards were often discussed at the in-service days and was the particular focus during the time period of 2012 to 2013. In 2019, dental staffs were encouraged to complete three e-learning modules which the British association of oral surgeons has created to promote the careful and responsible use of antibiotics in dentistry and oral surgery.

Clinical leaders and senior managers of health service organizations implement systems to reduce the occurrence of medication incidents, and improve the safety and quality of medicine use. Clinicians and other members of the workforce use systems to safely manage medicines. Safe and appropriate antimicrobial prescribing is a strategic goal of the clinical governance system. Developing, implementing and regularly reviewing the effectiveness of the antimicrobial stewardship system is in place. As part of the national standards accreditation program, monitoring of the prescription of antimicrobials is becoming a requirement of dental clinics to address the overuse and inappropriate prescribing of antimicrobials.

DHSV have developed a custom screen that is attached to the 927 item code for completion by the treating dentist at the time of prescribing and assists in reminding the dentist of the information required to give to the patient. DHSV ran a trial of this custom screen in several locations at Barwon Health oral health services. The service commenced auditing of 927 item codes on a regular basis in an effort to reduce the inappropriate prescribing of antimicrobials.

Ensuring that current and accurate information and decision support tools are readily available to the clinical workforce when making clinical decisions related to medicine use is very important. In 2013 all clinicians had a link on their desktop to on line access to the 2012 therapeutic guidelines for dentists. Staff performance reviews assessed an understanding of the guidelines. The appropriateness of antibiotic and other medication prescribing is evaluated during the annual dental record keeping audit and by the "927" audits. This study was reviewed by the Barwon Health research ethics, governance and integrity unit (Research Project Number 17/18) and carried out according to local research policies and guidelines.

Data collection and analysis

A retrospective audit of electronic dental records for patients requiring medications/medicaments (Item 927) for dental treatment between July 1st 2009 and December 31st 2020 was performed. Data is presented as aggregated data. The percentage of patients receiving medicaments was calculated and compared across time periods. Data was extracted from the Titanium information management system (Version 14), a public oral health patient management system used within Australia.

Item 927 in the Australian schedule of dental services and glossary (Twelfth Edition) is described as the 'provision of medication/medicament' [9]. In January 2015, a new recording system for item code 927 was developed that included the number of 927AM (Antibiotic Prescription/Administration), 927O (provision of medication - other) and 927NR (provision of additional/alternative antimicrobials in non-responsive situations) and utilized at Barwon Health. The reasons for patients receiving medications in the dental clinic were analyzed.

Table 1: Comparison of number of patients (children and adults) receiving medications/medicaments at Barwon Health oral health services from July 1st 2009- June 30th 2020

Barwon Health	#Patients	#Visits	#Treatments	Drug therapy		
				Barwon Health	Barwon Region	State
2009/10	12,729	36,100	112,314	9	10.2	9.8
2010/11	14,137	38,483	120,555	9.9	9.9	9.5
2011/12	16,132	38,751	N/A			
2012/13	18,092	40,413	96,545	6.8	7.5	7.4
2013/14	23,445	60,695	N/A	2.5	3.1	6.1
2014/15	21,602	50,601	142,741	3	3.4	8.3
2015/16	23,060	52,205	160,410	3.1	3.8	8
2016/17	23,720	52,837	161,548	3.2	3.9	7.8
2017/18	22,928	52,162	152,282	3.2	6.5	8.4
2018/19	22,975	49,936	158,867	3.8	4.2	9.2
2019/20	18,401	37,118	122,222	3.9	4.7	9.7

Measure of the number of services provided per 100 individuals treated, Dental Health Services Victoria (DHSV). This information is extracted from the Dental care profile report (DHSV). The information provided by the Dental care profile report can be used:

- To measure the types of service provided by the agency compared to the region and state.
- To provide an indication of the treatment needs of the client group that accesses care at the agency compared with the region and state.
- To assess changes in service type provision and treatment needs over time.
- To facilitate the quality of care in terms of assessing treatment planning/appropriateness of care. Areas of over or under servicing will be apparent when assessing the profile data.

Drug therapy includes item numbers:

927 - For use in agencies without 927AM/927 NR/927O

927AM - Antibiotic prescription or administration

927 NR - Provision of additional/alternative antimicrobials in non-responsive situations

927O - Provision of medication – other

RESULTS

9% of patients attending the public community dental clinics (2009/10) at Barwon Health received medications/medicaments. Table 1 displays the dental care profile report for children and adults at Barwon Health from 1st July 2009 until 30th June 2020 in comparison to the state of Victoria (Dental Health Services, Victoria, DHSV). The dental care profile provides a measure of the services provided per 100 individuals treated. From 1st July 2012 to 30th June 2020, yearly quantification of medication/medicament administration at Barwon Health public dental clinics reduced to 6.8%, 2.5%, 3.0%, 3.1%, 3.2%, 3.2%, 3.8% and 3.9% respectively. Across the state of Victoria, Australia in 2009/10 and 2010/11 medication/medicament administration measured 9.8 and 9.5 services per 100 individuals treated (DHSV). From 1st July 2012 to 30th June 2020, yearly quantification of medication/medicament administration in the public dental clinics has remained fairly similar at 7.4%, 6.1%, 8.3%, 8.0%, 7.8%, 8.4%, 9.2% and 9.7% respectively (Table 1).

In January 2015 a new system for coding was introduced at Barwon Health. Table 2 shows quarterly comparisons for 927AM, 927O or 927NR noting that more than one type of medicament could be prescribed at each event.

Yearly comparison of antibiotic prescription/administration ranged from 468 to 733 events table 3. Yearly comparisons of other medications/medicaments prescribed ranged from 106 to 189 events.Yearly comparisons of the provision of additional/alternative antimicrobials in non-responsive situations ranged from 7 to 20 (Tables 2 and 3).

DISCUSSION

A reduction in prescribing medicaments in the dental clinic was observed at Barwon Health following staff being informed about the antimicrobial stewardship program. Barwon Health have done particularly well in reducing the administration of medicaments in the public dental clinics. Quarterly evaluations of medicaments prescribed are performed at Barwon Health to improve the quality of care for patients and assess treatment and appropriateness of care.

Behavioural modifications to cease over-prescribing antibiotics were necessary. Staff were aware of the benefits of reducing

Table 2: Quarterly comparison of number of adult dental patients receiving medications/medicaments at Barwon health oral health services from January 1st 2015- December 31st 2020.

Year	Q1	Q2	Q3	Q4	Total	Patient %
2015						
# patients	3166	2866	2508	2488	11028	
# visits	5099	5428	5190	4812	20529	
927	71				71	0.64%
927AM	15	91	99	78	283	2.56%
927NR	1	0	1	5	7	
927O	5	14	32	31	82	0.74%
2016						
# patients	2459	2616	2718	3306	11099	
# visits	4758	5781	5838	6026	22403	
927AM	123	123	96	126	468	4.22%
927NR	4	2	0	2	8	
927O	49	43	21	52	165	1.48%
2017						

# patients	3639	3583	3492	3362	14076	
# visits	6840	6275	6476	6318	25909	
927AM	146	134	104	114	498	3.53%
927NR	10	4	2	4	20	
927O	70	35	36	31	172	1.22%
2018						
# patients	3615	3635	3259	2862	13371	
# visits	6628	6959	6175	5202	24964	
927AM	138	155	136	135	564	4.22%
927NR	5	2	2	1	10	
927O	52	49	44	44	189	1.41%
2019						
# patients	2904	3455	3409	3256	13024	
# visits	5454	6677	6370	6040	24541	
927AM	137	121	162	185	605	4.64%
927NR	2	4	1	2	9	
927O	21	47	36	36	140	1.07%
2020						
# patients	4761	2724	4034	4225	15744	
# visits	7755	3741	6753	7230	25479	
927AM	158	159	214	202	733	4.66%
927NR	1	3	3	1	8	
927O	31	0	36	39	106	0.67%

Table 3: Yearly comparisons of the 927 events for adults at Barwon Health (from January 1st 2015- December 31st 2020).

Year	12 month time period	927AM	927O	927NR
2015	Jan 1st - Dec 31st	283	82	7
2016	Jan 1st - Dec 31st	468	165	8
2017	Jan 1st - Dec 31st	498	172	20
2018	Jan 1st - Dec 31st	564	189	10
2019	Jan 1st - Dec 31st	605	140	9
2020	Jan 1st - Dec 31st	733	106	8

927AM - Antibiotic prescription or administration

927O - Provision of medication - other

927NR - Provision of additional/alternative antimicrobials in non-responsive situations

medication/medicament administration to enhance efficacy, decrease treatment-related costs, minimise adverse events related to drug administration and reduce the potential for the emergence of antimicrobial resistance [10]. Along with the staff having a raised awareness about the need to reduce medication/medicament administration, dental patients have the right to understand the risks and benefits of antibiotic administration, which may lead to challenging situations and can lead to difficult conversations with patients. Patients may withdraw their consent at any time, refuse treatment or ask for it to be stopped after it has started. The importance of good record keeping of such interactions is fundamental [11]. Our catchment area surrounds the major city of Geelong, and is the second largest city within the state of Victoria and is a heavily utilised service. In 2019 out of the 605 antibiotic prescription events, only nine additional/alternative antimicrobials were prescribed in non-responsive situations.

Few studies within Australia have reported the prescribing habits of dental clinicians within Australia post 2016. Jaunay et al. [12] evaluated the prescribing habits of 10% of south Australian general dental practitioners by postal questionnaire. A tendency for over prescription was observed. A previous study by Ford et al. [13] describes the prescribing patterns of dental practitioners in Australia from 2001 to 2012. A concerning rise in the prescription of antibiotics and antifungals by dentists in Australia was observed. Questionnaires were distributed to Australian practicing members of the Australian and New Zealand Academy of Periodontists (ANZAP) to examine their antibiotic prescribing patterns for various periodontal conditions [14]. Some clinicians prescribed systemic antibiotics for the treatment of chronic periodontitis, while others prescribed these for periodontal regeneration procedures, implant placement surgery and mucogingival surgery. The study outlines the need for recommendations and guidelines for the prescription of antibiotics for periodontal and peri-implant conditions to ensure consistency between clinicians. Walsh et al. [15] described a large increase in the prescription of broad spectrum antibiotics

from 2011-2016 by Australian dentists.

A survey conducted in Jaipur, India aimed to identify the current knowledge, attitude and perception of dental undergraduates about antimicrobial stewardship. Good attitudes were observed, however deficiencies in perception and knowledge require further improvement [16]. A survey conducted in Poland with final year dental students in 2015 reported varying levels of the understanding of antibiotic use. The results outlined the need for further education of dental students about antibiotics and risks of antibiotic misuse [17]. Bianco et al. [18] reported on the appropriateness of antibiotic prescription in Italian dental practices and observed that a high proportion of antibiotic prescriptions before dental procedures were unnecessary. A questionnaire completed by final year dental students at Italian Universities regarding the appropriate use of systemic antibiotics for endodontic infections observed that knowledge improvement is necessary on antibiotics and their use in endodontics [19]. A report analysing dental antibiotic prescription practices in England (2010-2017), observed high levels of safety with the use of amoxicillin, while clindamycin had the highest rate of adverse drug reactions of common antibiotics prescribed by dentists [20]. Rates of antibiotic prescription have been reported to be increased for dental patients aged older than 60 years due to a number of reasons reported by dentists in Canada and the USA including antibiotic coverage for patients with valvular heart disease and prosthetic joints and more dental registrants per capita [21].

Antibiotics are advised as a prophylaxis prior to some dental procedures for patients with certain types of heart conditions. Lafaurie et al. [22] reported that premedication with antibiotics for dental patients should be restricted to patients at high risk of developing infective endocarditis as for the indications of the American heart association guidelines. A recently published study which was limited to patients with commercial dental insurance reported that according to the guidelines, 80.9% of antibiotic prophylaxis prescriptions before dental visits were unnecessary [23]. Another recent survey of general and specialist medical providers and dentists investigating prophylactic antibiotic prescribing prior to dental procedures found significantly different factors influencing decisions [24]. Clinicians were largely interested in further education on the subject. Chen et al. [25] observed variations between the prescribing habits of general dentists and specialists in the fields of oral surgery and implant dentists relating to antibiotic prophylaxis for patients who were medically compromised. Clear evidence-based guidelines on antibiotic prescription by dentists, particularly with regards to surgical prophylaxis, to reduce the inappropriate use of systemic antibiotics in dentistry are necessary. Prescribing antibiotics unnecessarily pose risks that may outweigh the benefits.

CONCLUSION

A reduction in medicament administration in the community dental clinics was observed, following staff having a raised awareness about the need for reduced antimicrobial prescriptions. Improving the education of staff about antimicrobial stewardship has led to a reduction in medication/medicament prescription in the public community dental clinic. Education for dental practitioners about the safe and appropriate use of antimicrobials is continuing for clinical staff employed in oral health services at Barwon Health with staff encouraged to complete e-learning modules which the British association of oral surgeons has created to promote the careful and responsible use of antibiotics in dentistry and oral surgery. Dentists in the UK have a statutory duty to reduce the risk of antimicrobial resistance by ensuring appropriate use of antibiotics. These guidelines provide clear and practical advice on when to prescribe, what to prescribe, for how long and at what dosage [26].

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