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Curricular Content Used by Dental Schools on the Recognition and Management of Substance Use Disorders

OHWRC
Oral Health Workforce Research Center

Center for Health Workforce Studies
School of Public Health
University at Albany, State University of New York

Curricular Content Used by Dental Schools on the Recognition and Management of Substance Use Disorders

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PREFACE

The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a study to provide baseline data on inclusion of curricular topics and clinical training related to substance use and the opioid epidemic in pre-doctoral dental education programs in the US.

This report was prepared for OHWRC by Simona Surdu and Margaret Langelier. Qiushuang Li completed the data analyses.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only HRSA-sponsored research center with a unique focus on the oral health workforce.

The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the School of Public Health, University at Albany, SUNY.

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This material is based upon data provided by the ADEA. The views expressed herein are those of the authors and do not necessarily reflect the position or policy of the ADEA.

Institutional Review Board

The plan for this study was reviewed and designated exempt from further review by the Institutional Review Board of the New York State Department of Health (Study No. 1466307-1).

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Technical Report

BACKGROUND

The importance of provider education and training to increase clinical competency in management and treatment of pain and identification of substance use disorders is discussed in literature as a primary intervention among strategies to address substance misuse. The National Academies of Sciences, Engineering, and Medicine identified 4 areas of importance in addressing the opioid epidemic, one of which was influencing prescribing practices through provider education about pain management.[1] This strategy would reduce the number of prescriptions, limit the demand for addictive substances, and eliminate or reduce reliance on opioids for pain management. A 2017 study examining the role of physician education and preparation of clinicians to address the opioid epidemic found that a physician's initial training had a noticeable impact on attitudes towards prescribing opioids, especially for general practitioners.[2] This finding suggests that pre-doctoral education in safe and effective prescribing practices for dentists, the majority of whom will practice general dentistry, would be beneficial.

While the number of prescriptions written by dentists has decreased significantly over the years, approximately 31% of these prescriptions are still being written during a non-surgical episode of care.[3] Some of these patients might have benefitted from more conservative prescribing practice, especially since medication management that includes opioids has been associated with more frequent adverse events among both child and adult patients.[4] Now, during the height of the opioid epidemic, dentists and oral surgeons remain among the top prescribers of opioids for young people between the ages of 10-19, an age group inclined to abuse drugs and develop addictions.[5] Consequently, it is important to understand how dental schools prepare their students for pain management, particularly as it relates to the potential for substance abuse. The "Massachusetts Model" has been cited in literature as a benchmark approach to training dental students on substance abuse and pain management.[6] There are likely additional "best practices" in preparing dentists on this important topic.[7]

While studies on curricular content related to substance use disorders and pain management in medical schools have been conducted in recent years, there has been little comparable research about curricular content in dental schools.[8,9] The objective of this research project was to obtain baseline data on dental school curricular content related to pharmacological pain management and on patient screening, identification, intervention, and referral for substance use disorders to better understand the extent to which dental students might be prepared to address substance use among patients in clinical practice.

METHODS

This study is based on an analysis of primary data collected through a survey of US dental schools in 2019 conducted by the American Dental Education Association (ADEA) in collaboration with the Oral Health Workforce Research Center (OHWRC), Center for Health Workforce Studies at the School of Public Health, University at Albany. The survey consisted of questions related to dental schools' implementations of changes in their predoctoral curriculum and clinical protocols to address the opioid epidemic.

The survey was distributed online to the 66 dental education programs in the US. The ADEA conducted the initial outreach to the dental schools and provided follow-up reminders to assure a high response rate. The survey was available online in January 2019. The survey was completed by a total of 46 dental schools (69.7% overall response rate). The curricular module was completed by 32 dental schools (40.5% response rate) and the clinical module by 31 dental schools (47.0% response rate).

This study also evaluated potential exogenous factors associated with changes in the dental school predoctoral curricular and clinical protocols in response to the opioid epidemic, including:

- Implementation of curricular and clinical protocol changes
- Aspects that influenced or facilitated curricular and clinical changes
- Measures included in current clinical protocols to address substance abuse
- Changes or development of subject areas related to the recognition and management of substance use disorders in predoctoral curriculum and continuing dental education courses

The exogenous factors under study included state-level characteristics such as the percentage of people in poverty, the presence of dental care health professional shortage areas (HPSAs), existence of a prescription drug monitoring program (PDMP), opioid prescribing patterns, and opioid related morbidity and mortality (ie, opioid use disorders, opioid overdose deaths) in the states in which dental schools were located. These data were extracted from a variety of public data sources, including: US Census Bureau, Kaiser Family Foundation, and Centers for Disease Control and Prevention, as follows:

- US Census Bureau, Current Population Survey, 2015–2018
- Kaiser Family Foundation analysis of Bureau of Health Workforce, Health Resources and Services Administration (HRSA), US Department of Health & Human Services (HHS), Designated Health Professional Shortage Areas Statistics, 2018

- Kaiser Family Foundation analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Multiple Cause of Death, 1999–2018
- Centers for Disease Control and Prevention (CDC), US Department of Health and Human Services (HHS), Annual Surveillance Report of Drug-Related Risks and Outcomes, 2018
- Kaiser Family Foundation analysis of Substance Abuse and Mental Health Services Administration (SAMHSA)'s restricted online data analysis system (RDAS), National Survey on Drug Use and Health (NSDUH), 2015–2016

The statistical analyses incorporated the following measures of state-level characteristics:

- Percentage of People in Poverty, 2015–2017
- Dental Care Health Professional Shortage Areas (HPSAs), 2016
- Prescription Drug Monitoring Program (PDMP), 2019
- Rates of Opioid Prescriptions Dispensed per 100 Persons by Type and Dosage, 2017
- Individuals Reporting Past Year Opioid Use Disorder per 1,000 population, 2015–2016
- Opioid Overdose Death Rates and All Drug Overdose Death Rates per 100,000 population, 2017

Descriptive statistical data analyses were employed to describe the state socioeconomic characteristics, existence of a prescription drug monitoring program, opioid prescription patterns, and opioid related morbidity and mortality. Various statistical data analyses (ie, frequency, percentage, mean, median, range, Fisher's exact test, and Mann-Whitney test) were used to assess the associations between state characteristics and dental schools' decision to make changes in their curriculum and/or clinical protocols in response to the opioid epidemic.

Analyses were conducted using SAS v9.4 (SAS Institute Inc., Cary, North Carolina). Statistical significance was defined as P-value<0.05 using 2-tailed tests.

FINDINGS FROM THE LITERATURE REVIEW

Opioid abuse is recognized as a major public health crisis[10] in the US resulting in significant mortality across all demographic groups. About 40% of opioid related deaths in 2016 involved a prescription opioid;[11] in addition, some deaths related to non-prescription opioid abuse may be tracked to initial exposure through a medical or dental event requiring pain control. From 1999 to 2018, more than 232,000 people died in the US from overdoses involving prescription opioids; this number was more than 4 times higher in 2018 than in 1999.[12]

In 2012, 6.4% of all prescriptions for opioid medications were written by dentists,[13] a decrease from a rate of 15.5% in 1998.[14] This reduction suggests that dentists are exercising stewardship in choosing medications for patients when prescribing for pain. Still, in 2015, about 31% of opioid prescriptions by dentists were written during a non-surgical episode of dental care[3] and dentists and oral surgeons remain among the top prescribers of opioids for young people 10-18 years of age.[5] Data from a study in England found that, in 2016, dentists in the US wrote prescriptions for opioids at a rate 37 times greater than dentists in England.[15]

The confidence and competence of dentists in addressing substance abuse with patients and their knowledge of appropriate pharmaceutical protocols for pain management are important considerations. Dentists may have insufficient knowledge of current trends in treatment of substance abuse and may find challenges communicating about suspected substance use with patients.[16] In a survey of dentists conducted in 2010, survey respondents identified barriers to including substance abuse services into practice including lack of knowledge and training and lack of referral resources.[17]

Another survey of a large cohort of general dentists in 2011 found that prior experience and knowledge of substance misuse were the strongest predictors of whether a dentist communicated with patients about suspected abuse.[18] Dentists who indicated that screening for substance abuse was part of the dentist's professional role were more likely than those who did not to discuss the topic with patients.[18] Appropriate and alternative prescribing practices for pain management and recognizing and referring for substance abuse disorders are thus important curricula topics for dental students and for continuing education for practicing dental professionals.

A survey of academic deans in all dental schools located in the US and Canada in 1986 was conducted to determine the extent to which predoctoral dental education programs included instruction in alcoholism and drug abuse in their curricula.[19] That survey found that about 63% of responding dental schools reported some instruction on both subjects but 23% did not include either topic in their curricula; 12% provided instruction on drug abuse only.[19] A subsequent survey

fielded to all dental schools in the US and Canada in 2009 found that 94.5% of responding schools reported inclusion of topics related to prescription drug misuse and abuse in the curricula using various instructional methods including lectures, small group instruction, and instruction in a school based clinic or community based extramural settings.[20] Lecture was the predominant mode of instruction and the mean time spent on the topic ranged from 1.38 hours for first-year students to 2 hours for fourth-year students. The majority of respondents (72.7%) also indicated inclusion of curriculum on other substance use and dependence (eg, methamphetamines).[20]

In 2017, the Commission on Dental Accreditation incorporated standard 2-24e requiring that that at a minimum and within the scope of general dentistry, students be competent in considering the impact of prescribing practices and substance use disorder.[21] In 2018, the American Dental Association's House of Delegates passed a resolution supporting mandatory continuing education for opioid prescribers, statutory limits on the duration of prescriptions for acute pain, and the use of Prescription Drug Monitoring Programs.[22] In March 2020, the ADEA updated a 2019 policy brief describing the public health impacts of the opioid epidemic and the importance of the contributions of dental education programs to the prevention of opioid misuse.[23] Thus, dental accrediting agencies and professional associations recognized the need for engagement of oral health clinicians and educators with strategies to address the opioid epidemic.

RESULTS FROM THE STUDY

Description of Dental School Respondents

Dental school enrollment in respondents' institutions varied from 147 to 1,515 students (mean=389.7) (Table 1). Dental school enrollment of survey respondents was similar to dental school enrollment in all 66 schools in the US in 2017–18, which ranged from 137 to 1,515 (mean=376.0; results not shown).[24] In 2017, dental schools that responded to the survey graduated between 20 and 362 students (mean=98.0). The number of graduates was similar to the numbers of graduates from all dental schools in the US in 2017, which ranged from 35 to 362 (mean=95.1; results not shown).[24]

The majority of survey respondents were from public dental schools (56.5%). More than a third represented private dental schools (37.0%), and a few were from mixed private and state-related dental schools (6.5%). The distribution of respondents by school type was similar to all 66 dental schools in the US (59.1% public; 36.4% private; and 4.5% private and state-related).[24] Survey respondents' distribution by geographic regions ranged from 17.4% in the Midwest to 23.9% in the West, 28.3% in the Northeast, and 30.4% in the South.

TABLE 1. Characteristics of Dental School Respondents

Dental School Respondents	n	Mean (Range), %
School Size		
Dental school enrollment, 2017–18	46	389.7 (147–1,515)
Dental school graduating class, 2017	45	98 (20-362)
School Type		
Public	26	56.5%
Private	17	37.0%
Private and state-related	3	6.5%
Total	46	100.0%
Geographic Location (Region)		
Midwest	8	17.4%
Northeast	13	28.3%
South	14	30.4%
West	11	23.9%
Total	46	100.0%

Data Source: American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

Key Survey Questions About Dental School Curriculum and Clinical Protocol Changes in Response to the Opioid Epidemic

Nearly 6 in 10 dental schools (59.4%) responding to the study reported implementation of a predoctoral curricular change in response to the opioid epidemic (Table 2). Another 2 in10 dental schools (20.1%) indicated that curricular changes were in progress.

The main factors influencing curricular changes as reported by dental schools were: specific state regulations/mandates (69.2%), the Commission on Dental Accreditation (CODA) Standard 2-24 for Dental Education Programs (73.1%), expectations from the university or academic health center to address the opioid crisis (50.0%), and grants or funding (23.1%) (Table 2).

TABLE 2. **Predoctoral Curriculum Changes in Response to the Opioid Epidemic**

Curricular Changes in US Dental Schools	n	%
Changes in predoctoral curriculum in response to the opioid epidemic (n=32)		
Yes	19	59.4%
Change in progress	9	28.1%
No	4	12.5%
Factors that influenced decisions to make curricular changes (n=26)[a]		
State regulations/mandates	18	69.2%
Commission on Dental Accreditation (CODA) changes to Standard 2-24e	19	73.1%
Expectation of the university or academic health center	13	50.0%
Grant/funding	6	23.1%

[a] Percentages may not add up to 100% as respondents could select more than one option.

Data Source: American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

More than 6 in 10 dental schools (61.3%) also reported implementation of clinical protocol changes in response to the opioid epidemic (Table 3). Another 3 in 10 dental schools (32.3%) indicated that clinical changes were in progress.

The main factors influencing clinical protocol changes as reported by dental schools were: specific state regulations/mandates (72.4%), the Commission on Dental Accreditation (CODA) Standard 2-24 for Dental Education Programs (51.7%), expectations from the university or academic health center to address the opioid crisis (44.8%), and grants or funding (17.2%) (Table3).

The main measures introduced by dental schools in their clinical protocol in response to the opioid epidemic were: education of patients on pain management (74.2%), screening of patients for substance abuse (67.7%), and policies limiting the number of doses (61.3%), days (58.1%), and refills (51.6%) of opioid prescriptions for patients (Table 3).

TABLE 3. Predoctoral Clinical Protocol Changes in Response to the Opioid Epidemic

Clinical Protocol Changes in US Dental Schools	n	%
Changes in clinical protocols or policies in response to the opioid epidemic (n=31)		
Yes, changes are complete	19	61.3%
Change is in process	10	32.3%
No, not yet, but changes are needed	1	3.2%
No, changes are not needed	1	3.2%
Factors that influenced/facilitated your change (n=29)[a]		
State regulations/mandates	21	72.4%
Commission on Dental Accreditation (CODA)	15	51.7%
Expectation of the university or academic health center	13	44.8%
Grant/funding	5	17.2%
Current clinical protocol measure(s) to address substance abuse (n=31)[a]		
Education of patients/parents on pain management	23	74.2%
Screening of patients for substance abuse or risk of substance abuse	21	67.7%
Policy limiting the number of opioid doses prescribed	19	61.3%
Policy limiting the number of days of opioids prescribed unless exception is documented	18	58.1%
Policy limiting number of opioid refills	16	51.6%
Referral to substance use disorder (SUD) management program	7	22.6%

[a] Percentages may not add up to 100% as respondents could select more than one option.

Data Source: American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

All or most dental schools participating in the study indicated that their current predoctoral didactic curriculum covered the following subjects: substance abuse (100.0%), management of acute pain (100.0%), pharmacologic and non-pharmacologic treatment of pain (100.0%), physiology of pain (100.0%), safe prescribing practices (96.7%), and impact of substance abuse on the oral cavity (93.3%) (Table 4). However, only half of them (50.5%) reported teaching about Screening, Brief Intervention, and Referral to Treatment (SBIRT), or screening and risk assessment.

Dental schools also indicated whether these changes in predoctoral curriculum subjects were made in response to the opioid epidemic (Table 4). More than three-quarters of dental schools made changes in safe prescribing practices (75.9%) and approximately 6 in 10 programs made changes to related topics including substance abuse (63.3%), management of acute pain (63.3%), SBIRT (60.0%), and treatment of pain (56.7%). Only about one-quarter of respondents indicated changes in subjects related to physiology of pain (26.7%) and impact of substance abuse on the oral cavity (25.0%) were in response to the opioid epidemic, suggesting that indicated changes were prompted by other factors.

TABLE 4. Subject Areas Covered in the Predoctoral Didactic Curriculum and Changes Made in Response to the Opioid Epidemic

Subject Areas	Subject Areas Covered in the Curriculum (n=30)			
	Yes		Changes in Response to the Opioid Epidemic	
	n	%	n	%
Substance abuse (substance abuse disorder, addiction)	30	100.0%	19	63.3%
Management of acute pain	30	100.0%	19	63.3%
Screening, Brief Intervention, and Referral to Treatment (SBIRT); screening and risk assessment	15	50.0%	9	60.0%
Safe prescribing practices	29	96.7%	22	75.9%
Pharmacologic and non-pharmacologic treatment of pain	30	100.0%	17	56.7%
Physiology of pain	30	100.0%	8	26.7%
Impact of substance abuse on the oral cavity	28	93.3%	7	25.0%

Data Source: American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

About 9 in 10 dental schools (89.7%) reported providing continuing dental education courses for external, non-faculty practitioners. More than half of these dental schools indicated providing continuing dental education in subject areas such as substance abuse (61.5%), management of acute pain (61.5%), treatment of pain (61.5%), and safe prescribing practices (53.8%) (Table 5). A smaller number of respondents provided continuing dental education on physiology of pain (30.8%), impact of substance abuse on the oral cavity (30.8%), or SBIRT (23.1%).

Most dental schools indicated that they developed and offered these continuing dental education courses in response to the opioid epidemic (Table 5). More than two-thirds of dental schools developed and offered continuing education in subject areas such as safe prescribing practices (71.4%), substance abuse (68.8%), and SBIRT (66.7%) in response to the opioid epidemic.

TABLE 5. Subject Areas Covered in the Continuing Dental Education Courses Provided for External Practitioners and Courses Developed and Offered in Response to the Opioid Epidemic

Subject Areas	Continuing Education Courses in These Subject Areas (n=26)			
	Yes		Developed in Response to the Opioid Epidemic	
	n	%	n	%
Substance abuse (substance abuse disorder, addiction)	16	61.5%	11	68.8%
Management of acute pain	16	61.5%	7	43.8%
Screening, brief intervention, referral to treatment (SBIRT); screening and risk assessment	6	23.1%	4	66.7%
Safe prescribing practices	14	53.8%	10	71.4%
Pharmacologic and non-pharmacologic treatment of pain	16	61.5%	7	43.8%
Physiology of pain	8	30.8%	4	50.0%
Impact of substance abuse on the oral cavity	8	30.8%	4	50.0%

Data Source: American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

Descriptive Statistics of State Characteristics

The percentage of people in poverty in states where the dental school respondents were located (n=45 states) varied from 8.6% to 20% with a mean and median of 12.9% and 13.2%, respectively (Table 6). The number of HPSAs in states where dental schools were located ranged from 11 to 424 with a mean on 164 and a median of 139 HPSAs. Thirty-nine of the 45 states (87.0%) in which responding dental schools were located had a PDMP in place in 2019.

Rates of opioid prescriptions dispensed per 100 persons by type and dosage in 2017 varied widely by state (Table 6). Rates of all opioid prescriptions per 100 persons ranged from 28.5 to 107.2 (mean=58.3; median=57.7). Similarly, the rates of past year opioid use disorder per 1,000 persons in 2015–2017 varied from 2.4 to 16.9 (mean=58.3; median=57.7) and rates of opioid overdose death per 100,000 population in 2017 varied from 5.1 to 39. 2 (mean=17.5; median=16.1).

TABLE 6. Descriptive Statistics of State Characteristics

State Characteristics (n=45)	Mean	Median	Min	Max
Socioeconomic Characteristics[1,2]				
Percentage of people in poverty, 2015–2017	12.9%	13.2%	8.6%	20.0%
Number of Dental Health Professional Shortage Areas (HPSAs), 2016	163.6	139.0	11.0	424.0
Prescription Drug Monitoring Program (PDMP), 2019[3]	**n**	**%**		
Yes	39	87.0%		
No	6	13.0%		
Rates of Opioid Prescriptions Dispensed per 100 persons by type and dosage, 2017[4]				
Rates of all opioid prescriptions	58.3	57.7	28.5	107.2
Rates of opioid prescriptions (MME/day) <50	43.2	41.5	24.1	87.6
Rates of opioid prescriptions (MME/day) >=50 to <90	9.9	9.8	3.0	16.5
Rates of opioid prescriptions (MME/day) ≥90	5.2	5.4	1.4	8.4
Rates of LA/ER opioid prescriptions	5.4	5.4	1.9	8.2
Rates of Past Year Opioid Use Disorder per 1,000 Population, 2015–2016[5]				
Rates of past year opioid use disorder	8.9	8.5	2.4	16.9
Rates of Overdose Death per 100,000 Population, 2017[6]				
Rates of opioid overdose death	17.5	16.1	5.1	39.2
Rates of all drug overdose death	24.9	22.3	10.5	46.3

Abbreviations: MME, morphine milligram equivalents; LA/ER, represents opioids that are long-acting (LA) or extended-release (ER).

Data Sources:

[1] U.S. Census Bureau, Current Population Survey, 2015 to 2018 Annual Social and Economic Supplements. Accessed 5/30/2019 from https://www2.census.gov/programs-surveys/demo/tables/p60/263/statepov.xls.

[2] Kaiser Family Foundation analysis of Bureau of Health Workforce, Health Resources and Services Administration (HRSA), US Department of Health & Human Services, Designated Health Professional Shortage Areas Statistics: Designated HPSA Quarterly Summary, as of December 31, 2018. Accessed 5/30/2019 from https://www.kff.org/other/state-indicator/dental-care-health-professional-shortage-areas-hpsas.

[3] American Dental Education Association (ADEA), 2019.

[4] Centers for Disease Control and Prevention. 2018 Annual Surveillance Report of Drug-Related Risks and Outcomes — United States. Surveillance Special Report. Centers for Disease Control and Prevention, US Department of Health and Human Services. Published August 31, 2018. Accessed 5/30/2019 from https://www.cdc.gov/drugoverdose/pdf/pubs/2018-cdc-drug-surveillance-report.pdf.

[5] Kaiser Family Foundation analysis of Substance Abuse and Mental Health Services Administration (SAMHSA)'s restricted online data analysis system (RDAS), National Survey on Drug Use and Health (NSDUH), 2015 and 2016, Substance Abuse and Mental Health Data Archive. Accessed 5/30/2019 from https://www.kff.org/other/state-indicator/past-year-opioid-use-disorder.

[6] Kaiser Family Foundation analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Multiple Cause of Death 1999-2018 on CDC WONDER Online Database, released 2019. Accessed 5/30/2019 from https://www.kff.org/other/state-indicator/opioid-overdose-death-rates.

Associations Between State Characteristics and Dental Schools' Decisions to Make Curriculum and/or Clinical Protocol Changes in Response to the Opioid Epidemic

The following section shows the key research findings on associations between state-level characteristics and dental schools making curriculum and/or clinical changes in response to the opioid epidemic.

Dental schools located in states with a *higher* prevalence of people in poverty were significantly more likely to indicate implementation of curricular changes in response to the opioid epidemic than dental schools located in states with a *lower* prevalence of poverty (77.7%-89.6% vs 74.0%; *P*=0.022) (Table 7).

TABLE 7. Associations Between State Characteristics and Dental Schools Decisions to Implement Curriculum and Clinical Protocol Changes in Response to the Opioid Epidemic

Dental School Changes in Response to the Opioid Epidemic[1]	State Characteristics Average Percentage of People in Poverty[2]
Curricular Changes (n=31)	
Yes	77.7%
Changes in progress	89.6%
No	74.0%
P-value	***0.022***
Clinical Protocol Changes (n=30)	
Yes, changes are complete	12.9%
Change is in process	12.2%
No, changes are not needed	13.2%
P-value	*0.677*

Data Sources:

[1] American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

[2] US Census Bureau, Current Population Survey, 2015 to 2018 Annual Social and Economic Supplements. Accessed 5/30/2019 from https://www2.census.gov/programs-surveys/demo/tables/p60/263/statepov.xls.

Dental schools located in states with *higher* rates of opioid overdose death (18.3% vs 10.5%; *P*=0.015) were significantly more likely to indicate state specific regulations or mandates as factors that influenced their decisions to make curricular changes than dental schools located in states with *lower* rates (Table 8).

Dental schools located in states with a *lower* prevalence of people in poverty (10.7% vs 13.2%; *P*=0.030) and/or *fewer* dental care HPSAs (81.7 vs 180.1; *P*=0.039) were more likely to indicate grants/ funding as factors that influenced their decisions to make curricular changes than dental schools located in states with a *higher* prevalence of poverty and/or *more* dental care HPSAs (Table 8).

Similarly, dental schools located in states with a *lower* prevalence of people in poverty (10.9% vs 13.0%; *P*=0.040) were more likely to indicate grant/funding as a factor that influenced their decisions to make clinical protocol changes compared to dental schools located in states with a *higher* prevalence of poverty (Table 8).

TABLE 8. Associations Between State Characteristics and Factors Influencing Dental Schools Decision to Make Curriculum and Clinical Protocol Changes in Response to the Opioid Epidemic

Factors Influencing Dental School Curricular and/or Clinical Protocol Changes[1]	State Characteristics		
	Percentage of People in Poverty[2]	Number of Dental Care HPSAs[3]	Rates of Opioid Overdose Death per 100,000 Population[4]
Curricular Changes (n=26)			
State regulations/mandates			
Yes	12.8%	158.4	18.3
No	12.2%	151.3	10.5
P-value	*0.716*	*0.716*	***0.015***
Grant/funding			
Yes	10.7%	81.7	21.8
No	13.2%	180.1	14.3
P-value	***0.030***	***0.039***	*0.080*
Clinical Protocol Changes (n=29)			
State regulations/mandates			
Yes	12.7%	177.6	16.6
No	12.7%	147.1	15.7
P-value	*0.9415*	*0.6077*	*0.642*
Grant/funding			
Yes	10.9%	98.6	17.7
No	13.0%	183.9	16.1
P-value	***0.040***	*0.088*	*0.750*

Abbreviation: HPSAs, Health Professional Shortage Areas.

Data Sources:

[1] American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

[2] U.S. Census Bureau, Current Population Survey, 2015 to 2018 Annual Social and Economic Supplements. Accessed 5/30/2019 from https://www2.census.gov/programs-surveys/demo/tables/p60/263/statepov.xls.

[3] Kaiser Family Foundation analysis of Bureau of Health Workforce, Health Resources and Services Administration (HRSA), US Department of Health & Human Services, Designated Health Professional Shortage Areas Statistics: Designated HPSA Quarterly Summary, as of December 31, 2018. Accessed 5/30/2019 from https://www.kff.org/other/state-indicator/dental-care-health-professional-shortage-areas-hpsas.

[4] Kaiser Family Foundation analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Multiple Cause of Death 1999–2018 on CDC WONDER Online Database, released 2019. Accessed 5/30/2019 from https://www.kff.org/other/state- indicator/opioid-overdose-death-rates.

Dental schools' changes of clinical protocols by limiting the number of doses, refills, and/or days of opioids prescribed as measures to address substance abuse were associated with *lower* state rates of opioid prescriptions (Table 9). For example, dental schools located in states with *lower* rates of long-acting or extended-release opioid prescriptions were more likely to indicate having a clinical protocol policy limiting the number of opioid doses prescribed compared to dental schools located in states with *higher* rates (5.2 vs 6.2 per 100 persons; *P*=0.045).

Also, dental schools' implementation of clinical policies limiting the number of opioid refills (9.1 vs 11.8 per 100 persons; *P*=0.027) and days of opioids prescribed (9.3 vs 12.0 per 100 persons; *P*=0.036) in response to the opioid epidemic was associated with *lower* state rates of opioid prescriptions at higher daily dosages (Table 9). Similarly, dental schools' implementation of clinical protocol policies limiting the number of opioid refills (8.6 vs 10.0 per 1,000 population; *P*=0.037) and days of opioids prescribed (8.3 vs 10.7 per 1,000 population; *P*=0.024) was associated with *lower* state rates of opioid use disorders.

All dental schools that implemented a clinical policy limiting the number of opioid refills for their patients were located in states that mandated dentists to consult the PDMP. In contrast, nearly 30% of dental schools that have not implemented such a clinical policy were located in states that did not mandate dentists to consult the PDMP (*P*=0.037) (Table 9).

TABLE 9. Associations Between State Characteristics and Measures Included in the Clinical Protocol by Dental Schools in Response to the Opioid Epidemic

Measures Included in the Clinical Protocol (n=30)[1]	State Characteristics			
	Rates of Opioid Prescriptions Dispensed per 100 Persons[2]		Rates of Opioid Use Disorder per 1,000 Population[3]	PDMP State Required Mandate,[4] n (%)
	>=50 to <90 MME/day Daily Dosage	Long-Acting or Extended-Release		
Policy limiting the number of opioid doses prescribed				
Yes	9.5	5.2	8.8	18 (94.7%)
No	11.9	6.2	9.9	8 (72.7%)
P-value	*0.064*	***0.045***	*0.227*	*0.126*
Policy limiting number of opioid refills				
Yes	9.1	5.2	8.6	16 (100.0%)
No	11.8	6.1	10.0	10 (71.4%)
P-value	***0.027***	*0.063*	***0.037***	***0.037***
Policy limiting the number of days of opioids prescribed unless exception is documented				
Yes	9.3	5.3	8.3	17 (94.4%)
No	12.0	6.1	10.7	9 (75.0%)
P-value	***0.036***	*0.098*	***0.024***	*0.274*

Abbreviations: MME, morphine milligram equivalents; PDMP, State Prescription Drug Monitoring Program.

Data Sources:

[1] American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

[2] Centers for Disease Control and Prevention. 2018 Annual Surveillance Report of Drug-Related Risks and Outcomes — United States. Surveillance Special Report. Centers for Disease Control and Prevention, US Department of Health and Human Services. Published August 31, 2018. Accessed 5/30/2019 from https://www.cdc.gov/drugoverdose/pdf/pubs/2018-cdc-drug-surveillance-report.pdf.

[3] Kaiser Family Foundation analysis of Substance Abuse and Mental Health Services Administration (SAMHSA)'s restricted online data analysis system (RDAS), National Survey on Drug Use and Health (NSDUH), 2015 and 2016, Substance Abuse and Mental Health Data Archive. Accessed 5/30/2019 from https://www.kff.org/other/state-indicator/past-year-opioid-use-disorder.

[4] American Dental Education Association (ADEA), 2019.

Dental schools' changes of curriculum on substance abuse (substance use disorder or addiction) in response to the opioid epidemic were associated with *lower* state rates of all opioid prescriptions (58.7 vs 68.7 per 100 persons; *P*=0.037), higher daily dosages of opioid prescriptions (9.9 vs 12.6 per 100 persons; *P*=0.046), and long-acting or extended-release opioid prescriptions (5.3 vs 6.5 per 100 persons; *P*=0.028) (Table 10). Similarly, dental schools' changes to curriculum about management of acute pain in response to the opioid epidemic were associated with *lower* state rates of higher daily dosage opioid prescriptions (9.8 vs 12.6 per 100 persons; *P*=0.034) and long-acting or extended-release opioid prescriptions (5.4 vs 6.4 per 100 persons; *P*=0.048).

Other associations between state exogenous factors and changes or development of subject areas related to the recognition and management of substance use disorders in predoctoral didactic curriculum and/or continuing dental education courses in response to the opioid epidemic did not reach statistical significance.

TABLE 10. Associations Between State Characteristics and Changes in Subject Areas Covered in the Predoctoral Didactic Curriculum in Response to the Opioid Epidemic

Changes in Subject Areas Covered in the Predoctoral Curriculum (n=30)[1]	State Characteristics		
	Rates of Opioid Prescriptions Dispensed per 100 Persons[2]		
	All Opioids	>=50 to <90 MME/day Daily Dosage	Long-Acting or Extended-Release
Substance abuse (substance abuse disorder, addiction)			
Yes	58.7	9.9	5.3
No	68.7	12.6	6.5
P-value	***0.037***	***0.046***	***0.028***
Management of acute pain			
Yes	61.6	9.8	5.4
No	62.4	12.6	6.4
P-value	*0.452*	***0.034***	***0.048***

Abbreviations: MME, morphine milligram equivalents.

Data Sources:

[1] American Dental Education Association (ADEA) Survey of Dental Schools, 2019.

[2] Centers for Disease Control and Prevention. 2018 Annual Surveillance Report of Drug-Related Risks and Outcomes — United States. Surveillance Special Report. Centers for Disease Control and Prevention, US Department of Health and Human Services. Published August 31, 2018. Accessed 5/30/2019 from https://www.cdc.gov/drugoverdose/pdf/pubs/2018-cdc-drug-surveillance-report.pdf.

DISCUSSION

This research described dental schools' efforts to implement changes in their predoctoral curriculum to address opioid prescribing, pain management, and recognition and treatment of substance use disorders; the research also explored exogenous factors that might be associated with curricular and clinical changes in predoctoral education programs. Such factors included state socioeconomic characteristics, state implementation of a PDMP, opioid prescription patterns and opioid related morbidity and mortality in states.

This study found that many dental schools that responded to the survey had addressed CODA requirement 2-24e, mandating dental student education in pain and anxiety control and the impact of prescribing practices and substance use disorders, by adopting curricular content in the predoctoral dental program (59.4%). Other responding dental schools that had not yet met the standard were in the process of implementing change to didactic instruction to address the requirement (28.1%). Dental schools had also changed (61.3%) or were in the process of changing (32.3%) clinical protocols in their dental clinics in response to the opioid epidemic.

The CODA mandate was a major driver of change according to responding schools; 73.1% citied it as a factor that influenced curricular change and 51.7% cited it as a factor driving clinical protocol change. It was apparent in the survey that several other factors were also considered when contemplating change including local, state, and federal regulatory policies, community demand or expectation of change, and available grant funds to effect change.

While state regulations or mandates (69.2%) were almost equally as important as CODA (73.1%) as a driver of curricula changes, governmental mandates appeared to be the major driver of clinical protocol changes in academic dental clinics; 72.4% of respondents cited state regulations/mandates as an influential factor in making clinical protocol changes while 51.7% cited the CODA mandate as influencing these change decisions. Clinical protocol changes limiting the number of doses, days, and refills were reported from 51.6% to 61.3% of programs making such changes. Regulatory policies including use of PDMPs would carry mandates requiring reporting of prescriptions, duration of treatment, and number of potential refills.

It was also interesting that the most commonly cited changes to clinical protocols were related to education and screening of patients. The high percentages of programs with changes to their clinical protocols that incorporated patient education relative to pain management (74.2%) and screening and risk assessment for substance use (67.7%) suggest that ethical responsibility inherent in the dentist/patient relationship was a concomitant driver of change. Patient education about

appropriate use of pharmacologic therapies would better ensure patient safety by limiting introduction to or further exposure to addictive medications.

Including didactic and clinical education on emerging public health problems such as opiate addiction and substance use disorders in curricula is essential for safe and effective practice of clinicians in the community. Respondents to the survey noted the topical areas in which change had occurred in the curriculum and also indicated whether these changes had been made in response to the opioid epidemic. More than three-quarters of programs that had incorporated instruction in safe prescribing practices indicated that those changes were made in response to the opioid crisis. More than 60% of schools changing curriculum in substance abuse, management of acute pain, and screening and risk assessment services indicated that change was initiated in response to the opioid epidemic. While all schools provided didactic instruction on the physiology of pain (100%) and 93.3% of schools provided didactic instruction on the impact of substance abuse on the oral cavity, only one-quarter of these dental schools indicated that these topics were changed in response to the opioid crisis. The actual drivers for inclusion of these subjects in curricula is not discernible from the data.

The topic area with the most limited uptake in dental schools was SBIRT, screening and risk assessment, with only one-half of schools indicating current inclusion of this subject matter in their curriculum. In a related finding, just 22.6% of survey respondents indicated clinical protocol changes that included patient referral to substance use disorder management programs. These topics are important areas for future inclusion in didactic education and clinical training since they provide a clinician with useful tools to directly address substance misuse with patients.

Professional education programs strive to provide a curriculum that is responsive to the needs of the community and the environment in which clinicians practice. Many of the dental education programs that responded to the survey recognized the need in their localities for continuing education (CE) for already practicing dentists on topics related to opioids. Several programs had developed CE in substance abuse disorders, management of pain, treatment of pain, and safe prescribing practices for dentists in their communities and many had done so in response to the opioid epidemic.

While survey respondents indicated that there were several discrete drivers of curricular and clinical protocol changes in their programs relative to substance use and pain management and treatment including the CODA requirement, study researchers examined exogenous factors that might further affect decisions on altering curriculum, such as high rates of opioid abuse in the states in which the dental schools were located or having a PDMP requirement. Eighty-seven percent of responding dental schools were located in a state with a PDMP. Our analysis found that dental schools in states with *lower* rates of long-acting or extended-release opioid prescriptions were significantly more likely

to indicate having a clinical protocol policy limiting the number of opioid doses prescribed compared to dental schools located in states with *higher* rates. Also, dental schools' implementation of clinical policies limiting the number of opioid refills and/or days of opioids prescribed was significantly associated with *lower* state rates of opioid prescriptions at higher daily dosages.

Dental schools located in states with a *higher* prevalence of people in poverty were also more likely to indicate implementation of curricular changes in response to the opioid epidemic than dental schools located in states with a *lower* prevalence of poverty. Dental schools located in states with *higher* rates of opioid overdose deaths were also more likely to indicate state specific regulations or mandates as factors that influenced their decisions to make curricular changes than dental schools located in states with *lower* rates.

It is apparent from the data that many factors contributed to the decision of dental education programs to include specific curriculum related to safe prescribing, recognition of substance misuse, and the related pathology. The most important finding from this survey is that the majority of dental schools are including practical material in their curricula to teach students about the importance of prescriptive authority and to equip future dentists to address substance use with patients. It was apparent from the data that educators were aware that exposure to these issues should be embedded in multiple subject areas in the predoctoral curriculum and in actual clinical practice.

STUDY LIMITATIONS

The current findings are subject to several potential study limitations. The results presented in this report are from an exploratory pilot study of a relatively small number of participating dental schools; therefore, the small sample size may preclude detecting differences of interest and may cause bias in the study estimates. Although a small sample size may be appropriate to gather information from key content experts, these findings may not be generalizable to all dental schools in the US.

In addition, the study's cross-sectional design precludes any causal inferences between dental school changes in their curricular and/or clinical protocols in response to the opioid epidemic and state-level factors evaluated in this research.

Despite these study weaknesses, the findings provide an overview of the current state of curricular content used by dental schools on the recognition and management of substance use disorders and provide important insights about changes made in response to the opioid epidemic and potential exogenous factors associated with these changes. Therefore, further research with larger samples is warranted.

CONCLUSIONS

Many dental schools have altered both predoctoral curriculum and clinical practice protocols in response to the opioid epidemic and others are in the process of making similar changes. Educating future dentists about appropriate prescribing habits, alternative pharmacologic treatments for pain, and education and screening of patients for substance use disorders is essential in order for them to be effective clinicians. Dentists are key contributors to public health efforts to reduce initial or continuing exposure for patients to prescription medications with addictive properties. Targeted education of dental professionals about opioids during formative professional education and also in continuing education should remain an objective of professional education programs.

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