

## Knowledge and Opinions Regarding the Interface between Oral and Overall Health among California Physicians, Dentists, Pharmacists and Advanced Practice Registered Nurse Practitioners

Paul Gavaza<sup>1</sup>, Wonha Kim<sup>2</sup>, Thomas Rogers<sup>3</sup>, Eileen Fry-Bowers<sup>4</sup>, and Rashid Mosavin<sup>1</sup>

<sup>1</sup> Loma Linda University School of Pharmacy

<sup>2</sup> Loma Linda University School of Medicine

<sup>3</sup> Loma Linda University School of Dentistry

<sup>4</sup> Loma Linda University School of Nursing

### Abstract

**Background and Purpose:** Oral health is often related to other medical conditions. This study investigated the knowledge and opinions of California physicians, dentists, pharmacists, and advanced practice registered nurses (APRNs) regarding the interface between oral and overall health and their suggestions for strengthening this interface. **Methods:** A survey packet was mailed to randomly-selected California healthcare providers in Winter 2015. Twenty five-point Likert-type questions were used to measure the providers' knowledge and opinions of the oral and overall health interface. **Results:** Sixty-two physicians, 117 dentists, 136 pharmacists, and 289 Advanced Practice Registered Nurses (APRNs) responded (total N= 604). A majority of all health professionals agreed/strongly agreed that oral health topics received little attention in the education of non-dental health professionals (n=499, 82.6%), and that the dental discipline remains relatively segregated from other healthcare disciplines (n=500, 82.8%). Dentists and APRNs were more likely to agree/agree strongly that the inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications is a major problem. **Conclusion:** There is a need for more inter-professional collaboration by all primary care providers in managing the patients' oral and overall health, as well as more oral health education and training for all non-dental health professionals.

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### Introduction

Many people suffer from oral diseases including periodontal (gum) disease, dental caries (tooth decay), and other serious oral health problems. Dental caries are the most prevalent chronic disease. In 2011 – 2012, “approximately 91% of U.S. adults aged 20–64 had dental caries in permanent teeth” (Dye, Thornton-Evans, Li, & Iafolla, 2015). It has been estimated that about 3.9 billion people worldwide are affected by oral conditions such as severe periodontitis, severe tooth loss and untreated caries (Marcenes et al., 2013).

Oral health and systemic health interact in complex and numerous ways. Periodontal diseases have been linked with many health

conditions including HIV/AIDS, diabetes mellitus, cardiovascular disease, cancer, osteoporosis, and Sjogren's syndrome among others (Borgnakke, Ylostalo, Taylor, & Genco, 2013; Engebretson & Kocher, 2013; Kuo, Polson, & Kang, 2008; Scannapieco, Bush, & Paju, 2003). Oral infections and periodontal diseases influence the risk to overall health. Conversely, many systemic conditions pose risks for periodontal disease or have oral symptoms (e.g., dry mouth and oral infection). Furthermore, many patients with chronic conditions take prescription and over-the-counter medications that can negatively affect the oral cavity. Dentists, physicians and other health care professionals serve many patients who have both periodontal and medical concerns (Allen, Ziada, O'Halloran, Clerehugh, & Allen,

2008; Jansson, Lindholm, Lindh, Groop, & Bratthall, 2006; Moore, Orchard, Guggenheimer, & Weyant, 2000) and may witness firsthand the linkages between systemic health and oral diseases (Otomo-Corgel & Merin, 2002).

In practice, however, many healthcare professionals and patients often fail to see the link between oral health and overall health. For example, some physicians or APRNs might not make the connection that some of the medications they prescribe have oral side effects that could affect the patient's oral health. When treating immunocompromised patients some physicians or APRNs may fail to inquire about dental caries that can potentially cause systemic infection. Additionally, general dentists rarely take an active role in managing patients with systemic conditions or coordinate care of such patients by communicating with physicians (Kunzel, Lalla, & Lamster, 2006). In the current health care system, general dentists and dental specialists rarely interact or communicate with medical practitioners (Al-Khabbaz, Al-Shammari, & Al-Saleh, 2010).

Optimal patient care can be best provided by collaborative efforts of all healthcare providers, including oral health providers (Migliorati & Madrid, 2007). Better collaboration between disciplines will improve the quality of patient care (Madrid, Bouferrache, & Moller, 2006). There have been calls to enhance the interaction of medical, nursing, pharmacy and dental professions in caring for patients. Dental providers are essential partners in the management of systemic conditions and diseases. In addition, healthcare providers can and should play an important role in improving their patients' oral health through integrating oral health into general health care. Better collaboration between healthcare professionals would facilitate early detection of diseases, which would then result in early referral of patients, leading to early diagnosis and more prompt management of emerging oral and medical conditions.

We recently conducted four separate studies investigating the opinions of California

pharmacists, dentists, physicians, and advanced practice registered nurse (APRN) practitioners (Fry-Bowers & Gavaza, 2016; Gavaza, Kim, & Mosavin, 2015; Gavaza, Mosavin, & Ta, 2015; Gavaza, Rogers, & Mosavin, 2017) on the interface between oral and overall health and their suggestions for strengthening this interface. This study provides a bigger picture by combining and comparing the results from these four separate studies, each of them considering only one specific group of professionals (e.g., dentists) studies. The specific objectives of the study are to determine and compare: a) the healthcare professionals' knowledge and perception of the interface between oral and overall health; and b) the healthcare professionals' recommendations for strengthening the oral and overall health interface. Although this study compared answers to questions by profession, hypothesis testing statistics (e.g., chi-square statistics) were not conducted because we were more interested in findings with practical significance, as opposed to statistical significance.

## Methods

### Participants

This study is based on data from four separate studies that each targeted at licensed physicians, dentists, pharmacists and APRNs practicing in California. All the four studies only included licensed professionals from each of these four disciplines. Potential participants consisted of a random sampling of healthcare professionals who were listed from four separate registries provided by the California Department of Consumer Affairs. For each discipline, we used simple random sampling to select 1,400 (1,100 presumed delivered) dentists, 1,400 (1,076 presumed delivered) pharmacists, 1,400 (1,000 presumed delivered) physicians and 1,400 (~1,350 presumed delivered). Several survey packets were returned or not delivered for various reasons.

### Measures

A total of 20 Likert-type questions were used to measure the healthcare professionals' opinions of various issues surrounding the interface between oral and overall health including their

recommendations for improving the oral-overall health interface. These items were all rated using a bipolar semantic differential scale anchored by strongly disagree (1) and strongly agree (5).

The studies also collected the following demographic and practice characteristics data: area/setting of primary place of employment (rural, suburban or urban), years of practice, gender (male or female), age (year of birth), racial/ethnic background, and hours worked per week.

A self-administered postage-paid anonymous paper survey was mailed to the randomly selected healthcare professionals' addresses to collect the data in Winter 2015. The healthcare professionals were all invited through a cover letter to complete the survey and then fold it with the business reply on the outside, secure it with tape and then mail it back to the researchers.

The survey took approximately 10-15 minutes to complete. As an incentive for participation, all healthcare professionals were informed through a cover letter that they would be entered into a drawing to win one of four iPad 2 tablets or one of 40 Amazon gift cards worth \$25.00 each. The study's research protocol was approved by the Loma Linda University Health Institutional Review Board (IRB).

### Data Analysis

Data were inputted into Microsoft Excel® 2010 and then uploaded to PASW statistics 22 (SPSS, Inc., Chicago, IL) for analysis. Responses to all the 20 Likert type items were collapsed into three categories: strongly agree/agree, neither agree nor disagree, and strongly disagree/disagree. Descriptive statistics such as means, standard deviations, frequencies, and percentages were computed for all study variables for each profession. This study compiled data from all four disciplines to get a bigger picture. We also compared the number and percentage of respondents who agreed/strongly agreed versus those who disagreed/strongly disagreed across the professional groups.

## Results

### Demographic Characteristics of Healthcare Professionals

A total of 604 responses were received from 62 physicians, 117 dentists, 136 pharmacists, and 289 APRNs. Most healthcare providers were female (n = 395; 66.6%) and practiced in the urban setting (n = 296; 50.7%). The majority of healthcare professionals were Caucasian/non-Hispanic white (n=350, 60.3%) (Table 1). The average ages of healthcare professionals ranged from 50±14.6 years for pharmacists to 55.3 ±55.6 years for APRNs (Table 1).

**Table 1.**

Practice and Demographic Characteristics of Healthcare Professionals (n = 604)	
Items	n (%)
Gender	
Male	198 (33.4)
Female	395 (66.6)
Professions	
Physician (M.D.)	62 (10.3)
Dentist (D.D.S.)	117 (19.4)
Pharmacist	136 (22.5)
Advanced Practice Registered Nurse (A.P.R.N.)	289 (47.8)
Area/setting of primary place of employment	
Urban	296 (50.7)
Suburban	232 (39.7)
Rural	56 (9.6)
Race/Ethnicity	
African American/non- Hispanic black	19 (3.3)
Asian American/Pacific Islander	140 (24.1)
Caucasian/non-Hispanic white	350 (60.3)
Mexican American/Hispanic	38 (6.6)
Other	33 (5.7)
	Mean (SD)
Average Age	
Physician (M.D.)	55.3 (17.4)
Dentist (D.D.S.)	53 (13.9)
Pharmacist	50 (14.6)
Advanced Practice Registered Nurse (A.P.R.N.)	55.3 (55.6)
Average number of years in healthcare	
Physician (M.D.)	23.0 (15.5)
Dentist (D.D.S.)	24.7 (13.2)
Pharmacist	21.9 (15.3)
A.P.R.N.	14.7 (10.9)
Hours of work per week at primary place of employment	
Physician (M.D.)	45.7 (21.1)
Dentist (D.D.S.)	32.85 (8.7)
Pharmacist	36.8 (13.6)
A.P.R.N.	31.9 (13.1)

### Opinions about Oral Health and Overall Health

A majority of physicians (n=50, 80.6%), dentists (n=101, 87.1%), pharmacists (n=117, 86.7%), and APRNs (n=231, 80.2%) agreed/strongly agreed that oral health topics received little attention in the education of non-dental health professionals (Table 2). Physicians (n=49, 79.1%), dentists (n=99, 85.3%), pharmacists (n=106, 78.5%), and APRNs (n=246, 85.1%) agreed/strongly agreed that the dental discipline remains relatively segregated from other healthcare disciplines (Table 2) and that “this segregation has grown over time”.

A majority of physicians (86.9%), dentists (98.3%), pharmacists (91.9%), and APRNs (98.7%) believed that oral health should be closely regarded as an important component of overall medical care. Most physicians (n=47, 77.0%), dentists (n=115, 98.3%), pharmacists (n=121, 89.6%), and APRNs (n=278, 96.5%) agreed/strongly agreed to the need for more inter-professional care between providers in managing oral and overall health concerns of patients (Table 2).

**Table 2.**

Items	Healthcare Professionals’ Opinion about Oral Health and Overall Health							
	Physicians		Dentist		Pharmacists		APRNs	
	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)
1. Dental caries and periodontal diseases are generally thought of as infections by pharmacists.	25 (40.4)	18 (29.0)	36 (31.1)	44 (38.0)	65 (48.5)	47 (35.1)	124 (42.9)	103 (35.6)
2. Little time is devoted to oral health topics in the education of non-dental health professionals.	50 (80.6)	7 (11.3)	101 (87.1)	1 (0.9)	117 (86.7)	4 (2.9)	231 (80.2)	28 (9.7)
3. The dental discipline remains relatively segregated from other healthcare disciplines.	49 (79.1)	3 (4.8)	99 (85.3)	7 (6.1)	106 (78.5)	8 (5.9)	246 (85.1)	21 (7.2)
4. The separation of dental and other primary healthcare disciplines has grown over time.	25 (40.4)	8 (12.9)	48 (41.3)	26 (22.5)	53 (39.3)	24 (17.8)	109 (37.8)	60 (20.8)
5. Many medications are prescribed by physicians without consideration of their oral health ramifications.	38 (61.3)	8 (12.9)	93 (79.5)	7 (6.0)	88 (64.7)	11 (8.1)	216 (74.7)	27 (9.3)
6. Patients taking medications that can have xerostomic effects are adequately informed about the importance of maintaining oral health while taking the medications.	3 (4.8)	36 (58.1)	29 (24.8)	72 (61.5)	16 (11.7)	85 (62.5)	42 (14.6)	187 (64.9)
7. The inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications is a major problem.	29 (46.8)	10 (16.1)	95 (81.2)	5 (4.3)	66 (48.5)	13 (9.5)	181 (62.8)	16 (5.6)
8. Oral health should be more closely regarded as an important component of medical care.	53 (86.9)	3 (4.9)	115 (98.3)	1 (0.9)	124 (91.9)	2 (1.5)	284 (98.7)	4 (1.3)
9. Medicare should cover medically essential dental care/services.	53 (85.5)	3 (4.8)	93 (79.5)	7 (6.0)	126 (92.6)	3 (2.2)	280 (97.3)	2 (0.6)
10. There is a need for more inter-professional care by primary care providers in managing oral and overall health concerns of patients.	47 (77.0)	-	115 (98.3)	-	121 (89.6)	1 (0.7)	278 (96.5)	3 (1.0)

Notes. A or SA= “Agree” or “Strongly Agree” responses to the given question. D or SD= “Disagree” or “Strongly Disagree” responses to the given question.

Most physicians (n=58, 93.6%), dentists (n=116, 99.1%), and APRNs (n=255, 88.5%) indicated that they regarded oral health as an important component of overall medical care (Table 3). However, most physicians (71%), pharmacists

(70.4%), and APRNs (76%) agreed/strongly agreed that oral health is often regarded as less important than other health needs of patients (Table 3).

**Table 3.**

Healthcare Professionals' Opinion about Oral Health and Overall Health (continued)

	Physicians (n= 62)		Dentists (n=117)		Pharmacists (n=136)		APRN Practitioners (n=289)	
	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)	A or SA (%)	D or SD (%)
11. I always warn patients that their oral health can be compromised by certain medications.	21 (33.9)	25 (40.4)	-	-	61 (45.8)	37 (27.9)	138 (47.9)	84 (29.1)
12. I generally regard oral health as an important component of overall medical care.	58 (93.6)	2 (3.2)	116 (99.1)	1 (0.9)	-	-	255 (88.5)	7 (2.4)
13. Oral health is often regarded as less important than other health needs of patients.	44 (71.0)	10 (16.1)	-	-	95 (70.4)	23 (17.0)	219 (76.0)	48 (16.7)
14. Many primary care providers are aware of the relationship between oral health and the treatment/management of many non-oral diseases.	36 (58.1)	10 (16.1)	34 (29.8)	47 (40.9)	55 (40.7)	36 (26.7)	-	-
15. Dentists rarely consider the medical ramifications of the oral healthcare they provide.	13 (21.0)	25 (40.3)	-	-	29 (21.5)	71 (52.6)	52 (18.2)	141 (49.3)
16. Physicians prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquire about a patient's dental status.	25 (40.3)	7 (11.3)	91 (79.2)	7 (6.1)	59 (43.4)	28 (20.5)	-	-
17. Physicians prescribing immune suppressive and cytotoxic pharmaceuticals rarely advise patients about the importance of maintaining dental health while taking the medications.	21 (34.4)	7 (11.5)	78 (67.8)	12 (10.5)	59 (43.4)	25 (18.4)	-	-
18. Pharmacists are a great source for counseling patients on medications with oral health untoward effects.	31 (50.0)	10 (16.1)	72 (62.1)	20 (17.2)	113 (83.1)	7 (5.1)	-	-
19. Dentistry should be identified as a medical sub-specialty.	24 (38.7)	23 (37.1)	76 (65.0)	14 (11.9)	-	-	212 (73.9)	15 (5.2)
20. There is a need for improved integration of dentistry with other primary health care services.	50 (80.6)	2 (3.2)	110 (94.1)	1 (0.9)	-	-	273 (94.7)	3 (1.0)

Notes. A or SA= "Agree" or "Strongly Agree" responses to the given question. D or SD= "Disagree" or "Strongly Disagree" responses to the given question.

Most physicians (n=31, 50.0%), dentists (n=72, 62.1%), and pharmacists (n=113, 83.1%) believed that pharmacists are a great source for counseling patients on medications with oral health side effects. A majority of physicians, dentists, APRNs and pharmacists agreed that patients taking medications that can have xerostomic effects are inadequately informed

about the importance of maintaining oral health while taking the medications (Table 2). An overwhelming majority of healthcare professionals agreed that Medicare should cover medically essential dental care/services (Table 2).

Almost twice as many dentists (n=91, 79.2%) believed that physicians prescribing

immunosuppressive and cytotoxic pharmaceuticals infrequently inquired about a patient's dental status as compared to physicians (n=25, 40.3%) pharmacists (n=59, 43.4%), and APRNs (Table 3). Almost twice as many dentists compared to physicians felt that inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications was a major problem (Table 2)

### Discussion

The study findings show that most healthcare professionals regard oral health as an important component of overall medical care, suggesting that these professionals understand the connection between oral diseases and systemic conditions. They theoretically recognize their role in promoting oral health. Similar findings have been reported in the literature among dentists (Al-Khabbaz et al., 2010; Greenberg, Glick, Frantsve-Hawley, & Kantor, 2010), physicians (Deinard & Johnson, 2009; Lewis et al., 2009; Ramirez, Arce, & Contreras, 2010; Silk, 2010), and nurses/APRNs. This heightened appreciation can be explained by several high profile reports that highlighted the issue including *Oral Health in America: A report of the Surgeon General* in 2000 (U.S. Department of Health and Human Services, 2000) and the Institute of Medicine's *Dental education at the crossroads: challenges and change* which recommended the close integration of dentistry with medicine (Committee on the Future of Dental Education, 1995).

In practice, however, the integration does not happen easily. Most healthcare professionals believed that the dental discipline remains relatively segregated from other healthcare disciplines and many believed that the separation has grown over time. These findings suggest that oral health issues are not a top priority for healthcare professionals in their practice. These findings confirm those of previous studies among general dentists (Abdelghany, Nolan, & Freeman, 2011; Kunzel, Lalla, Albert, Yin, & Lamster, 2005; Mealey, Oates, & American Academy of Periodontology, 2006). Several manifestations of the separation

in clinical practice as noted by healthcare professionals in this study are as follows:

- Medications that can have xerostomic effects are prescribed without considering their oral health implications.
- Many medications are prescribed by physicians or APRNs without consideration of their oral health ramifications.
- Physicians or APRNs prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquire about the patient's oral status.
- Physicians or APRNs prescribing immunosuppressive and cytotoxic pharmaceuticals rarely advise patients about the importance of maintaining dental health while taking the medications.
- Patients taking medications that can have xerostomic effects are inadequately informed about the importance of maintaining oral health while taking the medications.

These findings collectively indicate the pervasiveness of missed opportunities to provide more comprehensive care. Limited formal training, lack of time, lack of knowledge, lack of re-imburement for some services, lack of confidence and negative beliefs and attitudes have been reported as barriers to translating scientific knowledge on the connection between general and oral health into clinical practice by the healthcare professionals in the literature (Esmeili, Ellison, & Walsh, 2010; Johnson, Glick, & Mbuguye, 2006).

Concerted efforts are needed to bridge oral and overall healthcare. First, this can be achieved through increased education and awareness on the oral-systemic link among all healthcare providers during graduate medical training as well as continued medical/dental education (Al-Khabbaz et al., 2010). Dental, medical, pharmacy and nursing schools should increase their integration of total health into their curriculum. The need to enhance healthcare professionals' knowledge about the bidirectional relationship between oral health and systemic conditions/diseases (e.g., diabetes) was raised by

the International Dental Federation (The International Dental Federation, 2007). This is in line with the American Association of Medical Colleges' recommendation that medical schools should increase oral health education (American Association of Medical Colleges, 2008). It has been suggested that dental, nursing and medical students should be trained in an integrated fashion, facilitating interdisciplinary collaboration and communication (Spielman, Fulmer, Eisenberg, & Alfano, 2005). Continuing nursing, medical, pharmacy and dental education in this area is available and many physicians are interested in oral health continuing medical education (Lewis et al., 2009; Prakash et al., 2006).

Secondly, most of physicians, dentists, pharmacists and APRNs in the present study believed that there is need for more inter-professional collaboration by all primary care providers when caring for patients. Furthermore, most of physicians, dentists and APRNs in this study also believed that "there is a need for improved integration of dentistry with other primary healthcare services" (range: 80.6% to 94.7% agreed/strongly agreed). These findings suggest that these healthcare professionals appreciate the need for collaboration among all primary care providers as reported elsewhere (Raybould, Wrightson, Massey, Smith, & Skelton, 2009). All primary care providers should work collaboratively in managing oral and general health concerns of their patients (Cullinan & Seymour, 2013, p. 280; U.S. Department of Health and Human Services, 2000). The best possible health care and true whole-person care can be provided by physicians, dentists, APRNs and pharmacists, if they collaborate (Cullinan & Seymour, 2013, p. 280; Haughney, Devennie, Macpherson, & Mason, 1998).

There was support for the role of pharmacists among the healthcare professionals as well. A large number of physicians, dentists and APRNs believed that "Pharmacists are a great resource to my patients for advice on drugs with oral health untoward effects" (range: 50.0% to 83.1%). It is noteworthy that pharmacists were more likely to agree with this statement (83.1%)

than physicians (50.0%). Pharmacists are easily accessible by the general public and should play a critical role in helping patients understand the link between oral and systemic health.

It is noteworthy that the healthcare professionals' opinions were fairly similar across disciplines on many of the items that were investigated. However, there were differences in the healthcare professionals' opinions across disciplines on a few items. For example, a higher proportion of dentists believed that physicians prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquired about a patient's dental status compared to physicians, pharmacists, and APRNs. In addition, more dentists compared to physicians felt that inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications was a major problem. These differences suggest that the California health care professionals are not a homogenous group and interventions to improve their practice on this subject should be discipline specific and take into consideration each discipline's unique characteristics and practice environment.

The generalizability of the study's findings is limited by the small sample sizes obtained for each of the professional groups. Owing to budgetary constraints, no second mailing or reminders were sent to healthcare professionals to boost the responses. It is possible that those who did not respond to this study had different opinions to those who did, making non-response bias a concern.

### **Conclusion**

Most healthcare professionals believed that there was a division between dentistry and other healthcare disciplines in practice. Healthcare professionals highlighted the need for more inter-professional collaboration by all primary care providers in managing the patients' oral and overall health as well as more oral health education and training for all non-dental health professionals. A strong majority also believed that Medicare should cover medically essential dental care/services.

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Author Information

Paul Gavaza, PhD  
Loma Linda University School of Pharmacy  
Shryock Hall # 226, 24745 Stewart Street  
Loma Linda, CA 92399  
E-mail: pgavaza@llu.edu.  
Fax: 909-558-7927

\* corresponding author