Recommendations for Third Molar Removal: A Practice-Based Cohort Study

Joana Cunha-Cruz, DDS, PhD, MPH, Marilynn Rothen, RDH, MS, Charles Spiekerman, PhD, Mark Drangsholt, DDS, PhD, Lyle McClellan, DDS, and Greg J. Huang, DMD, MSD, MPH, for the Northwest Practice-Based Research Collaborative in Evidence-Based Dentistry

Objectives. We investigated general dentists' reasons for recommending removal or retention of third molars and whether patients adhered to dentists' recommendations.

Methods. In a 2-year prospective cohort study (2009–2011) in the Pacific Northwest, we followed 801 patients aged 16 to 22 years from 50 general dental practices. Generalized estimating equations logistic regressions related patient and dentist characteristics to dentists' recommendations to remove third molars and to patient adherence.

Results. General dentists recommended removal of 1683 third molars from 469 (59%) participants, mainly to prevent future problems (79%) or because a third molar had an unfavorable orientation or was unlikely to erupt (57%). Dentists recommended retention and monitoring of 1244 third molars from 366 (46%) participants, because it was too early to decide (73%), eruption path was favorable (39%), or space for eruption was sufficient (26%). When dentists recommended removal, 55% of participants adhered to this recommendation during follow-up, and the main reason was availability of insurance (88%).

Conclusions. General dentists frequently recommended removal of third molars for reasons not related to symptoms or pathology, but rather to prevent future problems. (*Am J Public Health.* 2014;104:735–743. doi:10.2105/AJPH.2013.301652)

Removal of third molars, known as wisdom teeth, is one of the most common dental surgical procedures in the United States, representing 95% of all extractions among persons with insurance aged 16 to 21 years.[1] It has been estimated that 10 million wisdom teeth are removed from 5 million individuals in the United States each year, at a cost of more than $3 billion.[2] Dentists recommend early prophylactic removal of asymptomatic third molars to prevent risk of future pathology and to minimize operative and postoperative risks.[3–6] However, most third molars will erupt without symptoms.[7,8] In addition, third molar removal is associated with morbidity, such as pain, swelling, bleeding, infection, and paresthesia; the overall rate of complications varies from 4.6%[9] to 21%.[4] Thus, recommendations to retain and monitor asymptomatic third molars may be considered an appropriate strategy.[10–13]

Several studies have explored the reasons or indications for third molar removal, mainly among patients presenting to oral surgery offices.[3,4,14,15] These studies do not provide information from patients referred for third molar removal but not presenting to oral surgery offices, or the actual indication given by the referring dentist. Recommendations from general dentists and oral surgeons differ, with surgeons recommending significantly more third molar removal.[16,17] Although studies have investigated reasons for third molar removal at the time of surgery, little is known about factors that general dentists consider when making referral decisions.

Another interesting aspect of third molar management is patient adherence to recommendations. Although many patients are referred for third molar removal by their general dentist or orthodontist, studies usually only focus on patients who present to oral surgery offices.[15,18] Thus, these samples may self-select for various reasons. Patient referral patterns and adherence to recommendations for third molar removal in general dental offices are not well known.[19,20] Adolescent patients and their parents may or may not follow their dentist's recommendation to retain or remove third molars.

We enrolled patients aged 16 to 22 years with both symptomatic and asymptomatic third molars from the practices of general dentists to examine the decision-making process regarding management of third molars employed by general dentists and patients. Our main objectives were to investigate (1) the reasons given by general dentists for third molar removal or retention, (2) patient adherence to recommendations for third molar removal during follow-up, and (3) factors associated with these decisions, such as current symptoms, socioeconomic factors, and patient preferences. A companion article in this issue reports on the clinical outcomes of third molar retention and removal after the initial 2-year period.[21]

METHODS

As part of the Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry (PRECEDENT), a dental practice–based research network, we conducted a prospective cohort study. From May 2009 through September 2010, 50 general dentists enrolled participants from our practices and followed them for up to 2.6 years, with patient self-reported assessments every 8 months and a clinical examination at study end. We derived a target enrollment of 750 patients from sample size calculations. Our report of our findings conforms to the STROBE statement.[22]

Dentists and practice staff identified eligible participants during their dental office visits. We invited all patients aged 16 to 22 years and able to speak and read English who had at least 1 third molar present and had never had any third molars removed to participate in the study. Radiographs of the third molars taken in the past 12 months had to be available or indicated

to be taken at the time of the dental visit. We informed patients that the study purpose was to learn more about the management of third molars and that they would be contacted every 8 months for the next 2 years via e-mail to ask about the status of their third molars. Patient incentives were a gift certificate and lottery drawing for an MP3 player (iPod shuffle) for each 8-month follow-up survey completed.

Data Collection

We collected baseline data through a questionnaire in English completed by the participants and a dental examination performed by the dentist collaborative members, who were blinded to the patients' responses on the questionnaire. Dental team staff entered data into an online data entry system. The questionnaire inquired about demographics and oral conditions, including the presence of pain or discomfort from third molars, signs and symptoms of temporomandibular muscle and joint disorders, and paresthesia of tongue and lower lips.

The dental examination consisted of clinical and radiographic assessments and included information on angulation and eruption status of third molars. Dentists used an eruption guide to assist with qualifying the eruption status and a specially designed gauge that measured third molar angulation in radiographs to the nearest 10 degrees. As part of the clinical examination, we also assessed dental caries (tooth decay), pericoronitis (infection of tissue surrounding the third molar), clinical attachment loss (destruction of the periodontal ligament that attaches the tooth to the alveolar bone), temporomandibular signs and symptoms, and paresthesia of lip and tongue. We recorded the general dentists' recommendations, which were based on the clinical and radiographic examinations, to retain or remove each of the patient's third molars. We also indicated the general dentist's primary and secondary reasons for recommendations to remove or to retain. In addition, during initial study enrollment, dentists reported demographic and professional variables: gender, time in practice, practice setting, and philosophy toward third molar management. Response options for the philosophy question were (1) usually recommend prophylactic removal for most third molars, (2) recommend third molar removal if the eruption path is poor or space will be insufficient, or (3) only recommend removal if symptoms or pathology associated with third molars is detected.

During follow-up, we contacted participants via e-mail to answer short online surveys at 8-month intervals for up to 2 years. We asked participants whether they had had a third molar removed. If they had had a third molar extracted, we asked about their primary and secondary reasons for removal. If they had not had a third molar extracted, we obtained information on primary and secondary reasons for retaining the third molars.

At study end, we invited patients enrolled for 24 months as of December 31, 2011, (n = 400) to return to their dentist for a clinical and radiographic examination. At this clinical visit, we asked participants to complete a written 24-month questionnaire if they had not yet completed the Web version. Results of clinical outcomes of third molar removal or retention, including information from the follow-up patient questionnaire and this final visit, are reported in the companion article.[21]

Statistical Analysis

Our main outcomes were a dentist's recommendation to remove at least 1 third molar and patient adherence to this recommendation. We considered a patient's adherence to a dentist's recommendation to remove third molars positive when the dentist recommended third molar removal and the patient had at least 1 third molar extracted during follow-up. Our secondary outcome was patient adherence to a dentist's recommendation to retain or monitor all third molars. Dentist and patient characteristics are presented in Table 1.

We estimated odds ratios with generalized estimating equations multiple logistic regressions to relate the 2 primary outcomes to dentist and patient characteristics, with adjustment for additional patient and dentist characteristics. We used generalized estimating equations to take into account the clustering of participants within practices.[23] We performed analyses at the patient level, not the tooth level, because the vast majority of participants who received removal recommendations had all existing third molars recommended for removal (92%), and those who underwent third molar removal extracted all existing third molars (88%). We performed all analyses with SPSS Statistics for Windows, version 19.0.0 (IBM Corp, Armonk, NY).

RESULTS

Of 801 participants enrolled at baseline, we obtained dentists' third molar recommendations for 797, of whom 516 (65%) completed at least 1 follow-up questionnaire (see Figure 1 in the companion article[21]). Among participants who received a recommendation to remove at least 1 third molar, 57% had at least 1 third molar with angulation greater than 35 degrees, 78% had partial or full bony impaction, 15% had soft tissue impaction, and 8% had partially or fully erupted third molars. Among participants who received a recommendation to retain or monitor all existing third molars, 37% had at least 1 third molar with angulation greater than 35 degrees, 71% had partial or full bony impaction, 13% had soft tissue impaction, and 16% had partially or fully erupted third molars (Table A, available as a supplement to the online version of this article at http://www.ajph.org). Among the 50 general dentists conducting the study, 90% were male, 70% practiced solo, 50% had more than 20 years of practice, 50% practiced in a suburban setting, and 30% practiced in a rural practice setting (data not shown). General dentists reported that their philosophy on third molar management was to recommend removal of third molars (1) in most cases, for preventive reasons (22%); (2) if they were asymptomatic but had poor eruption path or insufficient space (72%); or (3) only if pathology or symptoms were present (6%).

Dentist Recommendations

Dentists recommended the removal of 1683 third molars from 469 (59%) participants (38 participants received both recommendations, to retain some third molars and to remove others). Main reasons for recommending removal were to prevent future problems (79%) and unfavorable third molar orientation or third molar unlikely to erupt in the dentist's opinion (57%). The least common reasons for recommending third molar removal were pericoronitis (4%), periodontal concerns (4%), dental caries (4%), other pathologies (1%),

TABLE 1—Associations Between Dentist Recommendation to Remove Third Molars and Patient Demographic and Clinical Characteristics and Dental Practice Characteristics: Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry, Pacific Northwest, 2009–2011

Characteristic	Total No.	Recommendation to Remove ≥ 1 Third Molar[a] %	AOR (95% CI)
Gender			
Female	392	59	1.0 (Ref)
Male	405	59	1.1 (0.8, 1.7)
Age,[b] y			
16	192	54	1.0 (Ref)
17	182	59	1.3 (0.9, 1.9)
18	166	66	1.1 (0.6, 1.8)
19	97	57	0.6 (0.3, 1.2)
20	71	56	0.9 (0.4, 2.2)
> 20	89	61	1.0 (0.4, 2.6)
Race			
White	718	59	1.0 (Ref)
Other	65	62	1.3 (0.7, 2.7)
Dental insurance			
Medicaid	88	53	1.0 (Ref)
None	82	62	1.5 (0.6, 3.6)
Private	626	59	1.4 (0.7, 3.1)
School attendance			
Not in school	114	68	1.0 (Ref)
Part-time college	42	55	0.7 (0.3, 1.7)
High school	421	57	0.5 (0.3, 0.9)
Full-time college	218	58	0.8 (0.5, 1.6)
Employed			
No	622	57	1.0 (Ref)
Yes	173	64	0.9 (0.6, 1.4)
Dental cleanings/y			
≥ 2	521	56	1.0 (Ref)
1	182	60	1.8 (1.1, 2.9)
< 1	93	69	1.8 (0.9, 3.6)
Orthodontic treatment ever			
No	354	57	1.0 (Ref)
Yes	442	60	1.1 (0.8, 1.7)
Eruption status (worst in patient)[b,c]			
Fully erupted	41	10	1.0 (Ref)
Partially erupted	47	66	14.6 (4.0, 53.0)
Soft tissue impaction	114	63	18.2 (5.4, 61.0)
Partial bony impaction	294	65	21.1 (6.1, 73.1)
Complete bony impaction	301	57	13.0 (3.3, 51.3)
Angulation (highest in patient)[b,c]			
≤ 35 degrees	409	49	1.0 (Ref)
> 35 degrees	388	69	2.6 (1.9, 3.6)

Continued

and availability of insurance coverage (2%; Figure 1).

Dentists recommended retention and monitoring of 1244 third molars in 366 (46%) participants. The main reason for recommending retention was that it was too early to decide (73%), followed by favorable eruption path (39%), sufficient space for eruption (26%), and fully erupted third molars (16%; Figure 2).

Participants with soft tissue, partial bony, or complete bony impaction were more likely to receive a recommendation to remove at least 1 third molar than were participants with a fully erupted third molar. Participants were also more likely than their counterparts to receive a removal recommendation if the third molar angulation was greater than 35 degrees, if they had pain or discomfort on or around the third molars, and if they had dental caries on second or third molars (Table 1). Participants whose dentist reported recommending third molar removal only if pathology or symptoms were present were less likely than participants whose dentist reported other philosophies to have a third molar removal recommendation (Table 1). These factors remained statistically significant in the multiple logistic regression model that incorporated additional patient and dentist characteristics. Participants whose dental cleaning frequency was yearly or less, rather than twice a year or more, and patients in a suburban rather than urban dental practice had increased odds of receiving a recommendation for removal in the final model (Table 1).

Follow-Up

Of 797 participants considered in this study, 35% were lost to follow-up (see Figure 1 in the companion article[21]). We followed up participants for an average of 19.7 months (SD = 5.3 months). Participants who returned at least 1 survey (n = 516) were more likely than patients lost to follow-up (n = 281) to have private insurance, to have had orthodontic treatment, to visit a dentist in solo practice, and to have dental cleanings once per year or more. They were less likely to have Medicaid insurance. We found no differences in third molar angulation, eruption status, or clinical conditions.

Of 516 participants with follow-up data, 200 (39%) had 720 third molars extracted, and their main reasons for removal were availability of dental insurance (88%), tooth not likely to

TABLE 1—*Continued*

Pain or discomfort around third molars[b,c]			
No	678	56	1.0 (Ref)
Yes	118	75	2.4 (1.0, 5.4)
Caries in second or third molars[b,c]			
No	736	57	1.0 (Ref)
Yes	61	77	4.0 (2.1, 7.5)
TMD signs/symptoms			
None	513	60	1.0 (Ref)
Jaw popping/clicking but no pain	117	53	0.9 (0.5, 1.6)
Pain on opening or in temples, jaw joint, or jaw muscles	166	60	0.9 (0.6, 1.3)
Dentist philosophy on asymptomatic third molar management[b,c]			
Recommend removal of most third molars for prevention	117	61	1.0 (Ref)
Recommend removal if asymptomatic but poor eruption path or insufficient space	647	61	1.6 (0.5, 5.7)
Recommend removal only if symptoms or pathology detected	33	6	0.0 (0.0, 0.2)
Dentist gender			
Male	728	60	1.0 (Ref)
Female	69	46	0.6 (0.1, 3.6)
Dental practice size			
> 1 dentist	224	58	1.0 (Ref)
Solo	573	59	0.8 (0.3, 2.0)
Dentist experience, y			
≤ 20	340	57	1.0 (Ref)
> 20	457	60	1.0 (0.5, 2.3)
Dental practice patients/d			
≤ 40	99	65	1.0 (Ref)
41–60	698	58	0.8 (0.3, 2.3)
Practice setting[b]			
Urban	143	49	1.0 (Ref)
Suburban	349	68	4.2 (1.2, 14.2)
Rural	305	53	1.5 (0.5, 4.5)

Note. AOR = adjusted odds ratio; CI = confidence interval; GEE = generalized estimating equation; TMD = temporomandibular muscle disorder. The sample size was n = 797.
[a]Of participants with a removal recommendation, 92% received a recommendation to remove all existing molars.
[b]Significant at $P < .05$ in GEE logistic regression with adjustment for all other covariates in table.
[c]Significant at $P < .05$ in bivariate GEE logistic regression.

erupt (78%), and dentist's recommendation (21%). Less common reasons for removal were prevention of future problems (11%), existing disease (7%), pain (0.5%), and other reasons (5.5%; Figure 2).

Of the participants with follow-up data, 396 reported retaining third molars in at least 1 follow-up, and their main reasons for not undergoing extraction were dentist's recommendation (82%), unable to schedule time off (49%), concerns about risks of surgery (20%), and previous pain no longer present (17%). Less common reasons for retaining third molars were lack of symptoms ("they have not bothered me"; 8%), cost of the removal ("too expensive"; 7%), lack of insurance coverage (7%), and other reasons (21%; Figure 2).

Patient Adherence

Among 300 participants with follow-up data whose dentist recommended removal of at least 1 third molar, 55% adhered to this recommendation during follow-up. Participants who had had orthodontic treatment, had had pain from temporomandibular muscle and joint disorders, and attended a solo practice were more likely than their counterparts to comply with a dentist's recommendation to remove third molars (Table 2). In the multiple logistic regression, soft tissue impaction, orthodontic treatment, solo practice, and rural or suburban practices were associated with higher odds of removal adherence (Table 2). Among the reasons for the dentist to recommend removal, the presence of pericoronitis (adjusted odds ratio [AOR] = 4.6; 95% confidence interval [CI] = 1.8, 11.8) and periodontal concerns (AOR = 0.4; 95% CI = 0.2, 0.8) were associated with higher and lower odds of patient adherence, respectively (data not shown).

Among the 216 participants with follow-up data whose dentist recommended retention or monitoring of third molars, 84% adhered to the recommendation to retain the third molars and 16% extracted at least 1 third molar during follow-up. Female gender of the dentist was the only factor associated with patients' adherence to recommendations to retain third molars. Among dentists' reasons for recommending retention, the belief that it was too early to decide was associated with lower patient adherence (data not shown).

DISCUSSION

More than half of participants received a recommendation from their general dentist to remove their third molars. The great majority of teeth recommended for removal were asymptomatic.

In the presence of pain, discomfort, or dental caries, patients were more likely to receive a recommendation to remove the third molar, and if removal had been recommended because of pericoronitis, they were also more likely to comply with the removal recommendation. However, pathologies were not a common reason for recommendation to remove or for complying with such a recommendation. Only 1 in 6 patients received a recommendation to remove third molars because of the presence of pericoronitis or dental caries, and half of them reported pain or existing pathology as a reason for complying with the recommendation. Many patients reported that they did not comply with dentists' recommendation to remove the third molar because the pain was no longer present. Thus, presence

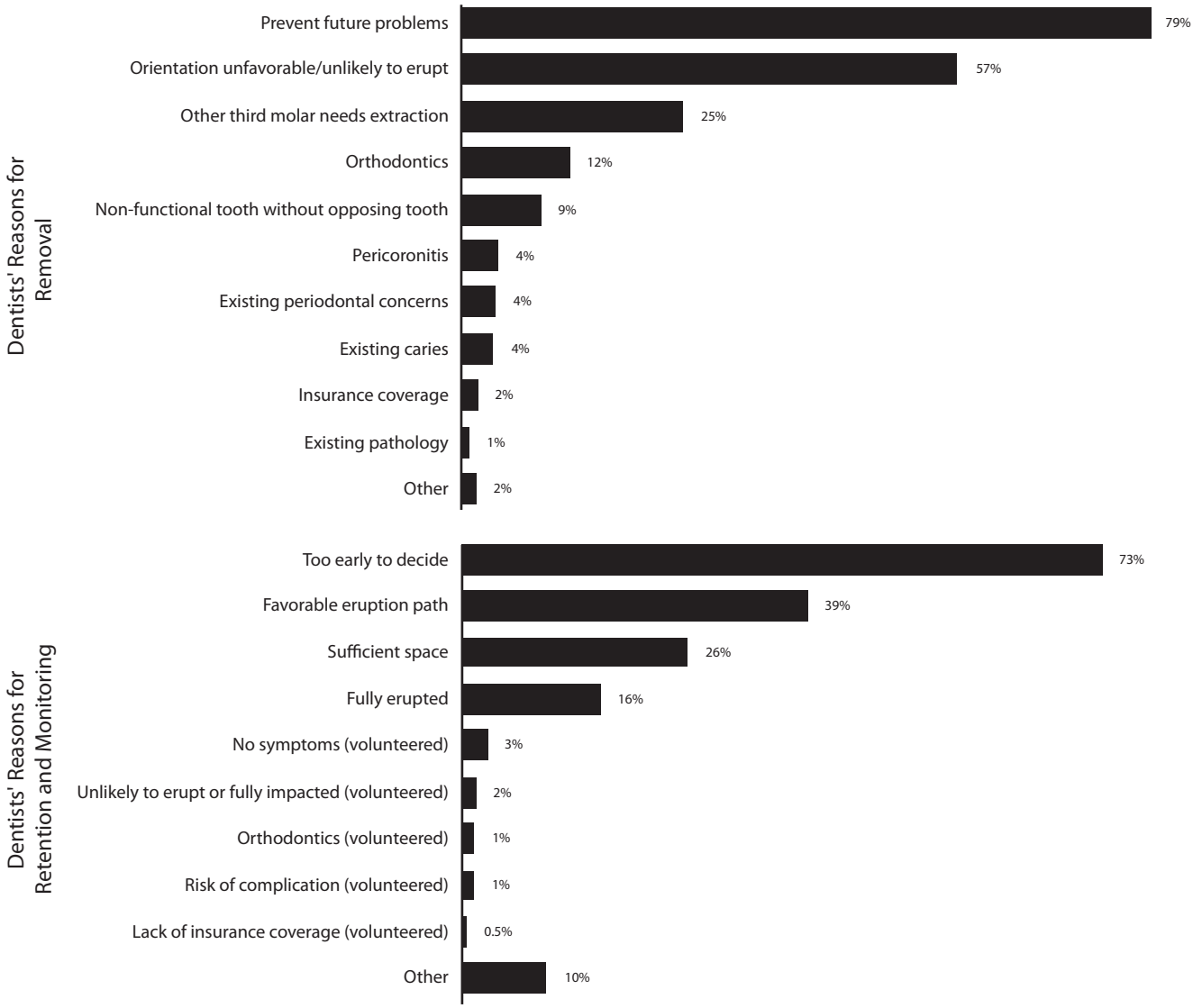

FIGURE 1—Reasons given by general dentists for recommending removal (n = 1683) or retention and monitoring (n = 1244) of third molars: Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry, Pacific Northwest, 2009–2011

of symptoms is associated with removal and adherence, but is not the main reason for either. Our findings are corroborated by other studies in the United States, which found that pericoronitis, cysts, dental caries, or pain was cited by fewer than 15% of participants seeking third molar removal.[3]

In contrast with studies in other countries, where symptoms such as pericoronitis and dental caries were the main reasons for recommending removal,[14,15,18,24–29] the vast majority of third molars recommended for removal in our study were asymptomatic. General dentists recommended removal mostly to prevent future problems. A recent systematic review by the Cochrane Collaboration indicated that no randomized controlled study supports or refutes routine removal of asymptomatic third molars.[30]

Other important reasons to recommend removal were the general dentists' judgment that a tooth had an unfavorable orientation or was unlikely to erupt; these were also common removal reasons listed by patients. However, a substantial proportion of third molars considered impacted in young adults may actually erupt over time.[8,31,32] On the other hand, judgment that the third molar would erupt because it had a favorable path or sufficient space or that it had already erupted often underlay general dentists' recommendations to retain or monitor third molars.

General dentists tended to recommend more removal if the third molars were not erupted (either soft tissue or bony impaction), but patients were more likely to follow these recommendations if they had a soft tissue

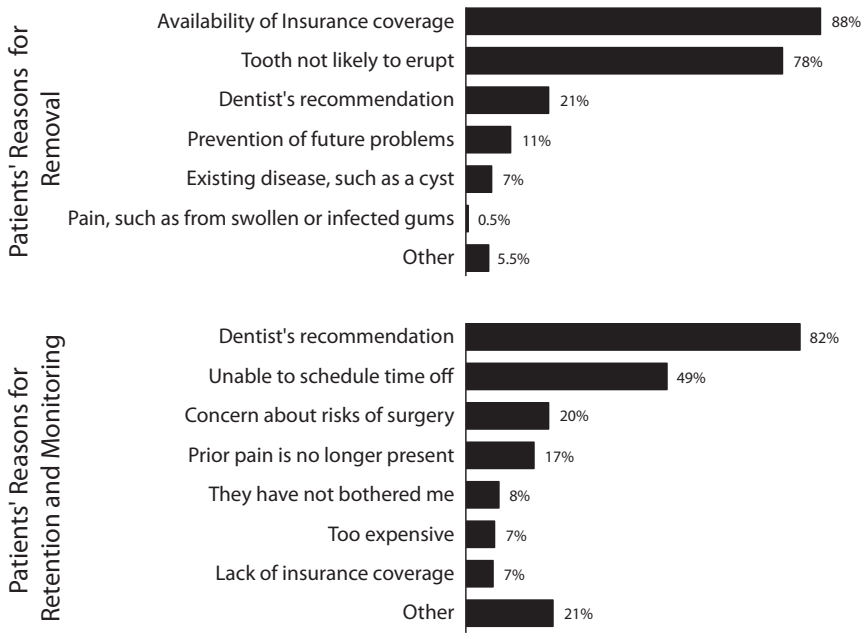

FIGURE 2—Reasons given by patients to remove (n = 200) or retain and monitor (n = 396) third molars: Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry, Pacific Northwest, 2009–2011

rather than a bony impaction. This may indicate that soft tissue impaction affects quality of life, but deep impaction is not tangible to the patient.

The main reason for general dentists to recommend retention or monitoring was that it was too early to decide. Watchful waiting is the best strategy for the management of third molars according to some investigators,[10–12] including the National Health Service in the United Kingdom.[13] If problems or symptoms arise in the future, a joint decision can be made by dentist and patient about proper treatment. We do not know whether patients in our sample whose dentists indicated that it was too early to decide will receive a recommendation to remove an asymptomatic tooth in the future. This may be highly likely in light of the high rate of removal recommendations we observed and the influence of the dentist's philosophy regarding third molar management on removal recommendations. Only 3 dentists in our study reported a philosophy of only recommending removal if the third molar is symptomatic or has pathology.

Although dentists in our study seemed concerned with the possibility of future problems when retaining third molars, patients were not. Removal of third molars may be seen as a rite of passage from adolescence to adulthood, but from the patients' perspective, it may represent a precautionary use of their parents' insurance in the face of uncertain dental insurance status in young adulthood. This is supported by the significance of availability of insurance in our study: it was the main reason patients adhered to their dentists' recommendations to remove, but ranked low among dentists' reasons for recommending removal. Other studies corroborate these findings,[1,33] showing that 50% of insured individuals have had their third molars removed by the age of 20 years.[33]

Most patients adhered to their dentist's recommendation either to remove or to retain and monitor their third molars. More than half of the participants who received a removal recommendation adhered to this recommendation, and adherence could have been even higher, because the second most common reason for patients not to remove the teeth was lack of time to schedule the surgery. Almost all participants (84%) adhered to retention recommendations, and they reported that the main reason for retaining the teeth was the dentist's recommendation. The influence of the dentist's recommendation on the patient's decision process highlights the importance of educating general dentists on the best available evidence on third molar management. After publication of National Institute for Clinical Excellence guidelines,[34] the United Kingdom had a decrease in prophylactic third molar removal and an increase in symptomatic third molar removal, as well as an increase in the age of patients at the time of removal.[35] Although changing referral patterns is challenging,[36] evidence-based guidelines and clinical algorithms could increase dentists' knowledge of best practices for third molar management.[35,37]

Strengths of our study included the primary care setting and the diversity of practices, which allowed us to investigate third molar management strategies for a broad sample of patients in general dentistry practices, by contrast to self-selected samples from oral surgery offices. These strengths likely increase the generalizability of our findings. Limitations included the short follow-up period and the 35% loss to follow-up. A follow-up longer than 2 years would be advantageous to assess the long-term decision-making process of third molar management. Despite our efforts and incentives, many participants were lost to follow-up. They had lower socioeconomic status than those retained in follow-up, but similar

TABLE 2—Associations Between Adherence to Dentist Recommendation to Remove Third Molars and Patient Demographic and Clinical Characteristics and Dental Practice Characteristics: Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry, Pacific Northwest, 2009–2011

Characteristic	Total No.	Adherence to Recommendation to Remove Third Molars	
		%	AOR (95%CI)
Gender			
Female	151	58	1.0 (Ref)
Male	149	52	0.8 (0.4, 1.4)
Age, y			
16	73	60	1.0 (Ref)
17	64	63	1.3 (0.7, 2.4)
18	68	49	0.9 (0.3, 3.1)
19	35	60	1.9 (0.3, 12.7)
20	26	46	1.3 (0.3, 6.0)
> 20	34	47	1.5 (0.3, 8.6)
Race			
White	273	56	1.0 (Ref)
Other	23	57	1.2 (0.4, 3.9)
Dental insurance			
Medicaid	30	63	1.0 (Ref)
None	12	67	1.4 (0.3, 7.4)
Private	257	54	0.6 (0.2, 1.9)
School attendance			
Not in school	37	49	1.0 (Ref)
Part-time college	13	23	0.2 (0.1, 1.1)
High school	152	61	1.9 (0.5, 7.5)
Full-time college	96	53	1.3 (0.5, 3.8)
Employed			
No	228	57	1.0 (Ref)
Yes	70	50	0.9 (0.5, 1.7)
Dental cleanings/y			
≥ 2	202	56	1.0 (Ref)
1	67	57	1.2 (0.8, 1.8)
< 1	30	43	0.9 (0.5, 2.0)
Orthodontic treatment ever[a,b]			
No	104	44	1.0 (Ref)
Yes	195	61	2.4 (1.2, 4.7)
Eruption status[b] (worst in patient)			
Fully or partially erupted	22	36	1.0 (Ref)
Soft tissue impaction	43	65	6.6 (1.7, 26.2)
Partial bony impaction	118	57	3.6 (0.7, 17.2)
Complete bony impaction	117	54	2.0 (0.4, 10.4)
Angulation (highest in patient)			
≤ 35 degrees	118	59	1.0 (Ref)
> 35 degrees	182	53	1.0 (0.6, 1.8)
Pain or discomfort around third molars			
No	248	54	1.0 (Ref)
Yes	51	63	1.3 (0.7, 2.7)

Continued

clinical characteristics. If participants lost to follow-up were less likely to adhere to a dentist's recommendation of third molar removal, the rates of adherence may be overestimated. It is difficult to achieve a high follow-up rate in a sample of young adults because they are transitioning into college or the work force.

Although evidence on the benefits of asymptomatic third molar removal is conflicting, the dentists in our study frequently recommended dental extraction. The primary reasons for this recommendation were not symptoms or pathologies associated with the third molars, but to prevent future problems or the judgment that the tooth would never erupt. Monitoring of asymptomatic third molars would have been a more cost-effective strategy for the management of third molars.[10–13] Half of the patients adhered to their dentists' removal recommendation during study follow-up. The main reasons for adherence were also not associated with pathologies, but with enabling conditions such as availability of insurance. Adherence to dentists' recommendations to retain and monitor a third molar was high; general dentists play an important role in the decision-making process of third molar management. ■

About the Authors

Joana Cunha-Cruz and Charles Spiekerman are with the Department of Oral Health Sciences, Marilynn Rothen is with the Regional Clinical Dental Research Center, Mark Drangsholt is with the Department of Oral Medicine, and Greg J. Huang is with the Department of Orthodontics, School of Dentistry, University of Washington, Seattle. Lyle McClellan is with the Willamette Dental Group, Spokane, WA.

Correspondence should be sent to Joana Cunha-Cruz, Dept of Oral Health Sciences, University of Washington School of Dentistry, 1959 NE Pacific St, Seattle, WA 98195-7475 (e-mail: silvajcc@uw.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

This article was accepted August 29, 2013.

Contributors

J. Cunha-Cruz developed the protocol and clinical research forms with the study team, assisted in study supervision and conduct, interpreted the data, and wrote the first draft of the article. M. Rothen was the lead regional coordinator for the Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry (PRECEDENT) and assisted with study supervision and conduct. C. Spiekerman conducted the data analysis. M. Drangsholt helped develop the protocol. L. McClellan collected data. G. J. Huang originated the study, developed the protocol with the study team, supervised the conduct of the study, and interpreted the data. All authors helped prepare the article.

TABLE 2—*Continued*

Caries in second or third molars			
No	276	56	1.0 (Ref)
Yes	24	50	0.6 (0.2, 1.8)
TMD signs/symptoms[a,b]			
None	194	56	1.0 (Ref)
Jaw popping/clicking but no pain	42	36	0.5 (0.2, 1.0)
Pain on opening or in temples, jaw joint, or jaw muscles	63	67	1.8 (1.0, 3.3)
Dentist philosophy on asymptomatic third molar management			
Recommend removal of most third molars for prevention	49	55	1.0 (Ref)
Recommend removal if asymptomatic but poor eruption path or insufficient space	249	55	1.0 (0.4, 2.3)
Recommend removal only if symptoms or pathology detected	2	50	2.1 (0.1, 38.8)
Dentist gender			
Male	277	55	1.0 (Ref)
Female	23	57	1.0 (0.4, 2.3)
Dental practice size[a,b]			
> 1 dentist	65	37	1.0 (Ref)
Solo	235	60	3.3 (1.7, 6.4)
Dentist experience, y			
≤ 20	117	55	1.0 (Ref)
> 20	183	56	1.1 (0.4, 2.9)
Dental practice patients/d			
≤ 40	36	44	1.0 (Ref)
41–60	264	57	1.4 (0.5, 3.8)
Practice setting[b]			
Urban	48	46	1.0 (Ref)
Suburban	154	59	2.8 (1.2, 6.5)
Rural	98	54	2.6 (1.0, 6.4)

Note. AOR = adjusted odds ratio; CI = confidence interval; GEE = generalized estimating equation; TMD = temporomandibular muscle disorder. Sample size was n = 300.
[a]Significant at $P < .05$ in bivariate GEE logistic regression.
[b]Significant at $P < .05$ in GEE logistic regression with adjustment for all other covariates in table.

Acknowledgments

This article was submitted on behalf of Northwest PRECEDENT, with support from the National Institute of Dental and Craniofacial Research (grants DE016750 and DE016752).

We thank the dentist investigator members of Northwest PRECEDENT and their staff for their invaluable contributions.

Human Participant Protection

The institutional review board at the University of Washington reviewed and approved the study protocol. All participants provided informed consent (or assent and parental consent if younger than 18 years).

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