

# The Impact of Third Molar Symptoms, Pain, and Swelling on Oral Health–Related Quality of Life

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**Purpose:** This study was designed to assess the impact of “pain and swelling” associated with third molars on patients’ quality of life before surgery.

**Patients and Methods:** The data for these analyses were obtained from a larger ongoing study designed to examine the surgical and medical management of problems associated with third molars. Data from 480 patients with 4 third molars scheduled for removal were used in the analysis. Questionnaires administered presurgery assessed patients’ medical and dental history, their reasons for seeking third molar removal, and sociodemographic characteristics. Adverse impacts on oral health–related quality of life were measured using the 14-item Oral Health Impact Profile (OHIP) questionnaire. The primary outcome variable was the percentage of people reporting 1 or more of the 12 non–pain-specific OHIP items “fairly often” or “very often” during the 3 months before enrollment.

**Results:** One third (178 of 480) of patients said they were seeking third molar surgery because of current or previous symptoms of pain/swelling, and 17% reported 1 or more of the 12 non–pain-specific OHIP items. In the multivariate logistic regression model, the odds of one or more impacts was greater for people who presented because of symptoms (odds ratio [OR], 2.9; 95% confidence interval [CI], 1.7 to 4.8), who were aged 25 years or more (OR, 1.9; 95% CI, 1.1–3.3), and who had a self-reported history of tooth loss due to pathology or trauma (OR, 2.9; 95% CI, 1.9 to 5.5).

**Conclusions:** Adverse impacts on quality of life occurred for 1 in 8 patients seeking third molar surgery, and the odds increased 3-fold for patients who had experienced pain/swelling compared with those who were asymptomatic.

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*J Oral Maxillofac Surg* 62:1118–1124, 2004

Patients in the second and third decades of life who have retained third molars frequently seek treatment either because of symptoms or because treatment has been recommended as a way to prevent such symptoms. Symptoms associated with retained third molars include those arising from pericoronitis and its se-

quelae. In a study of patients in Norway, Berge and Boe<sup>1</sup> reported that 43% of third molar complaints in 1 year could be attributed to pericoronitis. Blakey et al<sup>2</sup> reported that even patients with minor clinical signs of pericoronitis had considerable pain. In a multicenter study of recovery after third molar surgery,

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This work was supported by the Dental Foundation of North Carolina, Oral and Maxillofacial Surgery Foundation, and American Association of Oral and Maxillofacial Surgeons.

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0278-2391/04/6209-0013\$30.00/0

doi:10.1016/j.joms.2003.11.014

White et al<sup>3</sup> reported that 37% of patients having surgery indicated that they had previous “pain and swelling” associated with third molars and wanted third molars removed to prevent a recurrence of these symptoms. Patients seeking third molar surgery may also experience symptoms due to other pathology occurring as a consequence of retained third molars (eg, periodontal disease around adjacent second molars), and they may have pain from unrelated oral conditions that occur elsewhere in the mouth (eg, dental caries).

Although clinical conditions associated with retained third molars are well understood, little is known about the impact of those conditions on quality of life among affected patients. Such information is important to help address several related questions that confront clinicians who provide advice and care for such patients. First, it is useful to understand levels of presurgical morbidity typically experienced by their patients so that they can inform patients about the types of “baseline” impacts on daily life that can be expected if patients have symptoms and choose to forego or delay treatment. Second, the severity of any presurgical morbidity may help clinicians and patients select treatment alternatives in circumstances where clinical indicators alone do not provide a clear-cut indication of whether to proceed with surgery. For example, patients whose quality of life is adversely affected by presurgical conditions may elect to have surgery, even when clinical criteria suggest that surgery and conservative management could be equally efficacious. Finally, if there is additional information about the impact of the surgery itself on quality of life, clinicians can advise patients about the levels of morbidity that can be expected during recovery relative to their presurgical morbidity.

There is growing recognition that the impact of oral conditions on quality of life is an important outcome that can be quite useful in making treatment decisions. Quality of life is now foremost among “Health People 2010” national health targets for the US population.<sup>4</sup> This emphasis on health policy reflects a renewed “patient-based” approach to health care that has assumed greater relevance as the vast majority of health care procedures deal with non-life-threatening conditions. Hence, quality of life is assessed routinely in clinical trials to determine the ability of new drugs and procedures to achieve improvements in aspects of daily life that matter most to patients.<sup>5</sup> Methods for incorporating information about quality of life into clinical decision making for medical care have also been developed.<sup>6</sup>

In dentistry, one of the more widely used measures of oral health-related quality of life (OHRQoL) is the Oral Health Impact Profile (OHIP).<sup>7</sup> The OHIP questionnaire asks about the adverse impacts of oral con-

ditions on aspects of well-being including pain, psychosocial states, social interaction, and daily activities. The OHIP questionnaire has also been used in population studies in the United States, Canada, and Australia<sup>8</sup> in studies of prisoners,<sup>9</sup> medically compromised elderly,<sup>10</sup> patients with chronic pain,<sup>11</sup> oral medicine patients,<sup>12</sup> patients with HIV infection,<sup>13</sup> and patients with hepatitis C virus infection.<sup>14</sup> Clinical trials have used the OHIP to evaluate implant-supported prostheses<sup>15,16</sup> and steroidal therapy for oral lichen planus.<sup>17</sup>

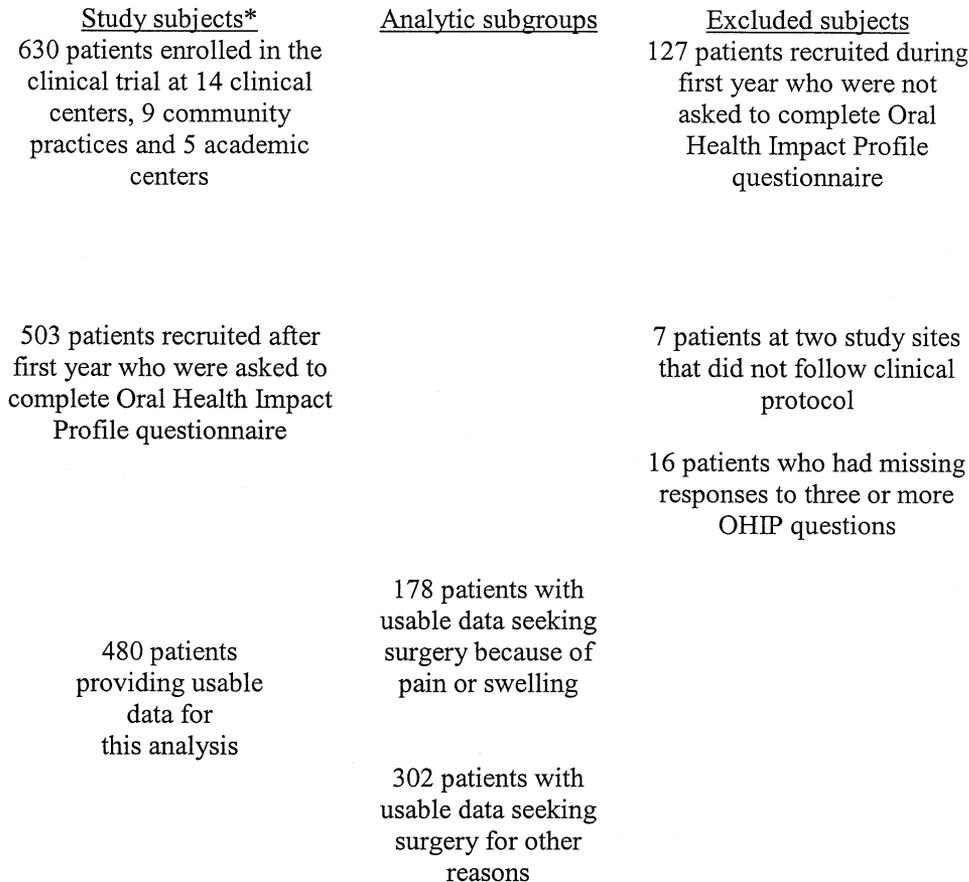
In a study of recovery after third molar surgery, 100 patients who were awaiting third molar surgery were assessed presurgery<sup>18</sup> and for up to 7 days postsurgery<sup>19</sup> using the OHIP-14 questionnaire. In the first 5 days after surgery, OHIP-14 scores increased significantly, indicating a worsening of OHRQoL, but OHIP-14 scores returned to presurgery levels after 7 days.<sup>19</sup> However, factors associated with presurgery OHRQoL were not reported.

The aim of this study was to describe OHRQoL among patients who were seeking third molar surgery. The study also sought to identify clinical and nonclinical factors that were associated with OHRQoL among these patients.

## Patients and Methods

The data for these analyses were obtained from a larger study designed to examine the surgical and medical management of problems associated with third molars. The larger study was an institutional review board-approved, prospective clinical trial that was conducted at 9 community practices and 5 academic clinical centers over a 5-year time period, ending in September 2001, when 630 subjects had been recruited (Fig 1). Inclusion criteria for the larger study dictated that patients be healthy (American Society of Anesthesiologists Risk Classification I, II), and free of extensive periodontal disease (American Academy of Periodontology I, II). A history of recent treatment for psychiatric illness or use of systemic antibiotics in the previous 3 months excluded patients. Females could not be pregnant or lactating.

One year after the start of the larger study, the 14-item OHIP questionnaire was added to the set of measures being collected before surgery.<sup>20</sup> The initial sample for the present study began with all patients who were enrolled for third molar surgery after the OHIP instrument was added to the protocol (Fig 1). Data for 7 patients enrolled at 2 treatment locations, which discontinued participation in the study for not following the study protocol, were removed from the data set. Also, 16 patients had incomplete OHIP data and were dropped from the analyses. Thus the final sample used in this study included 480 patients who



**FIGURE 1.** Flow of patients from enrollment to analysis and formation of analytic subgroups.

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\* Enrollment criteria

|                     |  |
|---------------------|--|
| Inclusion criteria: | Four third molars indicated for removal<br>Healthy; American Society Anesthesiologists Risk Classification I, II<br>Willing to participate                         |
| Exclusion criteria: | Pregnancy or lactating<br>Severe periodontal disease; American Academy of Periodontology III, IV<br>History of psychiatric treatment within the previous 12 months |

met 3 criteria: they were enrolled for third molar surgery at clinical sites adhering to the study protocol, they were asked to complete an OHIP instrument, and complete OHIP responses were available for them.

After consenting to participate in the study, and before removal of all 4 third molars, patients were interviewed and completed questionnaires that asked about demographics, their reason for seeking third molar removal, and OHRQoL. Patients were classified as "symptomatic" if they replied affirmatively to the question, "Have you had pain or swelling because of wisdom teeth and want to have them pulled before it happened again?" Adverse impacts on OHRQoL were

measured using the 14-item OHIP.<sup>20</sup> Patients were asked to indicate how frequently during the preceding 3 months they had experienced each of 14 impacts. Responses were recorded on a 5-point scale: "Never" (code 0), "Hardly Ever" (code 1), "Occasionally" (code 2), "Fairly often" (code 3), or "Very Often" (code 4). The main dependent variable for this analysis was the number of items reported "Fairly often" or "Very often." When computing the summed OHIP score, we excluded subjects who had missing or "don't know" responses to more than 2 OHIP items. For patients with 1 or 2 missing or "don't know" responses, the sample mean for the relevant question was substituted. Because 2 of the OHIP-14 questions

concerned pain (“Have you had painful aching?” and “Have you found it uncomfortable to eat?”), we excluded those questions when comparing summary OHIP scores between symptomatic and nonsymptomatic groups. However, to permit comparison with other studies, we also computed a summed OHIP score that used responses to all questions.

We first computed descriptive statistics for all patients, including the percentage of patients reporting 1 or more OHIP items. The percentage reporting 1 or more OHIP items was compared between symptomatic and nonsymptomatic patients and among other patient subgroups defined by age, gender, race, eligibility for Medicaid, and history of dental extractions. The  $\chi^2$  test was used to determine statistical significance. Multivariable logistic regression was used to determine which combination of patient factors was associated independently with reporting 1 or more OHIP items.

## Results

Of 496 patients seeking removal of their third molars, presurgery data on third molar symptoms and OHIP responses were provided by 480 (Fig 1). The 480 patients ranged in age from 13 to 57 years, but most (80%) were younger than 25 years (Table 1). The mean age of the enrolled patients was 21.5 years. Fifty-nine percent were female, and 84% were white. Approximately one third had not graduated from high school; only 7% were eligible for Medicaid. One in 12 subjects reported a history of tooth loss due to decay, pain, or trauma. Thirty-seven percent of patients (178 of 480) said that they were seeking third molar surgery because of current or previous symptoms of pain/swelling. Other reasons for seeking care were 1) “Dentist told me that wisdom teeth might cause problems in the future” (270 of 480, or 56%), 2) “other” reasons (17 of 480, or 3%), or 3) unstated reasons (15 of 480, or 3%).

Seventeen percent of subjects reported experiencing 1 or more of the 12 selected oral health impacts “fairly often” or “very often” in the 3 months before enrollment in the study (Table 2). An additional 25.6% reported 1 or more of those impacts occurring “occasionally” (but not more frequently) during that time period. Among these 12 specific OHIP items, the most common impacts were difficulty relaxing and feeling self-conscious, each reported “fairly often” or “very often” by nearly 7% of subjects. Other specific impacts, such as trouble pronouncing words, a worsened sense of taste, or being totally unable to function, were the least common impacts.

As expected, OHIP items referring to pain and discomfort were reported more frequently than the 12 selected impacts: 17% of subjects reported painful

**Table 1. CHARACTERISTICS OF 480 STUDY SUBJECTS**

| Characteristic                                   | Subjects, n (%) |
|--|-----------------|
| Age group (yr)                                   |                 |
| <18  | 151 (32.3)      |
| 18-24  | 222 (47.4)      |
| ≥25  | 95 (20.3)       |
| Unknown  | 12 —            |
| Gender   |                 |
| Male   | 199 (41.5)      |
| Female   | 281 (58.5)      |
| Race   |                 |
| White  | 402 (84.3)      |
| Black  | 37 (7.8)        |
| Other  | 38 (8.0)        |
| Unknown  | 3 —             |
| Highest educational level                        |                 |
| <High school                                     | 161 (33.8)      |
| High school/some college                         | 232 (48.8)      |
| College/postcollege                              | 82 (17.2)       |
| Unknown  | 5 —             |
| Eligible for Medicaid                            |                 |
| Yes  | 31 (7.0)        |
| No   | 410 (93.0)      |
| Unknown  | 39 —            |
| History of tooth loss due to pathology or trauma |                 |
| Yes  | 55 (11.5)       |
| No   | 424 (88.5)      |
| Unknown  | 1 —             |
| Seeking surgery because of pain/swelling         |                 |
| Yes  | 178 (37.1)      |
| No   | 302 (63.9)      |

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aching, and 14% said they had found it uncomfortable to eat “fairly often” or “very often” in the preceding 3 months (Table 2). When all 14 items were used to compute summary scores, 26.2% of subjects reported 1 or more items “fairly often” or “very often” and an average of 0.7 (SD, 1.7) item was reported at that threshold. The mean, summed OHIP score, based on all 14 items, was 7.1 (SD, 8.0). For subsequent analysis, OHIP summary scores were limited to the 12 items in Table 2 that do not specifically refer to pain and discomfort.

The percentage of subjects reporting 1 or more of the 12 non-pain-specific impacts “fairly often” or “very often” was associated ( $P < .01$ ) with age, history of tooth loss, Medicaid eligibility, and reason for seeking surgery (Table 3). Specifically, subjects were more likely to report impacts if 1) they were older rather than younger, 2) they had a history of tooth loss rather than no history of tooth loss, 3) they were eligible for Medicaid rather than not eligible, or 4) they were seeking third molar surgery for pain/swelling rather than seeking surgery for other reasons.

**Table 2. FREQUENCY OF IMPACTS EXPERIENCED IN THE 3 MONTHS BEFORE PRESENTATION (N = 480 PATIENTS)**

|   | Subjects Reporting Impact (%) |              |                         |
|---|-------------------------------|--------------|-------------------------|
|   | Never/Hardly Ever             | Occasionally | Fairly Often/Very Often |
| Twelve nonpain impacts*                             |                               |              |                         |
| Found it difficult to relax . . .                   | 83.7                          | 9.4          | 6.9                     |
| Felt self conscious                                 | 78.7                          | 14.6         | 6.7                     |
| Felt tense  | 80.8                          | 13.3         | 5.8                     |
| Had to interrupt meals . . .                        | 87.5                          | 7.1          | 5.4                     |
| Been a bit irritable with others . . .              | 86.2                          | 9.4          | 4.4                     |
| Had difficulty doing usual jobs . . .               | 92.1                          | 4.8          | 3.1                     |
| Diet has been unsatisfactory . . .                  | 92.9                          | 4.0          | 3.1                     |
| Been a bit embarrassed . . .                        | 90.2                          | 7.1          | 2.7                     |
| Felt that life in general was less satisfying . . . | 95.0                          | 3.3          | 1.7                     |
| Trouble pronouncing any words . . .                 | 94.6                          | 4.2          | 1.2                     |
| Been totally unable to function . . .               | 97.5                          | 1.2          | 1.2                     |
| Sense of taste has worsened . . .                   | 96.0                          | 2.9          | 1.0                     |
| One or more of the above 12 impacts                 | 57.3                          | 25.6         | 17.1                    |
| Pain/discomfort impacts                             |                               |              |                         |
| Painful aching in the mouth                         | 53.7                          | 29.4         | 16.9                    |
| Uncomfortable to eat                                | 60.6                          | 25.2         | 14.2                    |
| One or more of the above 14 impacts                 | 35.8                          | 37.9         | 26.2                    |

\*Subjects were queried whether they experienced each impact "... because of problems with your teeth or mouth during the last 3 months."

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There was a tendency for the percentage reporting impacts to be higher among African Americans, although the difference did not reach statistical significance ( $P = .07$ ). For those seeking surgery for pain/swelling, reported impacts of these symptoms on quality of life did not vary appreciably among males and females or among categories of educational attainment. Among those seeking surgery for pain/swelling, the rank order of individual impacts was similar to the order listed in Table 2, although the prevalence of specific impacts was higher. For example, more than 10% of these symptomatic patients reported each of the following impacts "fairly often" or "very often": difficulty relaxing, interrupting meals, being irritable, and feeling tense.

Both age and a history of tooth loss were associated with the reason for seeking third molar surgery. For example, 47.4% (45 of 95) of people older than 25 were seeking surgery for pain/swelling compared with 19.2% (29/151) of people younger than 18 years ( $P < .01$ ). Among people with a history of tooth loss due to pathology or trauma, 56.4% (31 of 55) were seeking surgery for pain/swelling compared with 34.7% (147 of 424) for people with no such history ( $P < .01$ ). However, results from the multivariate logistic regression model showed that all 3 factors were independently associated with the likelihood of reporting 1 or more impacts (Table 4). The odds of reporting 1 or more impacts was approximately 3 times greater for people seeking surgery for pain/swelling than for people who were not (odds ratio,

2.9). The corresponding 95% confidence interval (CI) of 1.7 to 4.8 excluded the null value of 1.0, showing that the reason for seeking surgery had a statistically significant effect on oral health impact, after controlling for the other variables in the model.

## Discussion

The principal finding from this study was that adverse impacts on OHRQoL were reported much more frequently among patients who presented for surgery with a history of third molar symptoms compared with patients who presented for surgery for other reasons. This result persisted, even after controlling for the finding that patients with a history of symptoms were more likely to have had previous extractions because of dental pathology and were more likely to be at least 25 years of age—2 additional factors that were associated with adverse impacts on OHRQoL. This main result is not surprising, because retained third molars are known to be associated with an increased risk of pericoronitis, which can be painful and debilitating.<sup>2</sup>

A contemporary view is that health involves more than the absence of disease. With this new perspective, there is additional focus appropriately on "quality of life" issues. The evolution of this concept, now viewed as important as clinical aspects of disease, was reviewed by Slade.<sup>21</sup> As thinking about health has matured, OHRQoL, which involves eating and social interaction, is now accepted as an integral part of

**Table 3. SUBJECT CHARACTERISTICS ASSOCIATED WITH REPORTING 1 OR MORE OF 12 NONPAIN OHIP ITEMS (N = 480)**

| Characteristic                                | Reporting Impact Fairly Often or Very Often* (%) | P Value† |
|---|--|----------|
| Age group (yr)                                |  |          |
| <18   | 11.9   |          |
| 18-24   | 16.7   |          |
| ≥25   | 27.4   | <.01     |
| Gender  |  |          |
| Male  | 14.0   |          |
| Female  | 19.2   | .14      |
| Race  |  |          |
| White   | 16.7   |          |
| Black   | 29.7   |          |
| Other   | 10.5   | .07      |
| Highest educational level                     |  |          |
| <High school                                  | 13.0   |          |
| High school/some college                      | 19.4   |          |
| College/postcollege                           | 18.3   | .24      |
| Eligible for Medicaid                         |  |          |
| Yes   | 29.0   |          |
| No  | 15.6   | .05      |
| History of tooth loss due to pathology/trauma |  |          |
| Yes   | 38.2   |          |
| No  | 14.4   | <.01     |
| Seeking surgery because of pain/swelling      |  |          |
| Yes   | 28.1   |          |
| No  | 10.6   | <.01     |

\*Percent of subjects reporting 1 or more of 12 OHIP questions that asked about aspects of oral health-related quality of life other than pain.

†P values based on  $\chi^2$  test.

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overall health. This is a very different view than that prevailing only a few decades earlier when oral health was assumed to be unrelated to general health and well-being except in special circumstances. Accompanying this change in perspective is the obvious need to measure clinical conditions that influence OHRQoL.

Our findings show that if patients have third molar symptoms of pain and swelling sufficient to prompt them to seek surgery, their quality of life is adversely affected. In this study, 26.2% of subjects reported 1 or more of the 14 OHIP items during the preceding 3 months, which is significantly greater than the prevalence observed in population samples of Australian adults (15.9%; 95% CI, 14.4% to 17.4%) and UK adults (18.2%; 95% CI, 16.9% to 19.5%).<sup>22</sup> This difference was apparent despite the fact that this study used a shorter (3-month) reference period in which impacts were reported compared with the Australian and UK study (12-month reference period). Our reason for

using the shorter reference period was to coincide with the clinical protocol in the current study, which will permit us to track postsurgery changes in quality of life among these patients.

Our study necessarily was limited to a convenience sample of patients seeking third molar surgery, but they were recruited in several centers with the consequence that these subjects comprised a diverse sample of patients seen by oral and maxillofacial surgeons in the United States. Patients were enrolled prospectively at multiple clinical sites, both community practices and academic centers. The mean age of the enrolled patients was 21.4 years, and more were female, similar to the ages and gender of patients studied by Goldberg et al,<sup>23</sup> Osborn et al,<sup>24</sup> and Eklund and Pittman<sup>25</sup> in studies of US patients having third molar surgery. The mean OHIP-14 score of 7.1 (SD, 8.0) among our subjects was less than the mean of 9.7 (SD, 6.3) observed presurgery in the study by McGrath et al,<sup>18</sup> perhaps attributable to McGrath's observation that "Most subjects reported that they had encountered problems with their wisdom teeth during the past year." In contrast, only one third of subjects in our study had experienced pain or swelling.

Nonetheless, our study cohort does not represent all patients who might have third molar symptoms. Patients were seeking treatment by surgical specialists; no general dentists or other dental specialists participated in the study. Hispanic patients were underrepresented in the sample. Patients with third molar symptoms but not seeking treatment were not included in our analysis.

The results from this study are relevant clinically for informing patients about the impacts on quality of life that can be expected if they choose to retain their third molars and what to expect if they develop symptoms related to their third molars. Adverse impacts of oral health on quality of life can be expected for 1 in 10 patients who do not develop symptoms related to third molars, probably due to the numerous other oral diseases such as dental caries that are all too prevalent

**Table 4. MULTIVARIATE LOGISTIC REGRESSION MODEL OF SUBJECT CHARACTERISTICS ASSOCIATED WITH ONE OR MORE IMPACTS ON QUALITY OF LIFE "FAIRLY OFTEN"/"VERY OFTEN" (N = 480)**

| Characteristic   | Odds Ratio | 95% Confidence Interval |
|--|------------|-------------------------|
| Seeking surgery because of pain/swelling (ref = no)      | 2.9        | 1.7-4.8                 |
| Age ≥ 25 yr (ref < 25 yr)                                | 1.9        | 1.1-3.3                 |
| History of tooth loss due to pathology/trauma (ref = no) | 2.9        | 1.9-5.5                 |

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in the population. However, for patients who develop pain and swelling related to third molars, the odds of experiencing adverse impacts increases 3-fold.

Currently, we are conducting longitudinal follow-up among subjects in this study, and we expect to observe net improvements in OHRQoL after the postsurgery recovery period, at least among symptomatic patients. We will also assess whether any presurgery factors help to distinguish between patients whose quality of life improves or does not improve, thus providing additional information to help surgeons and patients make decisions about third molar surgery.

### Acknowledgments

The authors offer a special thanks to the surgeons and their patients who volunteered to provide data for this analysis. The authors wish to thank Debora Price for helping manage data for this project.

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