Cost of Care for Subjective Tinnitus in Relation to Patient Satisfaction

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Abstract

Objective. A consistent management algorithm for subjective tinnitus remains to be elucidated. Chronic tinnitus yields approximately US$2110 in annual health care costs per patient. However, it is unclear whether spending more in the management of tinnitus equates with greater patient satisfaction. Thus, the aim of this study is to correlate patient satisfaction with patient demographics, provider recommendations, and total health care–related expenditures.

Study Design. A retrospective chart review and a patient satisfaction questionnaire.

Setting. All data were collected from a large Midwestern hospital.

Subjects and Methods. Patients were included who presented to the tinnitus clinic during the year 2011 and were between the ages of 18 and 89 years. They were excluded with diagnoses of Ménière’s disease, pulsatile tinnitus, acoustic neuromas, or autoimmune inner ear diseases. The retrospective data and satisfaction surveys were entered by 3 of the authors. Responses were based on Likert scales.

Results. Of the 692 patients included, 230 completed and returned the satisfaction questionnaire (33.2% response rate), yielding an overall mean of $662.60 charges. The frequency of intervention recommendations per patients ranged from 0 to 13, with a median of 4. Spearman’s correlations did not result in significant correlations between patient satisfaction and number of clinic visits ($P = .499$) or associated charges ($P = .453$).

Conclusion. Given that the variability among provider recommendations, the high overall mean of tinnitus-related charges, and patient satisfaction was not related to costs, further research is needed examining patient preference in the treatment of tinnitus.

Keywords

tinnitus, patient satisfaction, health care cost, expenditures, otolaryngology, ear, nose, throat

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Introduction

Tinnitus is the perception of external sound without accompanying external stimuli, and it may manifest as hissing, ringing, or even spoken words and music.¹² Prevalence in community samples ranges from 10% to 15% in adult populations and 7.5% in pediatric samples, with debilitating symptoms in 2% to 4% of those affected.³⁻⁹ Risk factors for developing tinnitus include a history of prior hearing impairment, head trauma, depression, recurrent otitis media, recurrent exposure to high-decibel environments (eg, certain occupations, gunfire), arthritis, nonsteroidal anti-inflammatory drugs, and other ototoxic medication usage.⁵⁻¹⁰ During 2012, the Veterans Administration noted that the most prevalent compensated service-related disabilities were tinnitus and hearing loss, specifically during the Gulf War era. Hearing damage in veterans is expected to grow 18% per year, and totaled $1.28 billion during 2011. Payments for tinnitus are expected to rise to $2.75 billion by 2016.¹¹⁻¹²

Tinnitus is classified as either subjective or objective.¹³ Objective forms of tinnitus tend to have more apparent etiologies.¹⁴⁻¹⁶ Conversely, in subjective tinnitus, a definitive etiology is frequently elusive, yielding a variety of treatments aimed at addressing otologic and systemic symptoms.¹⁷ Behavioral therapies, when used in a multidisciplinary stepwise approach, are associated with improvements in costs, quality of life, and reported tinnitus severity.¹⁸⁻²⁰ Other treatment options aim for symptomatic relief, such as treating presbycusis through hearing aids, cochlear implants, masking techniques, electrical promontory stimulation, and repetitive transcranial magnetic stimulation—which have all shown some positive outcomes with chronic tinnitus.²¹⁻²⁴

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Given the numerous available interventions without clear evidence for which single or combination of treatment modalities is most effective, it is not surprising that tinnitus patients often report distress, depression, and general dissatisfaction with treatment options.25-29

In 2013, the average yearly health care cost of chronic tinnitus was US$2110, with an annual productivity cost of nearly US$5065.30 These figures are higher than the annual costs of either fibromyalgia or chronic lower back pain, with the severity of tinnitus symptoms directly proportional to health care expenditures.30,31 Whether additional medical expenditures improve patient satisfaction in general is not well elucidated, and varies depending upon the medical population assessed.32-35 Patients with tinnitus report a willingness to undergo significant medical interventions and spend considerable amounts of money to address their symptoms.25,36 Therefore, the purpose of this study is to determine what patient characteristics, provider-reported recommendations, and charges for tinnitus-related care affect patient satisfaction undergoing such care.

Methods

This study comprised 2 components: a patient satisfaction survey, developed for use in this study, and a retrospective chart review. All data were collected from a large Midwestern hospital in accordance with Institutional Review Board approval (No. 7499, 8409) from the Henry Ford Health System, with consent waived. Eligible patients were those who (1) visited the tinnitus clinic between January 1, 2011, and December 31, 2011; (2) had a diagnosis of subjective tinnitus; and (3) were between the ages of 18 and 89 years. Patients were excluded if their diagnosis included Ménière’s disease, pulsatile tinnitus, acoustic neuromas, or autoimmune inner ear diseases.

The retrospective chart review included patient demographics, dates of visits to the tinnitus clinic, recommendations made during the tinnitus clinic visit, and behavioral health history. Chart reviews were completed by 3 of the authors (E.G., C.H., and R.H.), with random duplicate blinded entry to ensure interrater reliability. Provider data were also collected, but because of the quantity of providers and lack of single-provider follow-up by patients across multiple clinical visits, these data were not amenable to analyses at this time. Available providers in the tinnitus clinic include physicians, audiologists, nurse practitioners, physician assistants, and residents. Providers utilized standardized patient education handouts and video on tinnitus. Either patients are referred to the clinic by outside providers, or, as this is one of the few specialty tinnitus clinics, some schedule appointments after researching online. Behavioral health histories were documented as history of any behavioral health treatment, whether via behavioral health notes or patient report documented in clinic notes. Through internal data stores, billing codes for the identified cohort of all charges in relation to tinnitus were extracted for analyses. Medication recommendation data were extracted from electronic medical records.

The patient satisfaction survey was mailed to patients in early 2012, with 2 separate mailings approximately 2 months apart to maximize participation. Patients were provided both a letter outlining the purpose of the survey and a prepaid return envelope. The survey, developed for this study, assessed patient demographics and patient-related satisfaction on topics including patient-provider interaction time, helpfulness of the provider, provider interpersonal skills, quality of information received, outcomes of the treatment recommendations, overall satisfaction with care, and frequency of discussing tinnitus with primary care provider (the number of times that tinnitus was discussed with primary care providers outside the tinnitus clinic—before and after tinnitus clinic visit). Sample questions included “How helpful was the doctor/staff at explaining tinnitus?” “How well did the staff keep you informed about your treatment options?” and “Overall, how satisfied are you with the care you received for your tinnitus?” Response options depended on the nature of the question but were based on Likert scales with ranges from 0-4 to 0-7, with lower and higher scores indicating negative and positive responses or experiences, respectively.

Analyses

Data presented include standard descriptive statistics, including mean and standard deviation. Univariate analyses were conducted as indicated to examine significant relationships among individual variables. Spearman’s correlation coefficients were used to examine the associations between continuous variables and overall satisfaction score. Next, the overall score was compared between groups via the Wilcoxon 2-group test (for 2-level groups) or the Kruskall-Wallis test (for >2-level groups). These nonparametric tests were used because of the nonnormality of the overall score, as indicated from histograms, skewness, kurtosis, and Shapiro-Wilk tests. A number of the medication recommendations produced inadequate sampling sizes; therefore, we were unable to be compared on satisfaction. To strengthen internal validity and determine whether there was a unified overall patient satisfaction score, or if we could derive component scores of the satisfaction survey, we utilized maximum likelihood factor analysis with varimax rotation (orthogonal at 90) and squared multiple correlations to adjust diagonals of the correlation matrix. Next, univariate analyses were applied to determine whether multiple linear regression could be performed to explore a potential pattern of patient- and cost-related factors predicting patient satisfaction. Unfortunately, as outlined in the results, none of the univariate analyses were significant; therefore, we could not build a linear model with patient satisfaction as the outcome.

Results

This retrospective chart review included 692 patients who met eligibility criteria. Of these, 230 patients completed and returned the satisfaction questionnaire (33.2% response rate). Comparison between responders and nonresponders are provided in Table 1. The age of the responders was 63.5 ± 10.8 years old; they were equally men (n = 112, 49%) and women (n = 116, 50%); and they were
Table 1. Demographics, Expenditures, and Management Recommendations: Survey Responders vs Nonresponders.a

<table>
<thead>
<tr>
<th></th>
<th>All (N = 692)</th>
<th>Responders (n = 230)</th>
<th>Nonresponders (n = 462)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of clinic visits</td>
<td>1.7 ± 1.4</td>
<td>1.7 ± 1.3</td>
<td>1.7 ± 1.4</td>
<td>.490</td>
</tr>
<tr>
<td>Tinnitus-related charges, $</td>
<td>662.60 ± 1394.70</td>
<td>654.70 ± 1383.20</td>
<td>666.50 ± 1401.90</td>
<td>.499</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabitating</td>
<td>359 (52)</td>
<td>133 (58)</td>
<td>226 (49)</td>
<td>.031</td>
</tr>
<tr>
<td>Single</td>
<td>102 (15)</td>
<td>24 (10)</td>
<td>78 (17)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>28 (5)</td>
<td>11 (5)</td>
<td>17 (4)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>44 (6)</td>
<td>20 (9)</td>
<td>24 (5)</td>
<td></td>
</tr>
<tr>
<td>Prev behavioral health therapy</td>
<td>90 (13)</td>
<td>34 (15)</td>
<td>56 (12)</td>
<td>.522</td>
</tr>
<tr>
<td>Sleep disturbance</td>
<td>175 (25)</td>
<td>64 (28)</td>
<td>111 (24)</td>
<td>.0374</td>
</tr>
<tr>
<td>Medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alprazolam</td>
<td>60 (9)</td>
<td>21 (9)</td>
<td>39 (8)</td>
<td>.762</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>71 (10)</td>
<td>203 (88)</td>
<td>44 (10)</td>
<td>.366</td>
</tr>
<tr>
<td>Gingko biloba</td>
<td>69 (10)</td>
<td>28 (12)</td>
<td>41 (9)</td>
<td>.172</td>
</tr>
<tr>
<td>B vitamins</td>
<td>62 (9)</td>
<td>28 (12)</td>
<td>34 (7)</td>
<td>.037</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>65 (9)</td>
<td>18 (8)</td>
<td>47 (10)</td>
<td>.319</td>
</tr>
<tr>
<td>Arches formula</td>
<td>31 (4)</td>
<td>16 (7)</td>
<td>15 (3)</td>
<td>.026</td>
</tr>
<tr>
<td>Dietary concerns discussed</td>
<td>261 (38)</td>
<td>73 (32)</td>
<td>188 (41)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Dietary changes</td>
<td>326 (47)</td>
<td>101 (44)</td>
<td>225 (49)</td>
<td>.002</td>
</tr>
</tbody>
</table>

Values in No. (%) or mean ± SD.

predominantly Caucasian (n = 145, 65.3%). Patients had a mean 1.7 ± 1.3 tinnitus clinic visits and an overall mean $662.60 ± $1394.70 (range, $53 to $10 049) in charges related to tinnitus care. The most frequent charges were associated with clinic visits (100%), removal of something from the ear (20.4%), and audio exam (20.8%). Other charges included magnetic resonance imaging of the head, laboratory tests, and neurodiagnostics with auditory brainstem response. Tinnitus clinic patients were seen by 28 providers. Patients in the tinnitus clinic frequently saw a different provider on follow-up visits. With a total of 230 patients who completed the satisfaction questionnaire and with multiple variations in provider interactions and overlap of providers seen, we were unable to determine whether there were any strong single-provider effects.

A factor analysis was performed on the patient satisfaction survey to examine whether there were separate constructs and to ensure internal validity of the scale by removing items if needed. Factor analysis with varimax rotation (orthogonal at 90°) indicated 1 strong major factor and 3 questions that loaded as additional factors. The main factor explained 72% of the variation; therefore, the 11 items that loaded onto this factor were summed for an overall satisfaction score, with a range of 0 (least/lowest satisfaction) to 44 (highest satisfaction). The survey (with 11 items) displayed good internal validity, with a Cronbach’s alpha of 0.79. The factor loading for the 11 included survey questions are contained within Table 2. The overall patient satisfaction score was examined to determine normality (based on histogram, skewness, kurtosis, and Shapiro-Wilk test) and to ensure the most appropriate analytic approach based on the distribution of the data (eg, linear vs polynomial regression). The patient satisfaction outcome score was determined to be nonnormal. However, we examined univariate analyses to determine whether there were any significant differences between patient satisfaction and individual variables. According to the univariate analyses, there were no significant differences, among responders, between patient satisfaction and sex (P = .728), marital status (P = .643), race/ethnicity (P = .812), history of behavioral health treatment (P = .585), reported sleep disturbances due to tinnitus (P = .303), any particular medication recommendation (eg, alprazolam, corticoids, ginkgo biloba), or dietary discussion and recommendations (P = .305 and .310, respectively). Spearman’s correlations did not result in significant correlations between patient satisfaction and age (r = .027, n = 190, P = .715), number of clinic visits (r = .050, n = 187, P = .499), or associated charges (r = .050, n = 228, P = .453). We intended to perform multivariate analyses based on significant univariate findings, but given the total absence of significant univariate results and nonnormality of the outcome variable, we were unable to run larger models.

There appeared to be considerable variability in the number of recommendations across providers within the tinnitus clinic. Also, a substantial portion of the patients saw more than 1 provider. Therefore, rather than evaluate specific providers, we tabulated the number of recommendations made to each patient during each clinic visit to examine whether their frequency would affect patient satisfaction. A total count of recommendations documented to each patient at his or her first tinnitus clinic visit was created, including those regarding medications, herbs, supplements, scans, laboratory tests, dietary discussion and recommendations, and other interventions with the intention.
Overall, how satisfied are you with the care you received for your tinnitus? 0.46
If a friend or family member indicated they were experiencing ringing in their ears, how likely are you
Knowing what you know now, how likely would you pursue the same treatment for your tinnitus? 0.31
How well did the staff caring for your tinnitus answer your questions? 0.62
How knowledgeable was the staff caring for your tinnitus? 0.60
How responsive was the staff caring for your tinnitus to your questions? 0.60
How well did the staff keep you informed about your treatment options? 0.42
How easy was it to talk to the staff at the hospital about your tinnitus? 0.67
How well do you feel that the doctor/staff listened to you regarding your concerns about your tinnitus? 0.86
How helpful was the doctor/staff at explaining tinnitus? 0.68

Table 2. Factor Loading for Included Questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>During your appointment in the otolaryngology clinic for your tinnitus, did the medical personnel spend</td>
<td>0.67</td>
</tr>
<tr>
<td>too much time with you, too little time with you, or about the right amount of time with you?</td>
<td></td>
</tr>
<tr>
<td>How helpful was the doctor/staff at explaining tinnitus?</td>
<td>0.68</td>
</tr>
<tr>
<td>How well do you feel that the doctor/staff listened to you regarding your concerns about your tinnitus?</td>
<td>0.86</td>
</tr>
<tr>
<td>How easy was it to talk to the staff at the hospital about your tinnitus?</td>
<td>0.67</td>
</tr>
<tr>
<td>How well did the staff keep you informed about your treatment options?</td>
<td>0.42</td>
</tr>
<tr>
<td>How responsive was the staff caring for your tinnitus to your questions?</td>
<td>0.60</td>
</tr>
<tr>
<td>How knowledgeable was the staff caring for your tinnitus?</td>
<td>0.60</td>
</tr>
<tr>
<td>How well did the staff caring for your tinnitus answer your questions?</td>
<td>0.62</td>
</tr>
<tr>
<td>Knowing what you know now, how likely would you pursue the same treatment for your tinnitus?</td>
<td>0.31</td>
</tr>
<tr>
<td>If a friend or family member indicated they were experiencing ringing in their ears, how likely are you</td>
<td>0.46</td>
</tr>
<tr>
<td>to recommend the tinnitus clinic at Henry Ford Health System?</td>
<td></td>
</tr>
<tr>
<td>Overall, how satisfied are you with the care you received for your tinnitus?</td>
<td>0.46</td>
</tr>
</tbody>
</table>

*Item response options different from other items on the satisfaction scale but were recoded for consistent scoring and inclusion in final score.

Discussion

In a world where ongoing health care reform and astronomical medical costs overlap, there is increased scrutiny on health care spending in the United States. As such, responsible spending on quality patient care has become essential. Tinnitus can be a vexing diagnosis for patients and providers, as a clear etiology is frequently unattainable and, thus, no clear diagnostic or treatment algorithm exists.25,37 Patient satisfaction has lately received more attention as an important outcome, largely because of its link with reimbursements through the Centers for Medicare & Medicaid Services.34,35,38-41

Controlling for costs relative to positive outcomes is necessary for health care; however, our data suggest that increased spending did not show a direct relationship with patient satisfaction, neither linearly nor curvilinearly.

Second, there was no statistically significant relationship between patient satisfaction and treatment recommendations. Neither the specific recommendations made by providers nor the overall number of recommendations appeared to affect patient approval. We attempted to control for provider effects, but given the large number of providers and the fact that patients frequently saw more than 1 provider on subsequent visits, we could not parse out these data. However, instead of illuminating patient dissatisfaction with the care, recommendations, and interventions provided, our findings likely reflect a general disappointment with a lack of improvement in a condition with no clear cure. Anecdotally, a number of responders to the survey wrote in comments regarding this very interpretation. For example, one patient wrote, “I still have the problem. I do not know what to do.” This has important implications for providers: Given a patient’s presentation and possible distress, a provider may feel pressure to request costly tests or treatments to appease the patient, knowing there is no empirical support for the use of said tests or treatments. However, as indicated from our study, spending more does not appear to result in improved patient satisfaction. Ultimately, providers should rely on their clinical judgment, effective interpersonal skills, and the empirical literature on appropriateness of recommendations in the context of treatment for tinnitus.

Patients in our study had a mean expenditure of $662.60 with regard to their tinnitus care when utilizing the tinnitus clinic. This amount does not include the cost of other providers outside our institution or other costs related to tinnitus (eg, loss of productivity, personally purchased or insurance-reimbursed equipment, such as noise-cancelation devices). Based on the 2013 US Census and an estimated 10% prevalence of tinnitus in the adult population, costs loosely calculate to approximately $15 billion per year.3,42 Again, this is likely to be an underestimate of overall costs, especially when considering other populations with higher prevalence rates of tinnitus (eg, veterans).11,12

Given the lack of clarity regarding treatment options, studies are warranted addressing the cost and cost-effectiveness of testing and interventions for tinnitus. Moreover, multidisciplinary therapies involving cognitive-behavioral therapy need to be analyzed for cost-effectiveness against patient-related outcomes such as satisfaction, quality of life, psychiatric symptoms, and continued pursuit of other treatment interventions with little empirical support. Similar studies involving chronic conditions such as rheumatoid arthritis have shown a higher average long-term cost for delaying therapy; the same may be true for tinnitus.43 Further studies should explore this by analyzing the difference in cost, taking into account level of disability secondary to tinnitus. In addition, the time difference between first tinnitus clinic visit and receiving of the
patient satisfaction survey in the mail might have altered the level of satisfaction. Whether this delay affected responses we cannot be sure, but we would recommend future prospective research to assess satisfaction concordantly with care.\(^{34}\)

The major limitations of this study are twofold: one is the retrospective chart review; the other is the potential bias in patients who chose to respond to the survey. For retrospective chart review, data are only as good as the documentation. There could be a number of recommendations or other variables unaccounted for in the patient’s chart. Also, despite an adequate sample of patients who responded to the survey, there were significant differences between responders and nonresponders. Therefore, we cannot be sure that the responses accurately reflect the larger sample, as there could be factors influencing who responds versus who does not. This limits the generalizability of our conclusions to the larger population. Further studies should include a prospective larger survey cohort that can be compared against a chart review. Specifically, it would be beneficial to have patient satisfaction surveys implemented in clinic or disseminated immediately following a visit. Additionally, it is imperative for future research to attempt to parse out provider characteristics in relation to cost and patient satisfaction.

In conclusion, this study examined the relationship between costs associated with diagnosis and initial treatment recommendations and subjective satisfaction in patients with tinnitus. Surprising, we did not find a significant relationship between medical expenditures on diagnosing and treating and patient satisfaction. The frequency of recommendations made during clinic visits also did not relate to patient satisfaction. Ultimately, providers should take patient preference into account when making treatment recommendations, while continuing to use empirically validated diagnostic and treatment tools with their best clinical judgment for the care of patients with tinnitus.

**Author Contributions**

Eric Goldstein, research design, manuscript drafting, data entry, final approval of manuscript; Chuan-Xing Ho, research design, manuscript development, data entry, final approval of manuscript; Rania Hanna, research design, manuscript development, data entry, final approval of manuscript; Clara Elinger, research design, manuscript development and approval; Kathleen L. Yaremchuk, research design, manuscript development and approval; Michael D. Seidman, research design, manuscript development and approval; Michelle T. Jesse, research design, manuscript development, final approval of manuscript.

**Disclosures**

**Competing interests:** Michael D. Seidman, VISalus Sciences, royalty off labeled products; National Institutes of Health, research simulation work; Body Language Vitamin, company founder; AAO-HNS, Board of Directors; intellectual property rights (7 patents).

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