Prevalence and Burden of Illness of Migraine in Managed Care Patients

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ABSTRACT

OBJECTIVE: To determine the 3-month prevalence rate of migraine in a health maintenance organization (HMO) population, using a 2-stage screening process and neurologist exam, and to examine the burden of illness associated with both previously diagnosed and previously undiagnosed migraine in this population

METHODS: A migraine assessment was sent to a random sample of 1,000 HMO patients between April 1999 and January 2000. Those screening positive and a random sample of those screening negative for migraine were evaluated by neurologists using a structured diagnostic assessment. Then, those diagnosed to have migraines by the study’s neurologists completed a battery of 3 questionnaires, evaluating severity, distress, and impairment

RESULTS: Of 1,000 questionnaires sent, 753 (75.3%) were returned. The estimate of prevalence of migraine in this population ranged from 21.4% (adjusted for response bias) to 27.8% (unadjusted for selection bias). Only 48% of respondents had been previously diagnosed with migraine. The typical migraine was associated with significant pain, distress, and dysfunction. There was no significant difference between previously diagnosed and undiagnosed migraineurs on 3 outcome measures: pain, interference, or days of missed work. A higher proportion of previously diagnosed migraineurs (84%) reported moderate or greater distress compared with undiagnosed migraineurs (54%, P=0.002).

CONCLUSIONS: Using a neurologist exam, the researchers found that the prevalence of migraine headaches was higher than previously reported. About one half of migraineurs had been previously undiagnosed. Undiagnosed migraine is associated with significant pain, distress, and dysfunction and is similar in these respects to diagnosed migraine. Increased public education and physician education on migraine are warranted.

KEYWORDS: Migraine, Quality of life, Disability, Managed care, Epidemiology

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Migraine is a common and intermittently disabling condition, causing significant burden for both the individual and society, including loss of productivity, limitations in activity, and decreased quality of life. Migraine pain tends to be severe, resulting in associated symptoms and functional impairment.

In a survey of 500 self-reported migraineurs, 97% reported their headache pain to be of moderate-to-severe intensity. Migraine attacks can severely impair the ability to work and require bed rest in many of the approximately 28 million affected American sufferers. Migraine sufferers have more difficulty functioning at home and at work than nonmigraineurs. A recent economic model estimated that losses due to decreased productivity are roughly $1.9 million for a company with 10,000 employees and $23.8 million for a company with 88,000 employees.

Epidemiologic studies have found lifetime prevalence rates of about 18% in women, 6% in men, and 4% in children in the United States, with similar rates recently found in England. Most studies, however, have used indirect means to determine the diagnosis of migraine, such as interviews performed by lay clinicians or self-administered questionnaires. In addition, the use of different diagnostic criteria by different researchers, as well as samples confounded by age and gender differences, make comparability of results from different studies difficult to interpret.

The purpose of the current study was to examine the 3-month prevalence and disability associated with migraine in a health maintenance organization (HMO) population using a neurologic evaluation and examination by a neurologist as the gold standard to diagnose migraine. This means of diagnosis ensured the validity of the data obtained, and thus gave a more accurate estimate of the true prevalence of migraine in this population. In addition, the use of International Headache Society criteria helped standardize case definition and is consistent with the more recent population-based studies. Finally, the current study examined the disability associated with both diagnosed and undiagnosed migraine, which has not been well studied in an HMO population.

Methods

Subjects

Subjects were enrollees in one of the 13 separate clinics of the Dean Health Plan, a 175,000-member organization based in Madison, Wisconsin. The population of the chosen clinic (Middleton Clinic, a sample of convenience) was approximately

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4,164. Subjects were considered eligible if they met the following criteria:
1. they were between 18 and 63 years old;
2. they did not have a diagnosis of a life-threatening illness or neurological condition (e.g., Huntington’s, Parkinson’s, or multiple sclerosis) that would exclude them from participation;
3. they did not have point-of-service coverage; and
4. they had been continuously enrolled in the HMO for at least 1 year.

**Study Procedures**

A total of 3,286 patients from the participating study clinic were identified as meeting the study eligibility requirements from April 1999 to January 2000 by examining the Dean Health Plan claims database from the previous 12 months. Of these patients, a random sample of 1,000 patients was selected. These 1,000 patients were then sent a health assessment questionnaire and a letter from the principal investigator inviting them to participate in a study on the effect of illness on quality of life. Subjects were informed that they may be invited to participate in the second step of the study based on their answers to the assessment packet and were asked to indicate if they were willing to be contacted for this study. A $5 bill was enclosed with the letter as an incentive and a goodwill gesture for their time. Subjects who did not return the assessment packet within 2 weeks were mailed a second letter and assessment packet.

The health assessment questionnaire consisted of 14 yes or no questions of which 9 screened for migraine (Table 1). The questionnaire was developed specifically for this study since no similar validated public domain migraine screener was available at the time of the study. A positive screen for migraine was defined as affirmation of at least 2 of the 8 migraine symptoms mentioned in the questionnaire, whereas a negative screen was defined as no symptoms or 1 symptom. Individuals who screened positive for migraine were contacted and invited to participate in the next step of the study, as was a random sample of the respondents with negative screens. Because we took only a random sample of those screens consenting to be contacted, all data were weighted to reflect this sampling design (Figure 1).

The next step in the study consisted of an in-person neurological examination by board-certified neurologists (4 independent physicians not affiliated with the study) with expertise in the diagnosis and treatment of migraine. The neurologist examination served as the standard for the diagnosis of migraine and ruled out other diagnoses that could have accounted for patient symptoms. The examination was conducted with the use of a semistructured interview guide to ensure reliability among the 4 neurologists who conducted the examinations. In addition, study neurologists attended interrater reliability training on the administration of the semistructured interview, which included viewing a video and practice administration of the interview. Examination results were reviewed by an expert consultant (author M. Dominski) and any questions were discussed and clarified.

All subjects who were diagnosed with migraine by the neurologist also completed a battery of 3 questionnaires evaluating migraine severity, distress, and impairment. All subjects signed informed-consent documents, reviewed and approved by the Dean Foundation Institutional Review Board.

**Outcomes Measures**

The following 3 instruments were administered (each was developed specifically for use in this study since no similar instruments were available at the time of the study):

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**TABLE 1** Migraine Screener

<table>
<thead>
<tr>
<th><strong>Health Status Questionnaire</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructions:</strong> For each question, check the one box that best describes your answer. Mark only one box for each question, and be sure to answer all items.</td>
</tr>
<tr>
<td>1. In the past three months, have you had any moderate or severe headaches? If you marked YES to #1, please answer #2. If you marked NO to #1, please skip to #3.</td>
</tr>
<tr>
<td>2. Have any of these headaches been associated with the following?</td>
</tr>
<tr>
<td>a. Pain starting on one side</td>
</tr>
<tr>
<td>b. Throbbing or pulsating feeling in the head</td>
</tr>
<tr>
<td>c. Nausea or vomiting</td>
</tr>
<tr>
<td>d. Light being more bothersome than when you are without a headache</td>
</tr>
<tr>
<td>e. Sound being more bothersome than when you are without a headache</td>
</tr>
<tr>
<td>f. Changes in vision or seeing sparkling lights or jagged lines before or during the headache</td>
</tr>
<tr>
<td>g. Numbness or tingling of hand, arm, or face during the headache</td>
</tr>
<tr>
<td>h. Headaches made worse by routine physical activity, such as walking up stairs</td>
</tr>
<tr>
<td>3. In the past three months, have you had moderate or severe heartburn?</td>
</tr>
<tr>
<td>4. In the past three months, have you had moderate or severe arthritis?</td>
</tr>
<tr>
<td>5. In the past three months, have you had moderate or severe back or joint pain?</td>
</tr>
<tr>
<td>6. In the past three months, have you had moderate or severe allergies?</td>
</tr>
<tr>
<td>7. In the past three months, have you had any coughing up of blood?</td>
</tr>
</tbody>
</table>
1. **Sands-Taylor (ST) Migraine Questionnaire** (George Sands and Kirk Taylor [a neurologist employed by Pfizer, Inc.], unpublished test) (Appendix A). The ST Questionnaire evaluated symptoms associated with headaches with mild, moderate, and severe head pain. Embedded within the ST are 3 questions from the Work Productivity and Activity Impairment Inventory, adapted for use with migraine patients. These questions evaluate the number of missed work days in the past 3 months, degree of reduction in work productivity, and degree of impairment in regular daily activities due to migraine.

2. **Migraine Severity Scale** (MSS; (John H. Greist, Kenneth A. Kobak, and David J. Katzelnick) unpublished test) (Appendix B). The MSS is modeled on the Yale-Brown Obsessive-Compulsive Scale and evaluates the number and duration of migraines, as well as impairment, distress, and degree of control over migraines.

3. **Headache Specialist Diagnostic Patient Interview** (HSDPI; George Sands and Kirk Taylor, unpublished interview) (Appendix C). The HSDPI is a semistructured diagnostic interview developed for the current study that provides a migraine diagnosis based on International Headache Society criteria. Embedded within the HSDPI is a rating of average headache severity on a Likert scale ranging from 0 (no headache) to 10 (most severe headache). Scale ratings are subsequently translated into categories of mild (0-3), moderate (4-7), and severe (8-10).

## Results

### Participants

Of the 1,000 subjects sent an assessment packet and invitation to participate in the study, a total of 753 (75.3%) returned the packet (mean age: 41.27 years; SD= ±10.87; female: 59%), and 570 (57%) of these patients consented to be contacted for further participation (228 of 288 [79%] positive screens and 342 of 465 [74%] negative screens). Of the 228 positive screens, 223 (98%) were contacted and invited to participate in the next step of the study, as was a random sample (53%) of the 342 negative screens (n =182). A total of 237 subjects agreed to and completed the neurologist examination (136 positive screens and 101 negative screens). Of these 237, 68% were female, and the mean age was 41.3 years.

The weighted number of subjects completing the neurological exam was 336, of which 94 were migraine-positive. Of the 94 migraine-positive subjects, 79% were female and 21% were male. The mean age was 42.03 years (SD=±8.84; range: 19-59).

### Disease Prevalence

The prevalence of migraine in this population (unadjusted for selection bias, i.e., only a random sample of negative screens was contacted) was greater than 20% (mean: 27.8%; 95% confidence interval, .26-.28, with a prevalence of 19% in males and 34% in females. Only 48% of subjects with a diagnosis of migraine on the neurological exam reported having been previously diagnosed with migraine by a health care professional.

Because those with migraine may be more likely to return the mailed assessment packet, this prevalence may be inflated, with the low estimate of 21% being based on the assumption that all those who did not return the assessment packet were nonmigraineurs. An analysis of the HMO claims database found no significant difference between those who returned and those who did not return the assessment packet in the percentage of subjects with a claims diagnosis of migraine (4.7% versus 4.2%, $P=0.755$) or in the percentage of subjects using triptans (3.1% versus 2.5%, $P=0.657$), but there was a significant difference in mean age (38.8 versus 35.6 years, $P=0.001$) and percent female (58.8% versus 50.0%, $P=0.016$).

We also compared those consenting to be contacted with those who did not consent to be contacted in order to determine if those consenting to be contacted were more likely to have migraine and thus artificially inflate the prevalence estimates. An examination of the HMO claims database found that those who consented to be contacted had a significantly higher rate of migraine in the HMO claims database (5.8% versus 1.2%, $P=0.019$). We recalculated the prevalence using the most...
Prevalence and Burden of Illness of Migraine in Managed Care Patients

Conservative approach (i.e., we assumed that all those who did not consent to be contacted were migraine-negative). Using this approach to adjust for apparent response bias, the prevalence of migraine in this population was 21.4%. Finally, among those consenting to be contacted, there was no significant difference between those completing and those not completing the neurological examination in terms of prevalence of migraine or percentage using triptans in the HMO database. However, a small but significant difference was found in the percentage of females (67.9% versus 57.7% respectively, \( P = 0.036 \)).

Pain, Distress, and Dysfunction

The average pain severity of the typical migraine rated by neurologists on the 0 to 10 HSDPI Likert scale was 7.21 (SD = 2.12; median: 8.0). When collapsed into 3 categories, 5% could be categorized as mild (0-3 on the HSDPI), 42% as moderate (4-7), and 53% as severe (8-10). On the self-report MSS, the typical migraine was rated as causing moderate distress by 43% of migraineurs, severe distress by 19%, and extreme distress by 7% (Table 2). Sixty-six percent said their migraines caused definite-to-extreme interference in their social or occupational functioning (Table 3). Only 46% reported they were “always” or “usually” successful in stopping their migraines once they felt one coming on (Table 4). The average migraineurs missed 7.6 hours of work due to migraine in the past 3 months (SD = ±13.4), and migraine patients were limited in their activities on an average of 2.4 days in the past 3 months (SD = ±3.3). Sixty-three percent reported having at least 3 migraines over the last 3 months, and 21% reported 7 or more. Eighty-nine percent reported having migraines for longer than 2 years (median: 14 years), and 66% had migraines for 10 years or longer. Seventy-two percent had a positive family history of migraine.

Diagnosed Versus Undiagnosed Migraine

Previously diagnosed migraineurs were 89% female, compared with 71% female in the previously undiagnosed migraine group; \( \chi^2(1) = 4.629, P = 0.031 \). Mean age was 42.20 years (SD = 8.96; range: 20-56) for those previously diagnosed compared with 41.88 years (SD = ±8.83; range: 19-59) for those previously undiagnosed, \( t(92) = 0.173, P = 0.863 \).

Undiagnosed migraine was associated with substantial distress and impairment and was similar in migraine intensity and impairment as reported by patients in whom migraine had been previously diagnosed. A comparison between migraineurs who reported having been previously diagnosed with migraine by a health care professional and those who had not been previously diagnosed is presented in Table 5 and Figures 2-4. There was no significant difference between diagnosed and undiagnosed migraineurs on the mean pain associated with their typical migraine as reported on the HSDPI (7.36 versus 7.09, respectively, \( t(92) = .607, P = 0.545 \)). Similarly, no signifi-

### Table 2: Self-Reported Distress Caused by the Typical Migraine for Subjects Diagnosed With Migraine by Neurologist Exam (N = 94*) on the Migraine Severity Scale

<table>
<thead>
<tr>
<th>Distress Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Mild, infrequent, and not too disturbing</td>
<td>26 (28%)</td>
</tr>
<tr>
<td>Moderate, frequent, and disturbing, but manageable</td>
<td>39 (43%)</td>
</tr>
<tr>
<td>Severe, very frequent, and very disturbing</td>
<td>17 (19%)</td>
</tr>
<tr>
<td>Extreme, near constant, and disabling distress</td>
<td>6 (7%)</td>
</tr>
</tbody>
</table>

* Data were not obtained on 3 patients.

### Table 3: Amount of Self-Reported Interference With Everyday Activities Caused by Typical Migraine for Subjects Diagnosed With Migraine by Neurologist Exam (N = 94*) on the Migraine Severity Scale

<table>
<thead>
<tr>
<th>Interference Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>8 (9%)</td>
</tr>
<tr>
<td>Slight</td>
<td>23 (25%)</td>
</tr>
<tr>
<td>Definite, but manageable</td>
<td>28 (31%)</td>
</tr>
<tr>
<td>Substantial</td>
<td>20 (22%)</td>
</tr>
<tr>
<td>Extreme, incapacitating</td>
<td>12 (13%)</td>
</tr>
</tbody>
</table>

* Data were not obtained on 3 patients.

### Table 4: How Often Migraineurs Are Successful in Stopping Migraines Once They Feel One Coming On (N = 94*)

<table>
<thead>
<tr>
<th>Success Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>15 (16%)</td>
</tr>
<tr>
<td>Usually</td>
<td>27 (29%)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>25 (27%)</td>
</tr>
<tr>
<td>Rarely</td>
<td>20 (22%)</td>
</tr>
<tr>
<td>Never</td>
<td>5 (6%)</td>
</tr>
</tbody>
</table>

* Data were missing on 2 patients.

Note: The question was worded “How much control do you have over your migraine headaches? How successful are you in stopping them once you feel one coming on, for example, with medication, bed rest, relaxation, or other action?”

### Table 5: Age, Gender, and Severity of Migraine Pain Between Neurologist-Diagnosed Migraine Subjects Who Have Been Previously Diagnosed (n = 43) Versus Those Not Previously Diagnosed (n = 51) on the Headache Specialist Diagnostic Patient Interview (HSDPI) Severity Scale

<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Previous Diagnosis</th>
<th>No Previous Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean)</td>
<td>42.20</td>
<td>41.88</td>
</tr>
<tr>
<td>% Female</td>
<td>89%</td>
<td>71%</td>
</tr>
<tr>
<td>Mild (0-3)</td>
<td>0 (0%)</td>
<td>5 (9%)</td>
</tr>
<tr>
<td>Moderate (4-7)</td>
<td>20 (47%)</td>
<td>19 (38%)</td>
</tr>
<tr>
<td>Severe (8-10)</td>
<td>23 (53%)</td>
<td>27 (53%)</td>
</tr>
</tbody>
</table>

Note: HSDPI rates headaches on a 0-10 scale, with 0 indicating no headache pain and 10 indicating most severe headache pain.
No significant difference was found between diagnosed and undiagnosed migraineurs in the percentage of headaches with head pain categorized as mild (0-3), moderate (4-7), and severe (8-10), \( \chi^2(2) = 4.70, P = 0.095 \).

No significant difference was found between diagnosed and undiagnosed migraineurs in the amount of interference the typical migraine caused with daily activities, \( \chi^2(4) = 5.09, P = 0.278 \) (Figure 2). Fifty-nine percent of undiagnosed subjects reported definite, substantial, or extreme interference with daily activities compared with 75% for those previously diagnosed, \( \chi^2(1) = 2.76, P = 0.096 \).

There was a significant difference between diagnosed and undiagnosed migraineurs in the amount of distress reported, \( \chi^2(4) = 13.72, P = 0.008 \): 53.6% of undiagnosed subjects reported moderate or greater distress associated with their migraines compared with 83.9% of those previously diagnosed, \( \chi^2(1) = 9.34, P = 0.002 \) (Figure 3).

No significant difference was found between diagnosed and undiagnosed migraineurs in hours of missed work due to migraine (Figure 4). Subjects with undiagnosed migraine missed an average of 8 hours of work in the past 3 months due to migraine compared with 7.2 hours for patients who had been previously diagnosed, \( t(87) = 0.3, P = 0.76 \).

II Discussion

The prevalence of migraine based on International Headache Society criteria, as confirmed by structured neurological evaluation and examination in this managed care population (21.4% adjusted for selection bias, 27.8% unadjusted), is at least as high, if not higher than, previous epidemiologic studies of community samples.\(^7,14,15\) Higher prevalence could be explained by several differences in methodology between the current study and previous studies.

First, this study excluded members younger than 18 and older than 65 years. Individuals in these age categories are less likely to be actively having migraine headaches,\(^1\) but they may have been included in other study populations. Second, follow-up exams by neurologists resulted in a migraine diagnosis for some individuals who initially screened negative on the mailed assessment packet. Failing to identify this group would result in lower estimates of prevalence. Conversely, the inclusion of a structured headache interview administered by neurologists eliminated a diagnosis for participants who appeared to have migraine headaches but actually had other types of headaches.

Third, the higher rates of return of the mailed assessment packet by female members may have inflated the migraine prevalence. Finally, since this study was conducted in a single, fairly homogeneous clinic of a managed care organization, a replication study with a larger sample size and a more heterogeneous population is warranted to determine the generalizability of the results.
More than half of these individuals had never been told they had migraine headaches by a health care professional despite the fact that most reported having had migraine headaches for many years, having experienced real impairment, and having had health insurance coverage. This is cause for concern, and although this study was performed in 1999, under-recognition and under-diagnosis of migraine continue to be problems today.15

Increased public education and physician education about the symptoms and accurate diagnosis of migraine headache are urgently needed, as are simple and effective screening methods to identify patients with migraine in the family practice setting. Application of International Headache Society diagnostic criteria for migraine would be complex in this setting. However, diagnosis could be facilitated by simpler and more easily administered screening tools, such as the ones utilized in the current study. Other screens have also been reported to have good sensitivity and specificity.16-23

Limitations of this study include the fact that these data are now 5 years old, although it seems unlikely that the prevalence or burden of migraine in managed care members is less today than it was when these data were collected. We also did not measure costs and did not calculate the financial burden of migraine. We found that previously undiagnosed migraine patients reported pain, interference with activities of daily living, and hours of missed work in similar proportion to previously diagnosed migraine patients. This suggests a potential opportunity for diagnosis and treatment of undiagnosed patients; we did not, however, assess if this potential opportunity could be fulfilled in undiagnosed migraine patients. Use of a structured screening interview such as the one used in this study may increase the identification and treatment of previously undiagnosed patients. A study identifying and treating previously undiagnosed migraine and examining the impact of treatment on patient distress, disability, and financial burden would be instructive.

In this study, previously diagnosed migraineurs did not differ from previously undiagnosed migraineurs on 3 of 4 outcome measures but did have a higher proportion of patients reporting moderate or greater levels of distress. This finding may suggest that distress more than impairment drives migraineurs to seek help from the health care system. However, undiagnosed and diagnosed migraineurs had similar, elevated levels of severity, impairment, and missed work time. Therefore, the reasons for not seeking diagnosis or treatment must be more complex than milder symptoms or less impairment (though this similarity could be the result of previously diagnosed migraineurs having already received treatment).

The high levels of impairment and disease severity in diagnosed migraineurs also highlights undertreatment of migraine, which is still a relevant issue today. Evidence-based guidelines for the prevention and management of migraine have been published by the American Academy of Neurology (AAN) and others to assist family practitioners in generating algorithms that are appropriate for their practices.24,25 Current treatment algorithms recommend triptans for those with moderate-to-severe migraines or poor responses to nonsteroidal anti-inflammatory drugs.6,24-26 and triptan use reduces functional disability.27-32 and is cost effective.33,34 Preventative therapies identified by AAN as having the highest level of evidence-based efficacy and safety include antiepileptics (divalproex sodium/sodium valporate), antidepressants (amitriptyline), and beta-blockers (propranolol or timolol). Cognitive and behavioral treatments such as relaxation training, biofeedback, and cognitive behavior therapy are also recommended by AAN as possible preventative strategies.

Conclusions

The prevalence of migraine was high in this managed care population (34% of women and 19% of men, when unadjusted for response bias, and 30% of women and 12% for men, when adjusted for a prior probability response bias) compared with published population studies (18% of women and 6% of men).7-26 These values are very relevant to the family practice setting, perhaps even more relevant than those of general population studies since our study population comprised individuals who use the health care system. Second, disability was as high in migraineurs who had not been previously diagnosed as it was in previously diagnosed patients. This suggests that reasons for not seeking a diagnosis are more complex than the possibility that those who do not seek treatment have milder pain or disability than those who do seek treatment. Distress may be one factor that influences the decision to seek treatment since distress level was higher among previously diagnosed migraineurs. Finally, improved means for identifying and treating migraine are available and should be used in the managed care setting to the benefit of patients. Increased public and physician education about the symptoms and accurate diagnosis and treatment of migraine headache are needed.

DISCLOSURES

This study was supported, in part, by a grant from Pfizer, Inc.; funding was obtained by authors David J. Katzelnick and George Sands; Sands is employed by Pfizer, Inc., Katzelnick and author John H. Greist disclose that they have served as consultants for, participated in the speakers bureau of, and received research support from numerous pharmaceutical organizations, including Pfizer. Authors Kenneth A. Kobak, Monica King, and Mary Dominski disclose no potential bias or conflict of interest relating to this article.

Parts of this manuscript were presented at the American Association for the Study of Headache, 42nd Annual Scientific Meeting, Montreal, Canada, June 23-25, 2000. Kobak served as principal author of the study. Study concept and design were contributed by Kobak, Katzelnick, Sands, King, and Dominski. Analysis and interpretation of data were contributed by all authors. Drafting of the manuscript was the work of Kobak, Katzelnick, and King, and its critical revision was the work of Kobak, Katzelnick, Greist, and Sands. Statistical expertise was contributed by Kobak, Katzelnick, Greist, and Sands.
APPENDIX A  Sands-Taylor Migraine Questionnaire

INSTRUCTIONS: Please think of the PAST 3 MONTHS when answering these questions.

1. What percent of your migraine headache attacks are associated with head pain that is:
   1a. Mild __________%
   1b. Moderate __________%
   1c. Severe __________%
   (Total should add up to 100%)

SECTION ONE: Mild Headaches
Migraine headache attacks are often associated with certain symptoms in addition to head pain. These include nausea and/or vomiting, increased sensitivity to light and/or sound. The first section deals with migraine headache attacks where the headache PAIN is of MILD severity. Please refer to only those migraine headache attacks where the headache pain is of MILD severity when answering these questions. If none of your headache pains are MILD, that is, if the head pain was moderate or severe in all of them, skip this section and go on to Section Two (page 2).

2. In the past 3 months, how many migraine headache attacks have you had where the HEAD PAIN was of MILD severity?
   ❑ 1 None (IF NONE, GO TO Section Two, page 2)
   ❑ 2 1
   ❑ 3 2-3
   ❑ 4 4-5
   ❑ 5 6-8
   ❑ 6 9-12
   ❑ 7 13-18
   ❑ 8 19 or more

3. How long do your migraine headache attacks with MILD HEAD PAIN last on average?
   ❑ 1 Less than 30 minutes
   ❑ 2 31 minutes to 1 hour
   ❑ 3 1 to 2 hours
   ❑ 4 2 to 4 hours
   ❑ 5 4 to 8 hours
   ❑ 6 8 to 12 hours
   ❑ 7 12 to 24 hours
   ❑ 8 More than 24 hours

4. Do your migraine headache attacks with MILD PAIN affect your ability to function at work and/or at home?
   ❑ 1 YES  (GO TO Question 5)
   ❑ 0 NO  (GO TO Question 6)

5. For the following question, please think about how much your ability to function at work and/or at home is affected by your migraine headache attacks with MILD HEAD PAIN.

   What percent does each item below contribute to your decreased ability to function?
   5a. Head pain __________%
   5b. Increased sensitivity to light __________%
   5c. Increased sensitivity to sound __________%
   5d. Nausea and/or vomiting __________%
   (Total should add up to 100%)

SECTION TWO: Moderate or Severe Headaches
The second section deals with migraines where the headache PAIN is MODERATE OR SEVERE. Please refer to only those migraine headache attacks where the headache PAIN is of MODERATE OR SEVERE severity, that is, if they are all mild, skip this section and go to Section Three (page 4).

6. In the past 3 months, how many migraine headache attacks have you had where the HEAD PAIN was MODERATE OR SEVERE?
   ❑ 1 None (IF NONE, GO TO Section Three, page 4)
   ❑ 2 1
   ❑ 3 2-3
   ❑ 4 4-5
   ❑ 5 6-8
   ❑ 6 9-12
   ❑ 7 13-18
   ❑ 8 19 or more

7. How long do your migraine headache attacks with MODERATE-TO-SEVERE PAIN last on average?
   ❑ 1 Less than 30 minutes
   ❑ 2 31 minutes to 1 hour
   ❑ 3 1 to 2 hours
   ❑ 4 2 to 4 hours
   ❑ 5 4 to 8 hours
   ❑ 6 8 to 12 hours
   ❑ 7 12 to 24 hours
   ❑ 8 More than 24 hours

8. Do your migraine headache attacks with MODERATE-TO-SEVERE PAIN affect your ability to function at work and/or at home?
   ❑ 1 YES  (GO TO Question 9)
   ❑ 0 NO  (GO TO Question 10)

9. For the following question, please think about how much your ability to function at work and/or at home is affected by your migraine headache attacks with MODERATE-TO-SEVERE HEAD PAIN.

   What percent does each item below contribute to your decreased ability to function?
   9a. Head pain __________%
   9b. Increased sensitivity to light __________%
   9c. Increased sensitivity to sound __________%
   9d. Nausea and/or vomiting __________%
   (Total should add up to 100%)

SECTION THREE: Work and/or Home Impairment
The next three questions are about the past 3 months, not including today.

10. During the past three months, how many hours did you miss from work because of your migraine headache attacks? Include hours you missed on sick days, times you went in late, left early, etc.  __________ hours

(Continued on next page)
Prevalence and Burden of Illness of Migraine in Managed Care Patients

APPENDIX A  Sands-Taylor Migraine Questionnaire (continued)

11. During the past three months, how much did migraine headache attacks affect your productivity while you were working? Think about days you were limited in the amount or kind of work you could do, days you accomplished less than you would like, or days you could not do your work as carefully as usual. If migraine headache attacks affected your work only a little, choose a low number. Choose a high number if migraine headache attacks affected your work a great deal. (Circle a number.)

12. Now think about your regular daily activities (other than your job). This means the usual activities that you do every day, such as work around the house, shopping, child care, exercising, etc.

During the past three months, how much did migraine headache attacks affect your ability to do your daily regular activities? Think about days you were limited in the amount or kind of activities you could do, days you accomplished less than you would like, or days you could not do your regular activities as carefully as usual. If migraine headache attacks affected your daily regular activities only a little, choose a low number. Choose a high number if migraine headache attacks affected your daily regular activities a great deal. (Circle a number.)

SECTION FOUR: Family History of Migraine Headache Attacks

13. Does any relative related to you by blood get similar headaches?  ❑ 1  YES  ❑ 0  NO

SECTION FIVE: Medications

Please indicate whether or not you have taken any of the medications below in the PAST 3 MONTHS for migraine headache attacks and how much relief you obtained from each one.

<table>
<thead>
<tr>
<th>OVER-THE-COUNTER MEDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>14. Advil</td>
</tr>
<tr>
<td>15. Aleve</td>
</tr>
<tr>
<td>16. Aspirin</td>
</tr>
<tr>
<td>17. Excedrin</td>
</tr>
<tr>
<td>18. Excedrin Migraine</td>
</tr>
<tr>
<td>19. Ibuprofen (200 mg tablets)</td>
</tr>
<tr>
<td>20. Motrin</td>
</tr>
<tr>
<td>21. Nuprin</td>
</tr>
<tr>
<td>22. Tylenol</td>
</tr>
<tr>
<td>23. Other OTC medicines</td>
</tr>
<tr>
<td>Which ones? (list)</td>
</tr>
</tbody>
</table>

(Continued on next page)
## APPENDIX A  Sands-Taylor Migraine Questionnaire (continued)

### DRUGS PRESCRIBED BY A DOCTOR

<table>
<thead>
<tr>
<th>Medication</th>
<th>Have you taken this medication?</th>
<th>If taken, indicate here (by checking the box) how much RELIEF obtained.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Some</td>
</tr>
<tr>
<td>27. Dihydroergotamine (DHE) injection</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>29. Ibuprofen (600 mg tablets)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>30. Imitrex (injection)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>31. Imitrex (oral)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>32. Imitrex (nasal)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>33. Maxalt (oral)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>34. Maxalt (wafer)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>35. Midrin</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>36. Migranal</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>37. Migranal</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>38. Stadol</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>39. Tylenol with codeine</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>40. Vicodin</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>41. Wigraine</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>42. Zomig</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>43. Other prescription drugs</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Which ones? (list)</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
</tbody>
</table>

b.___________________
**APPENDIX B**

**Migraine Severity Scale**

We want to learn about the severity of your migraine headaches during the last three months.

When answering these questions, please refer only to your migraine headaches. Migraine headaches meet the following definition: migraine headaches last at least four hours and are associated with **at least two** of the following symptoms:

1) pain starting on one side of your head;
2) a throbbing or pulsating feeling in the head;
3) nausea or vomiting;
4) light or sound being more bothersome;
5) changes in vision or seeing sparkling lights;
6) numbness or tingling of your hand, arm, or face; or
7) headaches that are made worse by routine physical activity, such as walking up stairs.

Please rate only those migraine headaches that you have had in the **past three months**.

1. In the past three months, have you had any migraine headaches, that is, headaches that had at least two symptoms that we just described?
   - Yes
   - No (If no, GO TO #7)

2. How many migraine headaches (as just described) have you had in the past three months?
   - None
   - 1-2
   - 3-4
   - 5-6
   - 7-10
   - 11 or more

3. During the past three months, please rate separately how long your worst, your usual, and your mildest migraine headaches last.

   **Worst Headache (3a)**
   - Less than 2 hours
   - 2-4 hours
   - 5-8 hours
   - 9-12 hours
   - 12-24 hours
   - 24-48 hours
   - Over 48 hours

   **Usual Headaches (3b)**
   - Less than 2 hours
   - 2-4 hours
   - 5-8 hours
   - 9-12 hours
   - 12-24 hours
   - 24-48 hours
   - Over 48 hours

   **Mildest Headache (3c)**
   - Less than 2 hours
   - 2-4 hours
   - 5-8 hours
   - 9-12 hours
   - 12-24 hours
   - 24-48 hours
   - Over 48 hours

4. How much do your typical or usual migraine headaches interfere with your everyday activities?
   - No interference
   - Slight interference with social or occupational activities, but overall performance not impaired (e.g., may skip a social activity or put off some work activity but perform most work activities)
   - Definite interference with social or occupational performance, but still manageable (e.g., attends social activities but participates less than usual; definite decrease in work performance)
   - Causes substantial impairment in social or occupational performance (e.g., does not attend important social activities; leaves work or stays home from work)
   - Extreme, incapacitating (requires bed rest)

5. How much distress do your typical or usual migraine headaches cause you?
   - None
   - Mild, infrequent, and not too disturbing
   - Moderate, frequent, and disturbing, but manageable
   - Severe, very frequent, and very disturbing
   - Extreme, near constant, and disabling distress

6. How much control do you have over your migraine headaches? How successful are you in stopping them once you feel one coming on, for example, with medication, bed rest, relaxation, or other action?
   - Always
   - Usually
   - Sometimes
   - Rarely
   - Never

7. How long has it been since you’ve had your last migraine headache?
   - More than 3 months (ANSWER #7b)
   - More than 1 month (GO TO #8)
   - More than 2 weeks (GO TO #8)
   - More than a week (GO TO #8)
   - Less than a week (GO TO #8)

7b. Please indicate the date you had your last migraine headache. If you can’t remember, just make your best estimate.
   ______/_____/______ (date of last migraine)

8. How long have you had migraine headaches?
   - Less than 6 months
   - 7 to 12 months
   - 13 months to 2 years
   - 23 months to 4 years
   - More than 4 years but less than 10
   - 10 years or more
### Headache Specialist Diagnostic Patient Interview

**Instructions:** Initially, consider how many types of headaches the patient may have. Then, answer the following questions based on the patient's migraine headaches. If migraine headaches are not present in this patient, then answer the questions based on their most severe and disabling headaches. On page 3, please evaluate patient for migraine without aura and migraine with aura as it is possible for patient to be diagnosed with neither, either, or both. Please check an answer for all questions in order to collect the most accurate data possible.

#### LOCATION OF HEADACHES

1. **Yes ☐**  
   1) Are the headaches located more on one side or the other?
2. **Yes ☐**  
   2) Do the headaches ever begin on the other side?

#### QUALITY OF HEADACHE

3. **Yes ☐**  
   3) Do you have more than one type of headache? If yes, please describe the most severe and disabling headache by answering the following questions.
4. **Yes ☐**  
   4) Do you have nausea and/or vomiting with this type of headache?
5. **Yes ☐**  
   5a) Throbbing?
5b) Stabbing?
5c) Pressure?
5d) Tightness?
6. **Yes ☐**  
   6) Please rate the average severity of your most severe and disabling headaches from 0 to 10: 
   
<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Headache</td>
<td>Most Severe Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. **Yes ☐**  
   7) Do odors or strong smells bother you more than usual during the headaches?
8. **Yes ☐**  
   8) Does sound/noise/music bother you more than usual during the headaches?
9. **Yes ☐**  
   9) Does exercise or movement worsen your headaches?
10. **Yes ☐**  
    10) Do you have any numbness or tingling in your arms or legs during your headaches? (If yes, explore timing of onset.)
11. **Yes ☐**  
    11) Do you have any weakness (decreased strength) in your arms or legs during your headaches?

#### QUALITY AND DURATION OF HEADACHE

12. **___ months**  
   12) How long have you had headaches?
13. **___ per month**  
   13) How many times per month do you have each type of headache you’ve told me about?
14. **___ hours**  
   14) How long does each type of headache last?

#### ASSOCIATED SYMPTOMS

15. **Yes ☐**  
    15) Do you ever know that you are going to have a headache before you have one?
16. **Yes ☐**  
    16) Do you experience increased sensitivity to light?
17. **Yes ☐**  
    17) Does anything trigger or worsen your headaches?
18. **Yes ☐**  
    18) Do you see flashing lights or have any changes in your vision during or after your headaches?
19. **Yes ☐**  
    19) Do you have other symptoms with your headache?
20. **Yes ☐**  
    20) Do your parents, siblings, or children have similar headaches?
21. **Yes ☐**  
    21) Do your parents, siblings, or children have headaches associated with nausea and/or vomiting?
22. **Yes ☐**  
    22) What relieves your headaches?
22a) Resting in a dark or quiet room?  
22b) Sleep?  
22c) Vomiting?  
22d) Taking an over-the-counter medication?  
22e) Taking a prescription medication?  
22f) Other?  
22g) Nothing?  
23. **Yes ☐**  
    23) Do you need/take medication to control your headaches? If yes, please list the number of pills or capsules you take per month for each medication.

(Continued on next page)
APPENDIX C
Headache Specialist Diagnostic Patient Interview (continued)

DIAGNOSTIC STUDIES

24) Have you ever had?
   24a) Yes ❑  No ❑
   24b) Yes ❑  No ❑
   24c) Yes ❑  No ❑
   24d) Yes ❑  No ❑
   24e) Yes ❑  No ❑

If yes to any of the above, please list the clinically relevant findings.
____________________________________________________

INTERNATIONAL HEADACHE SOCIETY (IHS) CRITERIA DIAGNOSTIC CHECKLIST

1.1 Migraine without aura
Diagnostic Criteria

25) Yes ❑  No ❑
   25) At least 5 attacks fulfilling 26-28b

26) Yes ❑  No ❑
   26) Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)

27) Headache has at least 2 of the following characteristics:
   27a) Yes ❑  No ❑
   27b) Yes ❑  No ❑
   27c) Yes ❑  No ❑
   27d) Yes ❑  No ❑

28) During headache at least one of the following:
   28a) Yes ❑  No ❑
   28b) Yes ❑  No ❑

29) At least one of the following:
   29a) Yes ❑  No ❑
   29b) Yes ❑  No ❑
   29c) Yes ❑  No ❑

30) Yes ❑  No ❑
   30) Patient meets diagnostic criteria for migraine without aura?

2.1 Migraine with aura
(Aura as herein used does not necessarily imply that it precedes the headache, nor does it imply any relationship with epilepsy.)
Diagnostic Criteria

31) Yes ❑  No ❑
   31) At least 2 attacks fulfilling 32a-32d

32) Yes ❑  No ❑
   32) At least 3 of the following 4 characteristics:
   32a) Yes ❑  No ❑
   32b) Yes ❑  No ❑
   32c) Yes ❑  No ❑
   32d) Yes ❑  No ❑

33) At least 1 of the following:
   33a) Yes ❑  No ❑
   33b) Yes ❑  No ❑
   33c) Yes ❑  No ❑

34) Yes ❑  No ❑
   34) Patient meets criteria for diagnosis of migraine with aura?

35) Migraine with aura ❑  Migraine w/o aura ❑
   35) If patient meets criteria for both migraine with and without aura, which occurs most frequently?
REFERENCES


