Development and Validation of a Screening Tool to Identify Chronic Migraine (ID-CM)

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INTRODUCTION
• Despite its substantial economic and quality of life burden, chronic migraine (CM) remains under-diagnosed and under-treated.1,2
• Though screening is a common strategy for improving diagnosis, there are no validated screening tools for individuals with CM

OBJECTIVE
• To develop and validate a self-administered screening tool for CM among individuals with severe headaches

METHODS
• A draft screening tool was previously developed by:
  - Reviewing existing instruments for migraine
  - Generating an item pool of candidate items and conducting a Delphi panel with headache experts
  - Completing cognitive debriefing interviews in individuals with CM to assess relevance and understandability of questions and response options

• To determine psychometric properties and screening tool composition, the draft screening tool was administered via internet to severe headache sufferers identified through an online panel research company (Research Now):
  - Participants were sampled from four sources, three of which were from the Chronic Migraine Epidemiology and Outcomes (CaMEO) study: a prospective, web-based cohort study with a sample population of episodic and severe headache (n=28,877):
    1. Baseline over quota panel (n=1263): respondents who met criteria for migraine or CM and completed the CaMEO screening phase, but were not included in CaMEO
    2. Baseline screened out panel (n=4428): respondents screened negative for migraine and not enrolled in CaMEO
    3. Non-responder study complete panel (n=1065): subjects did not respond to the CaMEO baseline screener but responded to a non-responder study survey
  - Research Now self-report of physician diagnosis of migraine panel (n=229,981): subjects recruited to supplement CaMEO sourced cases
    - Sample members reporting minimum headache frequency inclusion criteria (at least 5 days per month) were screened at baseline and stratified on modified International Classification of Headache Disorders 3rd edition beta version (ICHD-3-B) and Silberstein-Lipton CM (SL-CM) criteria into three headache type categories:1,2
      1. CM
      2. Episodic migraine (EM)
      3. Other severe headache (defined by reporting headache of any frequency but not meeting the modified ICHD-3-B for migraine)
  - A two-stage screening process was employed to detect cases using ID-CM
    - Stage 1: Screen for migraine among respondents with severe headache
    - Stage 2: Screen for CM among migraine cases

• A unique item Response Theory (IRT) model was fit for each stage to determine ID-CM tool properties
  - Stage 1: IRT model for migraine screening based on symptom factors
  - Stage 2: IRT model for CM screening based on ‘activates’ and ‘making plans’ factors, as well as headache frequency
    - Item characteristic curves (ICCs) facilitated item selection and elimination
  - IRT models were also used to check initial CM-identification accuracy (extent to which a screening tool is able to accurately classify respondents into 2 categories)
    - Stage 1: Modified ICHD-3-B migraine classification predicted in severe headache sample
    - Stage 2: SL-CM classification predicted in migraine sample

• R² values for each model correspond to classification accuracy between ID-CM and ICHD-3-B/SL-CM criteria

METHODS continued
• In the final phase of the study, phone interviews were conducted by clinicians to compare ID-CM to the ‘gold standard’ (ie, clinician diagnosis)
  - Participants were sampled from the four sources with supplemental sampling from members of the CaMEO longitudinal cohort
    - Sensitivity and specificity were calculated to estimate agreement between ID-CM and clinical interview classification
  - ID-CM scoring algorithm was developed using data gathered from the online survey and clinical interviews
    - Psychometric analyses were conducted using M-plus version 7.1 (Los Angeles, CA) and sensitivity analyses were conducted using SAS version 9.2 (Cary, NC)

RESULTS
• The candidate screening tool item pool contained 27 items
  - A draft questionnaire of 20 items was selected based on face validity and clinical judgment from the Delphi panel
    - Cognitive debriefing interviews with CM patients confirmed that the 20 items were well understood and considered relevant in terms of how CM patients interpreted the questions and response choices, whether wording was appropriate, and whether instructions and formats were understandable
    - Out of the 28,877 participants recruited for the study, the draft screening tool was administered to 1562 persons having CM (n=363), EM (n=416), and other severe headache (n=783), corresponding to a 5.5% response rate
  - Stage 1 item pool was reduced based on initial IRT modeling
    - Figure 1 shows the ICC supported item elimination (unilateral pain): slopes are weak and curves shifted to the extreme left of the distribution
    - Figure 2 shows the ICC supported item selection (moderate to severe pain): slopes are strong, particularly if instructions are strongly non-overlapping, and shifted high in the latent distribution

• Stage 2 item pool was not reduced, all items demonstrated strong loadings and predictive value
  - Along with the ID-CM item pool was reduced, additional IRT models were used to check initial screening algorithm classification accuracy:
    - Stage 2 items compared to modified ICHD-3-B migraine classification
    - Stage 2 items compared to SL-CM classification
    - N=2923 received an invite to participate in the clinical interview phase of the study
      - The clinical interview sample at time of publication of this poster was n=111 (3.8% usable response rate), and was composed of n=36 CM cases, n=44 EM cases, and n=35 severe other headache
    - ID-CM had a sensitivity of 82% and specificity of 87% when compared to clinical interview classifications (Table 1)

• Stage 2 CM cases were validated using ID-CM and ICHD-3-B/CM classification criteria
  - Table 1 shows the ID-CM cases compared to modified ICHD-3-B CM classification
    - ID-CM had a sensitivity of 82% and specificity of 87% when compared to clinical interview classifications (Table 1)

DISCUSSION
• A two-stage screening process was employed to detect cases using ID-CM
  - Stage 1: Screen for migraine among respondents with severe headache
  - Stage 2: Screen for CM among migraine cases

CONCLUSIONS
• The questions to be included in the ID-CM are presented in Table 2
  - The preliminary scoring algorithm to classify CM is presented in Figure 3

REFERENCES
1. Headache Classification Committee of the International Headache Society. The International Classification of Headache Disorders. 3rd ed. 2018