Supplementary Material 1: ICD-9 CM/ICD-10-CA codes for migraine (chronic or episodic) study cohort identification

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| **Diagnosis Condition** | **ICD-10-CA** | **ICD-9-CM** |
| Migraine  Migraine without aura [common migraine] | G43.0 | 346  346.1 |
| Migraine with aura [classical migraine], includes:  Migraine   * Aura without headache * Basilar * Equivalents * Familial hemiplegic * With:   + Acute-onset aura   + Prolonged aura   + Typical aura | G43.1 | 346.0 |
| Status migrainosus | G43.2 | NA |
| Complicated migraine | G43.3 | NA |
| Other migraine  Includes:   * Ophthalmoplegic migraine * Retinal migraine | G43.8 | NA |
| Variants of migraine | NA | 346.2 |
| Other forms of migraine | NA | 346.8 |
| Migraine, unspecified | G43.9 | 346.9 |

Abbreviations: ED: emergency department; ICD-9-CM: The International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CA: International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada; IP: inpatient; NA: not applicable

Supplementary Material 2: Migraine sub-cohorts

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| **Cohort** | **Case definition** |
| Medication Overuse Headache | The Medication Overuse Headache Cohort included patients with ≥ 15 days of use/month for three months of simple analgesics (e.g., non-steroidal anti-inflammatory drugs [NSAIDs], acetaminophen) or with ≥ 10 days of use/month for 3 months of triptans, opioids, or mixed analgesics within a one-year look-forward period (i.e., one year after index date applicable to the Total Migraine Cohort). |
| Migraine with ≥2 and ≥3 StoppedPreventive Medications | Patients who stopped a minimum of two and three prior preventive medications for migraine were identified using prescription dispenses at any time during follow-up. Patients were classified as having ≥2 (≥3) stopped treatments if they had no subsequent prescription dispenses for the corresponding medication for a period of at least three months after end date of the prescription dispense (defined as dispense date plus days of supply). Medications dispensed within three months before entering the Total Migraine Cohort were not considered. |
| Emergency department (ED) Visit | The ED Migraine Cohort included patients identified from the Total Migraine Cohort who also had a record of ≥1 migraine-related ED visit(s) at any point during study follow-up (i.e., after entering the Total Migraine Cohort). |
| Chronic Migraine | The Chronic Migraine Cohort included patients that were identified using parameter estimates of a logistic regression model fitted by Pavlovic et al. (2019).1 The fitted model was used to generate predicted probabilities for each patient based on the following four predictors assessed during the 1-year post-index period: 1) Number of healthcare visits of any type (i.e., hospitalizations, physician visits, ambulatory visits, and emergency department visits): ≥24 (reference <24); 2) Pharmacy prescriptions for acute migraine medications, including opioids: ≥15 (reference <15); 3) Pharmacy prescriptions for unique migraine preventive drug classes: 1, ≥2 (reference 0) and; 4) Sex: Female (reference Male). Patients with a predicted probability ≥ 0.55 were included in the Chronic Migraine Cohort. |

1Pavlovic JM, Yu JS, Silberstein SD*, et al.* Development of a claims-based algorithm to identify potentially undiagnosed chronic migraine patients. *Cephalalgia*. 2019;39:465-476.

Supplementary Material 3: Conditions, weights, and ICD-9-CM/ICD-10-CA codes used to calculate the Charlson Comorbidity Index Score

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| **Comorbid Condition** | **ICD-9-CM** | **ICD-10-CA** | **Weight1** |
| Myocardial Infarction | 410.x, 412.x | I21.x, I22.x, I25.2 | 0 |
| Congestive heart failure | 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 425.4–425.9, 428.x | I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5–I42.9, I43.x, I50.x, P29.0 | 2 |
| Peripheral vascular disease | 093.0, 437.3, 440.x, 441.x, 443.1–443.9, 47.1, 557.1, 557.9, V43.4 | I70.x, I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9 | 0 |
| Cerebrovascular disease | 362.34, 430.x–438.x | G45.x, G46.x, H34.0, I60.x–I69.x | 0 |
| Hemiplegia or paraplegia | 334.1, 342.x, 343.x, 344.0–344.6, 344.9 | G04.1, G11.4, G80.1, G80.2, G81.x, G82.x, G83.0–G83.4, G83.9 | 2 |
| Dementia | 290.x, 294.1, 331.2 | F00.x–F03.x, F05.1, G30.x, G31.1 | 2 |
| Chronic pulmonary disease | 416.8, 416.9, 490.x–505.x, 506.4, 508.1, 508.8 | I27.8, I27.9, J40.x–J47.x, J60.x–J67.x, J68.4, J70.1, J70.3 | 1 |
| Rheumatic disease | 446.5, 710.0–710.4, 714.0–714.2, 714.8, 725.x | M05.x, M06.x, M31.5, M32.x–M34.x, M35.1, M35.3, M36.0 | 1 |
| Peptic ulcer disease | 531.x–534.x | K25.x–K28.x | 0 |
| Diabetes without chronic complications | 250.0–250.3, 250.8, 250.9 | E10.0, E10.1, E10.6, E10.8, E10.9, E11.0, E11.1, E11.6, E11.8, E11.9, E12.0, E12.1, E12.6, E12.8, E12.9,  E13.0, E13.1, E13.6, E13.8, E13.9, E14.0, E14.1, E14.6, E14.8, E14.9 | 0 |
| Diabetes with chronic complications | 250.4–250.7 | E10.2–E10.5, E10.7, E11.2–E11.5, E11.7, E12.2–E12.5, E12.7, E13.2–E13.5, E13.7, E14.2–E14.5, E14.7 | 1 |
| Renal disease | 403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 582.x, 583.0–583.7, 585.x, 586.x, 588.0, V42.0, V45.1, V56.x | I12.0, I13.1, N03.2–N03.7, N05.2–N05.7, N18.x, N19.x, N25.0, Z49.0–Z49.2, Z94.0, Z99.2 | 1 |
| Any malignancy, including leukemia and lymphoma | 140.x–172.x, 174.x–195.8, 200.x–208.x, 238.6 | C00.x–C26.x, C30.x–C34.x, C37.x–C41.x, C43.x, C45.x–C58.x, C60.x–C76.x, C81.x–C85.x, C88.x, C90.x–C97.x | 2 |
| Metastatic solid tumor | 196.x–199.x | C77.x–C80.x | 6 |
| Mild liver disease | 070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 070.6, 070.9, 570.x, 571.x, 573.3, 573.4, 573.8, 573.9, V42.7 | B18.x, K70.0–K70.3, K70.9, K71.3–K71.5, K71.7, K73.x, K74.x,  K76.0, K76.2–K76.4, K76.8, K76.9, Z94.4 | 2 |
| Moderate or severe liver disease | 456.0–456.2, 572.2–572.8 | I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7 | 4 |
| AIDS/HIV | 042.x–044.x | B20.x–B22.x, B24.x | 4 |

Abbreviations: AIDS/HIV: Acquired Immunodeficiency Syndrome/Human Immunodeficiency Virus: ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CA: International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada

1Quan H, Li B, Couris CM, et al. Updating and validating the Charlson comorbidity index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. *Am J Epidemiol* 2011; 173(6): 676-82

Supplementary Material 4: ICD-9-CM/ICD-10-CA codes for comorbidities of interest in patients with migraine

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| **Comorbid Condition** | **ICD-10-CA** | **ICD-9-CM** |
| Depression | F32.^ (Depressive episode)  F33.^ (Recurrent depressive disorder)  F34.1 (Dysthymia)  F38.1 (Other recurrent mood (affective) disorders) | V79.0 (Depression)  311 (Depression NOS) |
| Anxiety | F40.^ (Phobic anxiety disorders)  F41.^ (Other anxiety disorders) | 300.0 (Anxiety states) |
| Allergy | J30.^ (Vasomotor and allergic rhinitis)  Z88.^ (Personal history of allergy to drugs, medicaments, and biological substances) | 477.^ (Allergic rhinitis)  995.2 (Unspecified adverse effect of drug, medicament and biological)  995.3 (Allergy, unspecified)  V14.^ (Personal history of allergy to medicinal agents)  V15.0 (Personal history of allergy other than to medicinal agents) |
| Sleep Disorders | G47.^ (Other sleep disorders) | 326.^ (Organic sleep disorders) |
| Cardiovascular Disease (including hypertension, dyslipidemia, stroke) | I25.^ (Chronic ischaemic heart disease)  I11.^ (Hypertensive heart disease)  E78.^(Disorders of lipoprotein metabolism)  I64.^ (Stroke, not specified as haemorrhage or infarction)  I11-I15 (Hypertension) | 410-414 (Ischaemic heart disease)  429.2 (Cardiovascular disease, unspecified)  401-405 (Hypertensive disease)  V81.1 (Hypertension)  272.^ (Disorders of lipoid metabolism)  430-439 (Cerebrovascular disease) |
| Respiratory Disorders (including COPD, emphysema, asthma) | J43.^ (Emphysema)  J44.^ (Chronic obstructive pulmonary disease with acute lower respiratory infection)  J45.^ (Asthma) | 492 (Emphysema)  490-496 (Chronic obstructive pulmonary disease and allied conditions)  493.^ |
| Arthritis | M13.9^ (Arthritis, unspecified) | V13.4 (Personal history of arthritis) |
| Chronic pain disorder | R52 (Pain, not elsewhere classified) | 338.4 (Chronic pain syndrome) |
| Epilepsy | G40.^^ Epilepsy | 345.^ (Epilepsy and recurrent seizures) |
| Stroke | I60 (subarachnoid haemorrhage)  I61 (intracerebral haemorrhage)  I63 (cerebral infarction)  I64 (stroke, not specified as haemorrhage or infarction) | 433.^, 434.^ (Ischemic stroke)  430.^, 431.^ (Haemorrhagic stroke) |
| Fibromyalgia | M79.7 (Fibromyalgia) | NA |
| Obesity | E65-E68 (Obesity) | 278, V85.2-V85.4, and V45.86 (Obesity) |

Abbreviations: COPD: chronic obstructive pulmonary disease; ICD-9-CM: The International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CA: International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada; NA: not applicable; NOS: not otherwise specified

Supplementary Material 5: Acute medications

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| **Treatment classification** | **ATC Code** |
| **NSAIDs** | |
| Naproxen sodium (250-275 mg, 500-550 mg) | M01AE02 |
| Cambia – oral solution (50 mg diclofenac potassium solution) | M01AB05 |
| Oral diclofenac – tablets (50-100 mg) | M01AB05 |
| Ketorolac (Toradol) (50 mg intramuscular injection) | M01AB15 |
| Dihydroergotamine (subcutaneous injection) (1 mg) | N02CA01 |
| **Triptans** | |
| Oral sumatriptan (100 mg) | N02CC01 |
| Sumatriptan – Nasal (5 mg or 20 mg) or Subcutaneous injection (6 mg) | N02CC01 |
| Oral rizatriptan – tablets, wafers, or disintegrating tablets (5 or 10 mg) | N02CC04 |
| Almotriptan (6 mg or 12.5 mg) | N02CC05 |
| Zolmitriptan – Nasal or Oral disintegrating tablets (2.5 mg or 5 mg) | N02CC03 |
| Eletriptan (40 mg) | N02CC06 |
| Frovatriptan (2.5 mg) | N02CC07 |
| Naratriptan (1 mg or 2.5 mg) | N02CC02 |
| **Antiemetics** | |
| Domperidone – Oral (30 mg), Parenteral (30 mg), or Rectal (120 mg) | A03FA03 |
| Metoclopramide – Oral (10mg), Parenteral (10 mg), or Rectal (30 mg) | A03FA01 |
| Ondansetron – Oral (4,8 or 16 mg), Parenteral (4, 8, 16 mg), or Rectal (16mg) | A04AA01 |
| **Opioids** | |
| Opioids | N02A, A06AH, N01AH, N07BC |

Abbreviations: ATC: Anatomical Therapeutic Chemical code; NSAIDS: Nonsteroidal Anti-Inflammatory Drugs; mg: milligram

Supplementary Material 6: Preventive medications

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| **Treatment classification** | **ATC Code** |
| **Antihypertensives** | |
| Propranolol | C07AA05 |
| Metoprolol | C07AB02 |
| Nadolol | C07AA12 |
| Flunarizine | N07CA03 |
| Verapamil | C08DA01 |
| Candesartan | C09CA06 |
| **Anticonvulsants** | |
| Gabapentin | N03AX12 |
| Topiramate | N03AX11 |
| Divalproex | N03AG01 |
| **Antidepressants** | |
| Amitriptyline | N06AA09 |
| Nortriptyline | N06AA10 |
| Venlafaxine | N06AX16 |
| **Neurotoxin** | |
| OnabotulinumtoxinA (Botox) | M03AX01 |
| **Monoclonal antibodies** | |
| Aimovig (erenumab) | N02CD01 |
| Emgality (galcanezumab) | N02CD02 |
| **Antamines** | |
| Pizotifen (malate) | N02CX01 |

Abbreviations: ATC: Anatomical Therapeutic Chemical code