APPENDIX S1 Full list of ICD-10 codes.

* Alcohol abuse with withdrawal delirium (ICD-10-CM: F10.131)
* Alcohol abuse with withdrawal with perceptual disturbance (ICD-10-CM: F10.132)
* Alcohol abuse with withdrawal, uncomplicated (ICD-10-CM: F10.130)
* Alcohol abuse with withdrawal, unspecified (ICD-10-CM: F10.139)
* Alcohol dependence with withdrawal delirium (ICD-10-CM: F10.231)
* Alcohol dependence with withdrawal with perceptual disturbance (ICD-10-CM: F10.232)
* Alcohol dependence with withdrawal, uncomplicated (ICD-10-CM: F10.230)
* Alcohol dependence with withdrawal, unspecified (ICD-10-CM: F10.239)
* Alcohol use, unspecified with withdrawal delirium (ICD-10-CM: F10.931)
* Alcohol use, unspecified with withdrawal with perceptual disturbance (ICD-10-CM: F10.932)
* Alcohol use, unspecified with withdrawal, uncomplicated (ICD-10-CM: F10.930)
* Alcohol use, unspecified with withdrawal, unspecified (ICD-10-CM: F10.939)
* Alcohol abuse with withdrawal delirium (ICD-10-CM: F10.131)
* Alcohol dependence with withdrawal delirium (ICD-10-CM: F10.231)
* Alcohol use, unspecified with withdrawal delirium (ICD-10-CM: F10.931)
* Alcohol abuse with withdrawal with perceptual disturbance (ICD-10-CM: F10.132)
* Alcohol dependence with withdrawal with perceptual disturbance (ICD-10-CM: F10.232)
* Alcohol use, unspecified with withdrawal with perceptual disturbance (ICD-10-CM: F10.932)
* Alcohol abuse with withdrawal, unspecified (ICD-10-CM: F10.139)
* Alcohol abuse with withdrawal, uncomplicated (ICD-10-CM: F10.130)
* Alcohol dependence with withdrawal, unspecified (ICD-10-CM: F10.239)
* Alcohol dependence with withdrawal, uncomplicated (ICD-10-CM: F10.230)
* Alcohol use, unspecified with withdrawal, unspecified (ICD-10-CM: F10.939)
* Alcohol use, unspecified with withdrawal, uncomplicated (ICD-10-CM: F10.930)

APPENDIX S2 Admissions and length of stay among Emergency Department patients presenting with alcohol withdrawal syndrome from 2016–2023.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | TOTAL | OR (95% CI) |
| Hospital Admission Rate (%)a | 19,446 (57.9%) | 26,198 (57.9%) | 34,592 (57.5%) | 42,205 (57.2%) | 51,194 (57.6%) | 62,166 (57.6%) | 68,658 (57.5%) | 82,159 (58.0%) | 386,618 (57.7%) | 1.001 (0.999–1.004) |
| Hospital LOS (median, Q1–Q3) | 3 (2–5) | 3 (2–5) | 3 (2–5) | 3 (2–5) | 3 (2–5) | 3 (2–6) | 3 (2–6) | 3 (2–5) | 3 (2–5) | N/A |
| ICU Admission Rate (%) | 4469 (13.3%) | 6310 (14.0%) | 8136 (13.5%) | 9431 (12.8%) | 10,199 (11.5%) | 11,101 (10.3%) | 12,318 (10.3%) | 14,954 (10.6%) | 76,918 (11.5%) | 0.946 (0.943–0.949) |
| ICU LOS (median, Q1–Q3) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | 2 (1–4) | N/A |
| Total Number (%) ED Visits for AWSb | 33,609 (0.19%) | 45,220 (0.21%) | 60,167 (0.23%) | 73,732 (0.25%) | 88,833 (0.31%) | 107,856 (0.31%) | 119,421 (0.31%) | 141,592 (0.32%) | 670,430 (0.28%) | 1.074 (1.072–1.075) |
| Total Overall ED Visitsb | 17,304,266 | 21,915,067 | 26,564,781 | 29,825,167 | 29,017,620 | 34,478,340 | 38,938,008 | 44,761,549 | 242,804,798 | N/A |

aQ1–Q3, first and third quartile; hospital admission includes inpatient and ICU setting. bTotal increase in ED visits over time reflects increased numbers of hospital systems reporting data to Epic.

Abbreviations: AWS, alcohol withdrawal syndrome; ED, Emergency Department; ICU, intensive care unit; LOS, length of stay; N/A, not applicable.

APPENDIX S3 Medications administered in the Emergency Department for alcohol withdrawal syndrome from 2016–2023.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | TOTAL | OR (95% CI) |
| Benzodiazepines | 28,523 (84.9%) | 38,328 (84.8%) | 50,851 (84.5%) | 61,849 (83.9%) | 73,434 (82.7%) | 88,135 (81.7%) | 94,306 (79.0%) | 109,195 (77.1%) | 544,621 (81.2%) | 0.917 (0.914–0.920) |
| Gabapentin | 3688 (11.0%) | 5913 (13.1%) | 8186 (13.6%) | 10,757 (14.6%) | 13,510 (15.2%) | 17,512 (16.2%) | 19,634 (16.4%) | 23,132 (16.3%) | 102,332 (15.3%) | 1.054 (1.050–1.057) |
| Phenobarbital | 1330 (4.0%) | 2705 (6.0%) | 5098 (8.5%) | 7648 (10.4%) | 12,102 (13.6%) | 16,426 (15.2%) | 21,857 (18.3%) | 29,953 (21.2%) | 97,119 (14.5%) | 1.255 (1.250–1.259) |
| Propofol | 526 (1.6%) | 745 (1.6%) | 1036 (1.7%) | 1240 (1.7%) | 1445 (1.6%) | 1635 (1.5%) | 1683 (1.4%) | 1798 (1.3%) | 10,108 (1.5%) | 0.959 (0.950–0.968) |
| Dexmedetomidine | 418 (1.2%) | 905 (2.0%) | 1626 (2.7%) | 1813 (2.5%) | 1572 (1.8%) | 1237 (1.1%) | 730 (0.6%) | 699 (0.5%) | 9000 (1.3%) | 0.813 (0.805–0.820) |
| Ketamine | 72 (0.2%) | 100 (0.2%) | 183 (0.3%) | 276 (0.4%) | 343 (0.4%) | 445 (0.4%) | 469 (0.4%) | 565 (0.4%) | 2453 (0.4%) | 1.072 (1.051–1.093) |
| Carbamazepine | 137 (0.4%) | 155 (0.3%) | 241 (0.4%) | 261 (0.4%) | 257 (0.3%) | 271 (0.3%) | 296 (0.2%) | 217 (0.2%) | 1835 (0.3%) | 0.881 (0.863–0.900) |
| Valproic Acid | 79 (0.2%) | 67 (0.1%) | 68 (0.1%) | 96 (0.1%) | 107 (0.1%) | 99 (0.1%) | 94 (0.1%) | 77 (0.1%) | 687 (0.1%) | 0.846 (0.818–0.875) |
| Total ED Patients with AWSa | 33,609 | 45,220 | 60,176 | 73,732 | 88,833 | 107,856 | 119,421 | 141,592 | 670,430 | N/A |

aTotal increase in ED visits over time reflects increased numbers of hospital systems reporting data to Epic.

Abbreviations: AWS, alcohol withdrawal syndrome; ED, Emergency Department.

APPENDIX S4 Oral benzodiazepines administered in the Emergency Department for alcohol withdrawal syndrome from 2016–2023.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | TOTAL | OR (95% CI) |
| Any Oral Benzodiazepines | 20,633 (61.4%) | 29,222 (64.6%) | 40,466 (67.3%) | 48,972 (66.4%) | 56,960 (64.1%) | 67,193 (62.3%) | 74,907 (62.7%) | 84,671 (59.8%) | 423,024 (63.1%) | 0.967 (0.965–0.970) |
| Lorazepam | 11,889 (35.4%) | 17,719 (39.2%) | 24,858 (41.3%) | 29,843 (40.5%) | 35,275 (39.7%) | 42,014 (39.0%) | 45,776 (38.3%) | 52,856 (37.3%) | 260,230 (38.8%) | 0.990 (0.987–0.992) |
| Chlordiazepoxide | 6817 (20.3%) | 10,419 (23.0%) | 15,115 (25.1%) | 19,614 (26.6%) | 22,637 (25.5%) | 23,864 (22.1%) | 27,198 (22.8%) | 31,993 (22.6%) | 157,657 (23.5%) | 0.988 (0.986–0.991) |
| Diazepam | 5278 (15.7%) | 6753 (14.9%) | 10,047 (16.7%) | 11,673 (15.8%) | 12,948 (14.6%) | 17,210 (16.0%) | 21,560 (18.1%) | 21,098 (14.9%) | 106,567 (15.9%) | 1.004 (1.001–1.007) |
| Oxazepam | 428 (1.3%) | 875 (1.9%) | 991 (1.6%) | 927 (1.3%) | 845 (1.0%) | 1246 (1.2%) | 1393 (1.2%) | 1493 (1.1%) | 8198 (1.2%) | 0.935 (0.926–0.944) |
| Clonazepam | 551 (1.6%) | 691 (1.5%) | 801 (1.3%) | 898 (1.2%) | 919 (1.0%) | 1119 (1.0%) | 1179 (1.0%) | 1328 (0.9%) | 7486 (1.1%) | 0.923 (0.913–0.932) |
| Alprazolam | 490 (1.5%) | 543 (1.2%) | 635 (1.1%) | 690 (0.9%) | 855 (1.0%) | 1037 (1.0%) | 1187 (1.0%) | 1394 (1.0%) | 6831 (1.0%) | 0.965 (0.954–0.976) |
| Temazepam | 218 (0.6%) | 306 (0.7%) | 402 (0.7%) | 389 (0.5%) | 383 (0.4%) | 401 (0.4%) | 374 (0.3%) | 392 (0.3%) | 2865 (0.4%) | 0.864 (0.850–0.878) |
| Midazolam | 0 (0%) | 0 (0%) | 15 (<0.1%) | 21 (<0.1%) | 57 (0.1%) | 168 (0.2%) | 271 (0.2%) | 360 (0.3%) | 892 (0.1%) | 1.619 (1.543–1.699) |
| Estazolam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Flurazepam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Triazolam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Total ED Patients with AWSa | 33,609 | 45,220 | 60,176 | 73,732 | 88,833 | 107,856 | 119,421 | 141,592 | 670,430 | N/A |

aTotal increase in ED visits over time reflects increased numbers of hospital systems reporting data to Epic.

Abbreviations: AWS, alcohol withdrawal syndrome; ED, Emergency Department.

APPENDIX S5 Intravenous benzodiazepines administered in the Emergency Department for alcohol withdrawal syndrome from 2016–2023.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | TOTAL | OR (95% CI) |
| Any IV Benzodiazepines | 24,102 (71.7%) | 32,323 (71.5%) | 40,975 (68.1%) | 50,193 (68.1%) | 61,054 (68.7%) | 74,158 (68.8%) | 74,136 (62.1%) | 89,658 (63.3%) | 446,599 (66.6%) | 0.942 (0.940–0.945) |
| Lorazepam | 21,365 (63.6%) | 29,797 (65.9%) | 39,769 (66.1%) | 48,208 (65.4%) | 57,316 (64.5%) | 68,301 (63.3%) | 58,870 (49.3%) | 77,937 (55.0%) | 401,563 (59.9%) | 0.909 (0.907–0.912) |
| Diazepam | 5738 (17.1%) | 6018 (13.3%) | 2387 (4.0%) | 4453 (6.0%) | 8137 (9.2%) | 12,102 (11.2%) | 20,302 (17.0%) | 19,977 (14.1%) | 79,114 (11.8%) | 1.092 (1.088–1.096) |
| Midazolam | 737 (2.2%) | 1122 (2.5%) | 1697 (2.8%) | 1700 (2.3%) | 1928 (2.2%) | 2449 (2.3%) | 6195 (5.2%) | 3847 (2.7%) | 19,675 (2.9%) | 1.076 (1.068–1.083) |
| Total ED Patients with AWSa | 33,609 | 45,220 | 60,176 | 73,732 | 88,833 | 107,856 | 119,421 | 141,592 | 670,430 | N/A |

aTotal increase in ED visits over time reflects increased numbers of hospital systems reporting data to Epic.

Abbreviations: AWS, alcohol withdrawal syndrome; ED, Emergency Department; IV, intravenous.

APPENDIX S6 Medications prescribed among patients discharged from the Emergency Department with alcohol withdrawal syndrome from 2016–2023.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | TOTAL | OR (95% CI) |
| Any Benzodiazepine | 4729 (33.4%) | 6145 (32.3%) | 8082 (31.6%) | 9270 (29.4%) | 10,856 (28.8%) | 12,843 (28.1%) | 14,018 (27.6%) | 16,335 (27.5%) | 82,278 (29.0%) | 0.961 (0.957–0.965) |
| Chlordiazepoxide | 2566 (18.1%) | 3719 (19.6%) | 5388 (21.1%) | 6677 (21.2%) | 7996 (21.2%) | 9497 (20.8%) | 10,848 (21.4%) | 13,135 (22.1%) | 59,826 (21.1%) | 1.022 (1.018–1.026) |
| Lorazepam | 1594 (11.3%) | 1811 (9.5%) | 1994 (7.8%) | 1947 (6.2%) | 2121 (5.6%) | 2190 (4.8%) | 1940 (3.8%) | 2042 (3.4%) | 15,639 (5.5%) | 0.833 (0.827–0.839) |
| Diazepam | 400 (2.8%) | 442 (2.3%) | 522 (2.0%) | 510 (1.6%) | 573 (1.5%) | 1034 (2.3%) | 1049 (2.1%) | 978 (1.6%) | 5508 (1.9%) | 0.963 (0.951–0.975) |
| Gabapentin | 117 (0.8%) | 189 (1.0%) | 303 (1.2%) | 420 (1.3%) | 564 (1.5%) | 658 (1.4%) | 861 (1.7%) | 1178 (2.0%) | 4290 (1.5%) | 1.114 (1.097–1.132) |
| Naltrexone | 0 (0%) | 16 (0.1%) | 31 (0.1%) | 58 (0.2%) | 110 (0.3%) | 134 (0.3%) | 224 (0.4%) | 495 (0.8%) | 1068 (0.4%) | 1.494 (1.435–1.555) |
| Oxazepam | 45 (0.3%) | 93 (0.5%) | 112 (0.4%) | 99 (0.3%) | 120 (0.3%) | 151 (0.3%) | 130 (0.3%) | 113 (0.2%) | 863 (0.3%) | 0.899 (0.872–0.927) |
| Clonazepam | 75 (0.5%) | 59 (0.3%) | 45 (0.2%) | 45 (0.1%) | 45 (0.1%) | 51 (0.1%) | 57 (0.1%) | 89 (0.1%) | 466 (0.2%) | 0.837 (0.804–0.872) |
| Carbamazepine | 0 (0%) | 15 (0.1%) | 20 (0.1%) | 25 (0.1%) | 19 (0.1%) | 26 (0.1%) | 18 (<0.1%) | 22 (<0.1%) | 145 (0.1%) | 0.930 (0.863–1.003) |
| Disulfiram | 0 (0%) | 13 (0.1%) | 11 (<0.1%) | 17 (0.1%) | 21 (0.1%) | 19 (<0.1%) | 26 (0.1%) | 27 (<0.1%) | 134 (<0.1%) | 1.023 (0.942–1.109) |
| Acamprosate | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 19 (<0.1%) | 44 (0.1%) | 57 (0.1%) | 120 (<0.1%) | 2.098 (1.767–2.491) |
| Topiramate | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 11 (<0.1%) | 0 (0%) | 15 (<0.1%) | 0 (0%) | 0 (0%) | N/A |
| Estazolam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Flurazepam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Temazepam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Triazolam | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Valproic Acid | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| Total ED Patients Discharged with AWSa | 14,163 | 19,022 | 25,575 | 31,527 | 37,639 | 45,690 | 50,763 | 59,433 | 283,812 | N/A |

aTotal increase in ED visits over time reflects increased numbers of hospital systems reporting data to Epic.

Abbreviations: AWS, alcohol withdrawal syndrome; ED, Emergency Department.