**Supplementary material**

Supplementary Table 1. ICD-9-CM or ICD-10-CM codes for opioid use in emergent department.

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| Disease | ICD-9/ICD-10 CM code |
| Abdominal pain |
|  | Unspecified | 789.0, 789.6/R10 |
| Acute pancreatitis | 577.0/K85, B25.2 |
| Chronic pancreatitis | 577.1/K86.0, K86.1 |
| Cholelithiasis | 574/K80 |
| Chest pain |
|  | Unspecified | 786.50/R07.9 |
| Ischemic heart disease | 410–414/I20–I25 |
| Respiratory disease |
|  | Acute bronchitis | 466/J20, J21490/J40 |
| Pneumonia | 480–486/J12–J18 |
| Cough | 786.2/R05 |
| Acute upper respiratory infections | 465/J06 |
| Acute respiratory failure | 518.81/J96.00–J96.02, J96.90–J96.92 |
| Cancer pain |
|  | Lung cancer | 162/C33–C34 |
| Liver cancer | 155/C22 |
| Colorectal cancer | 153, 154/C18–C21 |
| Oral cancer | 140, 141, 143, 144,145/C00–C06146–149/C09–C14 |
| Breast cancer | 174/C50 |
| Malignancy of gallbladder and extrahepatic bile ducts | 156/C23, C24 |
| Pancreas cancer | 157/C25 |
| Urinary tract disease |
|  | Hydronephrosis | 591/N13.1, N13.2, N13.30, N13.39 |
| Urinary tract stone | 592.9/N20.9, N22592.1/N20.1788.0/N23 |
| Headache | 784.0/R51, G44 |
| Back pain | 724.5/M54.9724.2/M54.5 |
| Others |
|  | Fracture pain | 821/S72.3, S72.4, S72.8, S72.9, S79.729.5/M79.601 |
| Chronic kidney disease | 585/N18.4–N18.6, N18.9 |
| Congestive heart failure | 428/I50 |
| Cerebrovascular accident | 430–438/I60–I68 |
| Non-infectious fever | 780.6/R50.2, R50.9, R50.81 |
| Sore throat | 784.1/R07.0 |

ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification, before 2016; ICD-10-CM: International Classification of Diseases, 10th Revision, Clinical Modification, after 2016.