Supplemental Table 1: ICD-10-CM Diagnosis Codes

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| **Comorbid conditions** | **ICD-10 CM Codes** |
| *Substance use disorder* |  |
|  Alcohol use disorder | F101, F102, F109 |
|  Cannabis use disorder | F121, F122, F129 |
|  Cocaine use disorder | F141, F142, F149 |
|  Sedative and hypnotic related  disorder | F131, F132, F139 |
|  Stimulant use disorder | F151, F152, F159 |
|  Other psychoactive substance  use disorder | F161, F162, F169, F181, F182, F189, F191, F192, F199 |
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| *Psychiatric conditions* |  |
|  Anxiety | F400, F401, F402, F408, F409, F410, F411, F413, F418, F419, F42.2, F423, F424, F428, F429 |
|  Bipolar disorder | F301X, F302, F303, F304, F308, F309 |
|  Major depression | F320, F321, F322, F323, F324, F325, F3281, F3289, F329 |
|  Other mood disorder | F340, F341, F3481, F3489, F349, F39 |
|  Attention deficit hyperactivity  Disorder (ADHD) | F900, F901, F902, F908, F909 |
|  Post-traumatic stress disorder  (PTSD) | F4310, F4311, F4312 |
|  Schizophrenia | F200, F201, F202, F203, F205, F208, F209, F250, F251, F258, F259, F29 |
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| *Pain conditions* |  |
|  Back pain | M2578, M4000, M4003, M4004, M4005, M40202, M40203, M40204, M40205, M40209, M40292, M40293, M40294, M40295, M40299, M4030, M4035, M4036, M4037, M4100, M4102, M4103, M4104, M4105, M4106, M4107, M4108, M41112, M41113, M41114, M41115, M41116, M41117, M41119, M41122, M41123, M41124, M41125, M41126, M41127, M41129, M4120, M4122, M4123, M4124, M4125, M4126, M4127, M4130, M4134, M4135, M4180, M4182, M4183, M4184, M4185, M4186, M4187, M419, M4300, M4301, M4302, M4303, M4304, M4305, M4306, M4307, M4308, M4309, M4310, M4311, M4312, M4313, M4314, M4315, M4316, M4317, M4318, M4319, M4320, M4321, M4322, M4323, M4324, M4325, M4326, M4327, M4328, M438X9, M4640, M4644, M4645,M4646, M4647, M4648, M4649, M4710, M4714, M4715, M4716, M4720, M4724, M4725, M4726, M4727, M4728, M47814, M47815, M47816, M47817, M47818, M47819, M47894, M47895, M47896, M47897, M47898, M47899, M479, M4800, M4804, M4805, M4806, M48061, M48062, M4807, M4808, M4810, M4811, M4812, M4813, M4814, M4815, M4816, M4817, M4818, M4819, M4820, M4821, M4822, M4823, M4824, M4825, M4826, M4827, M4830, M4831, M4832, M4833, M4834, M4835, M4836, M4837, M4838, M489, M5104, M5105, M5106, M5114, M5115, M5116, M5117,M5124, M5125, M5126, M5127, M5134, M5135, M5136, M5137, M5146, M5147, M5184, M5185, M5186, M5187, M519, M532X7, M532X8, M533, M5380, M5384, M5385, M5386, M5387, M5388, M539, M5403, M5404, M5405, M5406, M5407, M5408, M5409, M5414, M5415, M5416, M5417, M5418, M5430, M5431, M5432, M5440, M5441, M5442, M545, M546, M5489, M549, M62830, M961, M962, M963, M965, M9922, M9923, M9924, M9925, M9926, M9927, M9928, M9929, M9932, M9933, M9934, M9935, M9936, M9937, M9938, M9939, M9942, M9943, M9944, M9945, M9946, M9947, M9948, M9949, M9952, M9953, M9954, M9955, M9956, M9957, M9958, M9959, M9962, M9963, M9964, M9965, M9966, M9967, M9968, M9969, M9972, M9973, M9974, M9975, M9976, M9977, M9978, M9979, M9983, M9984, M9902, M9904, Q762 |
|  Neck pain (e.g., cervical  spinal stenosis) | M47811, M47891, M4723, M4722, M4721, M47813, M47893, M47892, M47812, M47012, M4711, M47014, M47011, M4712, M47022, M47029, M47019, M47016, M47013, M47021, M4713, M47015, M50220, M5022, M5023, M5020, M50221, M50222, M50223, M5021, M5002, M5000, M5001, M50022, M50023, M50021, M50020, M5003, M5082, M5091, M5012, M50922, M50821, M5080, M5011, M50123, M50822, M50820, M50921, M5010, M4643, M5093, M50120, M50823, M5083, M50121, M5090, M4641, M50920, M50122, M4642, M5092, M50923, M5013, M5081, M9930, M9971, M9921, M9970, M4803, M9931, M9940, M9960, M9950, M4802, M9951, M4801, M9961, M9941, M9920, M542, M530, M531, M5413, M5411, M5412, M436, M5400, M5402, M5401, M5382, M5481, M5381, M5383 |
|  Migraine | G43001, G43009, G43011, G43019, G43101, G43109, G43111, G43119, G43C0, G43B0, G43D0, G43A0, G43A1, G43C1, G43B1, G43D1, G43401, G43409, G43411, G43419, G43501, G43509, G43511, G43519, G43609, G43619, G43601, G43611, G43701, G43711, G43709, G43719, G43801, G43811, G43809, G43819, G43901, G43911, G43909, G43919, G43821, G43829, G43831, G43839 |
|  Fibromyalgia | M797 |
|  Osteoarthritis/joint cartilage  | M129, M131X, M138X, M15X, M16X, M17X, M18X, M19X, M2210, M2211, M2212, M222X, M223X, M224X, M228X, M2290, M2291, M2292, M23X, M241X |
|  Inflammatory joint disorder  (e.g., rheumatoid arthritis, ankylosing spondylitis) | M05X, M06X, M08X, M120X, M255X, M353, M45X, M460X, M461, M465X, M468X, M469X, M488X, M498X, M790 |
|  Periarticular/soft tissue  Disorders (e.g., peripheral  enthesopathies, synovitis, bursitis) | M2570, M25711, M25712, M25719, M25721, M25722, M25729, M25731, M25732, M25739, M25741, M25742, M25749, M25751, M25752, M25759, M25761, M25762, M25769, M2577X, M701X, M702X, M704X, M705X, M706X, M707X, M7500, M7501, M7502, M751X, M7520, M7521, M7522, M7530, M7531, M7532, M7540, M7541, M7542, M7550, M7551, M7552, M7580, M7581, M7582, M7590, M7591, M7592, M76X, M77X, M2161X, M2162X, M65X, M66X, M67X, M700X, M7030, M7031, M7032, M71X |

Supplemental Table 2: Opioid use disorder diagnosis setting categories

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| **Hospitalizations** | **Physician and Advanced Practitioner Services** | **Substance Use and Mental Health Treatment** | **Outpatient and ED Hospital Services** | **Other** |
|   |   |   |   |   |
| Inpatient Claim | Physician Service | Outpatient substance abuse treatment services | Outpatient hospital services | Laboratory services |
| - | Nurse Practitioner Service | Inpatient and residential substance abuse treatment services | Emergency hospital services | All other settings |
| - | Medical or other remedial care service | Rehabilitative services | - | - |
| - | Advanced practice nurse services | Outpatient mental health treatment services | - | - |
| - | Nurse-midwife services | - | - | - |
| - | Clinic services | - | - | - |