Relationship Between Buprenorphine Adherence and Health Service Utilization and Costs Among Opioid Dependent Patients

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A R T I C L E   I N F O

A B S T R A C T

Buprenorphine-medication assisted therapy (B-MAT) is an effective treatment for opioid dependence, but may be considered cost-prohibitive based on ingredient cost alone. The purpose of this study was to use medical and pharmacy claims data to estimate the healthcare service utilization and costs associated with B-MAT adherence among a sample of opioid dependent members. Members were placed into two adherence groups based on 1-year medication possession ratio (≥ 0.80 vs. <0.80). The B-MAT adherent group incurred significantly higher pharmacy charges (adjusted means; \$6,156 vs. \$3,581), but lower outpatient (\$9,288 vs. \$14,570), inpatient (\$10,982 vs. \$26,470), ER (\$1,891 vs. \$4,439), and total healthcare charges (\$28,458 vs. \$49,051; $p < 0.01$) compared to non-adherent members. Adherence effects were confirmed in general linear models. Though B-MAT adherence requires increased pharmacy utilization, adherent individuals were shown to use fewer expensive health care services, resulting in overall reduced healthcare expenditure compared to non-adherent patients.

Opioid dependence is a substance use disorder characterized by compulsive opioid use typically resulting in the development of tolerance and withdrawal after a period of abstinence (American Psychiatric Association, 2000). Exposure to opioids in the United States is quite high. Americans consume 80% of the world's opioid supply despite representing only 4.6% of the global population (Manchikanti & Singh, 2008). Much of this opioid use comes from prescription opioids, which has contributed to a considerable increase in the illegitimate use of these substances (Fischer, Gittins, & Rehm, 2008; Zacny et al., 2003). It has been estimated that between 1990 and 2000, prescription opioid abuse increased as much as 400% (Substance Abuse And Mental Health Service Administration, 2003).

Opioid dependence imposes a significant economic burden on society, with annual societal costs estimated at over 55 billion dollars (Birnbaum et al., 2011). The majority of these costs are attributable to lost work productivity (46%) and health care costs (45%), with criminal justice costs (9%) making up the balance (Birnbaum et al., 2011). A hidden cost of opioid dependence is increased healthcare costs for comorbid medical and psychiatric illness. For example, among commercially insured individuals, opioid abusers have higher rates of medical and pharmacy utilization, an increased number of comorbidities including poisoning, hepatitis, psychiatric illnesses, and pancreatitis, and may incur as much as 8 times the total healthcare expenditure as non-abusers (White et al., 2005).

Studies have consistently demonstrated the positive economic impact of effectively treating substance abuse disorders (McCollister & French, 2003), including opioid dependence (Doran, 2008). Currently, there are several options available for the treatment of opioid dependence, including behavioral therapies or medication assisted treatment using full opioid agonists (i.e. methadone), partial μ-opioid agonists (buprenorphine), or opioid antagonists (naltrexone). This study focuses on buprenorphine, which is an increasingly popular treatment given that its combination with naloxone has been shown to minimize abuse and diversion while being effective to help relieve withdrawal symptoms (Johnson & McCagh, 2000). Buprenorphine-medication assisted therapy (B-MAT) has been shown to be effective in the treatment of opioid dependence both as maintenance medication and for supervised withdrawal from opioids (McCance-Katz, 2004), however it is not clear if it is more cost-effective to use buprenorphine for short term symptom relief or for long term maintenance. Under the provisions of the Drug Addiction Treatment Act of 2000, physicians can obtain a waiver to prescribe and dispense buprenorphine in an office-based setting, which also entails weekly patient visits during the initial phase of treatment, followed by an eventual reduction to monthly visits once the maintenance phase of treatment is reached (Substance Abuse and Mental Health Service Administration, 2004). Therefore, the long term use of buprenorphine will be associated with more frequent outpatient treatment visits and the increased costs of the medication. It is unclear if the additional costs of consistent, long term use of B-MAT will be offset by savings in other health care costs.

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Medication adherence has been linked to improved outcomes across a variety of chronic diseases states, (DiMatteo, Giordani, Lepper, & Croghan, 2002; Roebuck, Liberman, Gemmill-Toyama, & Brennan, 2011), and is considered a top public health priority (Bosworth & The National Consumers League, 2011). Adherence with B-MAT has already been shown to reduce the incidence of subsequent relapse among an opioid dependent sample (Tkacz, Severt, Cacciola, & Ruetsch, 2012), however little published work has examined the impact of adherence on specific healthcare utilization and expenditure. Although a more expensive ingredient, buprenorphine has been shown to result in significantly lower overall healthcare expenditure during the first 6 months of treatment compared to methadone treatment, with no difference during subsequent months (Barnett, 2009). The objective of the present study was to examine the relationship between B-MAT adherence and healthcare service utilization and costs among a commercially-insured sample of patient diagnoses with opioid dependence or abuse. It was hypothesized that B-MAT adherence would result in higher pharmacy utilization, but ultimately lower overall healthcare costs.

1. Materials and methods

1.1. Sample Selection

Aetna (Blue Bell, PA) provided medical, pharmacy and membership data for their opioid dependent commercial, fully insured HMO members during Q1 2007 through Q3 2012. All claims were de-identified, and the study was approved by Aetna's safety committee on human research protection. To identify the final study sample, the following inclusion and exclusion criteria were imposed:

1. an initial buprenorphine fill (branded or generic) on record appearing between 1/1/08 and 10/31/11 (hereafter referred to as the index date);
2. primary diagnosis of opioid dependence (304.0x), opioid abuse (305.5x) or opioid poisoning (965.0x) within 180 days of the index date; and
3. continuously and full eligibility for benefits for 6 months prior to and 12 months following the index date.

The sample attrition at each inclusion criterion imposition may be viewed in Fig. 1.

1.2. Measurement Window

The 6 months immediately preceding the index date was defined as the study pre-period, and served two purposes:

1) to effectively identify the first B-MAT fill, and
2) to generate a baseline measure of health.

The 12 months immediately following the index date served as the study post-period where the study's primary endpoints, outlined in the following section, were assessed.

1.3. Measures

Demographic variables of age, gender, and region of residence were obtained from the membership table. Health status during both the pre- and post-periods was estimated using the Charlson Comorbidity Index (Charlson, Pompei, Ales, & MacKenzie, 1987). The following health service outcomes served as the primary dependent variables, and were measured during both pre- and post-periods:

- total prescription fills (adjusted for 30-day supplies) and charges
- opioid fills, days' supply, and charges
- inpatient hospital admissions, days, and charges
- ER visits and charges
- outpatient visits and charges
- total medical charges
- total healthcare charges (medical + pharmacy charges)

A maximum of one inpatient admission and ER visit were assumed per day. Multiple outpatient visits were allowed in a single day, though they must have been associated with unique provider IDs. Persistence with B-MAT was measured as the number of days between the index date and the most recent B-MAT fill + the days supply value of the last fill. No adjustments were made for gaps in treatment. Paid amounts and allowed amounts were unavailable in the dataset, therefore charges were used as a proxy for healthcare expenditure (Lee, Balu, Cobden, Joshi, & Pashos, 2006; Salas, Hughes, Zuluaga, Vardeva, & Lebmeier, 2009; Sokol, McGuigan, Verbrugge, & Epstein, 2005).

1.4. Placement into B-MAT Adherence Groups

B-MAT adherence was estimated using the medication possession ratio (MPR), in which the total days' supply of a medication is divided by the length of the study window (Cooper, Hall, Penland, Krueger, & May, 2009). Therefore, B-MAT MPR for the current study was measured using the following formula:

$$\frac{\text{total days}'\ \text{supply of B-MAT in post-period}}{365\ \text{days(one-year post-period)}}$$

Members with an MPR ≥ 0.80 were categorized as adherent, while those with an MPR < 0.80 were categorized as non-adherent (Peterson et al., 2007).

1.5. Bivariate Analyses

Across the two adherence groups, means and standard deviations were reported for all continuous outcome measures, while proportions were reported for categorical measures. Chi-square tests of equality of proportions were used to assess statistically significant differences between groups on categorical variables, while and student's t-tests were used to assess group differences on age, persistence, and the Charlson Comorbidity Index. The Kruskal–Wallis test was used to measure group differences on post-period service utilization and charge measures. Additionally, analyses of covariance were conducted on all service utilization and charge measures controlling for gender, region of residence, age, pre-period value, and post-period Charlson Comorbidity Index in order to estimate adjusted means.

1.6. Multivariate Analyses

Post-period service utilization counts and charges were adjusted for gender, region of residence, age, post-period Charlson Comorbidity Index, pre-period value, and B-MAT adherence using generalized linear models. Service utilization outcomes were entered into negative binomial models, as overdispersion was present. Cost outcomes were entered into gamma models with a log-link. Marginal effects and standard errors were reported. The marginal effect of a given variable on health service and utilization outcome (dy/dx) was computed while holding all other regressors constant at their means. All data management, descriptive analyses, and bivariate analyses were conducted using SPSS v. 20 (SPSS Inc., Chicago), while multivariate analyses were conducted using STATA v.13 (StataCorp LP, College Station).