ADD or ADHD or What Exactly?—GIGO Part II and Other Lessons in Research with Administrative Claims

In this issue of JMCP, Wu et al. examined administrative claims data for a population of approximately 5 million beneficiaries to identify 4,569 adult patients who received at least 1 pharmacy claim for long-acting (osmotic release oral system [OROS])-methylphenidate (MPH), mixed amphetamine salts extended release (MAS-XR), or atomoxetine, and had at least 1 medical or facility claim with a diagnosis code for attention deficit disorder (ADD) or attention deficit/hyperactivity disorder (ADHD). In 6 months of follow-up, the median duration of therapy with OROS-MPH was 99 days versus 128 days for MAS-XR and 86 days for atomoxetine. The unadjusted median total all-cause medical cost ($1,062) for the cohort of OROS-MPH patients (n = 1,452) was 1.7% less than the total all-cause medical cost ($1,080) for MAS-XR patients (n = 1,554), and 16.4% less than $1,271 for atomoxetine (n = 1,563). The median total all-cause medical cost for the MAS-XR cohort was also less than the cost for the atomoxetine cohort. Mean total medical cost for the atomoxetine-treated patients was higher than for either OROS-MPH or MAS-XR, but the mean costs for OROS-MPH and MAS-XR patients did not differ significantly.

Wu et al. clearly warn us that these are all-cause medical costs, not ADD/ADHD-related medical costs. In fact, these authors identify for us that the difference in total medical costs among the 3 cohorts is influenced by a few cost-outlier cases. The highest-cost case for OROS-MPH was $35,597 versus $134,712 for MAS-XR, and $55,950 for atomoxetine. The diagnosis codes associated with the highest cost claim for the MAS-XR outlier were chronic kidney disease (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 585.xx) and iron deficiency anemia (ICD-9-CM code 280.9). The diagnosis codes associated with the highest-cost claim for the atomoxetine outlier were acute myocardial infarction (ICD-9-CM code 410.21) and paroxysmal ventricular tachycardia (ICD-9-CM code 427.1). These cost-outlier cases have no apparent relationship to ADD/ADHD itself or to an increased rate of accidents among ADD/ADHD patients, a premise underlying the measurement of total medical costs rather than only the costs for services with an ADD/ADHD diagnosis.

Also in this issue of JMCP, Olfson et al. examine administrative claims data for 55 million beneficiaries to derive 2 cohorts of non-elderly adult (age 18-64) users of extended-release (ER)-MPH drugs (n = 2,833) versus immediate-release (IR)-MPH (n = 2,289) who had at least 1 outpatient medical claim with a diagnosis code for ADD/ADHD. This research informs us that less than one-third (30%) of adult patients who received MPH had a medical claim for ADD or ADHD. The authors’ focus in this study was continuity or length of MPH therapy in adult ADD/ADHD patients, and the median duration of treatment with the index MPH medication was 68 days (95% confidence interval [CI], 65-71 days for ER-MPH versus 39 days [95% CI, 33-52 days] for IR-MPH). Although this difference of 29 days is statistically significant, the clinical and practical significance are unknown and no doubt small. Olfson et al. also inform us that only 51% of the IR-MPH patients and 61% of the ER-MPH patients had more than 1 pharmacy claim for the index MPH medication. Notably, the proxy measure for once-daily dosing employed in this study, a days supply equal to the number of units dispensed, was met by only 62% of ER-MPH patients even though ER-MPH’s 8-hour duration of effect was a premise underlying the authors’ comparison of ER-MPH with IR-MPH.

On the one hand, administrative claims aggregated in relational data warehouses create wonderful opportunities for data mining to answer research hypotheses. On the other hand, data torture can result when the limitations of claims data are underestimated. Researchers using administrative claims data would do well to remember that the primary purpose of a claim is obtaining payment for services rendered, not supporting research activities. Previously, Barbuto warned about the danger of garbage in, garbage out (GIGO) arising from manipulation of diagnosis codes for purposes of insurance coverage for patients or for reimbursement purposes for providers. For example, tension headache was replaced by migraine diagnoses in medical claims for reasons that had nothing to do with clinical presentation or actual diagnosis and everything to do with category of insurance coverage.

Some of the shortcomings of administrative claims to describe clinical conditions are made evident by example. In literature in which authors assess utilization or costs associated with ADD or ADHD, various ICD-9-CM codes are used to identify the condition. In their examination of the total health care costs of children with “ADHD” compared with children without ADHD and children with asthma, Chan et al. identified the ADHD sample by ICD-9-CM code 314, hyperkinetic syndrome of childhood. Kemner and Lage used more stringent criteria in their study of the association between MPH formulation and health care utilization in patients age 6 and older. Like Wu et al., Kemner and Lage identified ADHD using codes 314.00, attention deficit disorder without mention of hyperactivity, and 314.01, attention deficit disorder with hyperactivity. Yet another set of criteria was used in a study of psychotherapeutic medication utilization by children (ages 5 to 14) with ADHD. In this analysis, Zito and colleagues attributed a physician office visit to ADHD if it was coded with a diagnosis of 314.0, attention deficit disorder; 314.01, attention deficit disorder with hyperactivity; or 314.9, unspecified hyperkinetic syndrome; or if “restlessness” was indicated “as the reason for the visit” on a data collection form completed by the physician or office staff.

This variability in the diagnostic criteria employed in research possibly reflects ambiguities inherent in the coding
Attention deficit disorder is also known as attention deficit/hyperactivity disorder (AD/HD or simply ADHD). The Guiding Principles for the Diagnosis and Treatment of Attention Deficit/Hyperactivity Disorder provide a succinct overview of the opportunities for misdiagnosis and variable quality of care in the treatment of patients suspected of having ADD or ADHD. The medical coding of ADD or ADHD can be precise or imprecise. ADHD if coded according to the apparent plain meaning of the language used in the ICD-9-CM would be identified on the medical or facility claim as 314.01 (attention deficit disorder with hyperactivity) which includes in the 2007 code descriptions “combined type,” “overactivity NOS” (not otherwise specified), “predominantly hyperactive/impulsive type,” and “simple disturbance of attention with overactivity.” But what about patients with ADD without hyperactivity? ICD-9-CM code 314.00 is defined as “attention deficit disorder without mention of hyperactivity.” Thus, the taxonomy of this disorder seems to produce the oxymoronic situation that patients with ADD coded as 314.00 (no hyperactivity) are a subset of 314 (hyerkinetic syndrome) but are commonly referred to as patients with “ADHD.”

So, what difference does it make if one researcher uses the broad ICD-9-CM code 314 to describe “ADHD” research, encompassing ADD both with and without hyperactivity, whereas another limits the study population to the specific code 314.01 that explicitly includes hyperactivity? The answer is that we do not know. However, it seems quite likely that a narrow code such as 314.01, specific to ADHD, will identify fewer patients in an administrative claims database compared with a broad code such as 314. For those that like symmetry, at least we can say that the complexity and uncertainty in diagnosis and treatment of ADD/ADHD are matched well in the uncertainty of the clinical conditions of patients identified by ICD-9-CM code 314 and its subtypes in administrative claims.

The 3-character ICD-9-CM codes with 2-character modifiers create a seductive illusion of granularity in medical claims coding. The reality is less seductive. Although it is true that the medical diagnosis of ADD or ADHD can be precise, it is not known how many physicians spend the time necessary to precisely diagnosis these conditions and tailor treatment, including behavioral therapy as well as drug therapy. What is likely is that busy primary care physicians in submitting bills to payers do not typically make the fine differentiation between ICD-9-CM codes 314.00 and 314.01 for ADD without or with mention of hyperactivity, or for that matter, 314.0 for ADD alone. In fact, the Superbill maintained by the American Academy of Family Practice of the codes most common in office-based, outpatient practice lists “314.00, attention deficit w/o hyper-activity” as the only code under 314. So, it is probably acceptable to use ICD-9-CM code 314 with most suffixes for the purpose of research on ADD/ADHD when analyzing administrative claims, but this does not mean that the patients with medical claims having this code share a common pathology or, accordingly, that they would necessarily be expected to respond to the same drug treatments in the same way.

Olsson et al. describe the distribution of patients by “ADHD” subtype in their study of adult patients with “ADHD,” and the group that had an index pharmacy claim for ER-MPH was different than the group that received IR-MPH ($P < 0.001$). Code 314.01 accounted for 46% of the patients that received ER-MPH and 39% that received IR-MPH. Code 314.00 (without mention of hyperactivity) accounted for 48% of the patients that received ER-MPH and 53% of the patients that received IR-MPH. Approximately 6% of the ER-MPH patients and 8% of the IR-MPH patients had a 314 code other than 314.01 or 314.00. The clinical or practical significance of these differences is unclear.

This possibility of heterogeneity in patient populations designated with these results broad ICD-9-CM code 314 leads to a challenge in interpreting the existing literature that describes research on the utilization and costs associated with ADHD. Variability of sampling methods, and possibly of billing practices in different health care systems, means that readers have no way of knowing whether a sample population is sufficiently homogenous and representative of ADHD for the results to be clinically meaningful. Moreover, researchers face a challenge in trying to replicate the methods used in the published research when they are uncertain or skeptical of the specific rationale underlying methodological decisions. For example, Chan et al. examined health care resource utilization in children with ADHD and concluded that a diagnosis of ADHD was similar to a diagnosis of asthma in the magnitude of consumption of health care resources. The authors reported use of ICD-9-CM code “314” to identify “eligible children” with ADHD and assuage the reader by also requiring the presence of at least 2 pharmacy claims for “psychostimulant medications” (e.g., MPH, MAS, or pemoline) stating, “these medications are rarely used for other conditions, except narcolepsy.”

In the larger context, we need to maintain a healthy respect for the shortcomings of administrative claims data and resist the seduction inherent in thousands of specific codes that may or may not be used precisely by coders in medical clinics where the primary purpose of these codes is reimbursement, not differential diagnosis. This area of research in ADD/ADHD, perhaps representative of much of the field of research with administrative claims, needs a lot more specificity and consistency in description of the rationale underlying methods, particularly in the selection of patients by diagnosis and procedure codes.
Garbage in predicts garbage out even with thoroughness in description of methods, but complete and transparent description of methods and results will better inform us about what is in the “garbage.”

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**REFERENCES**


