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Effects of depression screening on diagnosing and treating mood disorders among older adults in office-based primary care outpatient settings: An instrumental variable analysis

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ABSTRACT

Existing literature shows mixed findings regarding the efficacy and effectiveness of depression screening, and relatively little is known about the effectiveness of depression screening among older adults in primary care visits in the U.S. This study examines the effects of depression screening on the three following outcomes: mood disorder diagnoses, overall antidepressant prescriptions, and potentially inappropriate antidepressant prescriptions among older adults ages 65 or older in office-based outpatient primary care settings. We used data from 2010–2012 National Ambulatory Medical Care Survey (NAMCS), a nationally representative sample of office-based primary care outpatient visits among older adults (n = 9,313 unweighted). We employed an instrumental variable approach to control for selection bias in our repeated cross-sectional population-based study. Injury prevention and stress management were selected as instrumental variables, as they were considered completely exogenous to outcomes of interests using conceptual and statistical criteria. We conducted multivariate bivariate probit (*biprobit*) regression analyses to investigate the effect of depression screening on each outcome, when controlled for other covariates. We found that depression screening was negatively associated with potentially inappropriate antidepressant prescriptions ($\beta = -2.17$; 95% CI −2.80 to −1.53; $p < 0.001$). However, no significant effect of depression screening on diagnosis of mood disorders and overall antidepressant prescriptions was found. Overall, depression screening had a negative effect on potentially inappropriate antidepressant prescriptions. Primary care physicians and other healthcare providers should actively utilize depression screening to minimize potentially inappropriate antidepressant prescriptions in older adult patients.

1. Introduction

Since the mid-1990s, depression screening has been a "prominent component of the "detect—treat—improve" paradigm for undetected depression" in primary care settings (Palmer and Coyne, 2003, p. 280). While community-dwelling ambulatory adults with depression are not likely to visit a psychiatrist for their depression or other mood disorders, they still seek care in primary care or other specialty visits, making "these visits particularly important opportunities to detect and initiate treatment of depression" or other mood disorders (Palmer and Coyne, 2003, p. 279). In the U.S., the rate of providing depression screening in primary care and other specialty visits remains relatively low; a recent study using national data suggests that approximately 5% of all visits had depression screening among adults ages 18 or over in 2006–2010 (Akincigil and Matthews, 2016).

Since late 1990s, the U.S. Preventive Services Task Force (USPSTF), as part of the Agency for Healthcare Research and Quality (AHRQ), have put significant efforts to creating and disseminating depression screening guidelines (U. S. Preventive Services Task Force, 2002). In 2002, the USPSTF recommended depression screening for all eligible adults, indicating that clinicians should routinely screen for depression because there is at least fair evidence of depression screening that "improves important health outcomes and [such] benefits outweigh harms" (U. S. Preventive Services Task Force, 2002, p. 763). Such a key recommendation has remained stable in updated USPSTF statements over time in 2009 and 2016 (Siu et al., 2016; U.S. Preventive Services Task Force, 2016).

Despite clinical and policy efforts, the utility of depression screening is controversial in existing literature. As summarized in Mojtabai's work (Mojtabai, 2011), advocates of depression screening highlight that depression screening should be used as the rates of detection and treatment of depression are relatively low given that the prevalence of depression and other mood disorders remains high among ambulatory adults. Critics, on the other hand, suggest that false-positive rates of

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depression screening are high, such that depression screening is not a cost-effective approach (Mojtabai, 2011; O'Connor et al., 2009; Thombs et al., 2012; Thombs and Ziegelstein, 2014; Thombs et al., 2014; Olfson et al., 2016). While existing evidence supports promising efficacy of depression screening in primary care settings, most of these studies were randomized controlled trials (RCTs) or systematics reviews from these RCTs (O'Connor et al., 2009; Thombs et al., 2014).

Unlike RCTs, which emphasize efficacy in ideal settings, population-based observational studies can evaluate the effectiveness of depression screening with greater validity in real-world settings (Khandker et al., 2010). To our knowledge, only one observational study had been conducted to understand the effect of depression screening on diagnosing and treating mood disorders (Mojtabai, 2011). The study suggests that depression screening was negatively associated with antidepressant prescriptions without a diagnosis of mood disorder (Mojtabai, 2011). The study, however, focused on the general U.S. population, and did not address antidepressant prescriptions that may be inappropriate for other reasons in older adult populations (Mojtabai, 2011).

In the U.S., an inventory of potentially inappropriate medications for older adults was created by Beers and his colleagues (hereafter referred to as Beers criteria) in the early 1990s (Beers et al., 1991) and the Beers criteria has been updated over time (American Geriatrics Society Beers Criteria Update Expert Panel, 2012; American Geriatrics Society Beers Criteria Update Expert Panel. American Geriatrics Society, 2015). Using the updated Beers criteria, a recent study estimated that 30.9% of older adults are exposed to potentially inappropriate medications (Miller et al., 2016). This is a public health issue that impacts potentially avoidable healthcare expenditures (Fick et al., 2001; Zuckerman et al., 2006; Fu et al., 2007) increased hospitalization (Budnitz et al., 2011; Cahir et al., 2014; Lindley et al., 1992; Lau et al., 2005; Klarin et al., 2005) and morbidity (Schmader et al., 1997) and mortality (Lau et al., 2005) rates. In light of clinical efforts to minimize potentially inappropriate prescriptions, we hypothesize that depression screening may help reduce potentially inappropriate antidepressant prescriptions because those without mood disorders would be less likely to receive them in older adults. To address these gaps, our study examines whether or not depression screening has potential effects on diagnosing and treating mood disorders among older adults who made office-based primary care outpatient visits.

2. Methods

2.1. Data source and study sample

We used data from 2010 to 2012 National Ambulatory Medical Care Survey (NAMCS) (n = 138,431 unweighted), which is administrated by National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC) (National Center for Health Statistics, 2012). The NAMCS is an annual cross-sectional survey of visits to office-based physicians in outpatient settings, and provides reliable information about the provision and/or use of ambulatory medical care services in the United States (National Center for Health Statistics, 2012). Our final analytic sample included older adults ages 65 and over, who had primary care visits, and had completed data for all covariates (n = 9313 unweighted). Exclusion criteria were individuals ages 64 or younger (n = 100,314 unweighted), and had visits other than primary care visits (i.e., specialty visits) (n = 28,105 unweighted). This study was deemed exempt by the University of Minnesota Institutional Review Board, as we used publicly available de-identified data. Further details of the survey, including descriptions, questionnaires, sampling methodology and datasets, are publicly available on the NAMCS website (National Center for Health Statistics, 2015).

2.2. Measures

2.2.1. Outcome variables

Three main outcomes of interests were: diagnosis of mood disorders, antidepressant prescriptions, and potentially inappropriate antidepressant prescriptions. First, we included the diagnosis of mood disorders (e.g., major depression, bipolar disorders, and other affective disorders) (see Appendix 1) (Finkelstein et al., 2007). The NAMCS collects up to three clinical diagnoses using the *International Classification of Diseases, 9th edition, clinical modification* (ICD-9-CM), and a binary variable (yes or no/missing) was constructed for the diagnosis of mood disorders (see Appendix 1).

For antidepressant prescriptions as an outcome measure, the NAMCS collects up to eight medications in 2010–2011, and up to 10 medications in 2012. For consistency across data, we only included the first eight medications. Using the 2015 American Hospital Formulary Service (AHFS) Compendium (American Society of Health-System Pharmacists, 2015), Wolters Kluwer's Drug Facts and Comparisons (Wolters Kluwer Clinical Drug Information, 2015), and previous studies (Mort and Aparasu, 2000; Lindsey, 2009; Mamdani et al., 2000; Maust et al., 2014; Olfson and Marcus, 2009; Sclar et al., 2012), we identified prescription-based antidepressant medications using generic names (see Appendix 2). We constructed a binary variable (yes or no) for overall antidepressant prescriptions. For potentially inappropriate antidepressant prescriptions, we constructed a binary variable (yes or no) using the 2012/2015 Beers Criteria (see Appendices 2 and 3) (American Geriatrics Society Beers Criteria Update Expert Panel, 2012; American Geriatrics Society Beers Criteria Update Expert Panel. American Geriatrics Society, 2015).

2.2.2. Independent variable

The key independent variable in this study was depression screening status (yes or no). The NAMCS specifically asks the following question, "Was the depression screening exam ordered or provided at the visit?"

2.2.3. Instrumental variables

We included two instrumental variables, injury prevention and stress management. The NAMCS asks, "Was health education related to [injury prevention or stress management] ordered or provided at the visit?" These instrumental variables were binary (yes or no) in nature. The selection of these instrumental variables was based on both conceptual and statistical criteria. Conceptually, the selected instrumental variables reflect either "the physician's greater opportunities to assess and to counsel on preventive health issues" (Mojtabai, 2011, p. 466) or "[indication of] working in practice settings that encourage or require more detailed and extensive preventive interventions and patient education" (Mojtabai, 2011, p. 466). In such cases, provision of health education related to injury prevention and/or stress management seems highly correlated with depression screening as part of preventive care. It is also argued that injury prevention and/or stress management are completely exogenous to outcomes of interests because such preventive care may lead to better diagnoses of mental health conditions and/or appropriate use of antidepressants. Statistically, using bivariate analyses, these instrumental variables were adequate as they were significantly associated with the depression screening, but not with the outcomes of interests ($p < 0.05$).

2.2.4. Control variables

Based on previous studies (Mort and Aparasu, 2000; Maust et al., 2014; Olfson and Marcus, 2009; Sankaranarayanan and Puumala, 2007; Aparasu et al., 2009; Comer et al., 2011; Daumit et al., 2002; Harrison et al., 2010; Jameson and Blank, 2010; Lagomasino et al., 2011; Manseau and Case, 2014; Mojtabai and Olfson, 2010), we included a number of covariates. For demographics, we included: age (65–74, 75–84, or 85 +), gender, race/ethnicity, census region, primary source of payment (Medicare, Medicaid, private, or others), reason for visit