Predictors of Depression Screening Rates of Nurses Receiving a Personal Digital Assistant-based Reminder to Screen

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ABSTRACT *The purpose of this study was to determine if race/ethnicity, payer type, or nursing specialty affected depression screening rates in primary care settings in which nurses received a reminder to screen. The sample comprised 4,160 encounters in which nurses enrolled in advanced practice training were prompted to screen for depression using the Patient Health Questionnaire (PHQ)-2/PHQ-9 integrated into a personal digital assistant-based clinical decision support system for depression screening and management. Nurses chose to screen in response to 52.5% of reminders. Adjusted odds ratios showed that payer type and nurse specialty, but not race/ethnicity, significantly predicted proportion of patients screened.*

KEYWORDS *Depression, Advanced practice nurse, Decision support*

INTRODUCTION

Depression is the most common mental disorder in the United States.¹ Major depressive disorder affects approximately 14.8 million American adults or 6.7% of the US adult population in a given year.² Depression is expected to become the second greatest cause of disability worldwide over the next decade.³ Depressive symptoms can impair functioning to the same extent or even more severely than chronic medical conditions such as congestive heart failure, arthritis, and diabetes.⁴

Depression often goes unrecognized; as a result, treatment that can alleviate the symptoms is not sought.⁵ Even though depressive disorders are common, most clinicians in primary care and other non-psychiatric settings often overlook symptoms of depression and the condition frequently goes unnoticed.^{6–8} Studies have shown that primary care practitioners fail to diagnose up to half of all patients who have depression.^{9–11} Researchers found, in another study, that less than half of the depressed patients in primary, chronic, palliative, and cancer care were identified, and only 10% of these were appropriately treated.¹²

A substantial body of literature documents that significant health disparities exist in depression diagnosis and care. Of particular note are those related to race, ethnicity, and socioeconomic status. Minorities have less access to mental health services, and are less likely to receive needed mental health services.¹³ At the same time, studies have

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shown that depression is more frequent among members of minority groups.^{14,15} Moreover, minorities in treatment often receive a poorer quality of mental health care and are more likely to be mistreated by mental health professionals.^{16,17} In another study, primary care practitioners were less likely to recognize major depression in Hispanic and African American patients in comparison to White patients.¹⁸ Additionally, socioeconomic status is linked to mental health. Poor mental health is more common among those who are impoverished.¹⁹ People in the lowest socioeconomic position have an increased prevalence of major depressive disorder and are more likely to persist in depression for more than one year.^{20,21}

The US Preventive Services Task Force recommends depression screening for adults in primary care practices when supports are in place to help clinicians ensure accurate diagnosis and provide effective treatment and follow-up.²² Depression screening has proven to be an effective and efficient tool to identify those with depression.²³ Screening instruments help identify and track symptoms to improve detection of illness.^{24–26} Clinicians need not have psychiatric expertise to play a major role in detecting and screening patients for major depression.²⁷ Primary care providers have also inherited this responsibility since the trend in managed care is to place the primary care physician at the point of entry to health care.²⁸ Nonetheless, disparities in depression screening among ethnic minorities and economically disadvantaged groups continue to exist.²⁹

Significant initiatives, such as the MacArthur Foundation Initiative on Depression and Primary Care, Robert Wood Johnson Foundation National Program on Depression in Primary Care, and the US Department of Veterans Affairs (VA) Mental Health Quality Enhancement Research Initiative, have focused on systems-level strategies to improve depression care and outcomes.^{30–32} These initiatives and others have considered the promising role of clinical decision support systems (CDSSs) in improving depression screening and management.^{33,34} For example, a small trial compared symptom reduction in patients treated by physicians using a clinical decision support system based upon the Texas Medication Algorithm Project as compared to usual care.³⁴ Another study examined whether feedback and treatment advice for depression presented to primary care physicians via an electronic health record improved clinical outcomes and care processes for patients with major depression.³⁵ Finally, a British study compared the effectiveness of case-finding followed by computer-generated, patient-specific guidelines with usual care for the management of common mental disorders in primary care.³⁶

Notably, most studies examining clinician screening and management of depression have focused on physicians. However, depression screening is within the purview of registered nurses and several studies have suggested that nurse screening and/or follow-up improves identification of depression.^{12,37,38} Moreover, advanced practice nurses (APNs) are on the frontline of providing primary healthcare to the US population³⁹ and have a broad scope of practice, including prescriptive authority in all 50 states.⁴⁰ Given their important role in caring for the underserved,⁴¹ APNs represent an important national resource for primary care management of depression in populations at high risks for health disparities.⁴²

As part of randomized, controlled trial testing, the effect of a personal digital assistant (PDA)-based CDSS on screening and management of depression, obesity, and tobacco dependence, we examined predictors of depression screening rates of registered nurses receiving a reminder to screen. These included patient factors associated with mental health disparities (gender, race, ethnicity, and socioeconomic status) and APN specialty.

METHODS

Sample and Setting

The sample for the study was a dataset of clinical encounters for nurses randomized to the depression screening arm of the study from January 2007 to January 2008. The dataset comprises 4,160 encounters in which nurses enrolled in APN training were prompted to screen for depression by a decision support reminder that was integrated into their PDA-based documentation tool. Encounters were entered by 34 nurses across four specialty training areas: acute care nurse practitioner (NP; $n=4$, 11.8%), adult NP ($n=8$, 23.5%), family NP ($n=16$, 47.1%), adult/women's health NP ($n=411.8\%$), and women's health NP students ($n=2$, 5.9%). Participation in the reminder study was voluntary. Nurses could request a PDA-based documentation application that did not include the decision support, i.e., opt out of participation. The de-identified dataset contains selected patient demographics and information related to the clinical encounter including whether the nurse chose to screen and depression screening score.

The study settings were clinical training sites used by the Columbia University School of Nursing. Training sites are throughout the metropolitan New York City area and care is predominately provided for underserved populations.

The Depression Screening Reminder

CDSS depression (Figure 1) is a PDA-based decision support system for depression screening and management that includes a reminder to screen for depression using Patient Health Questionnaire (PHQ)-2/PHQ-9. Based upon the results of screening, the CDSS generates a depression-related diagnosis and provides a clinical practice guideline (CPG)-based documentation template that is tailored to the depression-related diagnosis. The template serves to remind nurses of CPG-based interventions for depression and assists in documentation of the plan of care. The technical aspects of the system are described elsewhere.⁴³

Data Collection and Measures

All data were automatically collected during the course of nurse documentation in CDSS depression. Gender was captured as male or female. Race/ethnicity was captured in five categories: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; Hispanic; and White, not of Hispanic origin. Payment type served as our measure of socioeconomic status and was captured in six categories: private insurance, medicare, medicaid/state children's health insurance program (SCHIP), self-pay, no charge, and workers' compensation. NP specialty (acute care, adult, family, and women's health) was documented in the knowledgebase that supported CDSS depression. Screening rate (dependent variable) was calculated as the proportion of encounters screened among those in which a nurse received a reminder to screen.

Data Analysis

Statistical analyses were performed using SPSS and SAS statistical software packages. The unit of analysis was the encounter. Descriptive statistics were used to summarize depression screening rates in eligible encounters. Factors related to the percent of encounters that were screened were examined using multivariate logistic regressions, with the following potential predictors: race/ethnicity, payment type, and specialty type. For the multivariate analysis, payer type was condensed from six categories to three (private, public, other) since each of the original six categories

<p>Encounter</p> <p>Patient: AB Enc Date: 12/21/09</p> <p>Site: ▼ Select Site</p> <p>Visit: ▼ Select Type</p> <p>Payment: ▼ Select Payment</p> <p>Disposition: ▼ Select Disposition</p> <p>Ht: in Wt: lbs BP: / </p> <p>CC PMH V Meds V</p> <p>Age: 35 Years</p> <p>Screening Home</p>	<p>Patient Screening</p> <p>Screen for Depression? Yes ☐ No ☐</p> <p>Encounter</p>	<p>Patient Screening</p> <p>Over the last 2 weeks, how often have you been bothered by any of the following problems?</p> <p>Little interest or pleasure in doing things</p> <p>More than half the days</p> <p>Feeling down, depressed, or hopeless</p> <p>Several days</p> <p>Back Next</p>
<p>a. The nurse begins documentation of the clinical encounter from the Encounter screen and also typically ends documentation of the encounter by entering patient disposition and exiting via the Home button. The nurse selects Screening to initiate screening for the relevant guideline.</p>	<p>b. The nurse receives a reminder to screen for depression and decides whether or not to screen.</p>	<p>c. CDSS-Depression prompts the nurse to screen for depression using Patient Health Questionnaire (PHQ)-2/PHQ-9.</p>
<p>Patient Screening</p> <p>Depression Summary</p> <p>Depression score = 21</p> <p>Dx: Moderately severe to severe risk for Major Depressive Disorder.</p> <p>Suicide Risk: Yes</p> <p>Severe functional impairment: No</p> <p>Special Population: No</p> <p>Create Depression Plan</p> <p>Encounter Assess</p>	<p>Dx: Mod/sev dep risk, suicide risk</p> <p>Precp: Precptr agrees with Dx</p> <p>No Plans Entered for this Dx</p> <p>Dx Pr Rx Pt Rf i</p> <p>Screening Assess Encounter</p>	<p>Dx: Mod/sev dep risk, suicide risk</p> <p>▼ Precptr agrees with Dx</p> <p>Reason for Emerg Serv referral</p> <p>Psychiatric Emerg Serv</p> <p>Dx Pr Rx Pt Rf Del</p> <p>▼ Psychiatric Emerg Serv</p> <p>Screening Assess Encounter</p>
<p>d. At the conclusion of screening, CDSS-Depression generates a depression-related diagnosis and provides a CPG-based documentation template that is tailored to the depression-related diagnosis.</p>	<p>e. CDSS-Depression supports documentation of the patient goal and then based upon the diagnosis and the goal, displays a tailored plan of care template. The nurse selects CPG-based items from pull down pick lists to document the plan of care.</p>	<p>f. As the nurse selects items, the items appear in the plan of care so that the overall plan can be viewed and edited as needed.</p>

FIGURE 1. Screenshots of CDSS depression.

had too small of a sample to be meaningful in the analysis. The final model was selected using backward elimination method to keep all predictors with $p < 0.05$ in the model. The strength of associations was measured by adjusted odd ratios with 95% confidence intervals. All statistical tests were two-sided and considered statistically significant if p values were less than 0.05.

RESULTS

No nurses opted out of participation. The sample (Table 1) in the 4,160 encounters was predominantly Hispanic (48.8%) or African American (24.7%). Only 21.3%

TABLE 1 Frequencies of all and screened patients gender, race, ethnicity, and payer types

Variable	Total (%)	Total screened (%)
Gender		
Male	1,607 (38.6)	871 (54.2)
Female	2,548 (61.3)	1,313 (51.5)
Race/ethnicity		
White, not of Hispanic origin (reference)	797 (19.2)	506 (63.5)
Asian or Pacific Islander	69 (1.7)	54 (78.3)
Black, not of Hispanic origin	1,029 (24.7)	553 (53.7)
Hispanic	2,029 (48.8)	1,031 (50.8)
Payer type		
Private insurance	884 (21.3)	663 (75.0)
Medicare	496 (11.9)	299 (60.3)
Medicaid/SCHIP	1,833 (44.1)	887 (48.4)
Self-pay	136 (3.3)	99 (72.8)
No charge	54 (1.3)	35 (64.8)
Workers' compensation	8 (0.2)	5 (62.5)
APN specialty		
Acute care NP	201 (4.8)	97 (48.3)
Adult NP	1,493 (35.9)	976 (65.4)
Family NP	2,151 (51.7)	982 (45.7)
Women's health NP	315 (7.6)	130 (41.3)

had private health insurance. Most patients were cared for by nurses in family (51.7%) or adult (35.9%) NP training programs. The overall screening rate was 52.5%. Ranges for screening rates were: gender—51.4% (female) to 54.5% (male); race/ethnicity—50.8% (Hispanic) to 78.3% (Asian/Pacific Islander); payment source—48.4% (Medicaid/SCHIP) to 75% (private); and APN specialty—48.3% (acute care) to 65.4% (adult).

We conducted a series of bivariate hypothesis tests that examined the predictors of screening (gender, race/ethnicity, payer type, and APN specialty) in separate logistic regression models (Table 2). Race/ethnicity, payer type, and APN specialty models were significant based upon unadjusted odds ratios. Multivariate analysis was conducted using a sample of 3,446 encounters, since observations with missing data were not included in the analysis. A multivariate logistic regression model that included adjusted odds ratios for race/ethnicity, payer type, and APN specialty (Table 3) demonstrated that payer type ($p<0.0001$) and APN specialty ($p<0.0001$), but not race/ethnicity ($p=0.14$), significantly predicted nurse screening for depression.

DISCUSSION

In our study, 52.5% of nurses who received a reminder screened their patients for depression, which is a higher screening rate than published rates for selected reminders. In earlier studies, primary care clinicians overrode most computerized drug alerts (66.9-91.2%).^{44,45} Primary care practitioners who received a reminder to screen for diabetes in elderly patients only screened 31.8% of their eligible patients.⁴⁶ In another study, only about 10% of primary care providers adhered to reminders to screen for HIV.⁴⁷

TABLE 2 Unadjusted odds ratios of gender, race/ethnicity, payer type, and specialty related to proportion of patients screened

Variable	Odds ratio	95% Confidence interval	<i>p</i> value
Gender			
Male (reference)	1.00		0.09
Female	0.90	0.79, 1.02	
Race/ethnicity			
White, not of Hispanic origin (reference)	1.00		<0.001
Asian or Pacific Islander	2.07 ^a	1.15, 3.74	
Black, not of Hispanic origin	0.67 ^a	0.55, 0.81	
Hispanic	0.59 ^a	0.50, 0.70	
Payer type			
Private insurance (reference)	1.00		<0.001
Medicare	0.51 ^a	0.40, 0.64	
Medicaid/SCHIP	0.31 ^a	0.26, 0.37	
Self-pay	0.89	0.59, 1.34	
No charge	0.61	0.34, 1.10	
Workers' compensation	0.56	0.13, 2.34	
APN specialty			
Acute care NP	1.00		0.001
Adult NP	1.33	0.93, 1.90	
Family NP	2.69 ^a	2.10, 3.44	
Women's health NP	1.20	0.94, 1.52	
Other	0.49 ^a	0.26, 0.93	

^aStatistically significant at 0.05 level

Studies of specialty care practice including oncology (70%),⁴⁸ geriatrics (77%),⁴⁹ obstetrics (52%),⁵⁰ and adolescent medicine (7.5%)⁵¹ have indicated that screening rates have large variation. There are no studies documenting non-intervention depression screening rates in primary care. However, in a recent study at a VA primary care clinic, 97% screening rates were achieved over a one-month study period. The high rate of screening was fostered by a mandate by the VA, inclusion of decision support in the clinic's electronic health record, and use of a four-item universal screening instrument.⁵²

While depression screening in primary care has not been well documented, recognition of the disease has been well studied. Typically, depression is significantly under-recognized,⁵³ with studies estimating that primary care physicians fail to recognize 30–50% of depressed patients.^{27,54–57} Past research suggests that diagnosis of depression is influenced by a variety of factors, including patient characteristics such as age, race, and financial incentives or disincentives within a health insurance program.^{58,59} Multiple studies have found that primary care providers were less likely to detect depression in African American and Hispanic patients as compared to White patients.^{60,61} Our study focused on screening, an important aid to recognition, and found that when adjusted by payer type and NP specialty, the proportion of patients screened by nurses who received a reminder did not vary by race/ethnicity.

Nonetheless, our findings suggest that disparities in screening practices by payment type persist despite reminders to screen after adjusted by other predictors. Future research should further elucidate the relationship between payer type and depression screening rates. For example, does payer type influence the nature or

TABLE 3 Adjusted odds ratios of race/ethnicity, payer type, and specialty on proportion of patients screened (*n*=3,446)

Variable	<i>N</i>	Odds ratio	95% Confidence Interval	<i>p</i> value
Race/ethnicity ^a				
White, not of Hispanic origin (reference)	685	1.00	-	0.14
Asian or Pacific Islander	59	2.74	1.26, 5.96	
Black, not of Hispanic origin	912	0.98	0.77, 1.24	
Hispanic	1,785	1.03	0.83, 1.29	
Payer type ^b				
Private insurance (reference)	867	1.00	-	<0.0001
Medicare, medicaid, SCHIP	2,306	0.39	0.32, 0.47	
Self-pay, no charge, workers' compensation, other	273	0.94	0.68, 1.29	
APN specialty				
Acute care NP	255	1.00	-	<0.0001
Adult NP	1,321	2.36	1.77, 3.13	
Family NP	123	2.04	1.27, 3.27	
Women's health NP	1,747	1.52	1.16, 2.00	

^aAdjusted by payer type and specialty
^bAdjusted by race/ethnicity and specialty
^cAdjusted by race/ethnicity and payer type

duration of consultations or access to referral services for depression? In addition, nurses' specialty type significantly affected screening practices (after adjustment by other predictors). Previous studies have not considered the effect of specialty on screening practices. As such, further research should be conducted to examine practice settings and other contextual variables that may influence screening rates. For example, contextual factors such as number of patients at clinical sites may have contributed to these differences. Practice setting was not examined in our study which may affect screening rates. Nurses in different specialties may have practice settings with different case loads, which are likely related to payment type. Further exploration of the relationship between practice sites, payment types, and screening rates is needed to better understand disparities in care.

Limitations and Potential Biases

There are several limitations to this study. The unit of analysis was the clinical encounter; consequently, it is not possible to look at patients over time to determine depression-related patient outcomes. Moreover, the assumption of this study is that if screening is not documented then it was not done, which may underestimate services which were provided. Another limitation of this study is that the registered nurses who received the reminders were in APN training. The nurses were providing APN care under the supervision of an APN preceptor so the data reflect actual clinical encounters. However, the decision to screen or not screen could have been influenced by the preceptor, others in the practice setting, or a faculty member, because the nurse was not yet a credentialed NP. The potential biases relate to this issue are partially offset by the fact that the nurses represented four APN specialties, had different preceptors, and delivered care in a wide variety of clinical sites.

CONCLUSION

The results of this study suggest that multiple factors influence screening practices even when a CDSS provides a reminder to screen. Follow-up studies should be conducted to examine interventions which can eliminate socioeconomic disparities in care, especially for the management of depression.

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