

# Screening for and Diagnosis of Depression Among Adolescents in a Large Health Maintenance Organization

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**Objective:** The aim of this analysis was to determine changes in patterns of depression screening and diagnosis over three years in primary and specialty mental health care in a large health maintenance organization (HMO) as part of a project to develop quality measures for adolescent depression treatment.

**Methods:** Two series of aggregate data (2010–2012) were gathered from the electronic health records of the HMO for 44,342 unique adolescents (ages 12 to 21) who had visits in primary and mental health care. Chi square tests assessed the significance of changes in frequency and departmental location of Patient Health Questionnaire–9 (PHQ-9) administration, incidence of depression symptoms, and depression diagnoses.

**Results:** There was a significant increase in PHQ-9 use, predominantly in primary care, consistent with internally

generated organizational recommendations to increase screening with the PHQ-9. The increase in PHQ-9 use led to an increase in depression diagnoses in primary care and a shift in the location of some diagnoses from specialty mental health care to primary care. The increase in PHQ-9 use was also linked to a decrease in the proportion of positive PHQ-9 results that led to formal depression diagnoses.

**Conclusions:** The rate of depression screening in primary care increased over the study period. This increase corresponded to an increase in the number of depression diagnoses made in primary care and a shift in the location in which depression diagnoses were made, from the mental health department to primary care. The frequency of positive PHQ-9 administrations not associated with depression diagnoses also increased.

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Depression affects 12% to 25% of adolescents (1,2) and is associated with a range of negative academic, social, and health outcomes (3–6). Despite the high burden of depression and the availability of effective treatments, approximately 60% to 80% of affected adolescents do not receive appropriate care (7–9). Pediatric primary care is an important site for the identification of depression among adolescents, the critical first step in connecting youths to treatment (10,11). However, depression remains poorly identified in this setting (12–15). There is consensus among professional organizations and experts in pediatrics and psychiatry to recommend routine screening of adolescents for depression to improve case identification, although available evidence suggests that screening coverage is very low (16–18).

Quality measurement is an increasingly prominent approach for improving care, whereby providers and organizations are incentivized to adhere to essential health care practices (19–22). The U.S. Preventive Services Task Force (USPSTF) and other major practice guidelines have

recommended depression screening in primary care (12,15). Screening for depression in primary care has featured prominently in efforts to improve depression care, including national initiatives to develop quality measures (12,15). For example, the Centers for Medicare and Medicaid Services (CMS) included depression screening and follow-up for adolescents and adults as a quality measure in its electronic health record (EHR) incentive program, which encourages “meaningful” use of EHRs. Similarly, the National Collaborative for Innovation in Quality Measurement (NCINQ), one of seven centers of excellence funded by the Agency for Healthcare Research and Quality and CMS Pediatric Quality Measures Program, developed a suite of potential quality measures organized around a care pathway for managing adolescent depression in primary care. The first step in the pathway, and the first potential quality measure, is screening for depression (22).

The objective of this study was to partner with a large health maintenance organization (HMO) to further examine the use of depression screening as a quality measure. In the

study, NCINQ partnered with the HMO to study changing patterns of depression screening over time. USPSTF has also specifically highlighted the need for research linking screening to improved identification of depression cases (16). Therefore, this study also assessed the diagnosis of depression following screening, which NCINQ included as the second potential measure in the care pathway. Examination of large-scale, naturalistic data on screening and diagnosis will help to identify gaps in essential care practices related to identification of depression and provide an indication of the fit and possible value of depression quality measures in the context of current practice.

## METHODS

### Setting and Data Sources

Data for adolescents who met inclusion criteria were abstracted from the EHR of a large HMO. The identity of the HMO has been masked by agreement with the organization. The Chesapeake Institutional Review Board determined that this study was not human subjects research because only deidentified, aggregated data were collected. Starting in 2011, the HMO began to implement the adolescent version of the Patient Health Questionnaire-9 (PHQ-9) as a screening tool in primary care (23,24). Previously, the PHQ-9 was used primarily in the mental health department for diagnostic support and monitoring of patients with a known diagnosis of depression. Computer-programmed extraction of aggregate data for this study was conducted during May 29–31, 2013.

### Measures

**PHQ-9-Modified.** The PHQ-9 is a nine-item self-report questionnaire that assesses depression symptoms and severity and that has been validated with adolescents (23,24). Items based on *DSM-IV* criteria for depression are rated on a 4-point scale ranging from 0 (not at all) to 3 (nearly every day). The PHQ-9-Modified includes minimal adjustments to the original PHQ-9 to incorporate characteristics of depression among adolescents and age-appropriate language. Specifically, it includes irritability in the item assessing depressed mood and includes weight loss in the item assessing appetite. No psychometric data are available for the PHQ-9-Modified, but because it is identical to the PHQ-9 other than the described adjustments, its developers have indicated that using PHQ-9 cutoffs is appropriate. Throughout this article, “PHQ-9” is used to indicate the PHQ-9-Modified.

Consistent with research literature and practices within the HMO, a PHQ-9 score of 11 or greater indicated a positive screen (24). We wanted to identify instances in which the PHQ-9 was used to detect depression rather than as a way to track symptoms among individuals who were being treated for depression. Therefore, we identified positive PHQ-9 scores that were preceded by a period of six months with no record of depression diagnosis or an order for antidepressant medication. A PHQ-9 result that met these criteria was termed an “incident positive PHQ-9” and was taken to

represent the identification of new depression symptoms. The six-month depression-free period preceding a positive PHQ-9 began 14 days prior to the PHQ-9 chart entry date to allow for institutional lag time between PHQ-9 administration and upload into the EHR.

**Depression diagnosis.** Depression diagnoses in this study included *ICD-9* codes for major depressive affective disorder, depressive-type psychosis, depressive disorder not otherwise specified, and adjustment disorder with depressed mood, with mixed anxiety and depressed mood, or with mixed disturbance of emotions and conduct (25).

### Study Group

For three years (2010, 2011, and 2012), adolescents were included in the study sample if they were between the ages of 12 and 21 on December 31 of the previous year and if their EHR contained documentation of at least one face-to-face visit with a provider. Adolescents may have had multiple visits and multiple PHQ-9 results in a given calendar year, but they were counted only once. Information was also collected on the department in which the PHQ-9 was administered; if an adolescent received more than one PHQ-9 in a given calendar year, the adolescent was counted in the department where the first PHQ-9 was given. Adolescents over age 18 were seen in adult primary care settings. Because work flows for pediatric and adult clinical services may differ, these results are presented separately.

### Procedures

For each calendar year (2010, 2011, and 2012), the HMO created two series of patient data summaries. The first series focused on patterns of PHQ-9 use and depression diagnoses associated with PHQ-9 results. The steps were as follows: identify all unique adolescents who were administered the PHQ-9; identify those whose PHQ-9 score was above the clinical cutoff; within this group, identify all adolescents with an incident positive PHQ-9; and identify how many unique adolescents with an incident positive PHQ-9 had subsequent new diagnoses of depression.

The second series of patient data summaries provided context for the first series by comparing the number of depression diagnoses associated with PHQ-9 results against the total number of depression diagnoses made at the HMO in selected departments. The steps were to identify all unique adolescents with a diagnosis of depression in each calendar year and within this group, identify all those with a depression diagnosis associated with an incident positive PHQ-9.

Chi square tests assessed the significance of changes in patterns of PHQ-9 use, frequency of positive PHQ-9 results, incident positive PHQ-9 results, and diagnosis of depression following incident positive PHQ-9 results.

## RESULTS

### Use of the PHQ-9 in Primary Care

The number of PHQ-9 administrations by department changed significantly from 2010 to 2012 ( $p < .001$ ) (Table 1). Across all departments, the proportion of unique adolescents

**TABLE 1. Administration of the Patient Health Questionnaire–9 (PHQ-9) and depression diagnoses among unique adolescent patients with face-to-face visits in 2010–2012, by department**

Variable	2010 (N=44,342)			2011 (N=44,490)			2012 (N=43,341)			$\chi^2$	df	p
	N	Total N <sup>a</sup>	%	N	Total N <sup>a</sup>	%	N	Total N <sup>a</sup>	%			
Administered PHQ-9										1,514.74	2	<.001 <sup>b</sup>
Pediatric primary care	162	—	na <sup>c</sup>	890	—	na <sup>c</sup>	2,283	—	na <sup>c</sup>			
Adult primary care	158	—	na <sup>c</sup>	288	—	na <sup>c</sup>	419	—	na <sup>c</sup>			
Mental health	2,079	—	na <sup>c</sup>	2,037	—	na <sup>c</sup>	1,883	—	na <sup>c</sup>			
All departments	2,399	—	5	3,215	—	7	4,585	—	11			
Positive PHQ-9												
Pediatric primary care	91	162	56	196	890	22	435	2283	19	122.97	2	<.001
Adult primary care	114	158	72	185	288	64	280	419	67	2.89	2	.235
Mental health	1,057	2,079	51	1,006	2,037	49	997	1,883	52	5.00	2	.082
All departments	1,262	2,399	53	1,387	3,215	43	1,712	4,585	37	150.23	2	<.001
Incident positive PHQ-9 <sup>d</sup>												
Pediatric primary care	79	91	87	173	196	88	370	435	85	1.20	2	.548
Adult primary care	100	114	88	155	185	84	235	280	84	1.04	2	.593
Mental health	608	1,057	58	607	1,006	60	557	997	56	4.20	2	.122
All departments	787	1,262	62	935	1,387	67	1,162	1,712	68	11.34	2	.003
Depression diagnosis												
Pediatric primary care	43	79	54	85	173	49	134	370	36	13.69	2	.001
Adult primary care	22	100	22	37	155	24	58/	235	25	.28	2	.871
Mental health	244	608	40	266	607	44	226	557	41	2.01	2	.366
All departments	309	787	39	388	935	42	418	1162	36	6.83	2	.032

<sup>a</sup> For adolescents with a positive PHQ-9, the total N is the number of adolescents who were administered the PHQ-9 in the same department; for adolescents with an incident positive PHQ-9, the total N is adolescents with a positive PHQ-9 in the same department; and for adolescents with a diagnosis of depression, the total N is adolescents with an incident positive PHQ-9 in the same department.

<sup>b</sup> Model  $\chi^2$  test; does not include "all departments".

<sup>c</sup> It was not possible to determine the total number of unique patients in each department because many adolescents had visits in more than one department but could be counted in only one. If adolescents had a visit in primary care and mental health in the same year, they were counted in primary care.

<sup>d</sup> A positive PHQ-9 score that was preceded by a period of six months with no record of depression diagnosis or an order for antidepressant medication.

who had at least one PHQ-9 almost doubled. From 2010 to 2012, the number of unique adolescents who received a PHQ-9 increased 14-fold in pediatric primary care and almost threefold in adult primary care. The number of adolescents who received a PHQ-9 from the mental health department decreased from 2010 to 2012.

From 2010 to 2012, there was an increase in positive PHQ-9 results in pediatric primary care. Although the absolute number of positive PHQ-9 results in that setting increased nearly fivefold, the proportion of PHQs that were positive decreased significantly ( $p<.001$ ) (Table 1).

From 2010 to 2012, the number of incident positive PHQ-9s in pediatric primary care increased over four times. However, the proportion of positive PHQ-9 results in that setting that indicated possible new cases of depression changed very little (Table 1). In adult primary care, the number of incident positive PHQ-9s doubled from 2010 to 2012 but, similarly, did not change significantly as a proportion of all positive PHQ-9 results. There was also no significant change from 2010 to 2012 in the number of incident positive PHQ-9s as a proportion of all positive PHQ-9 results for the mental health department.

In pediatric primary care, the proportion of adolescents with incident positive PHQ-9s who went on to receive a depression diagnosis decreased significantly from 2010 to 2012 ( $p=.001$ ) (Table 1). There was no significant change in this proportion for adult primary care or for the mental health department.

### Depression Diagnosis and Case Identification

Although the proportion of unique adolescents with a depression diagnosis summed across all departments was unchanged from 2010 to 2012, there was a significant change in the number of depression diagnoses made within departments ( $p<.001$ ) (Table 2). From 2010 to 2012, the number of unique adolescents with a depression diagnosis increased by almost 40% in pediatric primary care (from 304 to 422 adolescents) and by almost 25% in adult primary care (from 179 to 222), while decreasing by 13% in the mental health department (from 917 to 796).

The proportion of adolescents with a depression diagnosis in pediatric primary care who had an incident positive PHQ-9 increased from 2010 to 2012 ( $p=.001$ ). Similarly, in adult primary care, there was a significant increase from 2010 to 2012 in the proportion of depression diagnoses associated with an incident positive PHQ-9 ( $p=.002$ ). In the mental health department, there was a significant change between 2010 and 2012 in the proportion of depression diagnoses associated with an incident positive PHQ-9 ( $p=.030$ ).

### DISCUSSION

This study assessed changing patterns of adolescent depression screening and diagnosis in a large HMO to inform the development and adjustment of quality measures. These data also make a novel contribution to the scant evidence

**TABLE 2. Diagnosis of depression among unique adolescent patients with face-to-face visits in 2010–2012, by department**

Variable	2010 (N=44,342)			2011 (N=44,490)			2012 (N=43,341)			$\chi^2$	df	p
	N	Total N <sup>a</sup>	%	N	Total N <sup>a</sup>	%	N	Total N <sup>a</sup>	%			
Depression diagnosis										34.35	2	<.001 <sup>b</sup>
Pediatric primary care	304	—	na <sup>c</sup>	316	—	na <sup>c</sup>	422	—	na <sup>c</sup>			
Adult primary care	179	—	na <sup>c</sup>	172	—	na <sup>c</sup>	222	—	na <sup>c</sup>			
Mental health	917	—	na <sup>c</sup>	824	—	na <sup>c</sup>	796	—	na <sup>c</sup>			
All departments	1,400		3	1,312		3	1,440		3			
Incident positive PHQ-9 <sup>d</sup>												
Pediatric primary care	43	304	14	85	316	27	134	422	32	29.85	2	.001
Adult primary care	22	179	12	37	172	22	59	222	27	12.49	2	.002
Mental health	244	917	26	266	824	32	226	796	28	7.00	2	.030
All departments	309	1,400	22	388	1,312	30	419	1,440	29	24.91	2	.001

<sup>a</sup> Patients in the same department with a depression diagnosis.

<sup>b</sup> Model  $\chi^2$  test; does not include "all departments".

<sup>c</sup> It was not possible to determine the total number of unique patients in each department because many adolescents had visits in more than one department but could be counted in only one. If adolescents had a visit in primary care and mental health in the same year, they were counted in primary care.

<sup>d</sup> A positive Patient Health Questionnaire-9 (PHQ-9) score that was preceded by a period of six months with no record of depression diagnosis or an order for antidepressant medication.

about screening and depression diagnosis in primary care in general. In line with an organizational recommendation to screen for depression among adolescents, screening at the HMO increased over three years, predominantly in primary care. The increase in screening led to a corresponding increase in depression diagnoses made in primary care and a shift in the location of many diagnoses from the mental health department to primary care. The increase in screening also led to a decrease in the proportion of positive screening results that resulted in depression diagnoses.

We speculate that the increase in screening occurred predominantly in primary care because although the HMO recommended screening of adolescents for depression organizationwide, the emphasis of the recommendation was on pediatric primary care. The recommendation was also less likely to have an impact on the mental health department, where providers were already in the practice of using the PHQ-9 for symptom identification and diagnostic support, most likely in the context of a depression complaint.

The finding that increased depression screening in primary care led to increased depression diagnosis in primary care, while intuitive, has little prior empirical support. Reflecting the lack of such evidence, the USPSTF has advocated precisely for research linking increased depression screening of adolescents with increased case identification (17). One large cross-sectional study of mental health screening of adolescents estimated national depression screening rates but did not provide data on results of the screening or on depression diagnoses made subsequent to the screening (18). This study also relied on provider self-report of screening practices rather than a review of the EHRs, as was the case in this study.

Another large study, which was based on Massachusetts Medicaid claims data, found that a state mandate and incentive to conduct behavioral health screening with children in primary care led to large increases in administered

screens over a one-year period and an increase in behavioral health assessments over the same period, although it was not possible to link these changes given that they came from different data sets (26). Depression screening in the Massachusetts study employed the PHQ-9 but only among older adolescents (ages 18 to 20), a much narrower age range compared with the age range in this study (ages 12 to 21). This study is the first published report of which we are aware to present naturalistic data on a large-scale implementation of adolescent depression screening in primary care and the first to link changes in screening practices over time to changes in frequency of depression diagnoses.

We also aimed to gauge the possible fit and utility of quality measures outlined in the NCINQ depression care pathway in a real-world practice setting, given current patterns in depression case identification and management. We speculate from the findings that the first two measures in the care pathway (screening and diagnostic assessment) are well situated to facilitate important changes in care and to contribute to improved identification of depression. This study provides encouraging evidence of providers' willingness to adopt screening on the basis of organizational recommendations. This, again, is an intuitive—yet important—finding, in light of studies demonstrating challenges in screening uptake and adoption (26,27).

Nevertheless, despite the dramatic increase in the rate of screening from 2010 to 2012, coverage remained at only 11% of the adolescent population by 2012. The Massachusetts Medicaid claims study, which reported a screening rate of 50% after providers were incentivized to adhere to state-mandated practices, suggests that greater increases in screening may be obtained with an official mandate and incentive, such as a quality measure for screening.

We also speculate that a quality measure to mandate timely follow-up after a positive screening result could further improve case identification. In this study, the increase in

depression screening in primary care resulted in a decrease in the proportion of incident positive PHQ-9s that led to confirmed depression diagnoses. We suggest some hypotheses to account for this result. Given the positive predictive value of the PHQ-9 for adolescents in primary care (15.2%) (24), it is likely that many positive results from PHQ-9 screening simply were not true cases of depression, possibly representing transient mood symptoms, and primary care providers were correct in not making depression diagnoses. However, increased use of the PHQ-9 as a screening tool in primary care may also lead to more frequent identification of consistent mild symptoms that are more difficult to diagnose confidently as depression. Considering that pediatricians may not feel confident in their ability to diagnose depression (27), the lack of diagnosis following positive PHQ-9 results may reflect difficulty or reluctance to make a diagnosis when one is warranted.

It is also possible that incident positive PHQ-9 results that did not lead to confirmed depression diagnoses represented true-positive cases of depression that did not receive a follow-up assessment to confirm the diagnosis. The possibility that case identification in primary care may be impeded by reluctance or low diagnostic confidence among primary care providers or by bottlenecks or barriers to further assessment highlights the need, as USPSTF recommends, to establish systems for accessing mental health supports to ensure accurate diagnosis and appropriate follow-up before initiating screening. A quality measure mandating and incentivizing the essential practice of confirming a depression diagnosis within a specified time after a positive screen could serve to facilitate changes to provider behavior and to organizational structure or work flow to ensure that these supports are available and accessed.

The HMO that served as a partner in this study is an example of a health system that has taken steps to meet the growing need to make mental health supports accessible in primary care. Many practices and organizations will not have the ability to provide such support internally and may instead partner with other organizations to establish the necessary mental health assessment and referral support. Other important challenges with screening, such as increasing the acceptability of screening to families and training providers in administration, scoring, and post-screening clinical decision making, must be addressed to ensure optimal functioning of screening initiatives (28). Further discussion of these factors is beyond the scope of this article.

This study had several limitations. Because data were aggregated and anonymous, it was not possible to ascertain PHQ-9 results and depression diagnoses for individual adolescents after the initial clinical visit. Future efforts should track individual patients through this process and beyond to assess additional factors associated with care quality, including whether a referral was made to specialty mental health services, whether psychotherapy was provided, and whether an antidepressant was ordered.

Because this study was conducted in a single setting, it is possible that the demonstrated impact of increased

depression screening may not generalize to other practice settings with different clinical work flows and different administrative or organizational structures or policies. We speculate, nevertheless, that increased screening in primary care will lead to increases in identification of depression symptoms in other primary care settings. There may be, however, differences between settings in how these newly identified symptoms translate into depression diagnoses because of differences in provider training and experience, clinical work flow and resources, and organizational structure and policies. Each organization that implements screening is likely to face unique changes in clinical work flow and challenges in ensuring appropriate follow-up for youths who screen positive for depression.

## CONCLUSIONS

This study aimed to assess patterns of depression screening and diagnosis in a large HMO to gauge the appropriateness and possible value of quality measures in the context of current practice. The data indicate that screening increased over time in accordance with organizational recommendations, although coverage remained very low. Increased screening in primary care led to an increase in confirmed depression diagnoses in primary care and a commensurate decrease in diagnoses made in specialty mental health care. Many adolescents who screened positive during the study period were not diagnosed as having depression, suggesting the importance of assessment to confirm diagnosis. Quality measures mandating depression screening and timely diagnostic confirmation may improve screening coverage and identification of depression. Given that effective and timely care for depression requires prompt treatment enrollment and management, we must develop quality measures that cover complete care pathways for children and adolescents with mental health conditions.

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