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CME Objective

After studying this article, you should be able to:

- Recognize a sustained increase in risk of suicide attempt and suicide death among patients who indicate suicidality on the Patient Health Questionnaire

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Financial Disclosure

All individuals in a position to influence the content of this activity were asked to complete a statement regarding all relevant personal financial relationships between themselves or their spouse/partner and any commercial interest. The CME Institute has resolved any conflicts of interest that were identified. In the past year, Alan J. Gelenberg, MD, has been a consultant for Zynx Health, has been a stock shareholder of Healthcare Technology Systems, and has participated in antitrust litigation on behalf of GlaxoSmithKline. No member of the CME Institute staff reported any relevant personal financial relationships. **Faculty financial disclosure appears at the end of the article.**

Risk of Suicide Attempt and Suicide Death Following Completion of the Patient Health Questionnaire Depression Module in Community Practice

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ABSTRACT

Objective: To examine the association between thoughts of death or self-harm reported on item 9 of the Patient Health Questionnaire (PHQ) depression module and the risk of suicide attempt or suicide death over the following 2 years.

Method: In 4 health care systems participating in the Mental Health Research Network, electronic records identified 509,945 adult outpatients completing 1,228,308 PHQ depression questionnaires during visits to primary care, specialty mental health, and other outpatient providers between January 1, 2007 and December 31, 2012. 9,203 nonfatal suicide attempts were identified using health system records of inpatient or outpatient encounters for self-inflicted injury. 484 suicide deaths were identified using cause-of-death codes from state mortality data.

Results: Cumulative hazard of suicide attempt during 2 years ranged from approximately 0.5% among those reporting thoughts of death or self-harm “not at all” to 3.5% among those reporting such thoughts “nearly every day.” Cumulative hazard of suicide death during 2 years ranged from approximately 0.04% among those responding “not at all” to 0.19% among those responding “nearly every day.” The excess hazard associated with thoughts of death or self-harm declined with time, but remained 2- to 5-fold higher for at least 18 months. Nevertheless, 39% of suicide attempts and 36% of suicide deaths within 30 days of completing a PHQ occurred among those responding “not at all” to item 9.

Conclusions: In community practice, response to PHQ item 9 is a strong predictor of suicide attempt and suicide death over the following 2 years. For patients reporting thoughts of death or self-harm, suicide prevention efforts must address this enduring vulnerability.

J Clin Psychiatry 2016;77(2):221–227
dx.doi.org/10.4088/JCP.15m09776

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Suicide remains the 10th-ranked cause of death in the United States, accounting for 41,000 deaths in 2013.¹ Suicide attempts lead to 600,000 emergency department visits² and 200,000 hospitalizations³ annually in the United States. Effective suicide prevention will require accurate identification of those at risk. In 2013, the US Preventive Services Task Force found only “minimal evidence suggesting that some screening tools can identify some adults at increased risk for suicide in primary care.”^{4(p741)}

Since the publication of the Preventive Services Task Force recommendations, we reported⁵ that the ninth question of the commonly used Patient Health Questionnaire (PHQ) depression module can accurately identify outpatients at increased risk of suicide attempt and death by suicide. Mental health and primary care patients reporting frequent thoughts of death or self-harm were 6 times as likely to attempt suicide and 5 times as likely to die by suicide during the following year compared to those not reporting such thoughts.

Increasing use of the PHQ and similar self-report scales in community practice⁶⁻⁸ creates both a need and an opportunity to understand how self-reported suicidal ideation predicts suicidal behavior. Clinicians using these questionnaires will need guidance regarding the immediate and long-term risk associated with thoughts of death or self-harm. Large health records databases allow us to address that question.

Here, we use data from approximately 500,000 patients in 4 health systems to examine the relationship between self-reported thoughts of death or self-harm and subsequent suicidal behavior. We focus on 3 questions: Are the relationships reported previously from a single health system replicated in this larger and more diverse sample? What is the immediate risk of suicidal behavior among outpatients reporting thoughts of death or self-harm? How does the risk associated with response to PHQ item 9 change over time?

METHOD

Data are drawn from 4 health systems in the Mental Health Research Network (MHRN), a National Institute of Mental Health–funded consortium of research centers based in large integrated health care systems. Across these systems, electronic medical records and insurance claims have been organized in a Virtual Data Warehouse to facilitate population-based research.⁹ Protected health information remains at each system, but common data definitions and formats facilitate sharing of de-identified data for research. Institutional Review Boards and privacy boards at each health system approved use of de-identified data for this research.

The 4 MHRN health systems contributing data to this report include Group Health Cooperative, HealthPartners, Kaiser Permanente of Colorado, and Kaiser Permanente of Southern California. These health systems recommend routine use of the PHQ in depression care visits and routinely record E-code (or cause-of-injury) diagnoses, allowing ascertainment of suicide attempts. These systems

- Reporting frequent thoughts of death or self-harm indicates a significant and sustained increase in risk of suicide attempt and suicide death.
- Prevention efforts should address suicide risk as an enduring vulnerability rather than a short-term crisis.

serve a combined population of approximately 5 million patients in California, Colorado, Minnesota, Washington, and Idaho. Patients are generally representative of each system's geographic area and are enrolled through a mixture of employer-sponsored insurance, individual insurance, capitated Medicare and Medicaid programs, and other state-subsidized low-income programs.

The PHQ depression module (often referred to as the PHQ-9) begins with the general instruction “Over the last 2 weeks, how often have you been bothered by any of the following problems?” The ninth item asks about “Thoughts that you would be better off dead or of hurting yourself in some way” with response options including “Not at all,” “Several days,” “More than half the days,” and “Nearly every day.”

The study sample included all PHQ results in electronic medical records between January 1, 2007 and December 31, 2012. Any individual patient could contribute multiple PHQ observations. Suicide deaths were identified using cause-of-death data from state death certificate files. Deaths were classified as due to suicide if *ICD-10* cause-of-death codes indicated definite (X60 through X84) or possible (Y10 through Y34) self-inflicted injury. Death certificate data were available through December 31, 2012. Nonfatal suicide attempts were identified using electronic medical records (for services provided at health system facilities) and insurance claims (for services provided by external providers or facilities). These data were available through December 31, 2013. Three criteria were used to identify nonfatal suicide attempts:

1. *ICD-9* diagnosis of self-inflicted injury or poisoning (E950 through E958)
2. *ICD-9* diagnosis of injury or poisoning considered possibly self-inflicted (E980 through E988)
3. *ICD-9* diagnosis of suicidal ideation (V62.84) accompanied by a diagnosis of either poisoning (960 through 989) or open wound (870 through 897).

We previously reported^{5,10,11} that validation by clinician review of 200 full-text medical records found a positive predictive value of 100% for the first criterion, 80% for the second, and 86% for the third (compared to treating providers' documentation of self-inflicted injury with suicidal intent). Given the relative frequency of these 3 criteria in our sample, we estimate the weighted mean positive predictive value to be 94% for all 3 combined.

Table 1. Distribution of Responses to Patient Health Questionnaire Item 9 According to Patients' Sociodemographic Characteristics^a

Variable	Not at All	Several Days	More Than Half the Days	Nearly Every Day	Total, n
Sex					
Male	271,060 (79)	46,646 (14)	15,523 (5)	9,969 (3)	343,198
Female	752,843 (85)	85,127 (10)	27,971 (3)	19,169 (2)	885,110
Age, y					
18–29	211,608 (85)	23,823 (10)	7,706 (3)	4,746 (2)	247,883
30–44	295,915 (85)	33,683 (10)	11,032 (3)	7,098 (2)	347,728
45–64	342,368 (80)	55,156 (13)	18,812 (4)	12,693 (3)	429,029
≥ 65	174,012 (85)	19,111 (9)	5,944 (3)	4,601 (2)	203,668
Race/ethnicity					
White, not Hispanic	658,486 (82)	93,898 (12)	29,735 (4)	19,596 (2)	801,715
Asian	52,647 (87)	5,073 (8)	1,783 (3)	1,010 (2)	60,513
Black	67,764 (83)	7,773 (10)	3,333 (4)	2,289 (3)	81,159
Native Hawaiian or Pacific Islander	4,920 (83)	582 (10)	227 (4)	219 (4)	5,948
Native American	11,339 (79)	1,821 (13)	699 (5)	541 (4)	14,400
Hispanic	174,585 (89)	13,013 (7)	4,407 (2)	3,287 (2)	195,292
Other or unknown	54,162 (78)	9,613 (14)	3,310 (5)	2,196 (3)	69,281

^aAll values shown as n (%) unless otherwise noted; percentages are for the row for that variable.

The proportion of medically treated suicide attempts that might be missed by this method was estimated by examining the proportion of emergency department and hospital encounters for injury or poisoning in which a cause-of-injury code (or E-code) was not recorded.¹² In 2010, the proportion of injury or poisoning encounters with no E-code ranged from 11% to 26% in these 4 health systems.¹³

Descriptive analyses examined risk of suicide attempt (nonfatal or fatal) and suicide death following completion of a PHQ, stratified by response to item 9. Analyses of long-term risk accounted both for multiple PHQ observations per person and for censoring of availability of outcome data over time. Each new questionnaire defined a new period at risk, and a patient could contribute multiple overlapping risk periods by completing multiple PHQs. Each suicide attempt or death could be linked to multiple prior PHQ results from a single patient. This approach examines risk based on data available when the PHQ was completed, regardless of subsequent questionnaires. It avoids informative censoring that would occur if likelihood of completing a later PHQ was related to risk of a subsequent suicide attempt. For analyses of suicide attempts, each risk period was censored at the time of disenrollment from the health system, death from causes other than suicide, or last availability of suicide attempt data. For analyses of suicide deaths, each risk period was censored at the time of disenrollment from the health system, death from causes other than suicide, or last availability of suicide death data. Because predictors of repeat suicide attempts may differ from first attempts, PHQ-9 observations following a suicide attempt were excluded from analyses of suicide attempts.

Partly conditional Cox proportional hazards regression¹⁴ was used to estimate the association between response to PHQ item 9 and subsequent suicide attempt or death after accounting for potential confounders (age, sex, and health system). Estimated hazard associated with responding “nearly every day,” “more than half the days,” and “several days” was

compared to estimated hazard associated with responding “not at all” (the reference group). Because each individual patient could contribute multiple PHQ responses, the robust sandwich estimator¹⁵ was used to calculate confidence limits for hazard ratio estimates. To examine how the relationship between response to item 9 and hazard of subsequent suicidal behavior did or did not decrease over time, we compared alternative models including either a constant effect of item 9 response over time or 2 possible time-varying effects: a linear decrease or a log-linear decrease over time. Alternative models were evaluated using the Bayesian Information Criterion statistic [BIC]^{16,17}; a decrease of 10 points is considered a meaningful improvement in model fit.

RESULTS

After the previously described eligibility criteria and exclusions were applied, electronic medical records contained 1,228,308 PHQ results for 509,945 patients, including 302,659 patients (59%) with a single questionnaire, 95,880 (19%) with 2, 38,321 (8%) with 3, 20,204 (4%) with 4, and 52,881 (10%) with 5 or more. Encounters in which questionnaires were administered included 500,751 (41%) with specialty mental health providers, 442,509 (36%) with primary care providers, and 285,048 (23%) with various other medical or surgical specialists (including emergency department visits). At time of completing the PHQ, 709,580 (58%) had received some mental health diagnosis or treatment in the previous 90 days. Using the conventional classification of PHQ scores, depression was minimal (score 0 to 4) in 408,575 (33%), mild (score 5 to 9) in 295,907 (24%), moderate (score 10 to 14) in 221,845 (18%), moderately severe (score 15 to 19) in 153,946 (13%), and severe (20 or greater) in 103,098 (8%). As shown in Table 1, patients completing PHQs were predominantly female and were diverse with respect to age and race/ethnicity. Approximately 3.5% reported thoughts of death or self-harm “more than half the days” and approximately

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Table 2. Counts and Rates of Suicide Attempts and Suicide Deaths Within 7 and 30 Days of Completing the Patient Health Questionnaire (PHQ)

Item 9 Response	Nonfatal or Fatal Suicide Attempt			Suicide Death		
	No. of PHQ Responses	Within 7 Days, n (%) ^a	Within 30 Days, n (%) ^b	No. of PHQ Responses	Within 7 Days, n (%) ^c	Within 30 Days, n (%) ^d
Not at all	1,023,903	119 (0.012)	447 (0.044)	827,194	8 (<0.001)	28 (0.003)
Several days	131,773	77 (0.058)	290 (0.220)	106,434	3 (0.003)	24 (0.022)
More than half the days	43,494	60 (0.138)	188 (0.432)	35,793	4 (0.011)	13 (0.036)
Nearly every day	29,138	62 (0.213)	220 (0.755)	24,316	2 (0.008)	13 (0.053)
Total	1,228,308	318 (0.026)	1,145 (0.093)	993,737	17 (0.002)	78 (0.008)

^a χ^2_3 for comparison of proportions = 738, $P < .0001$.

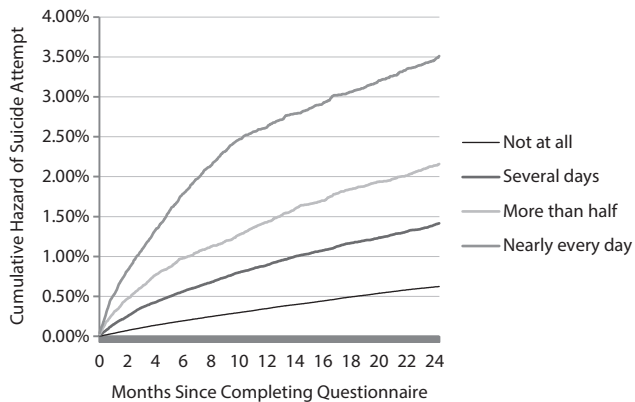
^b χ^2_3 for comparison of proportions = 2,405, $P < .0001$.

^c χ^2_3 for comparison of proportions = 28, $P < .0001$.

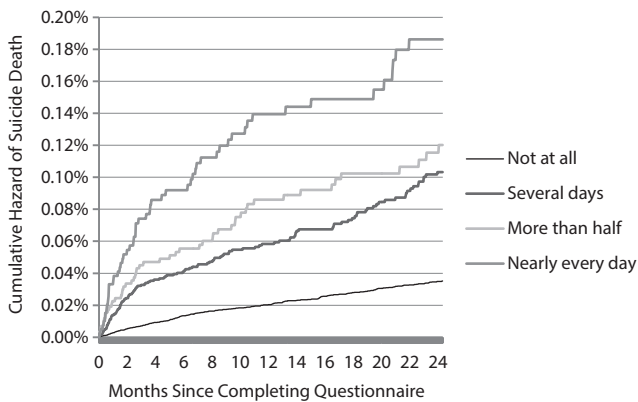
^d χ^2_3 for comparison of proportions = 152, $P < .0001$.

Figure 1. Cumulative Hazard of (A) Any Suicide Attempt and (B) Suicide Death During 2 Years According to Response to Patient Health Questionnaire Item 9 Regarding Thoughts of Death or Self-Harm

A. Suicide Attempts



B. Suicide Deaths



2.4% reported such thoughts “nearly every day,” but these proportions varied according to age and race/ethnicity.

In this sample, death certificate data identified 484 suicide deaths, including 457 attributed to definite self-inflicted injury and 27 attributed to possible self-inflicted injury.

Electronic medical records and insurance claims data identified 9,203 unique instances of nonfatal suicide attempt, limited to the first attempt per person. These included 6,345 diagnoses of definite self-inflicted injury, an additional 2,105

diagnoses of possible self-inflicted injury, and an additional 753 probable suicide attempts identified by the combination of a poisoning or wound diagnosis linked to a diagnosis of suicidal ideation.

Table 2 describes counts and rates of suicide attempts and deaths in 7 days and 30 days after completing the PHQ. While rates of suicide attempt and suicide death increased with escalating responses to PHQ item 9, over one-third of suicide attempts and suicide deaths occurred among those responding “not at all.” Even among those reporting thoughts of death or self-harm nearly every day, risk of any suicide attempt within 7 days was approximately 1 in 500 and risk of suicide death was approximately 1 in 10,000.

The estimated long-term hazard of any suicide attempt (nonfatal or fatal) stratified by response to PHQ item 9 is shown in Figure 1A. Over 2 years, cumulative hazard ranged from approximately 0.5% (1 in 200) for those responding “not at all” to approximately 3.5% (1 in 30) for those responding “nearly every day.”

In a partly conditional Cox proportional hazards model predicting risk of any suicide attempt, addition of item 9 response (3 indicator variables for levels of positive response) was a highly significant predictor of mean risk over 2 years ($P < .00001$ compared to model including only age, sex, and study site). Allowing the effect of item 9 responses to vary linearly over time significantly improved model fit (BIC decreased from 255,003 to 254,813). Model fit was further improved by allowing the effect of item 9 responses to vary over time in a log-linear fashion (BIC decreased to 254,786). Table 3 displays the estimated relative hazards of suicide attempt from the final model allowing a log-linear change over time. The excess hazard associated with reporting thoughts of death or self-harm did decrease over time, but relative hazards for all positive responses remained significantly elevated through 18 months.

The estimated long-term hazard of suicide death according to item 9 response is shown in Figure 1B. Over 2 years, cumulative hazard ranged from approximately 0.04% (1 in 2,500) for those responding “not at all” to approximately 0.2% (1 in 500) for those responding “nearly every day.” No clear separation was observed between those responding “several days” and “more than half the days.”

In a partly conditional Cox proportional hazards model predicting risk of suicide death by age, sex, and study site,

Table 3. Estimated Relative Hazards of Suicide Attempt or Suicide Death (with 95% confidence interval) According to Response to Patient Health Questionnaire Item 9 and Time Since Completion of Questionnaire^a

Item 9 Response	30 Days	90 Days	180 Days	360 Days	540 Days
Any suicide attempt					
Not at all	Reference	Reference	Reference	Reference	Reference
Several days	3.2 (2.9–3.6)	2.6 (2.4–2.9)	2.3 (2.1–2.5)	2.0 (1.9–2.3)	1.9 (1.7–2.1)
More than half the days	5.8 (5.0–6.6)	4.3 (3.8–4.8)	3.5 (3.1–4.0)	2.9 (2.5–3.4)	2.6 (2.2–3.1)
Nearly every day	10.3 (8.8–12.1)	7.3 (6.3–8.5)	5.9 (5.0–6.9)	4.7 (3.9–5.7)	4.2 (3.4–5.1)
Suicide death					
Not at all	Reference	Reference	Reference	Reference	Reference
Several days	3.6 (2.5–5.3)	3.1 (2.4–4.2)	2.8 (2.1–3.8)	2.6 (1.8–3.6)	2.5 (1.7–3.6)
More than half the days	5.3 (3.2–9.0)	3.9 (2.4–6.5)	3.2 (1.8–5.8)	2.7 (1.3–5.4)	2.4 (1.1–5.2)
Nearly every day	8.5 (5.3–13.7)	6.3 (4.1–9.7)	5.2 (3.2–8.4)	4.3 (2.5–7.6)	3.9 (2.1–7.2)

^aModel allows log-linear change in relative hazard over time and includes adjustment for age, sex, race/ethnicity, and health system.

Table 4. Relative Hazards of Suicide Attempt or Suicide Death 30 Days After Completion of Patient Health Questionnaire (PHQ) According to Response to Item 9

Variable	Relative Hazard of any Suicide Attempt		Relative Hazard of Suicide Death	
	Not Adjusted ^a	Adjusted ^b	Not Adjusted ^a	Adjusted ^b
Response to item 9				
Not at all	Reference	Reference	Reference	Reference
Several days	3.2	2.8	3.6	3.2
More than half the days	5.8	4.5	5.3	4.3
Nearly every day	10.3	7.9	8.5	6.7
Score for items 1–8				
0–9	...	Reference	...	Reference
10–14	...	1.3	...	1.3
≥ 15	...	1.6	...	1.5

^aValues not adjusted for response to PHQ items 1 through 8.

^bValues adjusted for response to PHQ items 1 through 8.

Symbol: ... = not applicable.

addition of 3 indicator variables for item 9 response was a significant predictor of mean hazard over 2 years ($P < .0001$). Table 3 displays the estimated relative hazard of suicide death for different responses to PHQ item 9, again allowing the effect of item 9 scores to vary over time in a log-linear fashion. Confidence intervals were wider than those for relative hazard of suicide attempt, reflecting the smaller number of events. Estimated relative hazard associated with a response of “more than half the days” appears to decline more with time than seen for suicide attempts. No statistically significant differences were observed between the “several days” and “more than half the days” groups at any time point. Otherwise, the overall pattern was generally similar to that seen for suicide attempts: relative hazard estimates declined over time but remained significantly elevated through 18 months (see Table 3).

The proportional hazards models described above were used to examine the unique contribution of item 9 to predicting suicidal behavior, over and above the effect of depression severity (as indicated by items 1 through 8). As shown in Table 4, adding categorical indicators for overall depression severity only slightly attenuated the excess hazard associated with response to item 9 for prediction of suicide attempts (column 2 vs column 3) or suicide deaths (column 4 vs column 5).

Analyses stratified by sex found that absolute hazard of suicide risk was higher in men, but relative hazard of suicide attempt and suicide death according to PHQ item 9 response was generally similar for men and women (see eAppendix 1 at PSYCHIATRIST.COM for details).

DISCUSSION

In this sample of over 1.2 million PHQ depression questionnaires completed by over 500,000 outpatients, we find that response to PHQ item 9 was a strong predictor of suicide attempt and suicide death over the following 2 years. These results extend our previous findings in 3 significant ways. First, the strong association between item 9 response and subsequent suicidal behavior is confirmed in a more diverse sample from 4 large health care systems (Figure 1). Second, we can more precisely describe the immediate risk of suicidal behavior, a significant concern for practicing clinicians (Table 2). Third, long-term follow-up data allow us to describe how risk evolves over time (Table 3).

These real-world data have several important strengths. The sample was not limited to research volunteers and included all PHQ responses in a large, diverse sample from community practice. Thoughts of death or self-harm were reported in real time rather than recalled months or years later. Suicide attempts and suicide deaths were recorded independently and prospectively. These results illustrate the potential for “big data” from electronic health records to accelerate research and inform quality improvement regarding suicide risk.

Diagnoses of self-inflicted injury, our primary criterion for identifying suicide attempts, may have included cases of self-inflicted injury without suicidal intent. Our chart review validation, however, found a positive predictive value of over 90% for provider-documented suicidal intent.

While frequent thoughts of death or self-harm were strongly associated with subsequent suicidal behavior, we should emphasize the trade-off between sensitivity (identifying all patients at risk) and positive predictive value (identifying those at highest risk). As shown in Table 2, any positive response to item 9 would have a sensitivity of 61% (698/1145) for detecting any suicide attempt and 64%

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(50/78) for detecting suicide death over 1 month. But the 2-year cumulative hazard of suicide attempt in those with any positive response is less than 2%. Using a higher threshold of “more than half the days” or “nearly every day” would increase cumulative hazard or positive predictive value to approximately 3% but reduce sensitivity to approximately 35%. This trade-off is not unique to identifying suicide risk; it was described over 30 years ago concerning cardiovascular disease prevention.¹⁸ Interventions limited to those at highest risk will not reach the medium-risk population for whom most morbidity and mortality occur. For perspective, a 3% hazard of suicide attempt in outpatients with frequent thoughts of death or self-harm is similar to the hazard of stroke in outpatients with atrial fibrillation and hypertension.¹⁹

The excess risk associated with reporting thoughts of death or self-harm did decrease with time. For example, the relative hazard of suicide attempt associated with reporting such thoughts “nearly every day” (compared to responding “not at all”) decreased from approximately 10 to approximately 4 over 18 months. Relative hazard of suicide death showed a similar pattern of decrease over time. Nevertheless, reporting frequent thoughts of death or self-harm was associated with statistically significant and clinically important increases in risk of suicide attempt and suicide death for at least 18 months.

The PHQ was designed to assess depression severity, not to assess suicide risk. Broader questions regarding hopelessness or suicidal thoughts, such as those in the Beck Depression Inventory²⁰ or the Quick Inventory of Depressive Symptomatology,²¹ might prove more sensitive. Questions focused on suicidal ideation, such as the Columbia Suicide Severity Rating Scale²² or the Scale for Suicidal Ideation,²³ might identify a smaller group at higher risk. At this time, we lack prospective data from community practice regarding those alternative assessments. We focus on the PHQ not because it is the optimal measure, but because it is widely used in community practice.

Most questionnaires in this sample were completed by patients receiving mental health treatment. Questions regarding thoughts of death or self-harm might have different meaning for patients with no mental health history. Our sample includes too few questionnaires from emergency

departments or other specialty clinics to examine whether results differ in those specific settings. In most cases, treating clinicians were aware of PHQ responses and might be expected to take appropriate clinical actions to reduce risk. The association we observe between item 9 response and subsequent risk occurred in spite of any such clinical intervention.

Our findings certainly do not suggest that clinicians can use the PHQ or any other assessment to accurately predict short-term risk of suicidal behavior. Instead, we find that short-term prediction is not feasible and that emphasis on short-term risk is misplaced. Frequent thoughts of death or self-harm indicate an enduring vulnerability rather than simply a short-term crisis.

Any efforts to identify and reduce risk of suicidal behavior must be guided by evidence regarding risk levels in different populations. In the general population, for whom 1-year risk of suicide attempt is less than 1 per 1,000, community-level programs can increase public awareness or reduce availability of lethal means.²⁴ At the other extreme, intensive programs^{25,26} focus on the small group of patients with recent or repeated suicide attempts, for whom 1-year risk approaches 1 in 2. Our findings suggest that responses to the commonly used PHQ depression scale identify a large intermediate group for whom 2-year risk of suicide attempt exceeds 1 in 30. Additional research is needed to identify effective interventions appropriate for this at-risk group.

The Preventive Services Task Force recommendation against screening for suicide risk cited the absence of data regarding either the accuracy of screening tests or the effectiveness of preventive interventions. Our findings address only the first of those gaps. While our data cannot assess the effectiveness of interventions, they do provide guidance regarding timing of prevention programs. Among outpatients reporting thoughts of self-harm “nearly every day,” cumulative hazard of suicide attempt was approximately 1 in 500 after 1 week, increasing to 1 in 30 over 2 years. Hospitalization or crisis-focused interventions may sometimes be necessary, but they cannot address risk that endures for months or years. Sustained interventions, most likely focused on skill development and maintaining treatment engagement, will be necessary to address sustained risk.

Submitted: January 5, 2015; accepted May 28, 2015.

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents that is outside US Food and Drug Administration–approved labeling has been presented in this article.

Financial disclosure: Drs Simon, Coleman, Rossum, Beck, Whiteside, Penfold, Shortreed, and Rutter, Ms Oliver, Mr Johnson, and Ms Operskalski have no personal affiliations or financial relationships with any commercial interest to disclose relative to the article.

Funding/support: Supported by Cooperative Agreement U19MH092201 with the National Institute of Mental Health.

Role of the sponsor: The funder (National Institute of Mental Health) was not involved in the design of the research, data analysis, interpretation, or preparation of this article.

Acknowledgments: Dr Simon had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Original data in the HMO Research Network (HMORN) Virtual Data Warehouse are owned by and remain under the control of the 4 participating health care systems. Investigators are allowed to access these data to address specific research questions, subject to specific approval by each health system’s Institutional Review Board and Privacy Board.

Supplementary material: Available at PSYCHIATRIST.COM.

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POSTTEST

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1. In this study, among outpatients who reported thoughts of death or self-harm “nearly every day” on the 9-item Patient Health Questionnaire (PHQ-9), the 2-year risk of suicide attempt (fatal or nonfatal) was approximately:
 - a. 1 in 3000
 - b. 1 in 300
 - c. 1 in 30
 - d. 1 in 3
2. Mr A returns for a follow-up visit regarding his depression treatment. At his first visit approximately 6 months ago, he completed a PHQ-9 questionnaire and responded “nearly every day” to item 9. At today’s visit, you should:
 - a. Not be concerned about suicidal ideation reported several months ago
 - b. Assume his risk for suicide decreased with treatment response
 - c. Again ask specific questions about suicidal ideation and/or behavior
 - d. Let him bring up suicidal thoughts if he chooses to



THE JOURNAL OF CLINICAL PSYCHIATRY

THE OFFICIAL JOURNAL OF THE AMERICAN SOCIETY OF CLINICAL PSYCHOPHARMACOLOGY

Supplementary Material

Article Title: Risk of Suicide Attempt and Suicide Death Following Completion of the Patient Health Questionnaire Depression Module in Community Practice

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DOI Number: dx.doi.org/10.4088/JCP.15m09776

List of Supplementary Material for the article

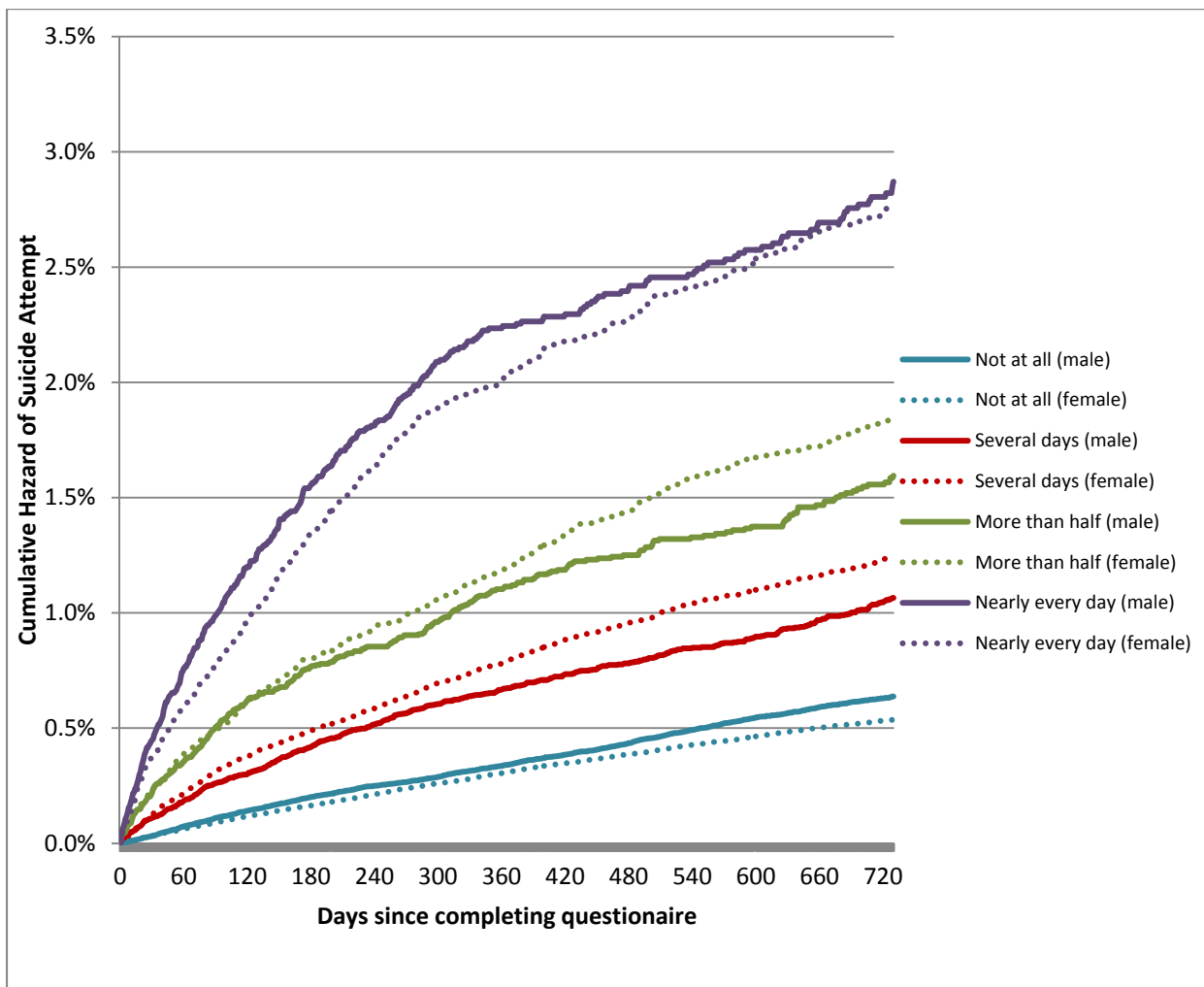
1. [eAppendix 1](#)

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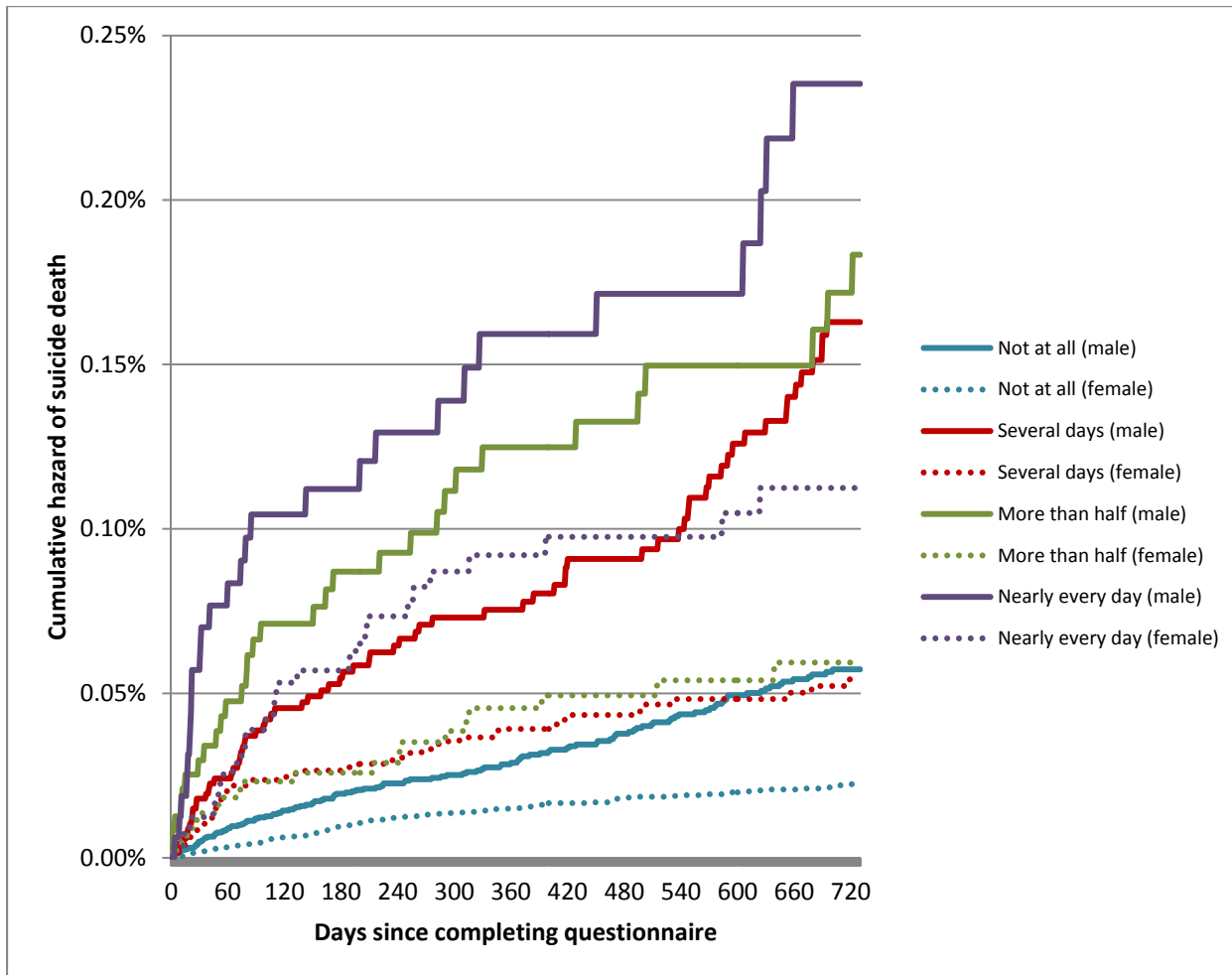
eAppendix 1

The figure below shows cumulative hazard of any suicide attempt over two years according to response to PHQ item 9 regarding thoughts of death or self-harm. Different colors represent different responses to PHQ item 9. Solid lines show cumulative hazard for males and dashed lines show cumulative hazard for females.



Males and females show a generally similar pattern of increasing hazard with response to item 9 (i.e. generally similar RELATIVE hazard). For any level of item 9 response, the cumulative hazard is generally similar for males and females (i.e. generally similar ABSOLUTE hazard). In other words, we findings do not indicate a clinically or practically important main effect of sex OR interaction between sex and item 9 score in predicting subsequent risk of any suicide attempt. Nevertheless, a formal test for interaction effect (test for heterogeneity of odds ratios for 3 indicator variables between two sex categories) is highly significant ($p=.001$). This “significant” interaction effect in the absence of a meaningful difference appears to reflect an “over-powered” interaction test (high level of precision due to large sample size and large number of suicide attempt events). Despite the significant test for interaction, we would conclude that the implications of response to PHQ item 9 for subsequent risk of any suicide attempt are generally similar for males and females

The figure below shows cumulative hazard of suicide death over two years according to response to PHQ item 9 regarding thoughts of death or self-harm. Different colors represent different responses to PHQ item 9. Solid lines show cumulative hazard for males and dashed lines show cumulative hazard for females.



Males and females show a generally similar pattern of increasing hazard with response to item 9 (i.e. generally similar RELATIVE hazard). But for any level of item 9 response, the cumulative hazard of suicide death is approximately twice as great in males (i.e. greater ABSOLUTE hazard). A formal test for interaction effect is not significant ($p=.78$), but we must acknowledge that (given the much smaller number of suicide deaths) this analysis is under-powered. The practical or clinical implications of these findings depend on whether we choose to focus on absolute or relative hazard. Regarding absolute hazard – Reporting frequent thoughts of death or self-harm implies approximately twice as much subsequent risk in males as in females. Regarding relative hazard – the proportional increase in risk associated with different levels of response to PHQ item 9 is generally similar for males and females (e.g. 8-fold increase in relative hazard after one month for response of “nearly every day” compared to “not at all”.)