Use of a PHQ-9 Heat Map to Facilitate Management Decisions in Patients with Depression

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ABSTRACT

Background: Depression is a common concern for patients seeking medical care. The Patient Health Questionnaire-9 (PHQ-9) is a tool used to diagnose and manage depression. Tracking individual symptom scores rather than the sum of multiple symptom scores has been found to be more predictive of depression treatment response.

Methods: The records of 30 patients who had a follow-up visit in primary care were reviewed. We discuss 3 patient scenarios and present their PHQ-9 data as individual symptom scores, in the form of a color-coded heat map.

Results: In the cases presented, medication side effects, anxiety, a thyroid disorder, and fibromyalgia were identified as possible influencers of the PHQ-9 survey scores.

Discussion: A heat map helped clinicians understand the patient's clinical status in an efficient manner. We encourage the development of a PHQ-9 heat map in electronic medical record systems.

INTRODUCTION

Depression is a common concern among primary care patients. The Patient Health Questionnaire-9 (PHQ-9)[1-4] is a clinical tool frequently used to diagnose and manage depression. However, the authors have experienced some dissatisfaction with the use of the PHQ-9 total score as the primary means to follow patients with depression. We developed this project to evaluate other methods to review data from serial PHQ-9 surveys.

The PHQ-9 questionnaire consists of 9 depression-related questions that patients score from 0 (no symptoms) to 3 (daily symptoms). Individual responses to those 9 questions are tabulated to give a total score, ranging from 0 to 27. Use of the PHQ-9 tool has been validated to diagnose depression; however, use of the PHQ-9 survey total score to track depression over time has not been studied extensively.

Previous studies have identified limitations of the tool.[5-9] For example, one limitation is that the total score includes both somatic symptoms, such as sleep and appetite changes, and nonsomatic symptoms, such as depressed mood.[5-9] Questions 1, 2, 6, and 9 (dealing with loss of appetite, depressed mood, thought of being a failure, and suicide) generally are considered cognitive/affective in nature. Questions 3, 4, 5, and 7 (dealing with sleep, energy, appetite, concentration, and moving slowly) are generally considered somatic-related. Nonsomatic symptoms are more closely aligned with depression status, whereas somatic symptoms are more easily influenced by medication side effects or unrelated medical conditions.[5] Some sources recommend tracking these 2 subsets separately.[6-9] Previously, tracking of individual symptom scores rather than a sum of scores has been found to be more predictive of depression treatment response.[10]

This report presents 3 patient's scenarios that depict the benefit of reviewing PHQ-9 answers independently. We also demonstrate the use of a heat map to depict PHQ-9 data over time. A heat map assigns colors to different responses to highlight answers of a higher intensity and draw clinicians' attention to those answers.

METHODS

This project occurred in 2 phases. During phase 1, we used data

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from responses to PHQ-9 surveys to evaluate the course of a patient's depression at the time of a follow-up visit. We utilized the functionality of our current electronic medical record (EMR) to review PHQ-9 data for 30 patients who had a follow-up visit for depression. During the patient's visit, the clinician reviewed changes in the total PHQ-9 score and patient interview to arrive at a clinical impression and treatment recommendations. Then, while still in the room with the patient, responses to individual PHQ-9 questions were reviewed utilizing EMR functionality. The clinician then determined if the additional review resulted in further conversation with the patient that led to additional or different treatment recommendations.

During phase 2 of the project, our group evaluated several methods of depicting data from the PHQ-9 responses of the 3 patients who were identified during phase 1. Although responses to individual questions over time can be visualized with our current EMR functionality, users are limited to reviewing a maximum of 4 responses at any given time. These responses are presented in multicolored graphs and can be difficult to interpret. Among several options depicting this data, our group preferred a heat map, which was created by assigning a color to each of the possible answers to the PHQ-9 questions. A score of 3 (most or all of days) was designated by the color red. Orange was designated for answer 2 (half of the days), yellow for 1 (1-2 days) and green for zero (no days).

Figure 1. Heat Map for Patient 1 PHQ-9 Survey

PHQ-9 Question	10/23/20	3/13/21	8/19/21	10/14/21	12/27/21	2/10/22
1. Little interest or pleasure in doing things	3	1	1	1	3	1
2. Feeling down, depressed or hopeless	2	1	2	1	3	1
3. Trouble falling asleep, staying asleep or sleeping too much	1	0	3	3	3	3
4. Feeling tired or having little energy	3	2	1	1	3	2
5. Poor appetite or overeating	1	2	3	3	2	1
6. Feeling bad about yourself or that you are a failure	2	1	1	1	3	0
7. Trouble concentrating on things	2	2	2	1	2	1
8. Moving or speaking slowly or being fidgety or restless	1	2	2	3	2	0
9. Thoughts that you would be better off dead or of hurting yourself	1	0	0	0	2	0
Total PHQ-9 Score	16	11	15	14	23	9
Fluoxetine 30 mg daily						
Venlafaxine XR 37.5 mg daily						

Blue indicates start and stop dates of medication.

Figure 2. Heat Map for Patient 2 PHQ-9 Survey

PHQ-9 Question	6/10/20	9/11/20	11/19/20
1. Little interest or pleasure in doing things	2	1	2
2. Feeling down, depressed or hopeless	0	1	1
3. Trouble falling asleep, staying asleep or sleeping too much	1	2	3
4. Feeling tired or having little energy	1	1	1
5. Poor appetite or overeating	0	0	0
6. Feeling bad about yourself or that you are a failure	0	2	0
7. Trouble concentrating on things	0	2	2
8. Moving or speaking slowly or being fidgety or restless	0	0	0
9. Thoughts that you would be better off dead or of hurting yourself	0	0	0
Total PHQ-9 Score	4	9	7
Sertraline 100 mg daily			
Trazodone 100 mg daily			
Duloxetine 60 mg daily			

Blue indicates start and stop dates of medication.

RESULTS

In each of the 3 cases studied, a heat map depicts data at the decision point described in the clinical scenario. We provide further patient follow-up information, including PHQ 9 scores, but do not depict this follow-up data in the heat maps.

The first patient had been taking fluoxetine 30 mg daily for depression for over a year. They stopped the medication due to emotional blunting in November 2021. When they presented to their physician in December 2021, the emotional blunting had improved, but the depression was much worse. This was demonstrated by worsening of the PHQ-9 score from 14 to 23. Venlafaxine XR 37.5 mg was initiated. In subsequent follow-up on February 10, 2022, their total PHQ-9 score decreased from 23 to 9. However, the patient was interested in further improvement in the depression symptoms and a dose increase was considered. Individual scores were reviewed and it was noted that responses to all 9 questions either improved or remained low except the sleep score (question 3). "Trouble falling asleep, staying asleep, or sleeping too much" was still occurring "nearly every day." The response to medication changes is depicted in a heat map (Figure 1).

At the time of the visit, trouble with sleep was the only question that still had a score of 3 (the color red). The patient indicated that this was related to insomnia. Since insomnia is a possible side effect of venlafaxine XR, a recommendation was made

to continue the low dose (37.5 mg) of venlafaxine XR and focus on sleep hygiene. Several nonpharmacologic recommendations to improve sleep hygiene were made. Three months later, the sleep question score decreased from 3 to 0, resulting in a decrease in total PHQ-9 score from 9 to 6, and the patient indicated that depression symptoms were under adequate control at this point.

The second patient had a history of depression, anxiety, and fibromyalgia. Sertraline 100 mg daily and trazodone 100 mg at bedtime had been prescribed by her primary care clinician. Unbeknownst to this clinician, a specialist at an outside facility prescribed duloxetine 60 mg twice daily for fibromyalgia. The primary clinician saw the patient in June, September, and November, and her PHQ-9 total score went up slightly from 4 to 9 and then to 7. On November 19, 2020, the primary care clinician became aware that the patient was taking duloxetine in addition to the trazodone and sertraline and they reviewed with her the PHQ-9 total and individual question scores. These data are depicted in Figure 2.

Figure 3. Heat Map for Patient 3 PHQ-9 Survey

PHQ-9 Question	2/5/21	2/6/21	3/22/21	4/22/21
1. Little interest or pleasure in doing things	1	1	2	2
2. Feeling down, depressed or hopeless	3	2	2	3
3. Trouble falling asleep, staying asleep or sleeping too much	1	2	3	1
4. Feeling tired or having little energy	2	2	2	1
5. Poor appetite or overeating	3	3	3	3
6. Feeling bad about yourself or that you are a failure	3	2	2	2
7. Trouble concentrating on things	2	2	1	3
8. Moving or speaking slowly or being fidgety or restless	2	1	1	1
9. Thoughts that you would be better off dead or of hurting yourself	1	1	1	1
Total PHQ-9 Score	18	15	17	17
Venlafaxine XR 37.5 mg daily				
Venlafaxine XR 75 mg daily				
Levothyroxine 25 mcg				

Blue indicates start and stop dates of medication.

Although total PHQ-9 sores remained low, review of individual answers indicated that sleep—specifically insomnia—had become more of an issue for her. Review of individual data guided the clinician toward a recommendation to taper and discontinue the sertraline and continue the duloxetine and trazodone. When seen for follow-up 3 months later, sleep had improved. The score for the sleep-related question (no. 3) improved from 3 to 1, and the total PHQ-9 score improved from 7 to 5. Although this was a small change in numeric score, the patient reported that her quality of life was much better, and she was satisfied with her depression management.

The third patient had depression and Hashimoto's thyroiditis. Over time, this individual progressed from a hyperthyroid to a hypothyroid state. Their depression was treated initially with venlafaxine XR 37.5 mg daily and subsequently increased to 75 mg daily without significant change in PHQ-9 total sore. When seen on April 22, 2021, the individual PHQ-9 scores were assessed with responses demonstrated in the heat map (Figure 3). In this instance, the sleep issue was not insomnia but excessive sleeping and fatigue. Thyroid studies at that time revealed progression to the hypothyroid state. Levothyroxine was started; venlafaxine XR and counseling were continued. The patient's PHQ-9 total score improved from 17 to 9.

DISCUSSION

Depression frequently coexists and shares symptoms with other psychiatric and physical conditions. In these examples, medication side effects, thyroid disease, and fibromyalgia were identified as possible influences to the PHQ-9 survey. Although the review of individual scores was helpful in only 3 of the 30 patients we reviewed, in those 3 situations, the review led the clinician to consider alternative interventions not contemplated when looking only at the total PHQ-9 scores. We encourage further study of the effect that patients' coexisting medical conditions and medications may have on individual PHQ-9 survey responses and believe that presentation of the individual responses over time can be clinically helpful in some scenarios.

When following patients with depression, clinicians have multiple decisions to consider, including dose increase or decrease, change of medication, addition of adjuvant medication, referral for cognitive behavior therapy or other counseling, sleep hygiene recommendations, and consideration of other medical issues. We found that a heat map matched to individual PHQ-9 responses helped clinicians appreciate details about the patient's current clinical status in an efficient manner. We encourage development of the PHQ-9 heat map within EMR systems so this tool would be available to clinicians as they see patients in follow-up for depression.

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