



The Cognitive Autopsy: A Root Cause Analysis of Medical Decision Making

Pat Croskerry

Publisher: Oxford University Press Print Publication Date: Apr 2020

Print ISBN-13: 9780190088743 Published online: May 2020

DOI: 10.1093/med/

9780190088743.001.0001

Teenage Tachypnea

Chapter: Teenage Tachypnea

Author(s): Pat Croskerry

DOI: 10.1093/med/9780190088743.003.0006

An 18-year-old female was sent to the emergency department (ED) of a tertiary care hospital from a nearby psychiatric hospital for assessment. She had been recently admitted there for treatment of an anxiety disorder and depression. According to the psychiatrist's note, she had frequent episodes of uncontrollable hyperventilation, associated with carpopedal spasm and loss of consciousness. Her main complaint was intermittent shortness of breath, and the psychiatric staff wanted to rule out a non-psychiatric diagnosis, specifically a chest infection. The ED was moderately busy at the time she was seen.

Initially, she appeared anxious and complained of feeling uncomfortable being in the ED. She was reassured by the triage nurse and encouraged to slow her breathing down. Her vital signs at triage were: 37, 108, 22, 117/65, 94. She initially received a triage-level assignment of 4 and was transferred to a cubicle. She was seen and assessed by a junior resident.

Teenage Tachypnea

She had a history of overdose and was currently being treated for anxiety and depression. She had been treated by her family doctor with buspirone and a benzodiazepine. In the psychiatric short-stay unit, she was being weaned off the benzodiazepine and had been started on the selective serotonin reuptake inhibitor citalopram. She had been diagnosed with asthma in the past but was not currently being treated for it.

On exam, she was mildly obese. She stated that she had been experiencing shortness of breath on and off for approximately 2 weeks. Cardiovascular, respiratory, and the head, eyes, ears, nose, and throat examinations were normal. Routine blood work was normal, an electrocardiogram was normal other than a mild tachycardia of 106, and chest X-ray was normal.

The resident could see no evidence of pneumonia on her chest X-ray and believed there was no other significant chest infection. In the absence of any findings in the patient's blood work and chest X-ray, the resident believed the patient's complaints were explainable on the basis of her psychiatric condition, and possibly exacerbated by the recent change in her medications. He believed she could be safely discharged back to the short-stay psychiatric unit.

The patient was subsequently assessed by the attending physician, who confirmed the resident's history and findings. However, he also elicited a history of heavy cigarette smoking and that the patient was on a birth control pill. He ordered a D-dimer test but was told this would take several hours due to a backup at the lab. Approximately an hour later, almost 8 hours after the patient had first arrived in the ED, she became very agitated and tachypneic. Several nurses were trying to calm her down, and she had been given a paper bag to breathe into. Soon afterwards, she lost consciousness. She was found to have pulseless electrical activity and then went into asystole. She could not be resuscitated. At autopsy, she was found to have pelvic vein thrombosis extending from the femoral vein, and massive saddle emboli in her lungs as well as multiple clots of varying ages.

Commentary



There is a failure at the outset to recognize the likelihood that this patient was at risk for pulmonary embolism. She had at least three risk factors: She was obese, on the birth control pill, and a heavy cigarette smoker. Clinical risk factors are summarized by the mnemonic THROMBOSIS¹ shown in Box 5.1.

Teenage Tachypnea

Box 5.1 Clinical Risk Factors for Deep Vein Thrombosis

- T** Trauma, travel
- H** Hypercoagulable, hormone replacement
- R** Recreational drugs (intravenous drugs)
- O** Old age (>60 years)
- M** Malignancy, medical illness
- B** Birth control pill, blood group A
- O** Obesity, obstetrics
- S** Surgery, smoking
- I** Immobilization (general and/or local)
- S** Sickness

The first bias in this case is the *premature* diagnosis in the psychiatric referral of “chest infection.” Although patients on an inpatient psychiatric unit are considered to be “medically cleared,” by sending the patient to the ED the psychiatric staff are correctly questioning whether there might now be a new medical diagnosis but, unfortunately, label it as a “chest infection.” Diagnostic labels tend to get attached to patients and *diagnosis momentum* may be established at an early stage. The problem is perpetuated here by the triage nurse urging the patient to slow her breathing down, assuming that the patient’s hyperventilation was due to anxiety and not to an underlying physiological cause—this represents a *triage cueing error*, and it led to assigning her a low-priority triage score on the basis of a presumed non-emergent psychiatric condition and sending her to a regular bed in the ED. This is an example of the maxim “Geography is destiny.”² The ED is a physically structured environment in which different locations (geography) are associated with different outcomes (destinies). As discussed in Case 1, placing a patient in a particular location (cardiac room) establishes an *ascertainment bias*, which sets people up to see what they expect to see (i.e., a cardiac problem). In the present case, a regular bed suggests a routine problem and not a life-threatening one. When any patient is sent to an ED for evaluation, it is preferable that no specific diagnosis be made. In this case, there are multiple, wide-ranging diagnoses on the differential for dyspnea. The least biased way of making a referral, and avoiding ascertainment bias, is to ask for an evaluation of the patient’s signs and symptoms and leave the rest to the emergency physician.

Overall, the main biases in this case appear to arise from the patient being referred from a psychiatric service. Generally, psychiatric patients are vulnerable to several categories of error. Once a patient is labeled as “psychiatric,” they tend to be seen differently, in part because they do have some characteristics that distinguish them from non-psychiatric patients, especially in the acute care setting (Table 5.1).³ Often, they

Teenage Tachypnea

become vulnerable to a variety of biases collectively referred to as *psych-out errors*, further characterized in Box 5.2.⁴

Table 5.1 Features and manifestations of diagnosis in psychiatric and non-psychiatric patients in the emergency setting

Feature	Non-Psychiatric Patient	Psychiatric Patient
Physical manifestation	May be present	Likely absent
Behavior	Usually cooperative, compliant	Passive, sometimes noncompliant
Attitude of patient	Generally appreciative	Neutral, sometimes unappreciative
Diagnosis	Mostly objective	Mostly subjective
Workup	Relatively fast	Usually slow
Lab/imaging studies	Contributory	Mostly noncontributory
Management	Relatively clear	More challenging
End point	Often definitive	Poor, revolving
Compliance	Usually good	Uneven
Attitude of staff	Good, supportive	Occasionally unsupportive
Presence of bias	Occasional	More common

Source: Adapted from Croskerry and Wears.³

Box 5.2 Psych-Out Errors

1. Diagnostic reliability:⁵ Compared with other diseases, psychiatric diagnoses generally are not associated with clear, tangible, measurable characteristics. Currently, there are no biological measures, blood tests, or imaging modalities that can detect and define a particular psychiatric diagnosis, as can be

Teenage Tachypnea

done with most medical diagnoses. The diagnosis is established largely on the basis of symptoms reported by the patient or collateral reports of their behavior, and establishing a match with a consensus that has been reached by experts. Thus, there is less reliability, less validity, and more uncertainty, ambiguity, and, inevitably, error surrounding psychiatric diagnoses.

2. Medical conditions masquerading as a psychiatric disorder: A significant number of medical conditions are associated with common psychiatric symptoms; for example, anxiety may be associated with hypoglycemia, pulmonary embolism, pheochromocytoma, hyperthyroidism, hypothyroidism, intracranial tumor, hyperadrenalism, and others. Symptoms of depression may be due to an underlying alcoholism, hyperthyroidism, hyperadrenalism, adrenal cortical insufficiency, pernicious anemia, hypoglycemia, intracranial tumors, pancreatic carcinoma, multiple sclerosis, systemic lupus erythematosus, acquired immune deficiency syndrome, and other factors. A variety of other medical mimics of psychiatric disease have been described.^{6,7,8,9}

3. Overlooking psychiatric illness in medical patients: This may arise from attributing symptoms in the second group (see No. 2) to an established medical condition rather than a psychiatric condition, comorbid or otherwise. Other examples include focusing on the medical diagnoses of patients with somatic symptom disorders and conversion disorders, and not giving the possibility of an underlying psychiatric condition sufficient consideration. It is often far easier to address the proximal medical symptoms of the patient than focus on the more distal psychiatric issue. Nevertheless, clinicians must make every effort to exclude a medical cause before psychiatric diagnoses such as these are considered.

4. Underestimating medical comorbidity in psychiatric patients: Although psychiatric patients generally have more medical problems than non-psychiatric patients,¹⁰ their medical comorbidities are consistently underestimated. Accounts of significant medical problems being overlooked in psychiatric patients are abundant. Generally, it is more likely that a significant comorbid illness will be missed in the psychiatric patient. In the present case, this may have led to the failure to take a history of cigarette smoking and not noting that the patient was on birth control medication. These are *errors of omission*.

5. Vulnerability to attribution errors: People have a general tendency to explain the behavior of others by attributing it to either situational factors or personal qualities or traits. *Fundamental attribution error* (FAE) occurs when we explain other people's behavior by overestimating their personality characteristics and underestimating the influence of the situation they might be in. Although FAE may occur for a wide

Teenage Tachypnea

spectrum of behaviors, for psychiatric patients it is especially the case in the management of personality disorders, most notably cluster B (borderline, narcissistic, histrionic, and antisocial). It is often difficult for health care personnel not to take personal offense at some of the behaviors of these patients and to remind themselves that the behavior is a manifestation of the disease. It is easier to make the FAE when we believe the person is in control of their own behavior.

6. Stigma of psychiatric illness: In most cultures, there is a widely acknowledged stigma of mental illness among the general public. It remains one of the most deep-rooted areas of bias in the way that disease is perceived. People are generally uncomfortable with mental illness and tend to avoid those who suffer from it. Historically, and perhaps for hundreds of thousands of years throughout our evolution, it has been the mysterious nature of mental illness that has made these diseases frightening. They are different from other health problems—we easily understand and readily sympathize when someone has limitations to their physical health but are less willing to help when someone is incapacitated mentally. Even within medicine there is a bias against psychiatry—it is viewed as unscientific and, as a specialty, attracts the least interest among medical students.

It seems likely that the resident reading the psychiatric referral would have noted the past history of hyperventilation syndrome, associated with carpopedal spasm and loss of consciousness. It is far easier to attribute the patient's presenting complaints to a recurrence of this condition rather than search for new explanations, and it is easy to dismiss tachycardia and tachypnea in a psychiatric patient, attributing these symptoms to anxiety. This is referred to as *posterior probability error*—if it has happened repeatedly in the past, there is a greater likelihood that it is the same problem now. However, anxiety state is, at the outset, a diagnosis of exclusion. Had the resident ordered an arterial blood gases, he would have easily detected the typical respiratory alkalosis that occurs with hyperventilation syndrome, as well as the probable hypoxemia associated with acute, severe pulmonary embolism (PE). Furthermore, the resident did not see any evidence of pathology on the chest X-ray and may have equated this with normal lungs. Although he was looking for manifestations of a chest infection, it would have been helpful if the patient's PE had been apparent. However, at least approximately 25% of cases of proven PE will have a normal chest X-ray (CXR). There is inadequate sensitivity or specificity to rule PE in or out on a CXR alone, even if the PE is massive.¹¹ PE is one of those conditions in which the absence of findings on CXR should raise an index of suspicion—it is like the dog that isn't barking (see Case 7). In the present case, there was also a failure to appreciate that if the tachypnea was due to anxiety, then the

Teenage Tachypnea

patient's oxygen saturation, measured by pulse oximetry, should not have been less than 95%.

Finally, the delay in assessment due to the low triage assignment, the additional delay due to a resident assessment, and the further delay due to waiting for the result of a laboratory test all contributed to a *time delay error*. Had she been seen, assessed, and correctly diagnosed promptly by the attending physician, she would have been monitored more closely and may have received treatment that might have changed the outcome.

Pulmonary embolism is a diagnosis that causes considerable difficulty. The symptoms and signs are nonspecific and vary significantly. They may mimic many other diseases, and PE may even present with almost no symptoms. One-third of patients may have no chest pain, and up to approximately half do not have tachycardia. In one study, the diagnosis was missed 50% of the time on initial presentation.¹² It should always be considered in the context of dyspnea. Physical examination may be entirely normal, especially if there is no infarction. In particular, the lungs may sound completely clear. Patients with PE may have intermittent shortness of breath because of changes in the location of embolic material in the lungs and ongoing and evolving physiological adaptations. Importantly, symptoms may not match the degree of ventilation-perfusion mismatch. Those with a small mismatch may experience marked dyspnea, whereas those with a significant one may have only mild dyspnea. As noted previously, the CXR may be normal in many proven PE cases, and routine blood work and an electrocardiogram will often be normal. A summary of the probable biases and other error-producing conditions in this case is given in Box 5.3.

Box 5.3 Probable Biases and Other Error-Producing Conditions

- Ascertainment bias
- Premature closure
- Diagnosis momentum
- Triage cueing error
- Psych-out error
- Error of omission
- Posterior probability error
- Knowledge deficit
- Time delay error

References

1. Chopra A. Thrombophlebitis and occlusive arterial disease. In: Tintinalli J, Kelen G, Stapczynski J (Eds.), *Emergency Medicine: A Comprehensive Study Guide* (6th ed.). New York, NY: McGraw-Hill, 2004; 409-418.
2. Perry SJ. Profiles in patient safety: Organizational barriers to patient safety. *Acad Emerg Med*. 2002; 9(8): 848-850.
3. Croskerry P, Wears RL. Safety errors in emergency medicine. In: Markovchick VJ, Pons PT (Eds.), *Emergency Medicine Secrets* (3rd ed., Chapter 7, pp. 29-37). Philadelphia, PA: Hanley & Belfus, 2003.
4. Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med*. 2003; 78(8): 775-780.
5. Aboraya A, Rankin E, France C, El-Missiry A, John C. The reliability of psychiatric diagnosis revisited: The clinician's guide to improve the reliability of psychiatric diagnosis. *Psychiatry (Edgmont)*. 2006; 3(1): 41-50.
6. Knight SR, Mallory MNS, Huecker MR. Medical mimics of psychiatric conditions, Part 1. *Emerg Med*. 2016; 48(5): 202-211.
7. Knight SR, Huecker MR, Mallory MNS. Medical mimics of psychiatric conditions, Part 2. *Emerg Med*. 2016; 48(6): 258-265.
8. Dorsey ST. Medical conditions that mimic psychiatric disease: A systematic approach for evaluation of patients who present with psychiatric symptomatology. *Emerg Med Rep*. September, 2002. AHC Media/Relias/Bertelsmann Education Group. <https://www.reliasmedia.com/articles/109640-medical-conditions-that-mimic-psychiatric-disease-a-systematic-approach-for-evaluation-of-patients-who-present-with-psychiatric-symptomatology>. Accessed December 20, 2018.
9. McKee J, Brahm N. Medical mimics: Differential diagnostic considerations for psychiatric symptoms. *Ment Health Clin*. 2016 Nov; 6(6): 289-296.
10. De Hert M, Correll CU, Bobes J, et al. Physical illness in patients with severe mental disorders: I. Prevalence, impact of medications and disparities in health care. *World Psychiatry*. 2011; 10(1): 52-77.
11. Stein PD, Willis PW, de Mets DL. Chest roentgenogram in patients with acute pulmonary embolism and no pre-existing cardiac or pulmonary disease. *Am J Noninvasive Cardiol*. 1987; 1(3): 171-176.
12. Pineda LA, Hathwar VS, Grand BJ. Clinical suspicion of fatal pulmonary embolism. *Chest*. 2001; 120(3): 791-795.