

# Clinical Hypothesis Testing in Family Practice: A Biopsychosocial Perspective

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Recent studies of the clinical problem-solving process have demonstrated the importance of hypothesis generation and testing in shaping the nature of information gathering, differential diagnosis, and therapeutic decision making. Family physicians and other primary care physicians are often faced with complex and undifferentiated illness problems that require them to go beyond the traditional biomedical model and entertain an expanded range of psychosocial hypotheses. In this paper the authors draw upon clinically relevant behavioral and social science research and propose several biopsychosocial hypotheses that have proven useful in the management of family practice patients. Seven illustrative case studies are presented, and some implications of this biopsychosocial paradigm for practice, research, and teaching are discussed.

Clinical reasoning and decision making have been the focus of a growing number of investigations.<sup>1-15</sup> In particular, it has been demonstrated that during clinical encounters, physicians generate a limited number of provisional diagnostic formulations, or hypotheses, designed to make sense of or "explain" a patient's problem(s) and guide the physician in the collection of relevant data (eg, history taking, physical examination, laboratory studies). These data are then employed in a process known as differential diagnosis to test the original hypotheses.

The majority of books and articles about differential diagnosis have been written from a traditional biomedical perspective.<sup>16-19</sup> Clinical problem solving employing solely biomedical hypotheses, however, has generally proven inadequate in the comprehensive evaluation and management of patients who present with illnesses that are complex mixtures of physical, emotional, and social

elements.<sup>20-22</sup> Recently it has been suggested that a more inclusive paradigm based on general systems theory—the biopsychosocial model<sup>23,24</sup>—should be developed and that it should have particular relevance for primary care physicians.<sup>25</sup>

To expand upon the traditional biomedical model of problem solving, this paper proposes a series of clinically relevant biopsychosocial hypotheses derived from emerging behavioral and social science research knowledge.<sup>26-33</sup> The classification system proposed is an elaboration of the "multidimensional hypothesis testing framework" developed by Lazare et al<sup>34</sup> for use in outpatient psychiatric clinics, and has proven to be extremely useful in the care of patients with illnesses that are undifferentiated or of uncertain nature.

## Multidimensional Hypotheses for Family Practice

Biopsychosocial hypotheses incorporating biomedical and psychosocial data bases allow the physician to consider possible relationships between illness and the various levels of the systems hierarchy (cell, organ, organ system, individual, family, group organization, community, society). Hypotheses are formulated either intuitively or

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explicitly by physicians during clinical encounters, and may include person level (biological, psychological, cognitive, and behavioral), physician-patient relationship level (clinical transactional), family level (intrafamilial), and society level (extrafamilial) hypotheses. The appendix details these various categories of clinically relevant biopsychosocial hypotheses.

## Clinical Vignettes

### Case 1

An anxious 32-year-old woman presents with the complaint of left breast pain of four days' duration (biological hypotheses 1, 2, 3, 4, 9 are entertained). She denies any fever, nipple discharge, breast lump, trauma, or cardiorespiratory symptoms. A physical examination is performed and found to be within normal limits. As the examination is being completed, the patient mentions incidentally that her mother underwent a left mastectomy for breast cancer on this very date three years ago and subsequently died from metastatic disease (psychological hypotheses 4 and 5 and cognitive hypothesis 2 are entertained). In the ensuing brief discussion the patient tearfully admits doing very little grieving after her mother's death. She notes a marked decrease in her breast pain as her feelings are shared. A follow-up appointment for grief work and supportive psychotherapy is arranged. The patient also requests that mammograms be scheduled for some future date.

### Case 2

An 18-year-old obese teenage girl presents with the complaint of vaginal discharge and abdominal pain of two days' duration (biological hypotheses 2 and 3 are entertained). She denies any fever, dysuria, or missed menstrual period, and pelvic examination reveals cervical and adnexal tenderness consistent with pelvic inflammatory disease. She is treated with appropriate antibiotics. While still in the examination room, the patient also asks for a referral to an ophthalmologist for glasses because of blurred vision and headaches, which she has had for two weeks (biological hypotheses 1, 2, 9, psychological hypothesis 2, and cognitive hypothesis 1 are entertained). There is no history of

hypertension, and she denies any head trauma or major psychosocial stresses. Funduscopic examination surprisingly reveals bilateral papilledema. She is admitted to the hospital, and subsequent neurological evaluation and testing confirms a diagnosis of pseudotumor cerebri.

### Case 3

A 3-year-old boy is brought to the family physician by his mother because of soiling (behavioral hypothesis 1 is entertained). The mother notes that her son has been toilet trained for almost a year and is otherwise healthy. She states that the problem began suddenly three weeks ago after she returned from visiting her cousins (intrafamilial hypotheses 1 and 4 are entertained). Physical examination of the boy reveals no abnormalities. On further questioning the mother begins to cry and states that while visiting her cousins, she learned that one of them had been raped and this had greatly upset her. She wondered whether her "nerves" might be causing her son's problem (cognitive hypothesis 2 is entertained). A follow-up visit for supportive psychotherapy is arranged, but the mother cancels this because her son's problem has resolved and she is now feeling much better after talking with friends.

### Case 4

A 72-year-old woman is admitted to the hospital with increasing shortness of breath (biological hypotheses 1, 2, 3, 4, 8 are entertained). She denies any fever, cough, chest pain, or night sweats. There is a history of "asthma," hypertension, cardiomegaly, and mild right-sided hemiparesis following a stroke ten years ago. Physical examination reveals no evidence of acute cardiopulmonary disease. Laboratory studies, including chest roentgenogram, serial electrocardiograms, cardiac isoenzymes, and pulmonary function tests, also demonstrate no acute pathology. Further questioning of the patient uncovers a history of recent excessive alcohol consumption and progressive memory loss (behavioral hypothesis 3, biological hypothesis 12, and cognitive hypothesis 3 are entertained). The patient begins to cry and states how frightened she is about her impaired thinking

and ability to function independently (psychological hypothesis 2 and cognitive hypothesis 2 are entertained). A workup for dementia reveals no treatable causes, and the patient eventually accepts the idea of being transferred to a nursing home, where her "respiratory symptoms" spontaneously improve<sup>67-69</sup> (psychological hypothesis 1 is entertained).

### Case 5

A 26-year-old woman presents with the complaint of vaginal discharge and fatigue (biological hypothesis 3 is entertained). She denies any fever or abdominal pain. Physical examination is within normal limits except for a cervical sodium-chloride wet preparation that reveals clue cells consistent with a diagnosis of *Gardnerella* vaginitis. When the physician returns to the consultation room, the patient asks in a slightly embarrassed but seductive voice whether he would like to come with her to a concert (clinical transactional hypothesis 1 is entertained). The physician politely but firmly declines the offer, and further discussion elicits the information that the patient is in the process of getting a divorce and feels lonely and depressed (psychological hypothesis 2, intrafamilial hypothesis 1, and extrafamilial hypothesis 1 are entertained). She is given a prescription for metronidazole, and follow-up for individual supportive psychotherapy is arranged.

### Case 6

A 30-year-old woman presents with concern about excessive hair loss. She has observed increasing amounts of hair on her brush as well as a receding hair line (biological hypothesis 10 is entertained). Her husband, a second-year medical student, has also been extremely worried about the many possible organic causes of hair loss he has read about. The couple is currently being investigated for a primary infertility problem, and the physician inquires whether there is concern that the "hair loss" could be a manifestation of a hormonal problem (cognitive hypothesis 1 is entertained). The patient is found to have normal thyroid function tests and basal body temperatures consistent with normal ovulatory cycles. The

physician suggests that the patient quantitate her daily hair loss and examine old photographs. It is subsequently discovered that she is losing fewer than 100 hairs daily and that her hairline has not changed.

### Case 7

A 62-year-old Jamaican woman who recently immigrated to the United States to join her children presents with the complaints of shortness of breath and insomnia (biological hypotheses 1, 2, 3, 4, 8 are entertained). She denies any fever, cough, chest pain, or night sweats. On physical examination, hypertension is noted, but there is no other evidence of acute cardiopulmonary disease. A chest x-ray film reveals borderline cardiomegaly, and an electrocardiogram demonstrates left ventricular hypertrophy. She is treated with a diuretic and asked to return in one week. At her follow-up visit, she notes no improvements in symptoms. Further questioning reveals continued insomnia as well as despondency, fatigue, and nightmares about death, but no hallucinations or memory loss (biological hypothesis 12 is entertained). Elicitation of her illness explanatory model uncovers a belief that her symptoms are the result of obeah (witchcraft)<sup>70</sup> performed by another family member still living in Jamaica (cognitive hypothesis 1 is entertained). She also admits to having difficulty adapting to the US way of life (extrafamilial hypothesis 3 is entertained). A diagnosis of major depressive disorder is made, and the patient is prescribed a course of tricyclic antidepressant medication with subsequent improvement in her vegetative and "respiratory symptoms" (psychological hypothesis 1 is entertained). She is seen for several sessions of brief supportive psychotherapy, and her family is mobilized to help her ventilate her fears and worries and adjust to US society (intrafamilial hypothesis 5 is entertained).

### Discussion

The 38 biopsychosocial clinical hypotheses presented above have proved helpful in (1) organizing the information elicited from patients in family practice and (2) orienting the selection of appropriate diagnostic and therapeutic strategies.



Certainly, these hypotheses cannot be considered exhaustive of all the possibilities, and various ones may conceptually overlap. It is expected that further refinements leading to more specific hypotheses can be made and that the categories proposed in this paper will serve as a useful starting point.

In general, the approach to problem solving in primary care differs from that in other medical care specialties.<sup>21</sup> Illness is frequently undifferentiated and of uncertain nature, and hypothesis testing usually takes place over a number of visits as a longitudinal process. As seen in the case studies above, not all hypotheses must necessarily be considered for each and every patient. At times, however, more than one hypothesis will be needed in conceptualizing a given clinical problem. The dynamic nature of clinical transactions almost certainly ensures that different physicians will entertain differing hypotheses leading to alternative diagnostic "constructions of clinical reality."<sup>71-73</sup>

Within the medical profession itself, the kinds of hypotheses primarily entertained by various clinicians will differ depending on the specialty. For the family physician who is both a generalist and a "specialist in breadth," the task is not so much mastery (an impossibility) of all possible clinical hypotheses, as it is the careful and judicious selection of those most appropriate for the management of illness in the realm of primary care. Referral to secondary and tertiary care specialists will often become necessary, indeed mandated, for problems requiring in-depth or specialized diagnostic hypothesis testing and treatment. Thus, for example, a surgeon might utilize a more elaborate list of biological hypotheses; a psychiatrist, more psychological and clinical transactional hypotheses; and a family therapist, more intrafamilial hypotheses.

Several important research questions emerge from this general discussion. First, do family physicians as a group consider hypotheses that differ in number and type from those generated by other practitioners? Although a number of investigators have recently compared the clinical reasoning behaviors of internists and family physicians,<sup>74-77</sup> these studies have not looked explicitly at the issue of psychosocial hypothesis testing.

Second, what is the relative incidence and prevalence of illness problems having psychosocial etiologies presenting to primary care physicians? This epidemiological question is an impor-

tant one, given that family physicians generally encounter a patient population and spectrum of diseases in primary care differing from those seen in secondary and tertiary care settings. It would be interesting to know, for example, the frequency of patient visits relating to anniversary reactions, grief reactions, dysfunctional illness explanatory models, or family problems.<sup>78-81</sup>

Third, and closely related to the second question above, is the crucial issue of whether employing psychosocial hypotheses along with traditional biomedical hypotheses leads to improved diagnostic accuracy, therapeutic outcomes, and patient and provider satisfaction? Family medicine research needs to move beyond the stage of anecdotal case reports toward systematic gathering of empirical data that can be used by the physician to decide when to employ an expanded range of psychosocial hypotheses and a smaller number of biomedical hypotheses in understanding a patient's problem(s).

Finally, it is hoped that the biopsychosocial hypothesis testing paradigm proposed in this paper can be incorporated usefully into medical school education at both undergraduate and graduate levels. Medical students should be exposed to the biopsychosocial model early in their training, and small-group discussion focusing on clinical case studies can be useful in introducing clinically relevant behavioral and social science concepts.<sup>82,83</sup> Differential diagnosis, whether taught in physical examination courses, on ward rounds at the bedside, or during outpatient precepting, should emphasize the importance of considering psychosocial as well as biomedical hypotheses. The biopsychosocial model with its comprehensive perspective holds great promise for reshaping the nature of medical care. An important challenge for the future will be the development of curricula that successfully transmit in a clinically useful way the many facets of this humanistic new paradigm.

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## Appendix Clinically Relevant Biopsychosocial Hypotheses

### Person Level

#### *Biological Hypotheses*<sup>16-19</sup>

The patient's problem can be understood in part as resulting from:

1. A vascular process (eg, hypertension)
2. An inflammatory process (eg, appendicitis)
3. An infectious process (eg, pneumonia)
4. A neoplastic process (eg, leukemia)
5. A degenerative process (eg, osteoarthritis)
6. An intoxication (eg, drug overdose)
7. A congenital abnormality or genetic process (eg, sickle cell anemia)
8. An autoimmune or allergic process (eg, asthma)
9. Physical trauma (eg, brain concussion)

10. An abnormality in the endocrine system (eg, hypothyroidism)
11. A nutritional deficiency or metabolic derangement (eg, iron-deficiency anemia)
12. An organic brain syndrome or major affective disorder (eg, dementia)

#### *Psychological Hypotheses*<sup>29,35-42</sup>

The patient's problem can be understood in part as resulting from:

1. His or her personality style and aspects of ego functioning and related psychodynamic issues
2. The emotional impact of personal stressful life events (eg, divorce, unemployment, chronic illness)



**Appendix  
Continued**

3. A personal developmental crisis or life-cycle transition
4. Unresolved grief
5. An anniversary reaction

*Cognitive Hypotheses*<sup>43-49</sup>

The patient's problem can be understood in part as resulting from:

1. His or her beliefs about the etiology, onset, pathophysiology, course, seriousness, or treatment of the illness (ie, the illness explanatory model)
2. The personal meaning of the illness for the patient and any associated images, events, or experiences (ie, the semantic illness network)
3. The impact of dysfunctional cognitive schema, delusions, or hallucinations

*Behavioral Hypotheses*<sup>40,50,51</sup>

The patient's problem can be understood in part as resulting from:

1. His or her eating, sleeping, or elimination habits (eg, binge eating, laxative abuse)
2. His or her sick role behavior (eg, secondary gain, noncompliance, "doctor-shopping")
3. A behavior disorder (eg, alcoholism, drug addiction, impotence) or other maladaptive coping behaviors
4. Some form of popular or folk medical treatment (eg, "toxic" herbal teas)

**Physician-Patient Relationship Level**

*Clinical Transactional Hypotheses*<sup>52-56</sup>

The patient's problem can be understood in part as resulting from:

1. His or her transference thoughts, feelings, or behaviors toward the physician during the clinical encounter (ie, transference hypotheses)
2. The physician's countertransference thoughts, feelings, or behaviors toward the patient during the clinical encounter (ie, countertransference hypotheses)

3. Lack of physician-patient agreement about the nature or definition of the problem, the goals of treatment, the methods of treatment, or the conditions of treatment (ie, clinical conflict hypotheses)
4. A "side effect" of the medical service provided, eg, drug reaction, stigmatization from disease labeling (ie, clinical iatrogenic hypotheses)

**Family Level**

*Intrafamilial Hypotheses*<sup>26,27,30,31,57-63</sup>

The patient's problem can be understood in part as resulting from:

1. Dysfunctional relationships in a family subgrouping (eg, the marital dyad, parent-child/sibling-sibling/three-generational relationships)
2. Family communication patterns (eg, enmeshed, disengaged)
3. A family developmental crisis or life-cycle transition
4. The impact of stressful life events (eg, illness, unemployment) on another family member
5. The inability of the family to serve as a resource in "buffering" or modifying the negative effects of stress on health

**Society Level**

*Extrafamilial Hypotheses*<sup>20,30,56,64-66</sup>

The patient's problem can be understood in part as resulting from:

1. The extent, nature, and availability of extrafamilial social supports
2. His or her ethnic background or social class and relationships to the rest of society (eg, racism, job discrimination)
3. Acculturation stresses and the process of immigration or emigration
4. Exposure to hazardous substances or conditions in the workplace or environment (eg, toxic industrial chemicals, radiation, environmental pollutants)
5. Natural disasters (eg, flooding, hurricanes) or warfare