Behavioral Aspects of Heart Disease

Psychiatric Complications in the Critically Ill Cardiac Patient

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Psychiatric consultation to the critically ill cardiac patient focuses on several common problems: anxiety, delirium, depression, personality reactions, and behavioral disturbances. A review of the causes and treatment of anxiety in the coronary care unit is followed by a discussion of delirium in the critically ill cardiac patient. A description of delirium associated with the use of the intraaortic balloon pump and its treatment with high doses of intravenous haloperidol is also included.

After the initial crisis has been stabilized in the critical care unit, the premorbid personality traits of the patient may emerge as behavioral disturbances—particularly as the duration of stay increases. The use of psychiatric consultation completes the discussion. ***(Texas Heart Institute Journal 1993;20:180-7)***

Key words: *Anxiety; behavioral disturbances; benzodiazepines; coronary disease; coronary care units; delirium; haloperidol/ infusions, intravenous; intra-aortic balloon pump; organic mental disorders; psychomotor agitation*

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The critically ill cardiac patient may present with derangements of emotion, cognition, and behavior that require prompt attention by the attending cardiologist. The normal psychological defenses and coping strategies of such a patient is compromised by the acute change in cardiac function. The coronary care unit (CCU) is a highly technological setting that is foreign and potentially frightening to a critically ill patient. However, it is being sick that makes the patient feel vulnerable and in danger even though CCU personnel are attentive and reassuring. The cardiac patient is admitted to the CCU following a major crisis in cardiac function (e.g., after cardiac arrest and resuscitation, myocardial infarction, cardiogenic shock, or severe heart failure). These medical conditions may be accompanied by problems of thought, emotion, and behavior caused by any of 4 factors[1] (Table I). The first is the effect of the medical illness or its treatment on the central nervous system, as in the case of hypoxia that arises from a hypoperfusion state secondary to diminished cardiac output. The second is the patient's subjective response to the way in which the cardiac illness will impair his or her future, such as a feeling that any worthwhile life is over after a myocardial infarction. Third, the patient's worry and preoccupation about physical symptoms may worsen the clinical state (as by failure to eat or to participate in rehabilitative efforts). Finally, the patient's interaction with family or environment may result in disturbances of thought, mood, or behavior (for example, the patient may appear more needy for staff attention when family members are either present or absent).

The experience in the CCU at the Massachusetts General Hospital shows that psychiatric consultation is requested because of anxiety, depression, behavioral problems, and delirium[1] (Table II). This paper reviews the causes and management of anxiety, delirium, and behavioral problems in CCU patients. A more thorough discussion of depression is presented by Fernandez in this issue.[2]

Anxiety

Admission to the CCU following a life-threatening medical event may lead to acute anxiety and fear in the patient. Initially, the fear of death is felt most acutely. Once this fear subsides, concerns about the illness and its treatments may become the focus of the patient's subjective preoccupation. The complexity of human personality is revealed in the CCU setting by the numerous manifestations that fear and anxiety can take, for example, outbursts of anger and impatience, threats to leave the hospital against medical advice, paranoia, frequent calls for the nurse, and silent withdrawal.[1,3-7] A combination of medication and quiet reassurance is the recommended treatment.

TABLE I. General Causes of Psychiatric Derangement in the Critically Ill Cardiac Patient

1. Central nervous system dysfunction
   - Hypoperfusion states of the central nervous system
   - Hypoxia
   - Metabolic derangements and infection
   - Medication side effects
   - Alcohol or drug withdrawal
2. Subjective interpretation of the meaning of the illness
   - Feeling that life is over
   - Loss of libido
   - Sense of personal failure
3. Personal worry and preoccupation
   - Catatonia
   - Major depression
   - Withdrawal
   - Hypochondriacal preoccupation with symptoms
   - Exaggerated or denied pain experience
4. Family and environmental interactions
   - Feeling that he or she is a burden to family members
   - Response to loss of control over activities of daily living
   - Clingy, needy response to caregivers or family
   - Response resulting in threats to leave the hospital against medical advice

Benzodiazepines are the best drugs for treating this initial stage of anxiety and fearfulness.[1,3,4,7] Which agent to use is a clinical decision that depends on the effect required by the clinician. Table III summarizes the generic and trade names and the pharmacologic properties of the commonly used benzodiazepines. Diazepam is a rapidly absorbed and quick-acting agent. The long half-life and active metabolites of this drug require frequent reassessment of patient response and dose adjustment. Other rapid-acting benzodiazepines include alprazolam, lorazepam, and clorazepate. Midazolam is a rapid-acting, short-lived benzodiazepine that can only be given parenterally. Because of its potency, use of midazolam should be restricted to a monitored setting so that respiratory depression can be detected and managed quickly or reversed with a benzodiazepine antagonist. Other benzodiazepines have varying half-lives and active metabolites, which the clinician should keep in mind when prescribing. Geriatric patients are particularly vulnerable to accumulation pharmacokinetics of the longer-acting metabolites of benzodiazepines.[8] For hypnotic effects, flurazepam, temazepam, and triazolam are frequently used with good efficacy. Triazolam is the benzodiazepine most often associated with amnestic problems, although all drugs in this category can cause amnesia.[9]

TABLE II. Reasons for Psychiatric Consultation in Coronary Care Unit (in Decreasing Frequency)

1. Anxiety
2. Depression
3. Management of behavior, e.g., signing out, dependency
4. Hostility
5. Delirium/psychosis

Lorazepam, with its rapid effects, parenteral availability, and absence of active metabolites, is a good choice when cardiovascular stability becomes compromised by patient anxiety in the CCU. The use of lorazepam is also advantageous because it can be given sublingually, which produces a more rapid effect than that achieved with oral administration.

Once anxiety and fear reach panic proportions, neuroleptic agents may be the most efficacious to calm patients and help them regain the ability to cope with the CCU.

Delirium

Delirium is a clinical state in which the patient shows fluctuating levels of consciousness and arousal, disorientation, diminished ability to concentrate, and either agitation or stupor, resulting in an inability to cooperate with staff.[10-12] Table IV summarizes the criteria for the diagnosis of delirium as established by the American Psychiatric Association in their Diagnostic and Statistical Manual of Mental Disorders (Third Edition-Revised) DSM-III-R.[13] Delirium jeopardizes the safety of the patient, who may try to leave the CCU bed, remove intravenous or intraarterial lines, or even attempt to self-extubate.[14-16] Acute changes in mental status require rapid assessment and treatment to maintain the medical stability of the patient and to lessen comorbidity and mortality.[17] Often the term "ICU psychosis" is applied to a patient demonstrating a range of cognitive, emotional, or behavioral derangements in the intensive care unit. The use of such a term obfuscates the more likely organic factors underlying the patient's clinical condition and implies that the patient's behavioral derangements are due to the environmental deprivation or overstimulation attendant upon an ICU setting.[4,14,18,19] However, this is rarely the case. Rather, a diligent search for an organic cause of the patient's brain dysfunction will reveal a specific or multiple sources of the acute change in mental status.

Common causes of delirium in the CCU are medications, hypoperfusion of the central nervous system, hypoxia, anemia, alcohol or drug withdrawal, and infections.[1,5,14] Tables V and VI provide informa-

TABLE III. Benzodiazepine Drugs

Generic Name	Trade Name	Rate of Onset	Half-Life (hours)	Metabolites	Route of Administration
Alprazolam	Xanax	Fast to intermediate	6-15	Yes	Oral
Chlordiazepoxide	Librium	Intermediate	8-28	Yes	Oral, IM, IV
Clonazepam	Klonopin	Slow	34	Yes	Oral
Clorazepate	Tranxene	Fast	48	Yes	Oral
Diazepam	Valium	Fast	26-53	Yes	Oral, IM, IV
Flurazepam	Dalmane	Fast	74	Yes	Oral
Lorazepam	Ativan	Intermediate	10-20	No	Oral, IM, IV, SL
Midazolam	Versed	Fast	1-4	No	IV
Oxazepam	Serax	Intermediate to slow	5-15	No	Oral
Prazepam	Centrax	Slow	70	Yes	Oral
Temazepam	Restoril	Intermediate to slow	12-24	No	Oral
Triazolam	Halcion	Fast	1-5	No	Oral

IM = intramuscular; IV = intravenous; SL = sublingual

tion regarding drugs associated with delirium and the differential diagnosis of delirium in the CCU.

The bedside assessment of delirium in a patient in the CCU is dependent on early recognition of prodromal signs of impending mental status changes, such as increasing anxiety, restlessness, sleep disturbance, or irritability. As these symptoms progress to intermittent disorientation and inappropriate or unusual behavior (e.g., playing with intravenous tubing, putting a nasal cannula in the ear or eye, etc.), the clinician needs to recognize that the patient is delirious and manage him or her accordingly (see *Treatment of Delirium* section below). Close attention to the patient's mental status is the best way to detect the beginning of delirium. A quick bedside mental status examination that focuses on the patient's orientation, short-term memory, concentration, and constructional skills will serve the clinician well. The "Mini-Mental State" examination by Folstein and colleagues[20] is a useful, standardized bedside test that takes only 10 to 15 minutes to perform. When the patient is intubated and cannot participate in standardized cognitive testing, inconsolable anxiety, agitation, or both are the best indications that the patient is delirious.

TABLE IV. Diagnostic Criteria for Delirium

1. Difficulty in maintaining or shifting attention
2. Disorganized thinking determined by rambling and incoherent speech
3. At least 2 of the following:
   - Decreased consciousness
   - Misperceptions, illusions, or hallucinations
   - Disturbance of the sleep-wake cycle
   - Psychomotor agitation or retardation
   - Disorientation
   - Memory impairment
4. Rapid development of the above symptoms (within hours or days)
5. Evidence from clinical examination that organic factors are causing the above symptoms and that these symptoms are not due to a major mental illness

(Adapted from DSM-III-R.[13])

Delirium Associated with the Intraaortic Balloon Pump. Mental status changes occurring in conjunction with the use of new and complex technologies such as coronary artery bypass grafting and open-heart surgery are well known.[21-23] The use of the intraaortic balloon pump (IABP) to achieve and maintain hemodynamic stability during crescendo

TABLE V. Differential Diagnosis of Delirium

System/Problem	Causal Factors
Central nervous system	Vascular
	Hypertensive encephalopathy
	Intracranial hemorrhage
	Stroke
	Vasculitis (e.g., lupus)
	Neoplastic
	Normal pressure hydrocephalus
	Seizure-related
Cardiopulmonary	Cardiac arrest
	Congestive heart failure
	Respiratory failure
	Shock
Endocrine/metabolic	Acid-base disturbance
	Adrenal dysfunction
	Fluid/electrolyte imbalance
	Diabetic ketoacidosis
	Hypoglycemia
	Hepatic failure (encephalopathy)
	Renal failure (uremia)
	Parathyroid dysfunction
	Thyroid dysfunction
	Porphyria
Infection	HIV encephalopathy
	Meningitis/encephalitis
	Sepsis
	Subacute bacterial endocarditis
	Tertiary syphilis
Intoxication/ withdrawal	Alcohol
	Anesthetic agents
	Anticholinergic agents
	Hallucinogens
	Psychostimulant agents
	Amphetamines
	Cocaine
	Phencyclidine
	Narcotic analgesics
	Sedative/hypnotic drugs
	Barbiturates
	Benzodiazepines
Poisons	Carbon monoxide
	Heavy metals
	Lead
	Manganese
	Mercury
	Medications
	Toxins

(Adapted from Tesar GE, Stern TA,[14] with permission.)

angina, cardiogenic shock, or perioperative support is common in the CCU; this use is associated with significant mental status changes.[16,24] In a retrospective chart review of 195 patients who underwent IABP placement at our institution during 1988, 34% of the patients developed delirium.[16,24] Often, the only known cause was the placement of the IABP. The pathophysiologic origin of this delirium is unknown, but possibilities include altered central nervous system perfusion caused by the counterpulsation hemodynamics, humoral factors released due to the presence of a large, pulsating foreign body in the thoracic aorta (e.g., tumor necrosis factor or antihistamines), disinhibition secondary to benzodiazepine treatment, akathisia secondary to neuroleptic therapy, and Type A personality factors.[16,24] During IABP treatment in the 195 patients mentioned above, medium or high doses of narcotics (more than 15 mg/day of morphine), benzodiazepines (more than 15 mg/day of diazepam), or neuroleptics (more than 10 mg/day of intravenous haloperidol) were used in 69% of patients with or without a recognized diagnosis of delirium.[16]

The delirium associated with IABP treatment was characterized by rapid onset (within the first 2 days after IABP insertion) and rapid resolution (within hours) after the IABP was removed. The only risk factor associated with the development of delirium was a history of seizures. Residual organic brain syndrome and the need for psychiatric consultation at the time of discharge from the hospital were highly correlated with the diagnosis of delirium during IABP therapy. Such variables as the indication for IABP placement, the cardiac procedure performed, premorbid medical conditions, the duration of IABP treatment, and mortality were similar for delirious and non-delirious IABP-treated patients. However, delirious patients spent an average of 9 extra days in the hospital after placement of the IABP.[16]

The use of high doses of intravenous (IV) haloperidol rather than morphine infusions and respiratory ventilation is a clinical choice the attending cardiologist faces when the patient becomes extremely agitated in the CCU and rapid behavioral calming is required to ensure the cardiovascular stability and physical safety of the patient.[15,25] In comparing the 2 treatments in patients with cardiogenic shock who were on IABP and became delirious, we found that the patients treated primarily with morphine infusions (>200 mg/day) to maintain behavioral calm had more complications while on the IABP (such as pneumonia, lower limb ischemia, bleeding, and stroke), a slightly higher mortality, longer hospital stay, and higher incidence of residual organic brain syndrome than did patients treated with high doses of IV haloperidol (mean dose, 135 mg/day).[16]

TABLE VI. Drugs in Clinical Use Associated with Delirium

- β-Adrenergic blockers
  - Albuterol
  - Atenolol
  - Betaxolol
  - Propranolol
  - Timolol
- Antiarrhythmics
  - Amiodarone
  - Disopyramide
  - Flecainide
  - Lidocaine
  - Mexiletine
  - Procainamide
  - Quinidine
  - Tocainide
- Antibacterials, antifungals, anthelmintics
  - Aminoglycosides
  - Amodiaquine
  - Amphotericin B
  - Cephalosporins
  - Chloramphenicol
  - Chloroquine
  - Colistin
  - Dapsone
  - Ethambutol
  - Gentamicin
  - Isoniazid
  - Ketoconazole
  - Mefloquine
  - Metronidazole
  - Nalidixic acid
  - Norfloxacin
  - Podophyllin resin (topical)
  - Quinacrine
  - Rifampin
  - Sulfonamides
  - Tetracyclines
  - Thiabendazole
  - Ticarcillin
  - Tobramycin
  - Trimethoprim-sulfamethoxazole
  - Vancomycin
  - Zidovudine (AZT)
- Anticholinergics
  - Atropine
  - Belladonna alkaloids
  - Benztropine
  - Diphenhydramine
  - Eye and nose drops
  - Phenothiazines
  - Scopolamine
  - Thioridazine
  - Trihexyphenidyl
- Anticonvulsants
  - Phenytoin
- Antihypertensives
  - Captopril
  - Clonidine
  - Methyldopa
  - Polythiazide
  - Prazosin
  - Reserpine
- Anti-inflammatory drugs, nonsteroidal
  - Ibuprofen
  - Indomethacin
  - Naproxen
  - Sulindac
- Antiparkinsonian agents
  - Amantadine
  - Bromocriptine
  - Levodopa
  - Pergolide
- Antiviral agents
  - Acyclovir
  - Interferon
- Calcium channel blockers
  - Diltiazem
  - Nifedipine
  - Verapamil
- Contrast media
- Histamine H_2 antagonists
  - Cimetidine
  - Ranitidine
- Hormonal preparations
  - Clomiphene
  - Progesterones (e.g., Megace)
- Immunosuppressive agents
  - Aminoglutethimide
  - L-Asparaginase
  - 5-Azacytidine
  - Chlorambucil
  - Ciprofloxacin
  - Cyclosporine
  - Dacarbazine
  - Ethionamide
  - 5-Fluorouracil
  - Interferon-α
  - Methenamine
  - Methotrexate
  - Procarbazine
  - Tamoxifen
  - Vinblastine
  - Vincristine
- Retinoids
- Sedative agents
  - Anesthetic agents
  - Antihistamines
  - Baclofen
  - Barbiturates
  - Benzodiazepines
  - Narcotic analgesics
- Psychiatric medications
  - Lithium
  - Monoamine oxidase inhibitors
  - Tricyclic antidepressants
- Steroids
- Sympathomimetics
  - Aminophylline
  - Amphetamines
  - Caffeine
  - Cocaine
  - Ephedrine
  - Phenylephrine
  - Phenylpropanolamine
  - Theophylline

(Adapted from Cassem NH, Hackett TP,[1] with permission.)

This study was initiated when it was noted that the highest doses of IV haloperidol used on our Psychiatry Consultation Service were administered during the management of delirious patients who were on the IABP.[26,27]

Treatment of Delirium. When a patient undergoes an acute change in mental status, it is important to determine the underlying cause and begin treatment immediately. If this cannot be done, as in the case of a delirious patient who requires lidocaine for expeditious stabilization of a cardiac arrhythmia, medical management is crucial. This can be accomplished best with neuroleptics, paralytic agents, narcotics, benzodiazepines, or a combination of these

agents.[1,6,12,14,15,25,26] Mechanical restraint may be necessary to protect the patient from pulling out any intraarterial or intravenous lines or from attempting to self-extubate, until behavioral calm is established using medications. Even when there is no known cause for the delirium in the critically ill cardiac patient, definitive treatment is required.

The most effective agents for treatment of agitation associated with delirium are the neuroleptics. Haloperidol is the most potent neuroleptic agent with the safest side effect profile and with flexible routes of drug administration (oral, intramuscular, or IV).[28] The pharmacokinetics of absorption from depot administration is unreliable, especially in a critically ill patient with compromised cardiac function and insufficient tissue perfusion. Accumulation of repeated doses by any route of administration is unpredictable and often leads to oversedation, especially in the geriatric patient.

This experience with the use of IV haloperidol shows it to be a fast and safe treatment in a cardiac monitored CCU.[7,26,27] A protocol for the use of IV haloperidol in the treatment of delirium is summarized in Table VII. Depending on the severity of the delirium, IV haloperidol is started with a maximum dose of 1 mg for mild symptoms, 5 mg for moderate symptoms, or 10 mg for severe symptoms. The dose is doubled every 30 to 60 minutes until behavioral calm is established. Thereafter, the next dose is withheld until symptoms begin to re-emerge, and then is usually given at the last dosage that resulted in symptom control. Future doses are tapered rapidly as long as agitation does not recur. Boluses of 30 to 50 mg of IV haloperidol are not unusual. The largest single dose of haloperidol recorded in the literature was 150 mg,[7] and as much as 1200 mg of haloperidol has been given in a 24-hour period.[27]

TABLE VII. Protocol for Using IV Haloperidol to Treat Delirious Patients

1. Assess the level of agitation to determine the starting dose of IV haloperidol:
   - Mild - use 0.5 to 1.0 mg
   - Moderate - use 2.0 to 5.0 mg
   - Severe - use 5.0 to 10.0 mg
2. If the patient is still agitated in 20 to 30 minutes, double the dose.
3. Continue to double the dose of IV haloperidol every 30 to 60 minutes until behavioral calm is established.
4. Hold further doses of IV haloperidol until the patient shows signs of re-emerging agitation. At that time, give the patient the last dose of haloperidol that resulted in sufficient behavioral calm.
5. Intravenous (1 to 2 mg) lorazepam can be administered every 4 hours as an adjunct to the haloperidol in order to establish and maintain behavioral calm.

Often, treatment with lorazepam as an adjunct to the haloperidol facilitates the rapid management of the agitated, delirious patient in the CCU.[29-31] Extrapyramidal reactions associated with the use of haloperidol (including akathisia) are lessened with the co-administration of lorazepam.[32,33] It is recommended that 1 to 2 mg of IV lorazepam be given every 4 hours when used in combination with IV haloperidol to establish behavioral calm. On the rare occasion in which a patient develops an acute dystonic reaction or is suffering from the internal restlessness associated with akathisia, IV diphenhydramine (25 to 50 mg) is rapidly effective and well tolerated medically. Alternatively, the parenteral administration of benztropine (1 mg) is also effective in the treatment of an acute dystonic reaction. The use of IV haloperidol (unlike intramuscular or oral administration) is associated with a rare incidence of extrapyramidal reactions.[15,26,27,32,33]

When bolus dosing of haloperidol is not effective in the management of agitation, a continuous infusion of haloperidol has been used successfully in the critically ill patient.[34,35] Dixon and Craven[35] reported their clinical experience with the use of a continuous infusion of IV haloperidol (2 mg/hr) in an agitated and frightened 78-year-old man who was in cardiogenic shock. This treatment resulted in behavioral calm after hourly boluses of haloperidol (1 to 5 mg) and morphine had proved ineffective.[35] Tapering and then discontinuing the infusion while the patient's condition remains stable completes the treatment successfully. No extrapyramidal side effects have been noted in the case reports cited.

Because IV haloperidol has not been approved by the U.S. Food and Drug Administration for routine clinical use, informing the hospital pharmacy of its use and documenting the risks and benefits in the patient's chart are strongly recommended.

An advantage of using IV haloperidol rather than continuous infusions of narcotics in critically ill patients is the lack of respiratory depression experienced by haloperidol-treated patients. In addition, haloperidol administration circumvents the changes in mental status that are common side effects of narcotic analgesia. Although IV haloperidol has been safe and effective in the management of agitation in critically ill patients, there are a few reports of a prolongation of the Q-T interval and the development of torsades de pointes.[36-39] With high-dose IV haloperidol administration, we advise cardiac monitoring, along with special efforts to maintain potassium and magnesium levels within the normal range. The CCU is ideal for IV haloperidol management of agitated delirium in the critically ill cardiac patient.

Environmental and psychosocial interventions are useful adjuncts to the rapid assessment and quick pharmacologic management of agitated patients with delirium in the CCU. Frequent calm verbal reassurance and reorientation may be helpful. The presence of familiar personal effects (e.g., clocks, radios, or family pictures from home) and frequent family visits may facilitate the calming of an anxious patient. However, once an episode of agitated delirium begins, pharmacologic management is the most important intervention.

Behavioral Problems

In 1971, Cassem and Hackett[5] described the progression of emotional and behavioral responses of patients during the time spent in the CCU (Fig. 1). Initially, anxiety is prominent, followed by increasing denial of the significance and prognosis of a stay in the CCU as part of a reaction against the anxiety.[5,18,40] After the 3rd or 4th day, depression may begin to appear as the impact on the patient's health status becomes clearer and the denial subsides. Also, as the patient adjusts to the initial shock of the medical crisis resulting in admission to the CCU, premorbid character traits will emerge.

During this time (from 3 to 5 days in the CCU), the patient may also become more passive-aggressive, whiny, demanding, irritable, entitled, and may cause interpersonal splits among the staff members caring for the patient. If the patient's normal personality has a hostile edge in normal day-to-day life, this will manifest as the CCU stay continues. These behaviors can result in disruption of care, because staff members may begin to avoid the patient or misperceive the patient's medical needs. A consultation with a psychiatrist is recommended for the development of strategies to manage these behaviors in the patient, thereby supporting the staff's ability to work with the patient and enabling the patient to derive the most benefit from CCU care. Depending on the patient's psychological make-up, which is best assessed by the psychiatrist, interventions such as firm limit-setting will be used. The addition of a psychiatrist to the treatment team of CCU nurses and other medical specialists will complement the quality care expected in the CCU. Clear communication with the nursing staff about the patient and about specific helpful interventions will best serve the goal of rapid recovery and discharge of the patient from the intensive care setting.

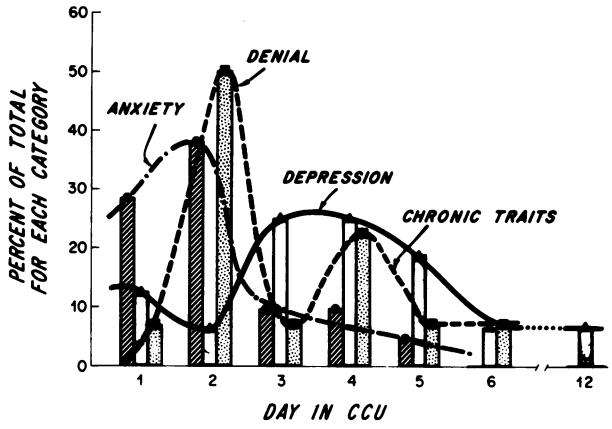

Fig. 1 *Typical onset of emotional and behavioral reactions of a coronary care unit (CCU) patient.*

(From Cassem NH, Hackett TP,[5] with permission.)

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