Care of the Person with Human Immunodeficiency Virus-Related Opportunistic Disease

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This is the second article in a four-part continuing education series on AIDS patient management and care. Upon completion of this article, the reader should have a full understanding of: 1) the opportunistic diseases related to HIV infection; 2) the current treatment of these diseases; and 3) future trends in AIDS research.

Caring for the person with Human Immunodeficiency Virus (HIV) related opportunistic disease represents one of the greatest challenges facing health care professionals today. When infected with the HIV, the T4 lymphocyte is unable to serve as an immunoregulatory cell, causing direct impairment of cell-mediated immunity and indirect impairment of the humoral immune system. These defects leave the infected person at risk for opportunistic infections and cancer. Medical treatment is directed at treating the life-threatening opportunistic diseases, rather than directly against the infecting virus. Nursing care is multifaceted, dealing with issues of immunosuppression, respiratory impairment/failure, isolation, drug toxicity, and terminal illness. Not only is the care complex and time-consuming, but the technology and knowledge base are expanding at an unheard of rate. To stay abreast of these changes is almost as great a challenge as caring for the person with AIDS or HIV-related illness. HIV-related disease has changed the face of health care, affected economics, and forced all of us to recognize the potential/actual threat and act accordingly.

HIV AND THE IMMUNE SYSTEM

Acquired immune deficiency syndrome or AIDS, results from a breakdown in immune system function. Normally the immune system functions through an intricate interplay of cellular elements, including lymphocytes, monocytes, macrophages, neutrophils, eosinophils and basophils, and chemical mediators such as lymphokines, cytokines, complement, histamine, plasma proteases, and prostaglandins. Chemical mediators are soluble substances that facilitate intracellular communication. The primary function of the specific immune response is the recognition of "self from not-self."

There are two types of acquired immunity. Both are specific and rely upon recognition of self. Both involve lymphocytes, small round mononuclear leukocytes, comprising ~ 30% of all circulating leukocytes. Technical advances have enabled the identification of two major types of lymphocytes involved in two distinctly different types of immune function. These are thymus-derived lymphocytes (T-cells) and bursa-derived lymphocytes (B-cells).

T-cells are involved in cell-mediated immunity. Several T-cell subsets have been identified: T4 (OKT4) or helper/inducer cells, T8 (OKT8) or suppressor/cytotoxic cells, and NK (natural killer) which perform immune surveillance. T4 and T8 lymphocytes are immunoregulatory cells, switching on or off specific immune responses.

Cell-mediated immunity involves a number of different functions; defense against intracellular organisms such as bacteria, fungi, viruses, and protozoa, transplant rejection, graft-versus-host disease, hypersensitivity reactions, and immune surveillance. If defective, the person is at increased risk for the development of opportunistic diseases, such as infections and cancers.

B-cells are involved in humoral immunity or antibody production. Antibodies, a type of serum protein called immunoglobulins, can agglutinate and lyse bacteria, neutralize toxins, and function as opsonins. Antibody production is regulated by the T-cell. Signals from the T4 lymphocyte transform the B-cell into a plasma cell which produces immunoglobulin. If the T4 cell is not available, the B-cell/plasma cell is unable to make antibodies in response to new infection or turn off production of old antibody when the need no longer exists.

The etiologic agent of AIDS is HIV. It also is known as the Human T-cell Lymphotrophic Virus III (HTLV III), the Lymphadenopathy-associated Virus (LAV), and the AIDS-associated Retrovirus (ARV). While the HIV can infect a number of different cells which carry the CD4 receptor, it preferentially infects the T4 lymphocyte (*1*). When the HIV infects the T4 cell, it takes over the internal working of the cell for new virus production, and eventually causes death of the infected T4. This leads to greatly diminished numbers of T4s, which is the hallmark immunologic abnormality (*2,3*).

The aftermath of infection by the HIV upon the immune system leads to the clinical syndromes which are recognized as part of the spectrum of HIV-related illness. Clinical illness is directly related to the degree of dysfunction and failure of immune regulation by the T-cells. HIV disease encompasses an acute retroviral illness associated with AIDS-related complex (ARC), the initial infection by HIV, an asymptomatic carrier state, persistent generalized lymphadenopathy (PGL), and AIDS. The major distinguishing feature between AIDS

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and ARC is the presence or absence of life-threatening opportunistic disease, either infection or cancer (*4*).

HIV-RELATED OPPORTUNISTIC DISEASE

Opportunistic disease associated with HIV infection is common and varied. Virtually any organism can become a pathogen for the person whose immune system has been devastated by the HIV. Different cancers are also being identified more frequently in the person infected with the HIV. The hallmark opportunistic diseases of AIDS are still *Pneumocystis carinii* pneumonia (PCP) and Kaposi's sarcoma (KS). These are the two rare conditions that were recognized in the early 1980s and focused medical attention on what we now know as AIDS (*5*).

Protozoal infections are perhaps the most numerous of the opportunistic infections (OI) seen in persons with AIDS. Sixty percent of the initial diagnoses of AIDS are made upon diagnosis of PCP. Eighty percent of all persons with AIDS will have at least one episode of PCP during the course of their illness. PCP while treatable still carries a 25% mortality rate with the first episode. PCP in the HIV-infected person frequently presents as an indolent disorder with insidious onset and slow progression of symptoms rather than the fulminant course generally seen in other immunosuppressed individuals. PCP is generally thought to represent reactivation of a latent infection (*6*). Cryptosporidiosis is a protozoal infection that is manifested by severe watery diarrhea and may affect up to 30% of all persons with AIDS. Toxoplasmosis is thought to be a reactivation of a latent infection that presents as an encephalitis and/or brain abcess with focal neurological defects (*5*).

Viral infections carry significant morbidity and mortality for the person infected with HIV. The most common infecting viruses are from the Herpes family; Cytomegalovirus (CMV), Herpes simplex (HSV) and Varicella-zoster (VZV/HZV). CMV may present as localized disease involving the central nervous system, retina, liver, lungs, gastrointestinal tract or adrenal glands, or as a widely disseminated infection involving a number of the above organ systems and characterized by severe constitutional symptoms such as high, spiking fevers, rigors, weight loss, etc. CMV chorioretinitis is the most common cause of blindness in the person with HIV infection. Herpes simplex (HSV) infections are characterized by persistent, recurrent severe mucocutaneous ulcerations most frequently involving the mouth, nose, genitals, and anus. HSV infections can become widely disseminated and may be fatal. Varicella-zoster infections may be local, severe, or widely disseminated. Primary exposure to the virus may result in progressive varicella, a serious and frequently fatal form of chicken pox. Reactivation results in a typical case of "shingles," the severity of which is dependent upon degree of immunosuppression. HZV infections are common in persons with ARC and do not constitute severe enough disease to change their diagnosis to AIDS (*5,7*).

Opportunistic fungal infections are most often *Candida albicans*, but other fungi may be pathogenic. Oral candidiasis is a common manifestation in the person with ARC. Esophageal, pulmonary, or otherwise disseminated candidiasis represents invasive fungal infections and is associated with the diagnosis of AIDS. Infection with *Cryptococcus neoformans* usually presents as a meningitis although it also may be a pneumonitis or disseminated infection. Fungi endemic to certain geographical areas such as *Coccidioides immitis* (desert southwest) and *Histoplasma capsulatum* (Ohio and Mississippi River basins) may present as the more common invasive fungal infections in those particular areas (*5*).

Bacterial infections are less common than the other OIs. They are categorized according to the predominant immunologic defect present. Those bacterial infections associated with a defect in T-cell function are primarily intracellular organisms such as mycobacteria, *Nocardia asteroides*, *Salmonella sp.*, *Listeria monocytogenes*, and *Legionella pneumophilia*. Of these, mycobacterial infections are the most common. Atypical mycobacterial infections, such as *Mycobacterium avium-intracellulare* (MAI) complex are more common than typical mycobacterial infections. MAI infections are frequently disseminated, involve the gastrointestinal tract, and are characterized by severe constitutional symptoms. *M. tuberculosis* infections are more common in persons with AIDS who are intravenous drug users. Bacterial infections related to B-cell abnormalities are most commonly *Streptococcus pneumoniae* and *Haemophilus influenza*. Both of these organisms are characterized by recurrent, severe infections usually represented by pneumonias and bacteremias. Bacterial infections are a much more frequent cause of morbidity and mortality in the pediatric AIDS patient. Bacterial infections of unknown susceptibility are probably related to defects in mechanical barriers such as mucous membranes and skin related to long-term vascular access devices and infectious or malignant ulcerations involving the gastrointestinal tract.

Kaposi's sarcoma, a multifocal systemic neoplasm of vascular endothelium, is the most commonly AIDS-associated cancer diagnosed. At one time, the diagnosis of KS accounted for 24% of all AIDS diagnoses made, but the incidence appears to be decreasing. KS also is seen most often in male homosexuals/bisexuals. AIDS-associated KS frequently involves visceral organs and causes death within 2–3 yr of diagnosis in contrast to classical KS which is indolent and remains localized to skin (*2,5*).

Non-Hodgkin's lymphomas are the second most common type of cancer seen in persons with AIDS. These are all high-grade B-cell neoplasms, either primary brain or widely disseminated at diagnosis. Other lymphoproliferative malignancies diagnosed include Hodgkin's disease and chronic lymphocytic leukemia (*2*).

Tumors, such as squamous cell carcinoma of the mouth and cloacogenic carcinoma of the rectum have been rarely observed. Undoubtedly over time, additional types of cancers will be associated with HIV infection.

AIDS dementia complex (ADC) or HIV encephalopathy is becoming a more frequent sequelae of HIV infection. It is recognized that while the HIV primarily infects the T4 lym-

phocyte, other cells which have the CD4 receptor on their membranes also may become infected, such as certain cells of the central nervous system. Clinical findings are those of disabling cognitive and/or motor dysfunction interfering with occupational or activities of daily living, or loss of behavioral milestones in a child, progressing over weeks to months in the absence of concurrent illness or conditions other than HIV infection which could explain the findings. This may occur in ~ 50% of all persons with AIDS and is included in the case control definition of AIDS from the Centers for Disease Control (CDC) (*4*).

HIV wasting syndrome or "slim disease" also is a new inclusion in the CDC's definition of reportable HIV disease. It is described as the findings of profound involuntary weight loss plus either chronic diarrhea or chronic weakness and documented fever in the absence of concurrent illness or condition other than HIV infection that could explain the findings. This is the most common opportunistic disease seen in African AIDS (*4*).

TREATMENT OF HIV-RELATED OPPORTUNISTIC DISEASE

Treatment of HIV-related disease is primarily that of treatment of the life-threatening OI or cancer. Little progress has been made in treating the actual retroviral infection and its devastation of the immune system.

HIV-related OIs are characteristically severe and recurrent. Drugs used for treatment are toxic, and, for unknown reasons, persons infected with HIV are at greater risk for the development of drug toxicities, especially those involving skin and bone marrow (Table 1). The treatment course is usually protracted. Some infections, because of recurrence rates, will require continuous therapy. With long-term therapy the risk of development of treatment resistance is also high (*5,7*).

Treatment directed toward the HIV is limited to the use of one agent, zidovudine (Retrovir*, AZT), for the majority of persons with HIV-related disease. Viral replication is inhibited as long as the person is taking the drug. Adverse reactions have included headache, leukopenia, and severe anemia. Special interest groups are pleading with governmental regulatory agencies to make investigational drugs available to greater numbers of persons infected with the HIV. Attempts at immune modulation and cellular replacement have not been successful, presumably secondary to inability to completely eradicate the HIV (*5*).

Antineoplastic therapy is evolving for HIV-associated cancers. Aggressive combination chemotherapy such as that employed in non-AIDS related cancers is associated with increased morbidity and mortality in persons with AIDS-associated cancers. Current approaches include the use of older less aggressive regimens and the selection of agents for their lack of bone marrow or immune suppression.

Individuals with illnesses viewed as hopeless often fall prey to persons/groups associated with unproven methods of treatment. AIDS quackery is a growing business soon to be worth billions of dollars per year (*8*). Lack of compassion and inability to promise a cure on the part of conventional medicine is frequently seen as the major impetus for a person to seek out unproven methods. Health care professionals must recognize the pressures the person is under and relate to them in a nonjudgemental, nonpaternalistic, and nonthreatened/nonthreatening way.

CARE OF THE PERSON WITH HIV DISEASE

HIV opportunistic disease may involve any organ and is frequently multisystem. Approaches to care may vary but will ultimately include interventions that are site-specific, treatment-specific, and nursing diagnoses-oriented. Several appli-

Table 1. Treatment of Opportunistic Infection

Infection	Drug	Toxicity
Protozoal		
Pneumocystis carinii	TMP/SMX	Skin, marrow, liver, GI, fever
	Pentamidine	Renal, pancreatic, marrow, skin
Cryptosporidium	Symptomatic	
	Spiramycin*	GI, skin
Toxoplasma gondii	Sulfadiazine/pyrimethamine	Skin, GI, marrow, neuro, fever
Viral		
Cytomegalovirus	Ganciclovir*	Marrow
HSV/VZV/HZV	Acyclovir	Marrow, liver, CNS
Fungal		
Candida albicans	Nystatin	Patient compliance
	Clotrimazole	Patient compliance
	Ketoconazole	GI, liver
Disseminated fungal	Amphotericin B	Renal, marrow, fever
	Flucytosine	GI, marrow, liver
Bacterial		
MAI Complex	Anti-tuberculous	Not effective
	Symptomatic	
M. tuberculosis	Multi-drug	Multiple toxicities
Others	Standard	Specific toxicities

* Investigational.

cable nursing diagnoses are: alteration in immune response; actual/potential impairment of skin and mucous membrane integrity; activity tolerance related to decreased tissue perfusion; ineffective breathing patterns; alteration in nutrition, i.e., less than body requirements; alteration in thought process; and social isolation. Since most opportunistic disease is infectious and involves the lungs, this paper will limit discussion to those nursing diagnoses relating to infection and pulmonary complications (*9,10*).

Alteration in immune response results from both direct and indirect effects of HIV infection. Neutropenia is becoming a more frequent occurence related to drug toxicity and infection. It is important to remember that the person with AIDS is severely immunsuppressed and that the health care worker (HCW) is a greater risk to the patient than the patient to the HCW. Handwashing before and after significant patient contact is still the best protection (*9*).

Respiratory infections are the most common OIs, and KS and NHL frequently involve the lungs. Systematic nursing assessment is an essential component of nursing care. Oxygen therapy, pulmonary toilet, positioning, monitoring vital signs including temperature at least every 4 hr, suctioning, administering anti-infective medications, and monitoring for side-effects are minimal nursing interventions. Fear associated with impending respiratory failure will require that the health care professional be supportive and available. The nurse must be alert and open to the discussion of possible mechanical ventilation with the patient and significant others. The nurse will provide for assistance in daily activities should the patient be unable to do so (*9–19*).

Health care workers frequently have concerns about their own safety when caring for the person with HIV infection. Three known routes of transmission of the HIV exist: sexual, parenteral, and perinatal. Studies have been unable to show transmission of the virus through nonsexual casual contact. The HCW's risk is the same as that of the general population. The CDC currently is studying HCWs who sustained either occupational needlesticks or skin and mucous membrane exposure to blood from HIV-positive persons. The most recent update reported on 1,203 exposures (*11*). Of these, only four HCWs have become HIV antibody positive, for a rate of 0.4%/exposure. No seroconversions followed mucous membrane or skin exposure. Forty percent of the needlestick injuries could have been prevented by not recapping needles and properly disposing of used needles and sharps. Compare this to the risk of acquiring hepatitis B from needlesticks, 12%–30%/needlestick depending upon the study. Between 200 and 300 HCWs die each year from hepatic failure secondary to occupational acquisition of hepatitis B. There have been no HCW deaths from HIV disease secondary to occupational exposure to HIV (*12*).

Because there is a slight risk of acquiring the virus through occupational exposure, "Universal Precautions for Prevention of Transmission of HIV, Hepatitis B, and Other Bloodborne Pathogens in Health-Care Settings", hereafter known as Universal Precautions, have been recommended by the CDC when exposure to potentially infectious body fluid or substance is possible (*13*). If these precautions are followed, the need for widespread routine HIV testing of hospitalized patients is lessened. Universal Precautions apply to blood and other body fluids containing visible blood. Universal precautions also apply to semen and vaginal secretions, and to tissues and body fluid for which risk of transmission is unknown. Universal precautions do not apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. While studies have shown that virus particles have been isolated from these fluids, no epidemiologic studies have implicated these fluids in transmission of blood-borne pathogens such as HIV and HBV. Health care workers must continue to increase their knowledge about AIDS and HIV infection. In doing so, HCWs can channel AIDS-related fear and panic into a healthy respect for this and other blood-borne pathogens (*12*).

HIV INFECTION AND THE FUTURE

The Public Health Service and CDC current estimates call for 450,000 cumulative cases of AIDS by 1993 since reporting began in 1981. By 1993, ~ 40% who have been diagnosed will be alive and requiring health care. HIV disease is a spectrum of diseases, ranging from the asymptomatic carriers who vastly outnumber those with reportable AIDS to the persons with significantly altered immune systems and opportunistic disease. Needs of these separate populations vary and must be met.

HIV is a costly disease. It has been estimated that by 1993 it will take in excess of 3–8 billion dollars per year to care for those persons with full-blown AIDS (*14*). HIV disease has been costly in terms of creative potential and human lives lost. One needs only to look at the impact of AIDS upon the arts. Overall mortality from AIDS is 58%, but this is directly related to length of time from diagnosis. What about the impact of HIV infection upon an already troubled health care economy? Who pays for care, research, and education? What impact will HIV infection have on the health care professions? Will there be fewer persons entering these fields? Will the HCW shortage worsen? How much loss will occur in the current ranks due to fear, family pressures, or burnout? How many will leave because of caregiver promise and plight? HIV disease has changed the face of health care delivery today and forever.

HIV disease is a reality. There are no "quick fixes" on the horizon. Prevention through education is our only hope. As members of health care professions, it is our responsibility to support local, state, and national governmental efforts to educate the public. As members of health care professions, it is our responsibility to function as role models for officials and the public to insure that persons with HIV disease are treated compassionately and nondiscriminatorily.

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CARE OF THE PERSON WITH HUMAN IMMUNODEFICIENCY VIRUS-RELATED OPPORTUNISTIC DISEASE

For each of the following questions, select the best answers. Then circle the number on the reader service card that corresponds to the answer you have selected. Keep a record of your responses so that you can compare them with the correct answers, which will be published in the next issue of the *Journal.*

A. *The function of the specific immune response is the recognition of "self" from "not-self."*
137. True
138. False

B. *Cell-mediated immunity involves:*
139. B-cells
140. T-cells

C. *T-cell subsets that perform immune surveillance are:*
141. T4 helper/inducer cells.
142. NK natural killer cells.
143. T8 suppressor/cytotoxic cells.

D. _____ *are involved in antibody production.*
144. T-cells
145. B-cells

E.
Antibody production is regulated by _____.
146. B-cells
147. T-cells

F. *The extent of HIV-related illness is directly related to the degree of dysfunction and failure of immune regulation by T-cells.*
148. True
149. False

G. *The major distinguishing feature between AIDS and ARC is the:*
150. presence of T-cells.
151. presence or absence of opportunistic disease.
152. presence of cancer or infections.
153. 151 and 152.

H. _____ *infections are the most numerous of the opportunistic infections seen in AIDS.*
154. Kaposi's sarcoma
155. Protozoal
156. *Pneumocystis carinii*
157. Pneumonia

I. *Pneumocystis carinii will affect* _____ *of all persons with AIDS.*
158. 5%
159. 20%
160. 80%
161. 100%

J. *PCP will cause death in* _____ *of AIDS patients during the first onset.*
162. 5%
163. 25%
164. 75%

K. *Viral infections most commonly infecting AIDS patients are:*
165. shingles.
166. herpes simplex.
167. Varicella-zoster.
168. all of the above.

L. *Bacterial infections are a much more frequent cause of death in pediatric AIDS patients.*
169. True
170. False

M. *The cancer which is most commonly associated with AIDS is:*
171. non-Hodgkins lymphoma.
172. Kaposi's sarcoma.
173. squamous cell carcinoma.

N. *AIDS dementia occurs in all cases.*
174. True
175. False

Your answers to the above questions should be returned on a readers service card (found in the back of the *Journal*) no later than September 1, 1989. Remember to supply your name and address in the space provided on the card; also, write your VOICE number after your name. Your VOICE number appears on the upper left hand corner of your *Journal* mailing label. No credit can be recorded without it. A 70% correct response rate is required to receive 0.1 CEU credit for this article. Members participating in this continuing education activity will receive documentation on their VOICE transcript, which is issued in March of each year. Nonmembers may request verification of their participation but do not receive credit.