PERSPECTIVES OF NUTRITION THERAPY AND QUALITY OF LIFE IN THE TREATMENT OF HIV-POSITIVE PATIENTS

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The purpose of this study was to assess the nutrition education received and desired by HIV-positive individuals, and the relationship of nutrition education received, quality of life, and nutrition-related symptomologies. HIV-positive individuals (n=76) were recruited at an HIV clinic, support group, and community center to complete a questionnaire. The questionnaire evaluated participant knowledge of their HIV-related and nutrition-related laboratory values, their quality of life, and present symptoms. Pearson’s correlation coefficients were calculated to assess the relationship between quality of life sum scores and symptomology scores, as well as the relationship between nutrition topics discussed and topics desired by participants. A regression was used to compare which factors were influenced by symptoms. The data was compiled and analyzed using social sciences software (SPSS, version 13.0). There was a significant, positive correlation between symptoms present and worsening of quality of life scores (p ≤ 0.05). In addition, there was a significant, negative correlation found between nutrition topics discussed and desired (p ≤ 0.05). Furthermore, the regression was significant with a moderate effect size and low beta weights with quality of life being the only significant factor (p ≤ 0.05). Thus, the conclusions drawn from the regression alone was limited. Regardless, participants with more symptoms had poorer quality of life, and those with a
high desire of nutrition education received little information. Advocacy is needed to limit this disconnect and enhance the disease management of the HIV-positive community.
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CHAPTER I
INTRODUCTION

Each year, about 43,144 people are diagnosed with HIV and about 29,644 people are diagnosed with AIDS in the United States (Centers for Disease Control and Prevention, 2010). In this population, nutrient deficiencies have been shown to be associated with faster disease progression, more frequent opportunistic infections, and a greater incidence of HIV-related mortality (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006).

The use of highly active antiretroviral therapy (HAART) has changed the prognosis of HIV infection, resulting in prolonged survival, slower disease progression, decreased mortality, improved quality of life, and decreased opportunistic infection (Lazzaretti, Kuhmmer, Sprinz, Polanczyk & Ribeiro, 2012; Shievitz & Knox, 2001). However, the use of these drugs is associated with the development of adverse nutritional problems, such as weight loss, lipodystrophy, obesity, diarrhea, malabsorption, altered metabolism, cardiovascular disease, hyperlipidemia, bone disease, and insulin resistance (Duran, Almeida, Segurado & Jamie, 2008; Shievitz & Knox, 2001; Lazzaretti, et. al., 2012; Fitch & Grinspoon, 2011). Although, clinical problems related to progressive malnutrition have been replaced by adverse nutritional problems in the context of undetectable viral load and immunological reconstitution, malnutrition and wasting are still found among infected individuals with the use of HAART. (Lazzaretti, et al., 2012). Therefore, the new nutritional challenges of HIV involve long-term complications from HAART use.
Problem Statement

A well-nourished individual with HIV who has a controlled viral load is more likely to be able to withstand the effects of HIV infection, support immune status and possibly delay the progression of HIV. There are several nutrition indicators that have a strong correlation with survival, such as appropriate body mass index, adequate body cell mass, and others (Fields-Gardner, 2010; Shevitz & Knox, 2001). Research has shown weight loss to be associated with both morbidity and mortality of individuals with HIV.

Nutrition interventions are frequently viewed as alternative therapy; however, interventions should be regarded as adjunctive therapy. Nutritional interventions can be essential in improving HIV disease management (Salomon, De Truchis & Melchior, 2002). Proper interventions increase the awareness of nutritional needs, the practice of improved nutritional behavior, and emotional support (Schwenk, Steuck & Kremer, 1999). Along with appropriate education, these interventions should begin when the HIV diagnosis is made (Los Angeles County Commission of HIV Health Services, 2002), which can assist in maximizing the gain of lean body mass and minimizing the gain of visceral fat (Salomon, De Truchis & Melchior, 2002).

It is understood that nutrition interventions should be individualized with general goals of achieving healthy body weights, body composition, and lab values. Other goals that should be evaluated include: reducing the nutrition-related side effects and complications of medication and disease progression, enhancing quality of life, and expanding access to nutrition services. Individualized management emphasizes tailored education to the patient based on comorbidities that develop, symptoms, and side effects.
of disease and medication. Therefore, standards of practice across all disciplines can be ambiguous, which can cause gaps in nutritional management and cross talk of general management of HIV (Fields-Gardner, 2010). Research is important to establish standardized practice guidelines on the integration of nutrition-related interventions into disease management (Fields-Gardner, 2010).

Currently, there is an abundance of research evaluating the nutritional implication of disease and medical management of HIV (Fields-Gardener, 2010). The clinical implication of the research implies a level of dissemination of this knowledge to the patient. An extensive literature review revealed no research that has assessed the use of and desire for nutrition education and its importance to HIV-positive individuals (Fields-Gardener, 2010).

**Purpose Statement**

The purpose of this study was to assess nutrition education received by HIV-positive individuals, and the relationship of nutrition education received and HIV-positive individuals’ quality of life and nutrition related symptomologies.

**Hypotheses**

Once data was collected, it was evident that data to describe correlations between the original grouping of asymptomatic and symptomatic, as well as, medication-users and non-users were not obtainable. Therefore, the hypotheses for this research were modified to remove the grouping.

H1: Current treatment strategies for HIV will lack medical nutrition therapy.
H2: There will be a difference in perception of quality of life between groups (antiretroviral therapy versus non-antiretroviral therapy and also asymptomatic versus symptomatic).

H2 (new): There will be an association between the perception of quality of life and symptomology present among individuals with HIV.

H3: There will be a difference in nutrition information provided and nutrition information desired between groups (antiretroviral therapy versus non-antiretroviral therapy and also asymptomatic versus symptomatic).

H3 (new): There will be a relationship established between nutrition information provided and nutrition information desired by individuals with HIV.
CHAPTER II

LITERATURE REVIEW

HIV Defined

HIV is a blood borne and sexually transmittable retrovirus (Batterham & Garsia, 2001). The retrovirus class of viruses uses RNA to replicate by synthesizing DNA. Using the enzyme reverse transcriptase, the virus converts its RNA into DNA, which becomes incorporated into the host cell’s genes. HIV also belongs to a subgroup of retroviruses known as lentiviruses. Lentiviruses are “slow acting” viruses, which are characterized by a long interval between initial infection and the onset of serious symptoms (National Institute of Allergy and Infectious Disease, 2009). Unlike other viruses, the immune system cannot clear HIV from the body. In addition, the virus can hide in different cells of the body for long periods of time, making it even more difficult for the immune system to combat (U. S. Department of Health and Human Services, 2012d).

The virus targets the T-lymphocyte cells that display the CD4 cell surface phenotype. Consequently, the CD4 is the major receptor recognized by the virus, which can leave other cells vulnerable to infection—like macrophages and some B-lymphocytes. These immune system cells are responsible for recognizing foreign antigens (Batterham & Garsia, 2001). The virus uses the CD4 cells to replicate the virus, which destroys the cells; thus, weakening the immune system (Centers for Disease Control and Prevention, 2012). If left untreated, the infection causes a gradual decline in
immune function, resulting in an increased susceptibility to opportunistic infections, among other health complications (Batterham & Garsia, 2001).

HIV can lead to AIDS. AIDS is the late stage of HIV infection in which the immune system of the HIV-positive person has been severely weakened to the point that is has difficulty fighting infections and other diseases (Centers for Disease Control and Prevention, 2012).

**Pathophysiology of HIV**

**Structure.** The outer layer of HIV, known as the viral envelope, is made up of two layers of lipids. This lipid membrane contains the glycoproteins, gp120 and gp41. Gp120 is used to bind the virus to CD4 cells, and gp41 is key in facilitating the fusion of the viral membrane to the CD4 cell membrane. The virus also contains RNA and the enzymes reverse transcriptase and integrase. The reserve transcriptase enzyme is used to synthesize DNA from RNA, while integrase is used to incorporate the virus’s genetic material into the host cell’s DNA (National Institute of Allergy and Infectious Disease, 2009a).
**Invasion.** When the virus comes into contact with the surface of the CD4 cell, the gp120 grabs ahold of the cell (National Institute of Allergy and Infectious Disease, 2009a). This binding causes a conformation change to the gp120, which allows a co-receptor to bind. Following this process, the two cells fuse. Gp41 facilitates the fusion, allowing the virus to enter the cell. Once inside the cell, the virus begins the reverse transcription process. During reverse transcription, the virus integrates itself into the cells deoxyribonucleic acid and rapidly makes copies of itself. As the replication process occurs, newly synthesized core proteins, enzymes, and ribonucleic acid gather together and begin to bud off the host cell. The buds contain immature viral particles made up of long-chained proteins and enzymes. During this stage of the life cycle, the immature virus is not yet infectious. The proteins and enzymes begin to be cleaved by
the viral enzyme called protease. The protease’s activity allows for the creation of mature viruses (National Institute of Allergy and Infectious Disease, 2009a).

**Evolution.** The enzyme, reverse transcriptase, often makes random mistakes during the replication of the HIV’s RNA (National Institute of Allergy and Infectious Disease, 2009b). Therefore, unique strains of the virus develop. These strains can be harder to kill, because they are either more aggressive or replicate at even faster rates. These strains may also recombine with other strains to produce an even wider range of viruses. This can make treatment difficult. Those strains that tend to be virulent tend to be seen in those at late stages of infection. One of the major reasons the virus is so deadly is because the virus is constantly evolving and evading the immune system defenses (National Institute of Allergy and Infectious Disease, 2009b).

**Transmission**

The HIV is transmitted through specific human body fluids (U.S. Department of Health and Human Services, 2012d). The body fluids that contain the virus are blood, semen, breast milk, vaginal fluids, and rectal mucosa. Other body fluids—such as saliva, sweat, tears, urine, or feces—do not contain enough of the virus to infect an individual. More specifically, transmission can occur during sexual contact; during pregnancy, childbirth, or breastfeeding; sharing needles for injecting drugs; through occupational exposure for healthcare workers; and from blood transfusions or organ transplants from an HIV-positive donor (U.S. Department of Health and Human Services, 2012d). The most common route of transmission is through unprotected sexual intercourse with an HIV-positive individual. The virus cannot reproduce outside the human body; therefore,
it cannot be spread by air, water, or through casual physical contact with an HIV-positive individual (Centers for Disease Control and Prevention, 2012).

**Reducing risk.** Transmission of HIV can be prevented through practicing safer sex with the use of condoms; not sharing needles, toothbrushes, razors, or items that may be contaminated by blood; maintaining adherence to anti-HIV medications; and by not breastfeeding if HIV-positive (U.S. Department of Health and Human Services, 2012e). Other ways to reduce transmission is: limiting the number of sexual partners, participating in frequent HIV testing, and by using safe needle practices—if drug injections are required. A major risk reduction method for female to male transmission is male circumcision. This has been a major focal point in HIV prevention in third world countries (Centers for Disease Control and Prevention, 2012).

**Diagnostic Criteria of HIV**

The most common test to determine whether an individual is HIV-positive uses tests that look for the HIV antibodies in the body. Generally, it takes about three months from initial infection before antibodies begin to show in the blood at a high enough concentration that can be detected by an antibody test (U.S. Department of Health and Human Services, 2012e). There are two types of antibody tests: enzyme immunoassay (EIA) tests and rapid HIV antibody tests. EIA tests use blood, saliva, or urine to detect the HIV antibodies. EIA test results can take up to two weeks. Rapid HIV antibody tests also use blood, saliva, or urine to detect HIV antibodies. These test results can take 10-20 minutes. If a positive result from either of these tests is determined, then the individual must get a Western blot test to confirm the results. The Western blot test can
take up to two weeks to confirm the positive result (U.S. Department of Health and Human Services, 2012a).

An antigen test is another type of test used to diagnose HIV (U.S. Department of Health and Human Services, 2012a). These are not as common, but they can diagnose an individual as early as one to three weeks after the initial infection. The antigen test requires a blood sample. Another type of test is called the polymerase chain reaction (PCR) test. PCR tests detect the genetic material of the virus, and can identify HIV in the blood within two to three weeks of infection (U.S. Department of Health and Human Services, 2012a).

**Diagnostic Criteria of AIDS**

The diagnosis of AIDS occurs when a patient’s CD4 cell count is less than 200 cells per cubic millimeter of blood, or if diagnosed with an AIDS-defining condition (U.S. Department of Health and Human Services, 2012d). An AIDS-defining condition is a life-threatening disease that can advance HIV to AIDS. Common examples of AIDS-defining conditions are pneumonia, tuberculosis, and toxoplasmosis (U.S. Department of Health and Human Services, 2012d).

**Epidemiology**

The Centers for Disease Control and Prevention (CDC) has estimated that 1.7 million people have HIV in the United States since the first reported case of AIDS in 1981 (U.S. Department of Health & Human Services, 2012b). Between 1981 and 2008 in the United States, it was estimated that a total of over 619,000 people had died from HIV-related complications. In addition, between 1981 and 2008, more than 25 million people
had died from AIDS worldwide. In 2009 alone, more than 17,000 individuals with AIDS
died in the United States. Approximately one in five individuals with HIV are unaware
of their infection (U.S. Department of Health & Human Services, 2012b). The total
number of people with HIV continues to increase; however, the rate of new infections has
remained relatively stable through the last few years with about 50,000 new infections
each year in the United States (U.S. Department of Health & Human Services, 2012e).

The majority of infections occur in gay, bisexual, and other men who have sex
with men, commonly referred to as “MSM” (U.S. Department of Health & Human
Services, 2012b). MSM accounted for 61% of all the new infections in 2009. Similarly,
MSM accounted for 49% of people living with HIV in 2008. The CDC estimates that
MSM make up about 2% of the United States male population, but account for more than
half of all new infections. The 2009 statistics illustrate that Caucasian MSM accounted
for the largest number of new infections with African American MSM a close second.
From 2006 to 2009, a quarter of all new infections consisted of young MSM aged 13 to
29 (Centers for Disease Control and Prevention, 2011). Out of all groups, African
American MSM was the only group to experience a significant increase in new infections
from 2006 to 2009 in the United States. Heterosexual individuals and those who inject
drugs make up the remaining major risk behaviors. Heterosexuals made up 27% of all
new infections in 2009, while injected drug users made up 9%. As a comparison, women
made up 23% of the estimated new infections in 2009 (U.S Department of Health &
Human Services, 2012e).
Among all ethnic groups, African Americans make up the largest group affected by HIV. African Americans accounted for 44% of all new infections in 2009, but only represent 16% of the United States population. Hispanic Americans make up the second largest HIV-positive ethnic group. Hispanic Americans represent 16% of the population, and account for 20% of new infections in 2009 (U.S. Department of Health & Human Services, 2012e).

**Progression of HIV**

HIV has a well-documented disease progression. However, different health agencies and organizations—like the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO)—have different stages and criteria for each stage (AIDS Education and Training Centers, 2013). It is also well known that if HIV is left untreated, it will overwhelm the immune system, leading to acquired immunodeficiency syndrome (AIDS) (U.S. Department of Health and Human Services, 2009a). The CDC defines the stages by the individual’s CD4 count and the presence of any related conditions (AIDS Education and Training Centers, 2013). These conditions can either be AIDS-defining or opportunistic in nature. The CDC stages are asymptomatic, symptomatic, and AIDS (AIDS Education and Training Centers, 2013). The WHO stages are based on clinical findings that do not require a CD4 count, and are usually used globally. The stages are one through four, from primary infection and ending with advanced HIV or AIDS. Each stage is defined by specific clinical conditions or symptoms (AIDS Education and Training Centers, 2013).
Generally, the disease progresses moves from a primary infection stage, asymptomatic stage, symptomatic stage, and ends at an AIDS stage. The U.S. Department of Health and Human Services (2012c) states the primary infection stage, or acute infection, occurs as early as two weeks or up to three months after initial infection. During this stage, individuals may experience acute flu-like symptoms called antiretroviral syndrome (ARS). The HIV-positive individual will have extremely high levels of virus in the blood, which allows for easy transmission of the virus. The individual will also start to develop antibodies to the virus, called seroconversion. After initial infection, and seroconversion, the virus becomes less active in the body. This period is commonly referred to as the “chronic” or “latency” period, and clinically referred to as the asymptomatic and symptomatic stage of infection (U.S. Department of Health and Human Services, 2012c).

The asymptomatic stage includes individuals who may or may not be experiencing complications that affect their medical, nutritional, or functional health status (Los Angeles County Commission of HIV Health Services, 2002). The symptomatic stage occurs when complications of infection appear. The virus activity is manageable and symptoms become controlled (Los Angeles County Commission of HIV Health Services, 2002). Once the disease becomes less manageable, an AIDS diagnosis is considered. AIDS, or advanced HIV, is the diagnostic term reserved for individuals with a least one AIDS-defining condition related to HIV induced immunosuppression (Mahan & Escott-Stump, 2008). The final stage of HIV progression is AIDS. At this
stage, the individual has signs and symptoms of AIDS-defining conditions related to disease progression (Los Angeles County Commission of HIV Health Services, 2002).

**Importance of the CD4 Cell Count**

Since the human immunodeficiency virus targets and destroys the body’s CD4 T-lymphocyte or immune cells, the reduction in CD4 cells causes difficulties for the body to fight off infections. The CD4 count is a key test to measure the number of CD4 cells in an individual’s blood. This value indicates the level of damage to the immune system, and indicates when drug therapy is recommended (U.S. Department of Health and Human Services, 2012e).

Generally, the CD4 counts indicate the stage, or the amount of disease progression the individual has experienced. The asymptomatic stage of infection includes individuals with CD4 counts over 200 cells per cubic millimeter of blood without any symptoms of the disease. The symptomatic stage includes individuals with CD4 counts between 200 and 500 cells per cubic millimeter of blood, along with clinical symptoms of the disease. The acquired immunodeficiency syndrome stage includes individuals with CD4 counts below 200 cells per cubic millimeter with the presence of one or more AIDS-defining conditions (Rai, Dutta, & Gulati, 2010). To put it into perspective, HIV-negative individuals in good health, tend to have about 800 to 1200 CD4 cells per cubic millimeter of blood (National Institute of Allergy and Infectious Disease, 2009a).

Alternatively, the CD4 cell count has been associated with lower body weights (Mangili, Murman, Zampini & Wanke, 2006; Macallan, 1999; U.S. Department of Health
and Human Services, 2010). It has been documented that with each 100 cells per cubic millimeter decrease in an individual’s CD4 cell count was associated with approximately a 1.9-kilogram lower body weight (Mangili, Murman, Zampini & Wanke, 2006). Therefore, one of the main goals of treatment is to increase the amount of CD4 cells, while, simultaneously, decreasing the amount of virus in the individual’s blood (U.S. Department of Health and Human Services, 2012c).

**Mechanisms behind the depletion.** There are numerous mechanisms that researchers believe to work simultaneously to destroy the host CD4 cells. The National Institute of Allergy and Infectious Disease (2009a) evaluated data that suggested billions of CD4 cells are lost each day from viral replication, which overwhelms the immune system’s ability to regenerate the lost cells fast enough. The processes that destroy CD4 cells are through direct cell killing, apoptosis, the “innocent bystander” effect, anergy (the inactive state of cells caused by viruses), and by damage done to precursor cells. Anergy is the inactivated state caused by signals from the virus.

Direct killing of the cell occurs when large amounts of viruses are produced and bud out of the cell, disrupting the cell membrane. This may also occur when viral proteins collect inside of the cell, which interferes with cells’ functions. It is also theorized that the HIV proteins distort the regulation of the cell’s function, inducing apoptosis—or programmed cell death. The “innocent bystander” theory involves cells becoming destroyed by killer T cells after HIV particles bind to cell surfaces, causing those cells to become targeted. This state leaves the CD4 cells unable to respond to the stimulation of the immune system. It has been suggested that HIV also destroys
precursor cells of the immune system (National Institute of Allergy and Infectious Disease, 2009a). In addition, HIV may also destroy precursor cells of different immune cells that mature to have specific functions (National Institute of Allergy and Infectious Disease, 2009a).

**Importance of the Viral Load Test**

HIV viral load is a major determinant of the disease progression, which depends on complex interactions between viral and genetic host factors and differs among individuals (Mahan & Escott-Stump, 2008). One of the major goals of medical therapy is to achieve an undetectable viral load. An undetectable viral load means that the amount of HIV in the individual’s blood is low enough that a viral load test does not detect the virus. Though an individual may have an undetectable viral load, it does not mean that the individual is unable to transmit the virus, or that he or she is cured (U.S. Department of Health and Human Services, 2012e). Effective therapy should reduce viral load to less than 50 copies per milliliter of polymerase chain reaction test (Thompson, et al., 2010).

With the use of HAART, viral suppression is not always accompanied by a complete immune reconstitution. After viral control is achieved, the immune system’s recovery is frequently slow and incomplete (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006) and the patient is therefore at risk for developing opportunistic infections with resulting weight loss (Schwenk, Steuck & Kremer, 1999). The relationship between viral suppression and immune recovery is complex and involves multiple factors. Of these factors, the nutritional status is believed to play an essential role (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006).
As opposed to the CD4 count, changes in an individual’s viral load have been found to be inversely associated with changes in weight. For individuals not receiving HAART, each log-10 increase in HIV viral load results in a 0.92-kilogram decrease in body weight (Mangli, Murma, Zampini & Wanke, 2006; Sattler, et al., 2008). Similarly, Macallan (1999) demonstrated that with increased viral load levels, there was an increase in resting energy expenditure.

The Nutritional and Medical Management of HIV

Overview of the Nutritional Concerns

Nutrition is an important aspect in building and sustaining an immune system that can withstand the effects of HIV. Achieving adequate nutritional status and preventing malnutrition are essential components to maintain positive health outcomes for people living with HIV (Los Angeles County Commission of HIV Health Services, 2002). Most studies on the nutritional status of individuals with HIV disease focused on HIV-associated wasting (Macallan, 1999; Karlsson & Nordstrom, 2001; Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000; Mangili, Murman, Zampini & Wanke, 2006; Salomon, De Truchis, & Melchior, 2002; Shevitz & Knox, 2001; Batterham, Brown & Garsia, 2001). More recently, the research literature has included incidences of additional nutritional problems commonly experienced by this population such as lipodystrophy, hyperlipidemia, obesity, malabsorption, diarrhea, and insulin resistance. These problems can be associated with progression of the virus itself or as side effects of drug therapy (Hendricks, Willis, Houser & Jones, 2006; Shevitz & Knox 2001).
Even with the implementation of HAART, however, weight loss continues to be a dominant feature of the disease. Lean body mass has been correlated with quality of life among individuals (Shevitz & Knox, 2001). Conversely, obesity rates have increased among this population (Hendricks, Willis, Houser & Jones, 2006). Therefore, the weights of HIV individuals should be monitored closely with efforts to correct weight gain or loss. During episodes of weight loss, the proper treatment regimen can be determined through evaluation of opportunistic infections, malabsorption, and any increase in viral load (Shevitz & Knox, 2001).

The nutritional treatment of HIV needs to be aggressive to control symptoms of infection or medication, especially diarrhea and nausea (Shevitz & Knox, 2001). Since the improvement in prognosis and treatment of HIV, nutritional complications are playing a primary role in the lives of these individuals. Careful monitoring of weights and nutrition-related side effects of infection and medication are imperative (Shevitz & Knox, 2001).

In addition, during the course of HIV infection, part of the nutritional management of patients diagnosed with HIV is nutrition education. The nutrition education topics critical to HIV management include the following: healthful dietary principles, maintenance of lean body mass and the treatment of wasting, management of metabolic complications due to drug therapies, management of drug and food or nutrient interactions, management of gastrointestinal symptoms that may influence the types and amount of food ingested, appropriate use of herbal and nutritional supplements, cultural and ethnic beliefs related to diet and food, role of exercise, relationship between
substance abuse and nutrition, and food safety (Nerad, Romeyn, Silverman, Allen-Reid, Dieterich, Merchant, Pelletier, Tinnerello & Fenton, 2003; Mahan & Escott-Stump, 2008). Similarly, there is a high demand for this type of education. Nutrition therapy for HIV positive individuals has been a growing interest among the HIV population, but has received little attention among researchers. For example, the nutrition for healthy living cohort found that over half of their participants used some kind of dietary supplement, even though few supplements have shown improvement in outcomes (Shevitz & Knox, 2001).

**Nutrition Assessment**

Nutrition assessment should be completed early during the disease process to monitor for malnutrition, which tends to occur before weight loss, and to provide dietary counseling (Stack, Bell, Burke, & Forse, 1996). Assessments with regular monitoring of changes in weight or biochemical lab values should be a component of continuous HIV care (Los Angeles County Commission of HIV Health Services, 2002). For HIV-positive individuals with symptomatic infection or changes in weight, nutritional assessments should be a continuous priority for the healthcare team (Shevitz & Knox, 2001). Generally, HIV-positive individuals should be referred to a registered dietitian to receive comprehensive medical nutrition therapy on an ongoing basis (Los Angeles County Commission of HIV Health Services, 2002).

Comprehensive nutrition assessment includes analysis of dietary intake, biochemical measurements, as well as current and past anthropometric measurements (Los Angeles County Commission of HIV Health Services, 2002). Dietary intake
consists of diet history or intake and history of alcohol, narcotic, and stimulant use (Shevitz & Knox 2001). Anthropometry measurements consist of height, weight, BMI, waist and hip circumference, and waist-to-hip ratio (Shevitz & Knox, 2001). Lean body mass, fat mass, and waist-hip ratio can be assessed by skinfold calipers and measuring tape, DEXA, bio-electric impedance analysis (BIA) or other comparable means (Los Angeles County Commission of HIV Health Services, 2002). The biochemical measurements involve serum proteins, lipid profile, micronutrients, fasting glucose, and immunological parameters. These lab tests would also include viral load and a CD4 cell count to monitor disease progression and medical effectiveness (Shevitz & Knox, 2001).

Anthropometric measures have been shown to agree well with lean body mass changes measured by dual X-ray absorptiometry in individuals with HIV infection and therefore, may be regarded as a valid tool for prospectively following individuals in clinical practice. Single frequency (50 kHz) bioelectrical impedance analysis has been evaluated for its ability to estimate lean body mass, total body water fluid and body cell mass. It is a quick, non-invasive and relatively inexpensive way to assess body composition, even if multi-frequencies bioelectric impedance could be better to assess malnutrition in HIV individuals (Salomon, De Truchis & Melchior, 2002).

Biochemical lab tests are done to identify and provide intervention strategies for clinical manifestations of drug toxicities or any underlying medical abnormalities such as anemia, vitamin depletion, insulin resistance, diabetes mellitus, hyperlipidemias, lipodystrophy, hypertension or other medical conditions (Los Angeles County Commission of HIV Health Services, 2002). Other specific factors that are involved in
clinical assessment are: usual weight before infection; weight history since development of infection; amount of regular exercise and weight training; presence of opportunistic infections, fever, and diarrhea; history of eating disorders; and social and financial issues that affect food availability or preparation (Shevitz & Knox, 2001). Unfortunately, appropriate emphasis is often not placed on the nutritional evaluation of such individuals, and it is assumed that treatment with highly active antiretroviral therapy will improve nutritional deficiencies and increase lean body mass. This is consistently not the case, and continued nutritional management to improve immune function is critical to good HIV management (Salomon, De Truchis & Melchior, 2002).

Qualitative research with primary care providers reports that some will conduct risk assessment and counseling only during initial visits, when concerns about HIV risk are prompted by changing circumstances in a patient’s life, such as a new relationship; or by a medical condition, such as a sexually transmitted disease; or in response to a patient’s question (Morin, Koester, Steward, Maiorana, McLaughlin, Myers, Vernon & Chesney, 2004). Other providers report conducting prevention assessment and counseling regularly, and view themselves as actively helping individuals to reduce their risk of transmission (Morin, et. al., 2004). In a study analyzing the assessment of HIV-positive individuals, it was found that diet and nutrition counseling were reported by 58% of the participants in the previous six months (Shevitz & Knox, 2001).

**Nutrition focused physical assessment.** The use of nutrition focused physical assessment is to clinically evaluate the nutritional status of an individual. Trained nurses, physicians, registered dietitians, or other health care providers perform physical
assessments. Broadly, this assessment evaluates the oral health, the general physical appearance, and muscle and subcutaneous fat loss. The goal is to identify any factors that reflect nutritional status or influence dietary intake. Those factors include: body composition measurements, vital signs measurements, body fat percentage, visual assessment for clinical signs of nutrient deficiencies, skin evaluation, oral assessment, lung evaluation, and abdominal assessment (Touger-Decker, 2006). The use of physical assessments can help identify wasting and nutrients deficiencies, such as zinc (Hendricks, Willis, Houser & Jones, 2006).

**Medical Nutrition Therapy**

Medical nutrition therapy (MNT) refers to the use of specific nutrition procedures and interventions in the treatment of an illness, injury or condition. Medical nutrition therapy protocols define the level, content, and frequency of nutrition care that is appropriate for the disease or condition (Los Angeles County Commission of HIV Health Services, 2002; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012). Optimizing nutrition status, immunity, and overall well being; preventing the development of specific nutrient deficiencies; preventing loss of weight and lean body mass; maximizing the effectiveness of medical and pharmacological treatments; and minimizing health care costs are the primary goals of medical nutrition therapy (Los Angeles County Commission of HIV Health Services, 2002; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012).

Often, HIV-positive individuals are first exposed to medical nutrition therapy while experiencing an acute medical condition, usually in an inpatient setting. In
addition, many HIV-positive individuals are exposed to nutrition information from sources that are disreputable or uneducated in the field of medical nutrition therapy. Optimally, individuals should receive nutrition counseling by a registered dietitian early in the disease process and follow-up through any complications or infections (Bowers & Doles, 1996; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012).

The minimum intervention of medical nutrition therapy for adults depends on their stage of infection. The minimum therapies are broken down as follows: 1) asymptomatic HIV infection should receive medical nutrition therapy at least one to two times a year; 2) HIV symptomatic but stable, HIV acute, and palliative stage individuals should receive MNT about two to six times a year (Los Angeles County Commission of HIV Health Services, 2002).

Medical nutrition therapy is less costly and invasive than other HIV-treatment interventions and should therefore be routinely employed on a widespread basis (Los Angeles County Commission of HIV Health Services, 2002).

The MNT specific for HIV focuses on total caloric and protein intake. The World Health Organization (WHO) suggests an increase of expected energy expenditure by 10%. During times of opportunistic infections or malabsorption, needs might increase by 20-30% (Ockenga, et al., 2006). Protein requirements are suggested to be higher than that of the general population. It is recommended to increase intake to 1.2 to 1.8 grams per kilogram of body weight a day (Ockenga, et al., 2006; Stack, Bell, Burke, & Forse, 1996).
Benefits of MNT. Establishing guidelines and providing medical nutrition therapy in HIV care will help: prevent malnutrition and opportunistic infections; improve and support quality of life; increase nutrition self-management skills for HIV-positive individuals and their caregivers; decrease the amount of hospitalizations, emergency room visits, morbidity and mortality, and cost of care; decrease or delay invasive or expensive treatments by providing early appropriate nutrition interventions; and improve tolerance and adherence to medications (Los Angeles County Commission of HIV Health Services, 2002; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012; Mahan & Escott-Stump, 2008; Suttajit, 2007; Hu, Jiang, Chen, He, Deng, Wang, Wang, Lu, Klassen & Zeng, 2011; Bowers & Doles, 1996; Salomon, De Truchis & Melchior, 2002; Schwenk, Steuck & Kremer, 1999; Shevitz & Knox, 2001).

Nutrition Intervention

It is evident that HIV infection and progression are closely associated with dietary factors and inappropriate nutritional practices. The most prevalent goal of nutritional intervention in HIV is to maintain or replace lean body mass to improve the quality of life of the individual. Nutrition counseling and intervention can help individuals gain weight in a relatively healthy fashion, if needed (Suttajit, 2007; Ockenga, et al., 2006). In addition, interventions can be aimed to improve adherence and relieve gastrointestinal symptoms (Ockenga, et al., 2006; Stack, Bell, Burke, & Forse, 1996), and is the foundation of any treatment of HIV-wasting (Schwenk, Steuck & Kremer, 1999).

Nutrition interventions need to evaluate the adequacy of energy and nutrient intake, treat symptoms of opportunistic infections, identify conditions that increase
resting energy expenditure, treat side-effects of medicine and disease progression, and correct any acute weight loss. Fat redistribution, dyslipidemia and hyperinsulinemia can occur with highly active antiretroviral therapy (HAART) even in individuals with weight loss and wasting syndrome, which emphasizes the importance of interventions geared towards appropriate carbohydrate, lipid, protein and vitamin intake (Salomon, De Truchis & Melchior, 2002). In addition, weight history and assessment of dietary intake should be evaluated prior to prescribing any nutritional supplement in HIV-positive individuals (Sattler, et al., 2008).

**Current nutrition resources.** There are a variety of nutrition-related resources available for health care practitioners, especially registered dietitians or other nutrition professionals. The Academy of Nutrition and Dietetics (AND) has an Evidence Analysis Library (EAL) and a Nutrition Care Manual (NCM) for their members that highlights important research, treatment strategies, guidelines for treatment, and supplemental handouts for a variety of diseases. There is a specific section on the EAL designated to HIV (Academy of Nutrition and Dietetics, 2013a). Similarly, there is a section of the NCM for HIV (Academy of Nutrition and Dietetics, 2013b). Furthermore, the AND has published a position statement analyzing the treatment of HIV (Fields-Gardner, 2010). Other resources available for health care practitioners that specify nutrition-related concerns for HIV-positive individuals are located on the U.S. Department of Health and Human Services website (2013), and the U.S. Department of Agriculture’s Food and Nutrition Information Center website contains links to additional nutrition-related information (U.S. Department of Agriculture, 2013). The World Health Organization
(2013) provides documents and articles that can be retrieved or ordered from their website.

**Nutrition support.** Nutrition support incorporates the use of nutritional supplements, enteral feedings, or parenteral nutrition to individuals that cannot consume adequate calories and protein. Nutrition support might be vital during critical care situations with significant weight loss—defined as greater than five percent of body weight in three months—or when the body mass index (BMI) is less an 18.5 kilogram per meter squared (Ockenga, et al., 2006). Initial nutrition support interventions should focus on nutritional counseling with or without oral supplementation to increase weight or stop weight loss. If these interventions fail, tube feedings or intravenous nutrition might be required (Ockenga, et al., 2006).

**Protein supplementation.** Oral protein supplementation should be the first defense against malnutrition (Stack, Bell, Burke, & Forse, 1996). Juven is a therapeutic nutrition drink mix with a blend of Revigor—a source of the leucine amino acid metabolite, HMB, arginine, and glutamine (Abbott Nutrition, 2013; Clark, et al., 2000). This product has been shown to help maintain and build lean body mass. Research shows that the combination of HMB, arginine, and glutamine work to alter protein breakdown and protein synthesis rates, which results in protein growth (Clark, et al., 2000). During episodes of wasting—defined as least five percent weight loss in three months—the formula provided additional benefits of an increasing CD4 and CD8 cells and a decreasing viral load (Clark, et al., 2000). In a succeeding study, the same formula increased body mass and fat-free mass in patients with cancer cachexia compared with
controls (May, Barber, D’Olimpio, Hourihane, & Abumrad, 2002). It is important to note that there are similarities with the involuntary weight loss experienced during cancer cachexia and HIV-associated wasting (Clark, et al., 2000).

For weight-stable HIV-positive individuals with controlled HIV, supplemental calories or protein may be unlikely to improve body composition or nutritional status (Sattler, et al., 2008). In addition, those with adequate caloric and protein intake may not experience increases in lean body mass with protein supplementation (Sattler, et al., 2008) unless strength training is involved (Shevitz & Knox, 2001). However, the use of whey protein as a supplement has been shown to significantly increase CD4 count (Sattler, et al., 2008). If oral supplements are deemed necessary, they should be encouraged to be consumed between meals to avoid interfering with intake during meals (Ockenga, et al., 2006).

**Enteral and parenteral nutrition.** A standard tube feeding formula is adequate to meet needs (Ockenga, et al., 2006). It is usually not recommended to use an immune-modulating formula due to conflicting results (Ockenga, et al., 2006). However, individuals tend to benefit from a formula that utilizes medium-chained triglyceride (MCT) oils during episodes of fat malabsorption, diarrhea or severe malnutrition (Ockenga, et al., 2006; Stack, Bell, Burke, & Forse, 1996).

In order to determine the proper route of nutrition support, the clinician should evaluate any other clinical factors that would inhibit one route over the other. Standard criteria can be used to determine this route (Stack, Bell, Burke, & Forse, 1996; Ockenga, et. al., 2006). For example, total parental nutrition should only be used in cases where
enteral feeding is impossible (Ockenga, et al., 2006), or when individuals are experiencing significant diarrhea or malabsorption coupled with episodes of wasting of >10% body weight (Stack, Bell, Burke, & Forse, 1996). It has been shown that outcomes are similar between enteral and parenteral routes (Ockenga, et al., 2006).

Generally, the proper use of nutrition support stops and reverses weight loss. However, most results indicate the gain in weight is adipose and not muscle. Without appropriate physical activity, nutrition support is unlikely to restore loss muscle mass (Ockenga, et al., 2006). If utilized properly, nutrition support should improve patient outcomes (Gasparis & Tassiopoulous, 2001). For example, during the early stages of documented malnutrition when the primary cause is due to anorexia, nutrition support is most effective. However, at later stages of malnutrition, when malabsorption or alterations in metabolism predominate, treatment becomes less responsive to nutrition support (Stack, Bell, Burke, & Forse, 1996).

**Dietary supplementation.** For individuals living with chronic medical conditions, such as HIV, dietary supplements often play a critical role in their lives. The most common non-protein dietary supplements utilized by HIV community are ones suggested to strengthen the immune system, such as mega-dose vitamins and antioxidants (Kalichman, et al., 2012). Kalichman et al. (2012) found that an average of one out of four HIV positive individuals used dietary supplements.

Though some dietary supplements interfere with medications, some supplements may prove to be beneficial during the disease process (Kalichman, et al., 2012). Actually, several randomized clinical trials now suggest that HIV-positive individuals...
who take micronutrient supplements have improved clinical outcomes (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006; Suttajit, 2007; Fawzi, et al., 2004; Hendricks, Willis, Houser & Jones, 2006; Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000). More specifically, micronutrient supplementations have been shown to significantly increase CD4 count (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006; Fawzi, et al., 2004). In addition, supplementation is associated with reductions in disease progression, and may be used as a low-cost intervention to delay initiation of HAART (Fawzi, et al., 2004; (Schwenk, Steuck & Kremer, 1999).

However, there is some controversy about supplementation with high doses of vitamins and antioxidants in HIV individuals, especially vitamin A and zinc (Suttajit, 2007; Forrester & Sztam, 2011). Research into high-dose micronutrients may benefit in the short-term for HIV-positive individuals who are malnourished or underweight (Forrester & Sztam, 2011). In view of the high urinary loss of some nutrients, and questions about what constitutes toxicity, there is a need to redefine ideal dose in the treatment of HIV-positive individuals (Suttajit, 2007). Generally, micronutrient intake at the Recommended Daily Allowance (RDA) remains an acceptable recommendation for this population (Forrester & Sztam, 2011). It is crucial that education occurs that guides the HIV-positive individual in selecting dietary supplements, since there is a lot of misinformation available through the Internet. Kalichman, et al. (2012) revealed that those who used dietary supplements were very likely to believe the information discovered online.
Drug Therapy

The recommended treatment for HIV is HAART. HAART involves taking a regimen of three or more anti-HIV medications from at least two different drug classes. Antiretroviral medications are increasingly formulated with two or more single agents in one pill. The use of only one antiretroviral drug does not suppress viral activity (Mahan & Escott-Stump, 2008). The classes of drugs are grouped according to the mechanism in which they fight the virus. The six drug classes are non-nucleoside reverse transcriptase inhibitors (NNRTIs), nucleoside reverse transcriptase inhibitors (NRTIs), protease inhibitors (PIs), fusion inhibitors, CCR5 antagonists, and integrase inhibitors. HAART works to prevent the virus from multiplying and, as a consequence, destroying CD4 cells. An increase in the individual’s CD4 cells indicates that the treatment is working (U.S. Department of Health and Human Services, 2012e).

Initiation. The initiation of HAART depends on the individuals’ overall health, current and lowest CD4 count, viral load levels, current and past clinical conditions and symptoms, and willingness to adhere to treatment (U.S. Department of Health and Human Services, 2012; Mahan & Escott-Stump, 2008). The initial regimen should be based on resistance testing, predicted virologic suppression, pill burden, drug-nutrient interactions, comorbidities, and patient preference (Thompson, et al., 2010). Generally, once-a-day regimens or fix-dose formulas are preferred as first time users (Thompson, et al., 2010). HAART treatment should be considered if the individuals CD4 count falls below 500 cells per cubic millimeter or has an acquired immunodeficiency syndrome-defining condition, if the disease progression spontaneously increases (identified as a
significant increase in viral load with depression of CD4 levels), if pregnant, has HIV-related kidney disease, and if treatment for hepatitis B virus is needed. The regimen for HIV is a life-long commitment that is often difficult for individuals to follow (U.S. Department of Health and Human Services, 2012e; Thompson, et al., 2010).

**Drug resistance.** HIV mutates rapidly with inadequate blood levels of active retroviral medication. The rapid mutation causes resistance to those drugs. In turn, viral resistance reduces the effectiveness of the medication. A high level of resistance to one class of medication can result in resistance to other drugs of the same class. Increasingly, people with new HIV infection have resistance to at least one class of medications (Mahan & Escott-Stump, 2008). Genotyping is usually performed before initiation of HAART to indicate the strain of HIV for the individual patient, and to identify which medications will or will not be effective (U.S. Department of Health and Human Services, 2012e).

**Drug therapy management.** The management of drug therapy for HIV is currently based on two prognostic markers: the CD4 T cell count and the HIV viral load test. A low T-cell count indicates a compromised immune system while a high viral load is indicative of uncontrolled replication of the virus and is associated with poor prognosis and disease progression (Batterham, Brown, & Garsia, 2001).

**Goals of medical management.** The overall goals of medical management in HIV are to reduce HIV-related morbidity and mortality, improve quality of life, restore and preserve immunological function, and minimize viral replication (Mahan & Escott-Stump, 2008). The most important goal of HIV management is to have a viral load less
than the threshold of detection reported as “undetectable” in the plasma (Batterham, Brown, & Garsia, 2001; Thompson, et al., 2010). In conjunction with medical management, nutritional management aims to assist in optimizing and extending the available therapies, minimizing drug toxicity, and managing side effects (Mahan & Escott-Stump, 2008).

**Drug adherence.** At least a 95% adherence rate to a medication schedule is necessary in order for medications to work correctly, especially to minimize the amount of virus in the body and the likelihood of viral mutations (Mahan & Escott-Stump, 2008; U.S. Department of Health and Human Services, 2012e). Improper adherence from late or missed doses or from food-drug interactions decreases optimal blood levels, which promote viral replications and the development of drug-resistant strains of HIV (Mahan & Escott-Stump, 2008; Chesney, Morin, Sherr, 2000). Drug-resistant strains complicate treatment for the individual and can become a threat to the general population if the resistant strain is transmitted to others (Chesney, Morin, Sherr, 2000). Barriers to medication adherence are: forgetfulness, multiple medications, side effects of medication, worrying that others will notice, being busy, economic barriers, being away from the home, changes or breaks in routines, depression, running out of medication, and being worried about becoming immune to the medication (Mahan & Escott-Stump, 2008; Chesney, Morin, Sherr, 2000). Generally, adherence decreases when side effects become apparent and increase when symptoms are relieved (Chesney, Morin, Sherr, 2000). It is imperative that individuals that initiate HAART are made aware that the leading cause of treatment failure is non-adherence (Chesney, Morin, Sherr, 2000). Adherence can be
easily monitored through evaluation of blood levels of drugs and CD4 or viral load, refill history, and pill counting (Chesney, Morin, Sherr, 2000). Some strategies to change adherence rates are: modifying the schedule, simplifying the regimen, utilizing devices to encourage memory, and referring patients to professionals to help problem-solve (Chesney, Morin, Sherr, 2000).

**Side effects of medical management.** According to Mahan & Escott-Stump (2008), not all individuals tolerate antiretroviral drugs. Life threatening reactions include hepatic necrosis, Steven-Johnson syndrome (rare disorder in which the skin and mucous membrane react severely to a medication causing a rash with blisters that leads to death and shedding of the top layer of the skin), lactic acidosis, and hypersensitivity (Mahan & Escott-Stump, 2008). Serious reactions include pancreatitis, Fanconi syndrome (nephrotoxicity), renal calculi, marrow suppression, and transaminasemia (elevated serum liver enzymes). Other reactions include gastrointestinal intolerance, peripheral neuropathy, rash, insulin resistance, hyperlipidemia, and fat atrophy or hypertrophy (Mahan & Escott-Stump, 2008).

**Antiretroviral Therapy**

**History.** In the beginning of medical therapy, nucleoside analogue reverse transcriptase inhibitors (NRTI) were used. In addition, there were non-nucleoside analogue reverse transcriptase inhibitors (NNRTI). Together, these drugs were known as reverse transcriptase inhibitors. These agents inhibited the reverse transcriptase enzyme used in HIV replication that was responsible for converting HIV’s RNA to DNA (Batterham, Brown, & Garsia, 2001). Eventually, these drugs began to be used in clinical
trials, independently and in combinations. Though the results of the trials showed an increase in CD4 cell count, the high rate of toxicity and the emergence of viral resistance that occurred limited the effectiveness of these agents (Batterham, Brown, & Garsia, 2001). In the mid-1990s, HIV treatment was met with new technology that changed the clinical approach to the disease. During this time, there was a widespread availability of viral load testing and an emergence of a new class of HIV medication called protease inhibitors (PI’s). PI’s inhibit the protease enzyme responsible for producing the matured virus (Batterham, Brown, & Garsia, 2001).

**Development of HAART.** Viral load testing indicated that treatment with dual-nucleoside therapy was not resulting in a long-lasting antiretroviral effects. Controlled clinical trials of combinations containing a PI as one of three initial agents led to the recommendation that the standard therapy regimen should contain three antiretroviral agents: two nucleosides plus a PI, or two nucleosides plus a non-nucleoside reverse transcriptase inhibitor. This remains the generally recommended treatment regimen. The use of a triple combination regimen is referred to as a highly active antiretroviral therapy (HAART). The use of HAART has resulted in a decrease in AIDS-related morbidity and mortality. Despite its potency, viral resistance develops quickly if strict adherence to the regimen is not maintained. Therefore, the initiation of HAART must consist of detailed consideration with patient lifestyle and dietary habits (Batterham, Brown, & Garsia, 2001). Furthermore, triple combination regimens can be associated with a variety of gastrointestinal side effects. Initial reports indicated the use of four or five drug regimens to increase antiretroviral potency, however, each additional agent conveys an additional
burden of pills and potential for drug interactions and side effects (Batterham, Brown, & Garsia, 2001).

**Goals of therapy.** The aim of HAART treatment is to achieve and maintain a viral load that is undetectable in the blood. Successful use of HAART treatment is evaluated with virological and immunological measures. An individual who achieves an undetectable plasma viral load has a longer duration of an antiretroviral effect and an enhanced increase in CD4 cell counts than those with a detectable viral load (Batterham, Brown, & Garsia, 2001).

**Drug Classes**

**Nucleoside reverse transcriptase inhibitors.** Nucleoside reverse transcriptase inhibitors (NRTI) block the enzyme reverse transcriptase by providing faulty versions of the nucleotides used to convert RNA to DNA. When reverse transcriptase uses these faulty nucleotides, the DNA becomes synthesized incorrectly. Therefore, the DNA cannot be incorporated into the host’s genetic material. The FDA approved NRTI’s are: Ziagen, Videx, Videx EC, Emtriva, Coviracil, Epivir, Zerit, Viread, and Retrovir (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e).

**Common side effects.** A number of toxicities of nucleoside reverse transcriptase inhibitor’s (NRTI) have been suggested to cause mitochondrial toxicity. These toxicities become apparent after long-term NRTI use. Depending on the drug, different symptoms may appear. The manifested symptoms include cardiac myopathy, peripheral neuropathy, lactic acidosis, and weight loss. All NRTI drugs have been associated with
the development of lipodystrophy (Salomon, De Truchis, & Melchior, 2002; Smith & Vazquez, 2012). The most serious of these manifestations of mitochondrial toxicity is lactic acidosis. The primary clinical features of lactic acidosis include malaise, weight loss, nausea and dyspnea. Since NRTI-associated lactic acidosis appears to represent hepatic toxicity, other features of hepatic failure may also be present, such as peripheral edema and ascites (Salomon, De Truchis, & Melchior, 2002; Smith & Vazquez, 2012). Unfortunately, there is a lack of preventive strategy against mitochondrial toxicity. Individuals should be made aware of these potential toxicities at regular intervals. In individuals with symptomatic lactic acidosis, the direct management is generally limited to cessation of the responsible NRTI (Salomon, De Truchis, & Melchior, 2002; Smith & Vazquez, 2012).

**Non-nucleoside reverse transcriptase inhibitors.** Non-nucleoside reverse transcriptase inhibitors (NNRTIs) bind to and alter the enzyme reverse transcriptase. This prevents the virus from making copies of itself, by directly interfering with the reverse transcriptase. The U.S. Food and Drug Administration (FDA) has approved the following NNRTI brands: Rescriptor, Sustiva, Intelenne, Viramune, and Edurant (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e; Smith & Vazquez, 2012).

**Common side effects.** NNRTIs commonly cause rash and inflammation. Other side effects include insomnia, diarrhea, nausea, headache, vomiting, and increased liver enzymes (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e; Smith & Vazquez, 2012).
**Protease inhibitors.** Protease inhibitors (PIs) are a class of antiretroviral agents, which inhibit HIV’s enzyme, protease. This is an enzyme necessary for the formation and maturation of infectious virus. PI drugs, when combined with nucleoside analogue reverse transcriptase inhibitors (NRTIs), severely suppress viral replication and prolong life in individuals with HIV infection (Penzak & Chuck, 2000). Individuals demonstrate a significant response to the initiation of PI-based HAART, as CD4 count rises and viral load decreases from pre and post PI use (Wanke, Gerrior, Hendricks, MsNamara & Schaefer, 2005). Despite this profound impact of PIs on the treatment of HIV infection, these drugs have been associated with lipodystrophy, hyperlipidemia, insulin resistance and hyperglycemia (Penzak & Chuck, 2000; Cabrero, Griffa, & Burgos, 2010). The FDA has approved the following PI brands: Reyataz, Prezista, Lexiva, Crixivan, Viracept, Norvir, Invirase, and Aptivus (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e).

**Common side effects.** HAART with PI-containing regimens dramatically improves the long-term survival of individuals with HIV (Shah, Tierney, Adams-Huet, Boonyavarakul, Jacob, Quittner, DInges, Peterson & Garg, 2005). This regimen would be expected to reduce serum triglycerides in HIV-positive individuals secondary to potent suppression of viral replication. However, because PI therapy is associated with elevated total cholesterol and serum triglycerides, these agents have a unique effect on serum lipids, which is independent of their effects on HIV replication (Penzak and Chuck, 2000; Shah et. al., 2005; Wanke, Gerrior, Hendricks, MsNamara & Schaefer, 2005). This effect on lipids causes an increased rate of lipodystrophy, which is estimated to occur in more
than half of individuals receiving PI therapy (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001; Cabrero, Griffa, & Burgos, 2010). In addition, use of PIs is associated with increased insulin production. This is consistent with prior findings of the direct effect of short-term administration of PIs on decreasing insulin sensitivity in HIV-negative healthy volunteers (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001). Protease inhibitor-related lipid disturbances occur shortly after beginning therapy, usually between three and 12 months (Penzak & Chuck, 2000). Usually, evidence of body-shape changes tends to appear well after six months (Wanke, Gerrior, Hendricks, MsNamara & Schaefer, 2005). Similarly, hyperlipidemia, pancreatitis and coronary heart disease have been linked to PI use (Penzak & Chuck, 2000).

**Fusion, or entry, inhibitors.** Fusion inhibitors block the human immunodeficiency virus (HIV) from entering the CD4 cells of the immune system. These inhibitors bind to the receptors of both HIV and CD4 cells. The FDA has approved one brand of fusion inhibitor use: Fuzeon. This inhibitor is administered as an injection and a pill (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e).

**Common side effects.** The common side effects, especially at the injection site, are itching, swelling, redness, pain, hardened skin, and bumps. There can be serious side effects of severe allergic reactions, pneumonia, trouble breathing, fever with vomiting and a skin rash, and blood can appear in the urine (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e; Smith & Vazquez, 2012).
**CCR5 antagonists.** CCR5 antagonists, a type of entry inhibitor, block the protein CCR5 on the CD4 cell that the virus needs to enter the cell. The FDA has approved the use of one CCR5 antagonist brand, Selzentry. The use of the CCR5 antagonist can only be used if the strain of human immunodeficiency virus uses this receptor (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e).

*Common side effects.* CCR5 antagonist use can cause liver and heart complications. Its use may also cause an allergic reaction, jaundice, vomiting, and abdominal pain (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e; Smith & Vazquez, 2012).

**Integrase inhibitors.** Integrase inhibitors block the human immunodeficiency virus enzyme, integrase. Integrase is the enzyme responsible for incorporating the virus’s genetic material with that of the host. The FDA has approved the use of one brand, Isentress (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e).

*Common side effects.* Integrase inhibitors can cause serious side effects of allergic reactions, skin reactions, and liver problems. It’s use may also cause jaundice, nausea, vomiting, loss of appetite, fatigue, muscle or joint aches, blisters in the mouth or on the skin, swelling of the eyes or face, and problems breathing (U.S. Department of Health and Human Services, 2009b; U.S. Department of Health and Human Service, 2012e; Smith & Vazquez, 2012).
Multiclass single-tablet regimens. Advancements in medical management have provided triple-combination regimens that allow for HAART administration with a single pill. The single-use pill has dramatically improved adherence (Chesney, Morin, Sherr, 2000). These medications are Atripla and Complera. Atripla is the combination of a NNRTI, efavirenz, and two NRTIs, emtricitabine and tenofovir (Deeks & Perry, 2010). Complera is the combination of a NNRTI, rilpivirine, and two NRTIs, tenofovir and emtricitabine (Bernardini & Maggiolo, 2013). The side effects of the combination regimen are associated with their respective drug classes (Deeks & Perry, 2010; Bernardini & Maggiolo, 2013).

The Nutritional Complications and Concerns with HIV

Body Composition Changes

There are numerous influences on body composition such as sex, age, race, individual genetic factors, diet, physical activity, hormones, and cultural and economic factors. In addition to these, illness and injury can affect nutritional status and body composition (Kotler, Thea, Heo, Allison, Engelson, Wang, Pierson, St. Louis & Keusch, 1999). This is especially true among individuals with HIV.

Kotler et al. (1999) evaluated the difference between an HIV-positive and HIV-negative group. The HIV-positive group showed lower values for body cell mass, fat free mass, and fat mass than the corresponding, HIV-negative, control groups. When comparing the difference between the groups, body cell mass and fat-free mass were significantly higher in HIV-positive men than in HIV-positive women. However, fat mass and percentage fat remained higher in the HIV-positive women than in the HIV-
positive men (Kotler et al., 1999). It was concluded that height and weight had the strongest influences on body cell mass, fat-free mass, and fat mass. Of all the other variables, sex had the strongest effect, followed by disease, and race. Neither age nor environment was a significant predictor of body composition (Kotler et al., 1999).

**Bone Disease**

Increased bone disease is an important co-morbidity associated with long-term HIV disease and its treatment. The specific mechanisms of these abnormalities are multifactorial. Traditional osteoporosis risk factors, antiretroviral use, and inflammation associated with HIV infection may contribute to low bone density. There are clinical consequences of reduced bone density noted for all populations, which is reflected in an increased risk of fractures (Fitch & Grinspoon, 2011).

**Risk factors.** Risk factors for low bone mineral density, such as tobacco use and low Vitamin D concentrations, are prevalent in the HIV-positive population. Generally, fracture rates appear to increase with age, which suggests that this co-morbidity of HIV may pose the greatest problem in an aging population who live with HIV as a chronic disease (Fitch & Grinspoon, 2011). Additionally, an increased viral load and immune dysfunction from disease progression may contribute to increased bone turnover and reabsorption (Fitch & Grinspoon, 2011). Other, more traditional, mechanisms that relate to bone density include low body weight, vitamin D deficiency, phosphate wasting, low growth hormone, and central fat distribution, all of which may contribute to bone loss (Fitch & Grinspoon, 2011).
One study showed that increased central adiposity is associated with reduced bone density (Huang, Rietschel, Hadigan, Rosenthal & Grinspoon, 2001). In addition, it has been shown that vitamin D concentrations are reduced in HIV-positive individuals. The cause of low vitamin D concentrations in this population is thought to be related to antiretroviral use (Fitch & Grinspoon, 2011; Thompson, et al., 2010).

**Suggested treatment.** The treatment options for HIV-positive individuals with low bone mineral density include optimizing weight, calcium intake and vitamin D status, menstrual and renal functions, and maintaining viral control (Fitch & Grinspoon, 2011). It is also important to evaluate the use of medications that may contribute to bone density, such as steroids. HIV-positive individuals at an increased risk for osteoporosis should avoid the use of any drugs that may interfere with phosphate and calcium metabolism or with proper renal function (Fitch & Grinspoon, 2011). The secondary causes of decreased bone mineral density, such as Vitamin D and calcium deficiency, should be screened for and appropriate treatment given (Fitch & Grinspoon, 2011). Other modifiable risk factors, such as vitamin D deficiency and lack of physical activity, should be evaluated for these individuals, and appropriate treatment included (Fitch & Grinspoon, 2011).

**Cardiovascular Disease**

Cardiovascular disease rate has increased in frequency among individuals with HIV since the use of HAART. This increased rate of cardiovascular disease is multifactorial, but believed to be associated with inflammation. The interactions between HIV infection and traditional risk factors is intensified by the infection, long-term use of
HAART medication, and lifestyle factors such as dietary intake and tobacco use contribute to cardiovascular disease rates (Fitch & Grinspoon, 2011; Thompson, et al., 2010). Between 1998 and 2008, the number of deaths from cardiovascular disease among this population remained relatively stable, while the number of deaths from AIDS, liver disease, and non-AIDS malignancies decreased (Fitch & Grinspoon, 2011).

**Risk factors.** The traditional risk factors for cardiovascular disease have been observed in individuals with HIV, including dyslipidemia, hypertension, and diabetes. Recent studies have shown that cardiovascular disease rates remain increased among HIV-positive individuals (Sattler, et al., 2008), even when these traditional metabolic risk factors are controlled for (Fitch & Grinspoon, 2011). Dyslipidemia, hypertension, and diabetes are traditional risk factors found in individuals with HIV. An increased risk for cardiovascular disease is observed even when traditional metabolic risk factors are controlled for (Fitch & Grinspoon, 2011). In addition to traditional risk factors, HAART medication may contribute to cardiovascular disease in HIV-positive individuals. For each year of HAART use, the relative risk of myocardial infarction increased 16%, and PI as a class, but not nucleoside reverse transcription inhibitors (NRTI), have been associated with increased myocardial infarction rates (Fitch & Grinspoon, 2011). Similarly, the duration of HIV disease has been associated with increased arterial plaque (Fitch & Grinspoon, 2011; Sattler, et al., 2008). Likewise, uncontrolled viral infection can contribute to cardiovascular risk (Thompson, et al., 2010).

Smoking is a highly prevalent modifiable risk factor in HIV-positive individuals, which contributes to the cardiovascular disease rate (Fitch & Grinspoon, 2011). In
addition to traditional cardiovascular disease risk factors and antiretroviral use, body composition abnormalities, including increased visceral adiposity and reduced subcutaneous fat, may be associated with myocardial infarction risk (Fitch & Grinspoon, 2011). These modifiable risk factors should be aggressively intervened upon for all HIV-positive individuals (Thompson, et al., 2010).

**Suggested treatment.** Lifestyle factors of dietary intake patterns, physical activity levels, and smoking cessation are critical to evaluate and intervene to reduce risk of cardiovascular disease in this population (Fitch & Grinspoon, 2011). Smoking cessation and weight reduction for obesity are important to decrease risk of this co-morbidity (Salomon, De Truchis & Melchior, 2002; Wanke, Gerrior, Hendricks, McNamara & Schaefer, 2005). The use of a HAART regimen that is least likely to contribute to metabolic abnormalities is important to consider (Fitch & Grinspoon, 2011). Lipid lowering and lifestyle management programs aimed to adjust metabolic abnormalities should be utilized for individuals with a high risk for cardiovascular disease (Fitch & Grinspoon, 2011). There is room for dietary education to promote general and cardiovascular health in this population, and to minimize effects of the drug therapy on cardiovascular risk factors (Wanke, Gerrior, Hendricks, McNamara & Schaefer, 2005).

**Dyslipidemia**

HIV-positive individuals that are on HAART are at risk to develop dyslipidemia (Lazzaretti, Kuhmmer, Sprinz, Polanczyk & Ribeiro 2011; Salomon, De Truchis & Melchior, 2002). Several factors influence the development of HAART-associated
dyslipidemia. Environmental and genetic factors, use of antiretroviral medication, and
the progression of the virus all play a role in the development of dyslipidemia (Lazzaretti,
Kuhmmer, Sprinz, Polanczyk & Ribeiro, 2011). Interestingly, abnormalities of lipid
metabolism were reported in association with elevations in serum triglycerides even
before the use of PIs for therapy among HIV-positive individuals (Salomon, De Truchis
& Melchior, 2002).

Risk factors. Modifiable lifestyle factors such as diet, physical activity and
smoking contribute significantly to dyslipidemia even in HIV-negative (Shah, Tierney,
Adams-Huet, Boonyavarakul, Jacob, Quittner, Dinges, Peterson & Garg, 2005). HIV-
positive individuals on PIs have a high risk for developing lipodystrophy, which includes
dyslipidemia. This may increase their risk for cardiovascular disease (Shah et. al., 2005).
More specifically, the two main contributors to dyslipidemia that increase the risk of
coronary heart disease in HIV-positive individuals on HAART are an elevated total
cholesterol level and a reduced HDL level (Shah et. al., 2005). Elevated triglyceride
levels also represent an independent risk factor even when the values are only moderately
elevated. The high incidences of low HDL levels in individuals with HIV deserve
clinical attention (Salomon, De Truchis & Melchior, 2002). Other factors that may have
contributed to the development of the abnormal lipid levels include genetic factors or
family history, inactivity, or the direct impact of the PIs on the metabolism of lipids
(Wanke, Gerrior, Hendricks, McNamara & Schaefer, 2005).

Suggested treatment. It is important to assess the lipid profiles of these
individuals regularly, especially those on PIs. Shah et. al. (2005) found that lipid
screening rates are suboptimal in this population, and only six in 10 individuals receive lipid screening within six months of initiation of PI use. In addition, dyslipidemia is more prevalent among individuals with intravenous drug use, those with unknown HIV risk exposure, and those cared for in non-urban areas (Shah et. al., 2005). Management of dyslipidemia should be directed towards abnormalities of HDL, LDL, and triglyceride levels (Salomon, De Truchis & Melchior, 2002).

**Resting Energy Expenditure**

Resting energy expenditure (REE) is the amount of kilocalories used for basic bodily functions, such as respiration and cardiovascular functioning. REE has commonly been found to be elevated in those with HIV (Mangili, Murman, Zampini & Wanke, 2006; Shevitz and Knox, 2001, Batterham, Morgan-Jones, Greenop, Garsia, Gold & Caterson, 2003; Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012; Mittelsteadt, Hileman, Harris, Payne, Gripshover, & McComsey, 2013). The exact mechanism is unknown, but it is believed to be from an increased viral load expression, opportunistic infections, the use HAART to suppress the virus, or from a heightened immune and inflammation response (Mangili, et al., 2006; Shevitz and Knox, 2001; Batterham, et al., 2003; Berneis, et al., 2000; Ross, et al., 2012; Mittelsteadt, et al, 2013).

Anorexia and nausea are associated with active virus replication and chronic medication use. In turn, these complications intensify each other. In combination with elevated rested energy expenditure, anorexia and nausea add to the increasing energy deficit (Shevitz & Knox, 2001). Other factors that influence energy intake are poor oral
dentition, malabsorption, and inadequate food accessibility or knowledge (Sheivitz & Knox, 2001; Rosset et al., 2012).

Equations for estimating energy requirements already utilized in clinical practice, such as the Harris-Benedict and Mifflin-St Jeor, may or may not be appropriate to estimate energy needs for individuals with HIV. It was found that the existing published prediction equations underestimated resting energy expenditure in HIV-positive men in the HAART era (Batterham, et al., 2013). However, recent studies have identified the use of these equations to accurately predict needs (Mittelsteadt, Hileman, Harris, Payne, Gripshover, & McComsey, 2013).

**Food Safety**

HIV-positive individuals have a great need for nutrition education as well as instruction in food and water safety, because they are at higher risk for food and water-borne illnesses (Los Angeles County Commission of HIV Health Services, 2002). Since individuals with HIV have a weakened immune system, they are highly susceptible to food-borne illnesses. The decreased immune function provides a setting for harmful infectious microorganisms such as E. coli, salmonella, and clostridium (Suttajit, 2007). Dietary interventions should include food safety education (Stack, Bell, Burke, & Forse, 1996).

**Insulin Resistance**

HIV-positive individuals receiving HAART therapy have had multiple reports describing insulin and carbohydrate metabolism abnormalities. In fact, cross-sectional studies strongly implicate PI therapy as a primary cause of insulin resistance in HIV-
positive individuals (Salomon, De Truchis & Melchior, 2002). It was reported that HIV-positive individuals receiving PI therapy have a 30-90% increased incidence of insulin resistance (Salomon, De Truchis & Melchior, 2002).

Among the general population, insulin resistance is associated with an increased risk of glucose intolerance and diabetes mellitus (Hendricks, Willis, Houser & Jones, 2006; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012), which poses an additional concern for individuals with HIV. In addition, insulin resistance increases the risk of arteriosclerosis and is associated with a dyslipidemia. Insulin resistance influences arteriosclerosis and dyslipidemia by decreasing lipoprotein lipase activity, increasing triglyceride levels, decreasing high-density lipoprotein (HDL) levels, and increasing the risk of abnormal fat metabolism (Salomon, De Truchis & Melchior, 2002).

According to Handigan, Jeste, Anderson, Tsay, Cyr, and Grinspoon (2001), certain modifiable dietary components—such as polyunsaturated fats, fiber (Gavrila, Tsiodras, Doweiko, Nagy, Brodovicz, Hsu, Karchmer & Mantzoros, 2003), and alcohol are strongly associated with insulin resistance and hyperlipidemia among HIV individuals. This was found to be independent of age, sex, PI use, and body fat distribution of the individuals (Handigan, Jeste, Anderson, Tsay, Cyr, & Grinspoon (2001).

**Lipodystrophy Syndrome**

Initially, the lipodystrophy syndrome was referred to as “fat redistribution” described as a syndrome of peripheral fat atrophy, central adiposity, hyperlipidemia, and insulin resistance (Shevitz & Knox 2001; Cabrero, Griffa, & Burgos, 2010).
Lipodystrophy is defined as peripheral subcutaneous fat wasting and visceral adiposity (Batterham, Morgan-Jones, Greenop, Garsia, Gold & Caterson, 2003; Cabrero, Griffa, & Burgos, 2010) accompanied by hyperlipidemia and insulin resistance (Shevitz & Knox, 2001; Cabrero, Griffa, & Burgos, 2010). The use of HAART has been associated with this syndrome of body composition abnormalities (Batterham, Morgan-Jones, Greenop, Garsia, Gold & Caterson, 2003). Since lipodystrophy is associated with metabolic complications such as dyslipidemia and insulin resistance, there is an increased risk of morbidity in the long-term (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001; Shah, Tierney, Adams-Huet, Boonyavarakul, Jacob, Quittner, Dingess, Peterson & Garg, 2005; Batterham, Morgan-Jones, Greenop, Garsia, Gold & Caterson, 2003).

Cardiovascular disease, diabetes mellitus, and stroke are increasingly prevalent in this population (Shevitz & Knox, 2001).

Individuals with lipodystrophy syndrome experience fat redistribution of peripheral body fat from the arms, legs, face, and buttocks along with increased abdomen adiposity of the trunk, chest, breasts, and neck. Alongside the fat redistribution, there is a significant metabolic disturbance of hyperinsulinemia, dyslipidemia, and impaired glucose tolerance (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001; Shah et. al., 2005; Cabrero, Griffa, & Burgos, 2010; Shevtiz & Knox, 2001). Exposure to PIs and, more recently, nucleoside reverse transcriptase inhibitors (NRTI) has been implicated in the etiology of this syndrome (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001; Salamon, De Truchis & Melchior, 2002; Shevitz & Knox, 2001; Cabrero, Griffa, &
Burgos, 2010). Lipodystrophy associated with NRTI has additional complications that associate its use with liver dysfunction (Shevitz & Knox 2001).

Other consequences of fat redistribution are HIV-positive individuals have significantly higher waist-to-hip ratio, lower extremity fat and higher trunk adiposity than HIV-negative individuals. (Hadigan, Jeste, Anderson, Tsay, Cyr & Grinspoon, 2001). It is evident in clinical practices that these body composition changes associated with lipodystrophy have a devastating effect on self-esteem, psychosocial functioning, and quality of life of individuals developing this syndrome (Shevitz & Knox 2001; Cabrero, Griffa, & Burgos, 2010). It is reasonable to suggest that early intervention and prevention of this syndrome would be the best action before the syndrome becomes clinically apparent (Cabrero, Griffa, & Burgos, 2010).

**Malnutrition**

Malnutrition is one of the major complications of HIV infection, and it has been recognized synergistically with wasting syndrome as a significant prognostic factor in advancing through stages of the disease (Salamon, De Truchis & Melchior, 2002; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012). Even though malnutrition is frequently found at the end stages of the disease process, it has also been found at the beginning of the infection process (Salamon, De Truchis & Melchior, 2002) and continues throughout disease advancement (Suttajit, 2007).

Malnutrition is recognized to impair host defense mechanisms against infections, to diminish physical mobility, to impair healing mechanisms, and to impair quality of life in individuals (Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000; Ross,
Malnutrition affects the length of survival time through a number of mechanisms including compromising host immune function, causing organ damage, and lessening the response to therapies (Salamon, De Truchis & Melchior, 2002). Malnutrition has been proposed to act as a co-factor of immune dysfunction by influencing both susceptibility to HIV infection and progression of disease (Los Angeles County Commission of HIV Health Services, 2002). Malnutrition may be in part a direct consequence of HIV infection itself, digestive side effects of drugs, and secondary events of the disease (Salamon, De Truchis & Melchior, 2002).

HIV infection also affects the nutritional status (Suttajit, 2007), which influences the risk of malnutrition (Ross, Caballero, Cousins, Tucker, & Ziegler, 2012). Salamon, De Truchis, and Melchior (2002) found that nutritional status was a significant predictor of survival rate in adults with HIV after adjusting for CD4 count and history of opportunistic infections.

**Risk factors.** The development of malnutrition is multi-factorial (Gasparis & Tassiopoulous, 2001). The main risk factors associated with malnutrition are decreased caloric intake, increased resting energy expenditure, chronic diarrhea, malabsorption, and opportunistic infections (Ross, Caballero, Cousins, Tucker, & Ziegler, 2012; Gasparis & Tassiopoulous, 2001; Salamon, De Truchis & Melchior, 2002). Those with HIV commonly face problems of inadequate intake and weight loss. Often this is due to nutritionally compromising conditions such as nausea, diarrhea, anorexia, fatigue, and difficulty chewing and swallowing (Los Angeles County Commission of HIV Health
Similarly, malabsorption of nutrients, elevated energy expenditure, and episodes of opportunistic infections contribute to malnutrition in these individuals.

**Prevention.** Malnutrition should be detected early in order to improve the ability to respond to therapies; in addition to, increasing survival and quality of life. (Suttajit, 2007). In order to reduce the prevalence of malnutrition, individuals with HIV infection should receive nutrition screenings. Those at a high risk of malnutrition should have a nutrition care plan put in place. These include evaluating estimated energy and protein requirements; a nutrition prescription for any food, supplements, parenteral or enteral nutrition, if appropriate; and a plan for monitoring (Hu, Jiang, Chen, He, Deng, Wang, Wang, Lu, Klassen & Zeng, 2011).

Oral nutritional supplementation combined with dietary counseling have been demonstrated to diminish whole body protein catabolism and increase lean body mass in HIV-positive subjects with modest to moderate malnutrition (Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000). In clinically severe situations, enteral nutrition as well as parenteral nutrition has been demonstrated to increase life expectancy and quality of life in severe malnourished and immunodepressed individuals (Salamon, De Truchis & Melchior, 2002).

**Micronutrients and Immune Function**

Numerous studies have reported a high prevalence of nutrient deficiencies early in the course of HIV (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006; Hendricks, Willis, Houser & Jones, 2006). Levels of serum antioxidant vitamin and minerals fall while oxidative stress increase during HIV disease progression (Suttajit, 2007). Whether
HIV-positive individuals are asymptomatic or at an advanced stage, a decreased level of antioxidant vitamins—like vitamin A, beta-carotene, and vitamin E—are found (Suttajit, 2007; Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006). Likewise, deficiencies of folate, vitamin B₁₂, calcium, iron, and zinc are also common in this population (Hendricks, Willis, Houser & Jones, 2006). These deficiencies have been shown to be associated with more frequent opportunistic infections, faster disease progression, and a greater incidence of HIV-related mortality (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006).

The possible mechanisms include increased intracellular oxidative stress, enhanced viral replication, and a reduction in the number of circulating CD4 lymphocytes associated with individual or accumulated nutrient deficiencies. These mechanisms, alone or in part, may contribute to the increased morbidity, more rapid disease progression, and the higher mortality seen in HIV-positive individuals with nutrient deficiencies (Kaiser, Campa, Ondercin, Leoung, Pless & Baum, 2006).

**Obesity**

The use of antiretroviral drug therapy has lead to subsequent improved life expectancy. As a consequence, HIV has become a chronic disease with long-term complications related to diet. Consequently, overweight and obesity trends gained new importance (Hendricks, Willis, Houser & Jones, 2006). A positive correlation has been determined between an individual’s body mass index (BMI) and total cholesterol, triglycerides, and glucose (Hendricks, Willis, Houser & Jones, 2006). As mentioned
previously, these correlations are associated with HIV disease progression and medical management.

Obesity is strongly associated with several major health risk factors and it has been well documented that obesity among the general population is associated with health complications such as cardiovascular disease, diabetes, some cancers, and increased mortality (Shevitz & Knox, 2001; Hendricks, Willis, Houser & Jones, 2006). For individuals with HIV, these complications become increasingly important concerns during disease treatment. More recently, in a large cohort (n =1669) of individuals living with HIV infection, it was reported that obesity and overweight was more prevalent than wasting. The prevalence of overweight was 30% for men and 31% for women (Hendricks, Willis, Houser & Jones, 2006).

The lipid abnormalities that occur during HAART treatment may signify an increased risk for cardiovascular disease. It is possible that chronic presence of these risk factors will lead to additional diseases during long-term management of HIV. The relationship between obesity, insulin resistance, metabolic syndrome and type 2 diabetes is long recognized in the general population. With the rise of obesity in HIV-positive populations, the prevalence of metabolic syndrome may be expected to increase, and clinical management of such conditions in HIV-positive individuals may become imperative (Hendricks, Willis, Houser & Jones, 2006).

As weight loss is a documented predictor of decreased survival, the role of intentional weight loss in overweight and obese HIV-positive individuals needs careful study (Hendricks, Willis, Houser & Jones, 2006). However, some studies have suggested
that body fat may slow the progression of HIV and actually protect lean body mass (Shevitz & Knox, 2001).

**Opportunistic Infections**

Opportunistic infections are rightly named so because they take the opportunity to cause destructive illnesses in individuals with a weakened immune system—such as individuals with HIV. Individuals with healthy immune systems can be exposed to difference bacteria, viruses, and parasites and have no reaction to these. However, for those living with HIV or AIDS, these can cause life-threatening conditions. Opportunistic infections are a sign of a declining immune system, and most threatening opportunistic infections occur when the CD4 count is below 200 cells per cubic millimeter (U.S. Department of Health and Human Services, 2010). Nutritionally, they may cause diarrhea, malabsorption, fever, and weight loss, as well as many other symptoms (Mahan & Escott-Stump, 2008). Opportunistic infections may interfere with metabolism, causing nutrients to be wasted and increased incidences of weight loss (Stack, Bell, Burke, & Forse, 1996). These infections are the most common cause of death for people with HIV or AIDS (U.S. Department of Health and Human Services, 2010).

The Centers for Disease Control and Prevention (CDC) has developed a list of over 20 opportunistic infections that are considered AIDS-defining conditions. If an individual with HIV would contract one of these infections, they would become diagnosed with AIDS regardless of the individual’s current CD4 count (U.S Department of Health and Human Services, 2010). These AIDS-defining conditions named by the
CDC are as follows: *Candidiasis* of bronchi, trachea, esophagus, or lungs; *invasive cervical cancer*; *Coccidioidomycosis*; *Cryptococcosis*; *Cryptosporidiosis*; *Cytomegalovirus disease*; *Encephalopathy*; *Herpes simplex*; *Histoplasmosis*; *Isosporiasis*; *Kaposi's sarcoma*; *Lymphoma*; *Mycobacterium avium complex*; *Tuberculosis*; *Pneumocystis carinii pneumonia*; recurrent *Pneumonia*; *Progressive multifocal leukoencephalopathy*; recurrent *Salmonella septicemia*; *Toxoplasmosis* of brain; and *Wasting syndrome* due to HIV (U.S. Department of Health and Human Services, 2010).

**Exercise**

Generally, exercise as a treatment option has been overlooked. Research indicates that exercise is beneficial for individuals, and even extreme exercise does not raise viral load levels (Shevitz & Knox, 2001). Across the HIV-positive population, there’s a significant independent negative association between fasting triglyceride levels and habitual aerobic or combined aerobic and resistance training, which suggests there is a negative relationship between exercise and insulin resistance (Gavrila, Tsiodras, Doweiko, Nagy, Brodovicz, Hsu, Karchmer & Mantzoros, 2003). The effect of exercise on triglyceride levels is possibly due to the increased lipoprotein lipase, which stimulates the release of free fatty acids from plasma lipoproteins (Gavrila et. al., 2003). In addition, Garila et. al. (2003) found that the inverse association between exercise and fasting triglycerides is independent of lean body mass.

Strength training should be utilized both in wasting and non-wasting individuals. For individuals without wasting, strength training increases lean body mass in exchange for fat mass, with no net change in weight, if energy balance is maintained. For
individuals with wasting, strength-training increases lean body mass and overall weight when combined with adequate dietary intake (Shevitz & Knox, 2001). Aerobic exercise promotes energy expenditure, which is beneficial for those with excess weight. Aerobic exercise may also provide other benefits, including improvement in cardiovascular fitness, increased uptake of glucose, and normalized levels of high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol. These benefits are likely to improve health of HIV-positive individuals who have central adiposity, dyslipidemias, or insulin resistance (Shevitz & Knox, 2001).

HIV-related abdominal adiposity has benefited from a combination of aerobic exercise and strength training to reduce trunk fat (Shevitz & Knox, 2001). As one might expect, individuals with a higher body mass index (BMI) are less likely to participate in strength training (Hendricks, Willis, Houser & Jones, 2006).

**Quality of Life**

The World Health Organization (WHO) defines quality of life as an individual’s perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. This definition reflects the view that quality of life refers to a subjective evaluation. Quality of life is embedded in culture, and it takes into consideration numerous domains. These domains consider the health and general well-being, care practices, symptoms and treatment for the individual. More specifically, these domains evaluate the physical, functional, psychological, social, economic, political and spiritual well being of the HIV-positive individual (Rai, Dutta & Gulati, 2010).
Quality of life is an important component to evaluate and improve patient’s well-being following HIV diagnosis (Rai, Dutta & Gulati, 2010). Improving quality of life is a major goal in treating individuals with HIV, so it is important to identify which domain of individual’s life is most affected by the disease (Rai, Dutta & Gulati, 2010). HIV takes a toll on the individual’s quality of life, which is impacted by the disease progression, social impact, emotional consequence, related stigma, and economic burden (Rai, Dutta & Gulati, 2010).

It is well documented that the physical health of HIV-positive individuals declines across the clinical stages of HIV infection. AIDS and symptomatic HIV-positive individuals have reported poor quality of life compare to asymptomatic individuals (Rai, Dutta & Gulati, 2010). This calls for more attention and care with respect to physical, psychological, level of independence, environment, social relations, and spiritual aspects of life (Rai, Dutta & Gulati, 2010).

**Wasting**

Early in the HIV epidemic, wasting was a unique characteristic of HIV infection. Wasting remains to be a significant clinical concern even with the utilization of HAART (Salomon, De Truchis & Melchior, 2002). Episodes of wasting are seen often in those who have not been treated or in those whose treatment has failed (Ockenga, et al., 2006). HIV wasting syndrome is defined by a loss of body weight of more than 10% of the usual body weight (Salomon, De Truchis & Melchior, 2002; Batterham, Brown, & Garsia, 2001; Ockenga, et al., 2006). Wasting is associated with chronic diarrhea along with or without chronic fever (Salomon, De Truchis & Melchior, 2002; Batterham, Brown, &
Garsia, 2001). The Centers for Disease Control and Prevention (CDC) included HIV-associated wasting as an AIDS-defining condition (Ross, Caballero, Cousins, Tucker, & Ziegler, 2012). The CDC defined wasting as an involuntary weight loss of more than 10% of baseline body weight (Ross, Caballero, Cousins, Tucker, & Ziegler, 2012) plus either diarrhea, fever, or weakness for more than 30 days in the absence of a concurrent illness. Because HIV-associated wasting and weight loss can occur without diarrhea, fever, or weakness, it may be argued that unintentional weight loss in the absence of fever or diarrhea is more troubling (Mangili, Murman, Zampini & Wanke, 2006).

Episodes of weight loss have been reported to be independent of the level of immune depression during the course of HIV disease (Salomon, De Truchis & Melchior, 2002). Even small weight losses of three or five percent are clinically significant, and are associated with increased morbidity and mortality (Batterham, Brown, & Garsia, 2001; Macallan, 1999). An increase in viral replication causes an elevation in resting energy expenditure contributing to the risk of wasting (Macallan, 1999). Likewise, weight loss has been associated with lower CD4 cell counts, and is an independent predictor of mortality (Mangili, Murman, Zampini & Wanke, 2006).

The etiology of HIV-associated wasting is multi-factorial, and causes may include socioeconomic status, access to care, cultural practices, psychological factors, and medical complications of and therapies for HIV disease (Mangili, Murman, Zampini & Wanke, 2006). Wasting, especially loss of lean tissue, has been associated with increased mortality, accelerated disease progression, and impairment of strength and functional status in individuals with HIV infection (Salomon, De Truchis & Melchior, 2002). It is
important to identify any early risk factors for wasting in HIV-positive individuals and to monitor wasting with a consistent set of strategies for diagnosis, assessment, and interventions (Salomon, De Truchis & Melchior, 2002). The most common risk factors that contribute to wasting are inadequate intake, malabsorptive disorders, metabolic alterations, and opportunistic infections (Salomon, De Truchis & Melchior, 2002; Mangili, Murman, Zampini & Wanke, 2006; Karlsson & Nordstrom, 2001).

Since individuals are seen at varying stages of HIV disease, baseline values may be less meaningful. (Mangili, Murman, Zampini & Wanke, 2006). Weight loss in HIV infection features depletion of both lean and fat tissues. It is the lean compartment that is an independent predictive factor of survival (Salomon, De Truchis & Melchior, 2002).

Therefore, wasting should be evaluated on three different terms: significant weight loss of greater than 10% since the last assessment; a body mass index (BMI) under 20, since it is indicative of progressive and advanced wasting; or a rapid rate of weight loss of 15% in six months. The inclusion of these three definitions may better capture medically important weight loss and provide clinical reference points (Mangili, Murman, Zampini & Wanke, 2006). Although the CDC case definition of wasting as an AIDS defining event requires a net weight loss of at least 10%, a weight loss of as little as 5% has been associated with increased mortality and morbidity (Salomon, De Truchis & Melchior, 2002; Sattler, et al., 2008).

**Suggested treatment.** The significant impact of wasting on survival, disease progression, and functional status highlights the need to prevent muscle wasting and weight loss in HIV-positive individuals. Education about appropriate nutritional
practices, exercise and the importance of maintaining energy balance should be emphasized (Salomon, De Truchis & Melchior, 2002). Improved prognosis and treatment of HIV leaves nutritional complications to play a primary role in the lives of individuals.

Careful monitoring of weights and nutrition-related side effects of infection and medication are imperative (Shevitz & Knox, 2001). Nutritional counseling is widely regarded as the basis of any treatment of HIV wasting. Oral supplements are often used in clinical practice as a low-cost intervention (Schwenk, Steuck & Kremer, 1999).

**Weight Maintenance**

Nutrient deficiencies can independently impair immune function and negatively impact the progression from HIV to AIDS and from AIDS to death. When weight falls to 66% of ideal body weight or body cell mass falls to 54% of normal, death becomes inevitable. Researchers have found that as little as a 5% weight loss over a four-month period is associated with increased risk of death and opportunistic complications in HIV (Los Angeles County Commission of HIV Health Services, 2002).

Nutritional counseling and support, appetite stimulants, and anabolic hormones can reverse weight loss and increase lean body mass in HIV-positive individuals (Salomon, De Truchis & Melchior, 2002). Initial reports about the effects of the introduction of PIs on weight and body composition suggested that, although weight gain occurred for the majority of people with HIV or AIDS commencing HAART, the composition of the gain was primarily fat mass. The increases in fat mass have been shown to correlate with increases in CD4 count and decreases in viral load (Batterham, Brown and Garsia, 2001).
There has been a relationship between weight, fat free mass, and viral load in the literature (Batterham, Brown, and Garsia, 2001). More specifically, it is found that increases in weight and fat free mass correlate with a decrease in viral load (Batterham, Brown, and Garsia, 2001). Similarly, it has been found that weight loss that occurs with suboptimal therapy fails to decrease viral load (Batterham, Brown, and Garsia, 2001).
CHAPTER III

METHODOLOGY

The purpose of this study was to assess nutrition education received by HIV patients, and the relationship of nutrition education received and HIV patients’ quality of life and nutrition related symptomologies. The investigation was a post-test only, quantitative, non-experimental, comparative and descriptive survey study. The Institutional Review Board at Kent State University approved this study.

Subject Selection

The subjects for this research included diagnosed HIV-positive males and HIV-positive, non-pregnant females. Participation was on a voluntary basis. Recruitment occurred through health care practitioners, support groups, and centers specializing in HIV. Therefore, the HIV statuses of participants were confirmed through completion of the questionnaire due to multiple questions being HIV specific. The sites that were contacted for distribution of the surveys to participants included: Summa Health Center in Akron, Ohio; the AIDS Resource Centers of Ohio; Metro Health in Cleveland, Ohio; Violets Cupboard in Akron, Ohio; the Community AIDS Network in Akron, Ohio; University Hospitals in Cleveland Heights, Ohio; the Columbus AIDS Taskforce; and the AIDS Taskforce of Greater Cleveland. Those sites who agreed to participate were: Summa Health Center in Akron, Ohio; Metro Health in Cleveland, Ohio; and the AIDS Taskforce of Greater Cleveland. Participants who reported an AIDS status, defined as a CD4 count less than 200 cells/mm$^3$, were excluded from the study.
Participants were categorized as asymptomatic or symptomatic based on their responses to the signs and symptoms checklist (Part IV). Additional categorization into pharmacological state of participants was concluded by their use of antiretroviral drug therapy, which was based on self-reported data (Question 9). However, two out of the three original hypotheses had to be altered due to the inability to subcategorize the participants in large enough groupings. The initial aim was to classify participants into two different groupings of antiretroviral therapy patients versus non-antiretroviral therapy patients and asymptomatic patients versus symptomatic patients. Once data was collected, only a small portion of participants fell into the asymptomatic categorization (n=8) or non-antiretroviral therapy grouping (n=4). Therefore, the hypotheses had to be adjusted to remove participant groupings so that analyses could be completed. The two new hypotheses developed were: there will be an association between the perception of quality of life and symptomology present among individuals with HIV (hypothesis 2), and there will be a relationship established between nutrition information provided and nutrition information desired by individuals with HIV (hypothesis 3).

Survey Development

The paper-based survey was developed in four parts. It takes participants about 10-15 minutes to complete, and the reading level of the survey is approximately the 6th grade level (Appendix D).

Part I: Participant Characteristics

This section includes basic demographic information, for example gender, age, height, weight, medication use, CD4 and viral load ranges. It continues with questions
inquiring for HIV-related and nutrition-related lab values, such as CD4, viral load, triglyceride levels, high-density and low-density lipoprotein, cholesterol levels, body fat percentage, blood sugar, and blood pressure. This section was developed by the researchers in order to get a broad overview of the participants, and assess the awareness of their disease and nutrition-related factors (Appendix D).

**Part II: Quality of Life**

Part II assesses quality of life by evaluating how the subjects have been feeling in the past month. The instrument used for this study was adapted from a previously validated survey developed by Holmes and Shea (1998). The HIV/AIDS-Targeted Quality of Life (HAT-QoL) quantifies the participant’s quality of life through a series of questions that the participant marks how closely they agree with the statement.

Permission for use in this thesis was granted by the Copyright Clearance Center for the use of the HAT-QoL (Appendix D).

**Part III: Nutritional Information**

This section assessed the nutritional information related to HIV that patients may have received from healthcare professionals. In addition, it included the nutrition topics that patients may like to know relating to their disease and medication. This section was created by the researcher with the objective of identifying the current topics covered for nutrition education. Participants were asked to check either “discussed” or “not discussed,” and then mark if they would like to discuss the topic by selecting the “want to” column that corresponded with that topic (Appendix D).
Part IV: Signs and Symptoms Checklist

Part IV evaluates symptomology by assessing if the subject is experiencing any problems the day of data collection. The instrument used was adapted from a validated survey (Holzemer, Hudson, Kirskey, Hamilton, & Bakken, 2001). The Revised Sign and Symptoms Check-List for HIV (SSC-HIVrev) allows the participant to state whether they are currently experiencing a symptom and to rate the intensity. The SSC-HIVrev may be used by clinicians and researchers, and does not require a copyright release (Appendix D).

Data Collection

The data was collected through quantitative, self-report, anonymous surveys from June through October 2013. The data was collected through the HIV clinic at Summa Health System, through a variety of support groups at Metro Health Medical Center, and through the HIV center of the AIDS Taskforce of Greater Cleveland. The researcher introduced the surveys to a variety of HIV-support groups at Metro Health Medical Center and to patrons who visited the AIDS Taskforce of Greater Cleveland. Health care practitioners in the Infectious Disease department at Summa Health System administered the survey. In addition, surveys were placed on a table in the Care Center for respondents to complete on their own will without being prompt or introduced by a health care practitioner or researcher. All completed surveys were placed in a sealed envelope and returned to the researcher and stored in a locked office at Kent State University. The verbal script was used during the introduction of the survey (Appendix B). All
participants were given the documental consent (Appendix C) to take with them at the same time they received the survey.

**Statistical analysis**

**Descriptive Statistics**

Statistical analysis was conducting using SPSS 13.0. Frequencies, means, and standard deviations were used to analyze the descriptive data and participant characteristics.

**Analysis of Hypothesis I**

A four-point Likert scale was used to quantify the quality of life section (Part II). “A lot of the time” response scored a four, while a “none of the time” scored a one. Quality of Life questions (Part II; Appendix D) were calculated for a sum score for each participant. The lowest possible quality of life score was 15, and the highest was 60. The higher the quality of life sum score, the poorer the quality of life. Five of the questions (“I have been satisfied with my physical activity,” “I’ve been able to accept the fact that I have HIV,” “I’ve felt as if my health care provider was someone who listens to me,” “I’ve felt confident in my health care providers ability to care for people with HIV” and “I’ve felt certain that my health care provider has my best interest in mind” were scored in reverse due to the nature of the question, because an “a lot of the time” response would not worsen quality of life.

A Pearson’s correlation coefficient was calculated to assess the relationship between the quality of life sum scores (Part II) and the symptomology scores (Part IV), as
well as the relationship between the nutrition topics discussed and the topics desired to be discussed (Part III). A p-value of \( p \leq 0.05 \) was selected a-priori for all analyses.

**Analysis of Hypothesis II**

The nutrition information (Part III; Appendix D) was evaluated by summing each category of “discussed,” “not discussed,” and “want to discuss” for each of the 30 nutrition education topics. In addition, each participant returned a sum score for the total number of nutrition topics that participant discussed and wanted to discuss. Each category and participant was evaluated using frequencies, and was input into a regression analysis.

Another four-point Likert scale was used to evaluate the intensity of symptomology using the signs and symptoms checklist (Part IV; Appendix D). A “severe” response scored a four, while a “not experiencing” scored a one. A sum score was then computed for each participant. The lowest potential score was 21, and the highest was 84. The participants who scored a 21 were classified as asymptomatic, since all responses were “not experiencing.” Participants who score anything above a 21 were classified as symptomatic.

A regression was computed to compare which factors (e.g., nutrition topics discussed, nutrition topics desired, and quality of life) were influenced by symptoms with a p-value of < 0.05 being deemed significant.
CHAPTER IV
JOURNAL ARTICLE

Introduction

The human immunodeficiency virus (HIV) instigates an ongoing decline in immunological function causing a variety of health complications and the development of acquired immunodeficiency syndrome (AIDS) if left untreated (Batterham & Garsia, 2001). Medical and symptomology management become chief priorities during the treatment of HIV. The recommended medical treatment of HIV is highly active antiretroviral therapy (HAART), which halts and reverses disease progression.

HAART involves a regimen of three or more anti-HIV medications from at least two different drug classes (U.S. Department of Health and Human Services, 2012e). The development of HAART has improved the prognosis of HIV by altering treatment strategies into chronic disease management with long-term nutrition-related complications (Hendricks, Willis, Houser & Jones, 2006; Lazzaretti, Kuhmmer, Sprinz, Polanczyk & Ribeiro, 2012; Shievitz & Knox, 2001). Incidences of cardiovascular disease, diabetes, obesity, lipodystrophy, altered metabolism, hyperlipidemia, insulin resistance and osteoporosis are becoming increasingly prevalent in persons living with HIV from HAART use or from the progression of the virus itself (Lazzaretti, et. al., 2012; Fitch & Grinspoon, 2011; Duran, Almeida, Segurado & Jamie, 2008 Hendricks, Willis, Houser & Jones, 2006; Shievitz & Knox, 2001). Individualized nutrition interventions can prove to be essential in improving disease management by assisting in achieving effective body weights, body composition, lab values, and reducing side effects.
of medication and disease progression (Salomon, De Truchis & Melchior, 2002; Fields-Gardner, 2010; Suttajit, 2007; Ockenga, et al., 2006). Implementation of standardized practice guidelines can be ambiguous in nature, which may cause gaps in nutritional management (Fields-Gardner, 2010). Goals for most nutrition interventions focus on maintaining or replacing lean body mass to improve the quality of life (Suttajit, 2007; Ockenga, et al., 2006), while prevention of chronic co-morbidities are often overlooked. In addition, patient education surrounding medication and potential side effects are often related to nutrition. The commonly reported side effects of medication involve gastrointestinal complications, such as diarrhea and nausea, which necessitate nutritional management (Batterham, Brown & Garsia, 2001).

There is an assortment of research encompassing the nutritional implications of disease progression and medical management of HIV. However, there seems to be no research assessing the use and desire for nutrition education and its importance to the HIV-positive population. The purpose of this study was to assess nutrition education received and desired by HIV-positive individuals, and the relationship of nutrition education received and HIV patients’ quality of life and nutrition related symptomologies. The hypotheses of the study were: 1) there will be an association between the perception of quality of life and symptomology present among individuals with HIV, 2) and there will be a relationship established between nutrition information provided and nutrition information desired by individuals with HIV.
Methodology

The investigation was a post-test only, quantitative, non-experimental, comparative and descriptive survey study. The Institutional Review Board at Kent State University approved this study.

Subject Selection

The subjects for this research included diagnosed HIV-positive males and HIV-positive, non-pregnant females. The HIV statuses of participants were confirmed through completion of the questionnaire due to multiple questions being HIV specific. Participants who reported an AIDS status, defined as a CD4 count less than 200 cells/mm$^3$, were excluded from the study. Individuals with an AIDS status were excluded due to the nature of the research evaluating broad chronic disease management.

Survey Development

The paper-based survey was developed in four parts: participant characteristics, quality of life measurements, nutrition information, and signs and symptoms checklist. Participant characteristics evaluated basic demographic information and participant knowledge about HIV-related and nutrition-related lab values. Quality of life instrument used was adapted from a validated study (Holmes & Shea, 1998) that quantifies participant’s quality of life through a series of questions that the participant marks how closely they agree with the statement. Nutrition information assessed nutrition-related topics that participants may, may not have, or would like to receive from a health care provider. The signs and symptoms checklist was an instrument that was adapted from a...
validated study (Holzemer, Hudson, Kirskey, Hamilton, & Bakken, 2001) that evaluated current symptoms present and their intensity.

**Data Collection**

The surveys were used to collect data from June through October 2013. An HIV clinic, a variety of HIV support groups, and an HIV community center were the sites of data collection. The researcher distributed the surveys at each support group and at the community center. Health care practitioners administered the survey at the HIV clinic site. In addition, surveys were placed at the clinic for respondents to complete on their own will without being prompt or introduced by a health care practitioner or researcher. All completed surveys were placed into a sealed envelope by the participants and returned to the researcher. A verbal script was used during the introduction of the survey (Appendix B). All participants were given a consent form (Appendix C) to take with them at the same time they received the survey.

**Statistical Analysis**

Statistical analysis was conducting using SPSS 13.0. Frequencies, means, and standard deviations were used to analyze the participant characteristics. Quality of Life questions (Part II; Appendix D) were calculated for a sum score for each participant. A four-point Likert scale was used to quantify the quality of life section (Part II). “A lot of the time” response scored a four, while a “none of the time” scored a one. A sum score was then calculated for each participant. The lowest possible quality of life score was 15, and the highest was 60. The higher the quality of life sum score, the poorer the quality of life. Five of the questions were scored in reverse due to the nature of the
question. The nutrition information (Part III; Appendix D) was evaluated by summing each category of “discussed,” “not discussed,” and “want to discuss” for each of the 30 nutrition education topics. In addition, each participant returned a sum score for the total number of nutrition topics that participant discussed and wanted to discuss. Each category and participant was evaluated using frequencies, and was input into a regression analysis. Another four-point Likert scale was used to evaluate the intensity of symptomology using the signs and symptoms checklist (Part IV; Appendix D). A “severe” response scored a four, while a “not experiencing” scored a one. A sum score was then computed for each participant. The lowest potential score was 21, and the highest was 84. The participants who scored a 21 were classified as asymptomatic, since all responses were “not experiencing.” Participants who score anything above a 21 were classified as symptomatic.

A Pearson’s correlation coefficient was calculated to assess the relationship between the quality of life sum scores (Part II) and the symptomology scores (Part IV), as well as the relationship between the nutrition topics discussed and the topics desired to be discussed (Part III). A p-value of p≤0.05 was selected a-priori for all analyses. A regression was computed to compare which factors (e.g., nutrition topics discussed, nutrition topics desired, and quality of life) were influenced by symptoms.

Results

Participant Characteristics

Seventy-six HIV-positive individuals completed the survey. Three (3.9%) were excluded due to reporting a CD4 count <200 cells/mm3, which signifies an AIDS status.
Overall, 72.4% (n=55) of participants were male with a mean age of 45±12.3 years (n=73). The mean number of years participants were diagnosed was 11.5 ±8.4 years (n=73). Table 1 describes all reported characteristics.

Table 1. Frequency data of participant characteristics (n=76)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>M±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (n=73)</td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>45 (±12.3)</td>
</tr>
<tr>
<td>BMI (n=71)</td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>27 (±7.2)</td>
</tr>
<tr>
<td>Years diagnosed (n=73)</td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>11.5 (± 8.4)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>72.4 (55)</td>
</tr>
<tr>
<td>Female</td>
<td>27.6 (21)</td>
</tr>
<tr>
<td>Medication use</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>94.7 (72)</td>
</tr>
<tr>
<td>No</td>
<td>5.3 (4)</td>
</tr>
<tr>
<td>Experiencing symptoms (n=73)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>93.2 (68)</td>
</tr>
<tr>
<td>No</td>
<td>11.0 (8)</td>
</tr>
<tr>
<td>CD4 Range</td>
<td></td>
</tr>
<tr>
<td>&gt;500 cells/mm3</td>
<td>35.5 (27)</td>
</tr>
<tr>
<td>400-499 cells/mm3</td>
<td>7.9 (6)</td>
</tr>
<tr>
<td>300-399 cells/mm3</td>
<td>9.2 (7)</td>
</tr>
<tr>
<td>200-299 cells/mm3</td>
<td>7.9 (6)</td>
</tr>
<tr>
<td>&lt;200 cells/mm3</td>
<td>3.9 (3)</td>
</tr>
<tr>
<td>Unknown</td>
<td>35.5 (27)</td>
</tr>
<tr>
<td>Viral Load Range</td>
<td></td>
</tr>
<tr>
<td>&gt;500,000 copies</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>1,000 - 100,000 copies</td>
<td>6.6 (5)</td>
</tr>
<tr>
<td>999 - 500 copies</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>499- 100 copies</td>
<td>1.3 (1)</td>
</tr>
<tr>
<td>&lt;99 copies</td>
<td>3.9 (3)</td>
</tr>
<tr>
<td>&quot;Undetectable&quot;</td>
<td>55.3 (42)</td>
</tr>
<tr>
<td>Unknown</td>
<td>32.9 (25)</td>
</tr>
</tbody>
</table>
Participant Awareness

Data was collected to determine if participants were able to identify important HIV-related and nutrition-related medical information. Generally, more than 67% of participants were unable to specify any nutrition-related labs (i.e., triglycerides, HDL, LDL, cholesterol, body fat, blood sugar, and blood pressure) and only half of the participants were able to supply HIV-related labs. The most known lab was blood pressure with 32.9% (n=25) of participants able to provide an answer. Fifty percent (n=40) of participants were able to list their specific CD4 count. Table 2 displays participants’ response rates for each of the lab measurements.

Table 2. Participant knowledge of their HIV and nutrition-related lab data  (n=76)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes % (n)</th>
<th>No % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
<td>55.3 (42)</td>
<td>44.7 (34)</td>
</tr>
<tr>
<td>CD4 Count</td>
<td>50.0 (38)</td>
<td>50.0 (38)</td>
</tr>
<tr>
<td>Viral Load</td>
<td>52.6 (40)</td>
<td>47.3 (36)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>7.9 (6)</td>
<td>92.1 (70)</td>
</tr>
<tr>
<td>High Density Lipoprotein (HDL)</td>
<td>6.6 (5)</td>
<td>93.4 (71)</td>
</tr>
<tr>
<td>Low Density Lipoprotein (LDL)</td>
<td>5.3 (4)</td>
<td>94.7 (72)</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>15.8 (12)</td>
<td>84.2 (64)</td>
</tr>
<tr>
<td>Body Fat Percentage</td>
<td>7.9 (6)</td>
<td>92.1 (70)</td>
</tr>
<tr>
<td>Blood Sugar</td>
<td>14.5 (11)</td>
<td>85.5 (65)</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>32.9 (25)</td>
<td>67.1 (51)</td>
</tr>
</tbody>
</table>

Participants were also questioned if they were aware of the last time the medical information was collected. Overall, participants did not know when the last time any of the nutrition-related labs were measured (i.e., blood lipids, body fat, blood sugar, and blood pressure). Fifty-four percent (n=38) of participants knew the last time their CD4 count was checked, and 47.1% (33) knew the last time their viral load was checked. Table 3 summarizes if the participants knew the last time the lab was drawn.
Table 3. Participant knowledge of the last month and year the HIV and nutrition-related lab data was obtained (n=70)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Knew last date % (n)</th>
<th>Unsure of % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD4 Count</td>
<td>54.3 (38)</td>
<td>45.7 (32)</td>
</tr>
<tr>
<td>Viral Load</td>
<td>47.1 (33)</td>
<td>52.9 (37)</td>
</tr>
<tr>
<td>Blood lipids</td>
<td>32.9 (23)</td>
<td>67.1 (47)</td>
</tr>
<tr>
<td>Body Fat Percentage</td>
<td>18.6 (13)</td>
<td>81.4 (57)</td>
</tr>
<tr>
<td>Blood Sugar</td>
<td>30.0 (21)</td>
<td>70.0 (49)</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>35.7 (25)</td>
<td>64.3 (45)</td>
</tr>
</tbody>
</table>

Lack of Medical Nutrition Therapy

Between 22.8% (n=13) and 86.6% (n=58) of participants report receiving some sort of nutrition-related education, but the education received varied vastly by nutrition-related medical issue. Generally, over half of participants report receiving some sort of nutrition-related information. The most frequently discussed topics reported were side effects of medication (86.6%; n=58), physical activity (83.3%; n=55), and weight loss (76.1%; n=51). These are typical topics discussed by health care practitioners and their HIV-positive clients. The least frequently discussed topics were micronutrient deficiencies (22.8%; n=22), osteoporosis (31.1%; n=19), and dyslipidemia (34.4%; n=22). The topics of highest interest that participants reported were protein (27.4%, n=17), multivitamin use (26.2%; n=16), and malabsorption (25.0%; n=15). The topics of topics of least interest were nausea (9.1%; n=6), hypertension (10.3%; n=7), and side effects of medication (11.9%; n=8). The sample number (n) reported varies by topic, because not every participant indicated whether they discussed each topic or not. Table 4 depicts all nutrition topics participants were asked about.
A regression was calculated to determine the factors associated with symptomology. The regression was significant \((p=0.002)\) with a moderate effect size \((R=0.425; R^2=0.180)\) (number discussed \(B=0.274\); number want to discuss \(B=0.327\); and quality of life \(B=0.327\)) and beta weights were low with the quality of life being the only significant factor \((p=0.003)\), which led the researchers to limit conclusions drawn from the regression. The quality of life factor was also the only single significant correlation to symptomology \((r=0.313; p \leq 0.001)\). Not surprising, there were no significant correlations with nutrition topics either discussed \((r=0.131, p =0.131)\) or desired \((r=0.081, p=0.364)\).

### Table 4. Participant response rate for nutrition education topics discussed, not discussed, or want to discuss with a health care provider*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Discussed</th>
<th>Not Discussed</th>
<th>Want to Discuss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered Metabolism (n=64)</td>
<td>45.3 (29)</td>
<td>54.7 (35)</td>
<td>23.4 (15)</td>
</tr>
<tr>
<td>Blood Pressure (n=65)</td>
<td>63.1 (41)</td>
<td>36.9 (24)</td>
<td>12.3 (8)</td>
</tr>
<tr>
<td>Calcium (n=63)</td>
<td>57.1 (36)</td>
<td>42.9 (27)</td>
<td>17.5 (11)</td>
</tr>
<tr>
<td>Calories (n=60)</td>
<td>45.0 (27)</td>
<td>55.0 (33)</td>
<td>21.7 (15)</td>
</tr>
<tr>
<td>Cardiovascular Disease (n=59)</td>
<td>61.0 (36)</td>
<td>39.0 (23)</td>
<td>23.7 (14)</td>
</tr>
<tr>
<td>Cholesterol (n=65)</td>
<td>67.7 (44)</td>
<td>32.3 (21)</td>
<td>15.4 (10)</td>
</tr>
<tr>
<td>Dyslipidemia (n=64)</td>
<td>34.4 (22)</td>
<td>65.6 (42)</td>
<td>12.5 (8)</td>
</tr>
<tr>
<td>Fatigue (n=64)</td>
<td>68.8 (44)</td>
<td>31.3 (20)</td>
<td>20.3 (13)</td>
</tr>
<tr>
<td>Food Safety (n=67)</td>
<td>52.2 (35)</td>
<td>47.8 (32)</td>
<td>20.9 (14)</td>
</tr>
<tr>
<td>Heart Burn (n=61)</td>
<td>47.5 (29)</td>
<td>52.5 (32)</td>
<td>18.0 (11)</td>
</tr>
<tr>
<td>High Density Lipoprotein (HDL) (n=62)</td>
<td>56.5 (35)</td>
<td>43.5 (27)</td>
<td>22.6 (14)</td>
</tr>
<tr>
<td>Hypertension (n=68)</td>
<td>63.2 (43)</td>
<td>36.8 (25)</td>
<td>10.3 (7)</td>
</tr>
<tr>
<td>Lipodystrophy (n=64)</td>
<td>46.9 (30)</td>
<td>53.1 (34)</td>
<td>21.9 (14)</td>
</tr>
<tr>
<td>Low Density Lipoprotein (LDL) (n=64)</td>
<td>54.7 (35)</td>
<td>45.3 (29)</td>
<td>21.9 (14)</td>
</tr>
<tr>
<td>Malabsorption (n=60)</td>
<td>31.7 (19)</td>
<td>68.3 (41)</td>
<td>25.0 (15)</td>
</tr>
<tr>
<td>Micronutrient Deficiencies (n=57)</td>
<td>22.8 (13)</td>
<td>77.2 (44)</td>
<td>19.3 (11)</td>
</tr>
<tr>
<td>Multivitamin Use (n=61)</td>
<td>67.2 (41)</td>
<td>32.8 (20)</td>
<td>26.2 (16)</td>
</tr>
<tr>
<td>Nausea (n=66)</td>
<td>54.5 (36)</td>
<td>45.5 (30)</td>
<td>9.1 (6)</td>
</tr>
<tr>
<td>Opportunistic Infections (n=62)</td>
<td>61.3 (38)</td>
<td>38.7 (24)</td>
<td>16.1 (10)</td>
</tr>
<tr>
<td>Osteoporosis (n=61)</td>
<td>31.1 (19)</td>
<td>68.9 (42)</td>
<td>21.3 (13)</td>
</tr>
<tr>
<td>Physical Activity (n=66)</td>
<td>83.3 (55)</td>
<td>16.7 (11)</td>
<td>15.2 (10)</td>
</tr>
<tr>
<td>Protein (n=62)</td>
<td>53.2 (33)</td>
<td>46.8 (29)</td>
<td>27.4 (17)</td>
</tr>
<tr>
<td>Quality of Life (n=61)</td>
<td>63.9 (39)</td>
<td>36.1 (22)</td>
<td>18.0 (11)</td>
</tr>
</tbody>
</table>
Side Effects of Medication (n=67)  86.6 (58)  13.4 (9)  11.9 (8)
Sodium (n=65)  53.8 (35)  46.2 (30)  12.3 (8)
Stomach Pain or Discomfort (n=63)  61.9 (39)  38.1 (24)  20.6 (13)
Triglycerides (n=66)  51.5 (34)  48.5 (32)  13.6 (9)
Vomiting (n=64)  40.6 (26)  59.4 (38)  14.1 (9)
Weight Gain (n=65)  61.5 (40)  38.5 (25)  18.5 (8)
Weight Loss (n=67)  76.1 (51)  23.9 (16)  16.4 (11)

*: Each topic has a varying n because a different number of subjects reported differently for each topic listed. Frequencies were calculated based on the number of respondents for each topic.

Relationship Between Quality of Life and Symptoms Present

Quality of life was assessed using a questionnaire of 15 questions that provided the researchers with a sum score of quality of life for each participant (Holmes & Shea, 1998). The lowest possible quality of life sum score is 15, indicating best quality of life. The highest possible quality of life sum score is 60, designating poorer quality of life. The quality of life sum score data ranged from a high quality of life score of a 15 to a low quality of life score of 50. The mean quality of life score was 31.2±12.7, which calculates as a moderate to high quality of life for the sample overall.

The standardized symptomology questionnaire used for this study allowed for participants to rate severity for 21 different symptoms related to HIV. The scores and the corresponding intensity reported by participants were then summed with symptomology sums ranging from no symptomology (i.e., asymptomatic) with a score of 21 and high symptomology with a score of 84. A higher score suggests the presence of more symptoms with a combination of increasing symptom intensity. Participant scores ranged from 21 to 72 with a mean of 27.2±11.4, which denotes that fewer symptoms were present in tandem with less intense symptomology.
The current study demonstrated that there was a significant, positive correlation between the summed quality of life and summed symptomology scores ($r=0.313$, $p\leq0.001$) as depicted in Figure 2. As the quality of life score increased (meaning lower quality of life), the more symptoms became apparent.

![Figure 2. Correlation between sum symptoms score and sum quality of life score ($r=0.313$; $p\leq0.001$)](image)

**Relationship Between Nutrition Information Received and Desired**

There were a total of 30 nutrition-related HIV topics listed for participants to specify the topics they have discussed, have not discussed, and would like to discuss. A sum score for each of these categories was calculated and then compared. The mean for the number of nutrition topics discussed was $14 \pm 9.7$, and the mean score for the number
of nutrition topics wanted to discuss was 4.5 ±7.8. There was a significant, negative correlation between the two variables (r=-0.277, p=0.002) (Figure 3). This indicates that as participants were exposed to more nutrition topics, their desire for additional nutrition information declined.

**Figure 3.** Relationship between nutrition topics participants have discussed versus those nutrition topics participants wanted to discuss (r=-0.277; p=0.002)

**Discussion**

The purpose of this study was to assess nutrition education received by HIV patients, and the relationship of nutrition education received and HIV patients’ quality of life and nutrition related symptomologies.
The first hypothesis regarding medical nutrition therapy provided to patients was neither accepted nor rejected due to insufficient data reported by participants to make a conclusion. The resulting data illustrated an even distribution of topics discussed and not discussed for almost every nutrition-related topic. Only a few topics, such as micronutrient deficiencies and side effects of medication, indicated clear distinction. In addition, not every participant revealed whether the topic has been discussed or not for each topic based on the evaluation of responses. The option for the participant to state whether the topic was discussed, not discussed, and would like to discuss the topic was across a single line (Appendix D). Frequently, participants would select a “want to discuss” topic, but not state whether the topic was previously discussed or not, even though it was stated that participants may select more than one box in the directions above and by the researchers who administered the survey. The second hypothesis assessing a relationship between quality of life and symptoms was accepted. The third hypothesis regarding the relationship between nutrition topics discussed and desired was rejected.

**Participant Characteristics**

The majority of participants (94.7%, n=68) reported HIV medication use and had an “undetectable” viral load (55.3%; n=42) representing that the medical management of the sample was successful. The average number of years diagnosed was over 10 (11±8.4) years, which is concurrent with the research indicating that treatment strategies for HIV have changed from treating an infectious disease to chronic disease management (Fields-Gardner, 2010; Campsmith, Nakashima & Davidson, 2003; Kalichman,
Benotsch, Suarez, Catz, Miller & Rompa, 2000). Over a quarter (27.6%; n=21) of participants were female, which is proportional to national statistics for women living with HIV (Centers for Disease Control and Prevention, 2013). Most participants (93.2%; n=68) were experiencing some symptoms mostly related to medication side effects; though, the intensities of the symptoms were low. This indicates that a high proportion of current regimens are producing side effects, which is concurrent with previous literature findings (Kalichman, Bineetha, Catz, 1999; Catz, Kelly, Bogart, Benotsch, & McAuliffe, 2000).

**Participant Awareness**

Overall, most participants lacked the ability to display awareness about their HIV-related and nutrition-related health information (Table 2). Eighty-four to 94% of participants were unable to provide any information about their blood lipid levels, which puts them at a very high risk of cardiovascular disease. This is not surprising due to the fact that most Americans lack health literacy, so they tend to not understand basic health information (Carmona, 2006). Health literacy is one’s illness-related knowledge and comprehension of a chronic illness (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000). A previous study surveying over 3,000 HIV-positive individuals found that only 12.5% could not recall their most recent CD4 count (Campsmith, Nakashima & Davidson, 2003). Thus, the low response for the HIV-related labs values may be related to participant’s health literacy (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000).
Similarly, participants were also unaware of when the listed HIV and nutrition measurements were last obtained (Table 3). Since most of the participants were not aware of the last date, it is not alarming that they were unable to provide lab data. This may be related to a lessening in priority because the diagnosis time was large or since medical management was effective as evidenced by about half the participants’ “undetectable” viral loads.

Often, as length of time living with a disease increases, adherence to management strategies tends to fall (DiMatteo et al., 1993). Adherence rates to specific disease management behaviors, such as diet, start to decline even at two years for the general population (DiMatteo et al., 1993). Most of the participants were middle-aged and have been living with HIV for some time, which might have also influence whether maintaining the specific lab reference was a priority. In fact, most participants (n=32) were not even concerned about their CD4 count. In addition, a large portion of participants had complete confidence in their health care practitioners ability to care for them as evidenced by the response rates of “a lot of the time” for the following questions “I’ve felt as if my health care provider was someone who listens to me,” (n=53) “I’ve felt confident in my health care providers ability to care for people with HIV (n=53)” and “I’ve felt certain that my health care provider has my best interest in mind (n=56).” Therefore, patients may perceive or accept their providers to care for their management and pay less attention to their actual health status.

These facts suggest that the people do not see the importance of nutrition in regards to their chronic disease management; there is no rationale to suggest that HIV-
positive individuals would be any different from other patients managing a chronic disease.

**Lack of Medical Nutrition Therapy**

In general, nutrition knowledge is insufficient among the public (Barratt, 2001). The reported results in this study imply that there is a general lack of nutrition-specific education provided and desired by the participants, even though the Academy of Nutrition and Dietetics (AND) position statement calls for nutrition education as an essential part of HIV care (Fields-Garner, 2010). The most frequent nutrition therapy topics reported being discussed—such as the side effects of medication and weight loss—might be anticipated, because health care providers would be more likely to focus on the potential side effects of medication, especially during initiation of medication. In addition, weight loss has always been a staple concern with HIV, which reflects the higher prevalence of discussion.

**Relationship Between Quality of Life and Symptoms Present**

This study established that as symptoms develop the quality of life of participants’ declines, which is similarly found in the research (Rai, Dutta & Gulati, 2010). Likewise, quality of life improves with HAART and available medical nutrition therapy (Lazzaretti, Kuhmmer, Sprinz, Polanczyk & Ribeiro, 2012; Shievitz & Knox, 2001; Los Angeles County Commission of HIV Health Services, 2002; Mahan & Escott-Stump, 2008). Improving the quality of life of the HIV population is not only one of the goals of medical management, but it a focus of health care practitioners (Rai, Dutta & Gulati, 2010; Fields-Gardner, 2010; Mahan & Escott-Stump, 2008). Symptoms of
lipodystrophy, such as body composition changes, and malnutrition impact quality of life (Shevitz & Knox 2001; Cabrero, Griffa, & Burgos, 2010; Berneis, Battegay, Bassetti, Nuesch, Leisibach, Bliz & Keller, 2000; Ross, Caballero, Cousins, Tucker, & Ziegler, 2012).

**Relationship Between Nutrition Information Received and Desired**

Surprisingly, it was found that, regardless of symptoms present, nutrition-related information that may provide relief were not sought out. Since most of the participant’s HIV was being controlled through antiretroviral drugs, the symptomology that was presented is most likely related to the use of medication or external factors, and not from the virus itself. In fact, most individuals received medical nutrition therapy only when severe nutrition-related symptoms become apparent (Fields-Gardner, 1995), which are generally unintentional weight loss and poor appetite (Sharkey, 1993).

It was found in the study that as nutrition-related information was obtained, there was a decrease in desire for additional information. Whether the participants discussed the topic once or multiple times was unable to be determined with this study. However, it is hard to imagine that all the participants were well versed in all aspects of the nutrition-related complications and concerns of HIV treatment. Of course, health care practitioners cannot force information upon individuals, but consistent encouragement is required to ensure patients are knowledgeable.

Poor health literacy leads to knowledge barriers of ones health, illness, and treatments (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000). There is an established relationship between health literacy and knowledge related to the HIV, such
as understanding CD4 count and viral load. Those with higher health literacy are more likely to know their HIV-related labs. In addition, individuals with higher education levels are more likely to have higher health literacy (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000). Individuals with low health literacy are generally less likely to be able to display knowledge and understanding of their health status (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000). Similarly, health literacy may not be impacted by the length of time an individual is diagnosed (Kalichman, Benotsch, Suarez, Catz, Miller & Rompa, 2000). As part of treatment, HIV-positive individuals need to be educated about their disease and the long-term effects of management to improve their health literacy and health outcomes. The importance of their health status needs to be reinforced and reassessed throughout their treatment.

**Limitations**

The data collected during this research was self-reported, and; consequently, the researchers are unable to confirm the responses. In addition, a small sample size was reported and the sample utilized was clustered in northeast Ohio, which may not make this generalizable to the entire HIV population. That, however, does not lessen the significance found with a well-medically treated population that was evident within this study. The researchers did not inquire about any existing comorbidities or chronic diseases that might impact perception of nutrition education. The level of nutrition knowledge was not assessed, so the researchers are unable to evaluate the education received. In addition, the education level or health literacy was not assessed, so we are
unsure if the participants understood their disease. However, the evidence found here warrants further investigation on the desire and knowledge of nutrition education.

**Implications for Practice**

There seems to be a general lack in desired nutrition education among the HIV-positive population. As with the general public, nutrition education aimed at prevention is limited (Barratt, 2001). Even among a population that has many well-documented comorbidities associated with long-term management, nutrition prevention is scarce (Barratt, 2001). Coupling the general lack of interest with the inability of participants to provide their HIV and nutrition-related lab values is very worrisome. Clinical management of HIV needs to require medical nutrition therapy for best prognosis. It is recommended that nutrition interventions start early and are continuous during the treatment of HIV (Fields-Gardner, 2010).

Effective nutrition counseling should be utilized to manage nutrition-related complications and symptoms of disease and medical management, improve weight and nutritional status (Fields-Garner, 2010). However, the nutritional care for most HIV-positive patients is poor or nonexistent (Horn & Weinman, 1999). The symptoms that may affect nutrition status include nausea, vomiting, diarrhea, anorexia, pain, chewing or swallowing difficulties, taste change and others can lead to wasting and weight loss (Fields-Garner, 2010), especially if those patients lack the nutritional knowledge to treat themselves or whom to seek out. Furthermore, as the diagnosis years continue to expand, new complications arise related to HIV and side effects of medication therapy, such as diabetes, prediabetes, and lipodystrophy (Fields-Garner, 2010). The long-term
morbiditys that can develop require continuous re-evaluation to prevent. Side effects of chronic diseases are hardly noticed, unless an obvious and devastating episode occurs, such as a cardiovascular incident. An emphasis on continuous nutrition therapy will provide such monitoring and allow for early interventions (Cabrero, Griffa, & Burgos, 2010; Fields-Garner, 2010). Registered dietitians are the most qualified and experienced with medical nutrition therapy (Fields-Gardner, 2010), and should demonstrate desired outcomes other health care practitioner to solidify their position in health care.

Regardless of whether the nutrition-related topics were discussed or not discussed, there was interest in a few topics. Over 20% of participants wanted information about altered metabolism, calories, cardiovascular disease, fatigue, food safety, HDL, LDL, lipodystrophy, malabsorption, multivitamin use, osteoporosis, protein, and stomach pain. This can provide a perfect opportunity for registered dietitians to take root and deliver on these needs. Whether these topics are generalizable is partially irrelevant. There is some need for education, and health care practitioners need to identify and address those needs. Furthermore, it is imperative that steps be taken to assure that the HIV-population become aware of these nutrition-related topics and their importance for their health. Health care providers cannot assume that HIV-positive individuals have the health literacy to know the long-term consequences of disease management. It was evident in this research that some HIV-positive individuals lack knowledge about their HIV-related and nutrition-related information, and cannot be expected to know if the health care practitioners are not making it important. It is quite disturbing that about half of the participants were unsure about their CD4 count and viral
load levels, and much more than half were unsure about their nutrition-related lab values. At this rate, HIV-positive individuals will be suffering more from cardiovascular complications rather than HIV.

All health care practitioners should be familiar with effective treatment strategies that improve the nutritional status of their patients (Fields-Garner, 2010). For example, the perception of the seriousness of a disease positively influences dietary adherence, while the perception of distress decreases medical and exercise adherence (DiMatteo et al., 1993). However, there are multiple barriers that inhibit the distribution of nutrition related-knowledge. Most noted barriers by physician for general nutrition education are a lack of time, inadequate teaching materials, lack of counseling training, lack of knowledge, inadequate reimbursement, and low confidence (Kushner, 1995). Lack of time is evident by research evaluating the amount of time spend on nutrition, which found that about 75% of physicians spent five minutes or less on dietary changes for less than 40% of their patients (Kushner, 1995). Furthermore, health-related information may be withheld or mentioned rather quickly by health care providers, if the results are within the normal reference ranges.

Medical nutrition therapy can be beneficial for more than issues of weight loss, wasting, and anorexia (Fields-Gardner, 2010). Resolution and prevention of many side effects related to HIV itself and the medical treatment would benefit from nutrition therapy. A push is needed from health care practitioners, especially registered dietitians, to advocate for nutritional care. If physicians are left in charge of nutritional care, medical nutrition therapy will not occur (Young, 1997). The current ADA position
statement summarizes the evidence of a variety of nutritional concerns for individuals with HIV (Fields-Gardner, 2010). The statement also calls for standardized practice guidelines, but fails to suggest any. Clear guidelines would provide practitioners with easier access to consistent health strategies and promotion.

Current treatment strategies should continue to chronically assess for symptoms and intervene appropriately; however, additional time needs to be endorsed for evaluation of anticipated complications. Consequently, if more time is shifted onto prevention, it will allow for improved patient care, instead of only reacting to complications. Ironically, providing more time on prevention would provide physicians more time to focus on medical management and adherence concerns. There are already physicians and other health care practitioners promoting transmission prevention to inhibit the spread of HIV. There needs to be additional advocacy for prevention of additional comorbidity complications from HIV and medical management. For medical-controlled, asymptomatic patients, continuous prevention of potential comorbidities should take priority. All patients need to be made aware of the importance of the nutritional concerns that accompany HIV and their specific treatment regimen. Also, patients need to be aware of reputable sources of information, such as the dietetics profession.

There seems to be an abundance of research evaluating the comorbidities that develop, but nothing in regards to the actual practice. The development of future research geared at this approach would enhance the level of care provided to HIV-positive individuals. Thus, future research requires a community approach, in which practical interventions to strengthen the knowledge of HIV-positive individuals is used.
This research would require partnership with health care practitioners and researchers, so that findings may be applied and assessed immediately. Similarly, this would provide a learning environment that would benefit all involved.

**Conclusion**

In conclusion, as the amount of nutrition education participants received, the desire for additional nutrition related HIV information declined. On the other hand, as the presence and intensity of symptoms increased the quality of life of the participants declined. The nutrition education desired and provided to participants is frightening absent. Health care practitioners must begin to advocate for improving the nutritional outcomes of patients by supplying their patients with effective nutrition education. This might require initial education focused on ways of elevating nutritional symptoms of disease and medical management, followed up by a focus on chronic disease prevention.
APPENDICES
APPENDIX A

LIST OF ABBREVIATIONS
Appendix A

List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS</td>
<td>Acquired immunodeficiency syndrome</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic acid</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
</tr>
<tr>
<td>HAART</td>
<td>Highly active antiretroviral therapy</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>PI</td>
<td>Protease inhibitor</td>
</tr>
<tr>
<td>RNA</td>
<td>Ribonucleic acid</td>
</tr>
</tbody>
</table>
APPENDIX B

VERBAL SCRIPT
Appendix B

Verbal Script

Hello, my name is Rocco Russo. I am a graduate student from Kent State University. As part of my degree, I am working on a research project. This project is looking at ways to better nutrition as part of treatment. It is up to you if you would like to fill out this survey. The survey takes about 10 minutes to complete. You must be over the age of 18 and have HIV.

It will ask you questions about your diagnosis, treatment, what nutrition topics you have talked with your doctors about, what nutrition topics you would like to learn more about, and generally how you have been feeling lately. There will be no information on the survey that will tie it to you. All the surveys will be locked away at Kent State University, and eventually destroyed. The end-goal of this research is to provide better nutrition care to people living with HIV.
APPENDIX C

DOCUMENTAL CONSENT
Appendix C

Documental Consent

Documental Consent to Participate in a Research Study

The following study is being done by a graduate student under the guidance of a professor from Kent State University. This study has been approved by Kent State University’s Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in every day life).

Participation in this study typically takes about 15 minutes and is strictly anonymous. Participants will answer questions about basic characteristics, followed by questions regarding quality of life, nutrition topics, and questions about current signs and symptoms.

All responses are treated confidential, and in no case will response from individual participants be identified.

It is up to you to decide whether you want to take part in this study. If you fill out this survey, then you are agreeing to participate. You also agree to the use of the provided information for research purposes only.

If participants have further questions, comments, or concerns about the study, they may contact the principal investigator, Rocco Russo, or the thesis advisor, Natalie Bish, at 330-672-2197. Participants may also contact the Institutional Review Board for additional information regarding the study at 330-672-8058.

Thank you for your participation.
APPENDIX D

SURVEY
## APPENDIX D

**SURVEY**

Part I: Participant Characteristics

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is your gender?</td>
<td>Male ☐ Female ☐ Transgendered ☐</td>
</tr>
<tr>
<td>2. What year were you born (YYYY)?</td>
<td>☐ Yes ☐ No <em>If you answered “Yes” to questions #3 or #4, please stop and return questionnaire to the administrator</em></td>
</tr>
<tr>
<td>3. Are you Pregnant?</td>
<td>☐ Yes* ☐ No</td>
</tr>
<tr>
<td>4. Have you ever had an AIDS diagnosis?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>5. What is your height? (in feet, inches):</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>6. How much do you weigh? (in pounds)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>7. Typically, how often do you visit with this center, clinic, or support group?</td>
<td>☐ Every (1) month ☐ Every 3 months ☐ Every 6 months ☐ Once a year ☐ Other (specify) __________________________</td>
</tr>
<tr>
<td>8. Are you on any HIV medication?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>9. If YES, list your medication(s). If you are unsure, leave the space blank</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>10. Check the range that your most recent CD4/t-cell count is in:</td>
<td>☐ &gt;500 cells/mm³ ☐ 200-299 cells/mm³ ☐ 400-499 cells/mm³ ☐ &lt;200 cells/mm³ ☐ 300-399 cells/mm³ ☐ I don’t know</td>
</tr>
<tr>
<td>11. Check the range that your most recent viral load is in:</td>
<td>☐ &gt;5 million copies ☐ 9,999 – 1,000 copies ☐ 5 million – 1 million copies ☐ 999 – 500 copies ☐ 999,999 copies – 500,000 copies ☐ 499 – 100 copies ☐ 499,999 copies – 100,000 copies ☐ &lt;99 copies ☐ 99,999 copies – 50,000 copies ☐ I don’t know</td>
</tr>
<tr>
<td></td>
<td>“undetectable” ☐ 49,999 copies – 1,000 copies ☐ I don’t know</td>
</tr>
</tbody>
</table>

100
12. Please fill in the following questions in the space provided. If you are unsure or do not know the information check the box for “I don’t know.” (Note: It is okay to not know the information)

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many years have you been diagnosed with HIV?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your exact CD4 count?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your exact viral load level?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your triglyceride (TAG) levels?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your HDL level?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your LDL level?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your cholesterol level?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your body fat percentage?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your blood sugar level?</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>What is your blood pressure?</td>
<td>☐ I don't know</td>
</tr>
</tbody>
</table>

13. Please write when the last time (month and/or year) you have had any of the following lab values measured. If you are unsure of, or do not know, the information, check the box for “I don’t know”

<table>
<thead>
<tr>
<th>Lab Values</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD4 count</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>Viral load</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>Blood lipids (fats)</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>(TAGs, HDL, LDL)</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>Body fat percentage</td>
<td>☐ I don't know</td>
</tr>
<tr>
<td>Blood glucose (sugar) level</td>
<td>☐ I don't know</td>
</tr>
</tbody>
</table>
Part II: Quality of Life

14. Please check the box that agrees most with the statement in the past 4 weeks

<table>
<thead>
<tr>
<th>In the past 4 weeks…</th>
<th>A lot of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have been satisfied with my physical activity</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I have been physically limited in my ability to do routine household chores</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Pain has limited my ability to be physically active</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve been worried about not being able to do my job/routine daily activities as I have in the past</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I haven’t been able to live the way I’d like to because I’m so worried about my health</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve been worried about my health getting worse</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve been worried about my CD4 count.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve felt uncertain about what the future holds for me</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve been worried about when I’m going to die</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve had regrets about the way I lived my life before knowing I have HIV</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve had been angry about my past HIV risk behavior.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve been able to accept the fact that I have HIV.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve felt as if my health care provider was someone who listens to me.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve felt confident in my health care providers ability to care for people with HIV.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I’ve felt certain that my health care provider has my best interest in mind.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

III: Nutritional Information

15. Below is a list of topics that you may have discussed with your health care provider. (Your health care provider may be a doctor, nurse, or dietitian specializing in HIV). Please check the box if you have discussed that topic. If you would be interested in more information, or would like to learn about the topic, check the third column. You may check more than one box.

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>Discussed</th>
<th>NOT Discussed</th>
<th>WANT TO DISCUSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Safety</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Multivitamin Use</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Protein</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Lipodystrophy (the relocation of body fat from the arms, legs, or face to the stomach area)</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>TOPIC</td>
<td>Discussed</td>
<td>NOT Discussed</td>
<td>WANT TO Discuss</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach pain or discomfort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise/ Physical Activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Loss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side effects of medication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(high blood pressure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altered Metabolism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(the changes to the way the body processes foods)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoporosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(disease where bones become fragile and break easily)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Burn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micronutrient Deficiencies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(too high or too low fat levels in the blood)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunistic Infections</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triglycerides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malabsorption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(the difficulty absorbing nutrients from foods)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular (heart) disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of Life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Part IV: Signs and Symptom Checklist

16. Below is a list of problems that you may be experiencing today. If you have the problem, rate the degree of INTENSITY that best describes the extent of the problem.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not Experiencing</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle aches</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Painful joints</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Fatigue</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Fever</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Gas/Bloating</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nausea</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Vomiting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Painful swallowing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Mouth ulcers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>White spots in mouth</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Headaches</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Chest pain</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Dizziness</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Weight gain in the stomach area</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Skinny arms and/or legs</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
16. Below is a list of problems that you may be experiencing today. If you have the problem, rate the degree of INTENSITY that best describes the extent of the problem.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not Experiencing</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swollen feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lack of appetite</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Constipation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insomnia/cant sleep</td>
<td></td>
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</tbody>
</table>
REFERENCES
REFERENCES


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