

# Nursing Care of Patients With Cirrhosis: The LiverHope Nursing Project

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Cirrhosis is a complex disease that is associated with disturbances in different organs besides the liver, including kidneys, heart, arterial circulation, lungs, gut, and brain. As a consequence, patients develop a number of complications that result in frequent hospital admissions and high morbidity and mortality. Patients with cirrhosis require constant and rigorous monitoring both in and outside the hospital. In this context, the role of nurses in the care of patients with cirrhosis has not been sufficiently emphasized and there is very limited information about nursing care of patients with cirrhosis compared with other chronic diseases. The current article provides a review of nursing care for the different complications of patients with cirrhosis. Nurses with specific knowledge on liver diseases should be incorporated into multidisciplinary teams managing patients with cirrhosis, both inpatient and outpatient. *Conclusion:* Nurses play an important role in the management and prevention of complications of the disease and improvement in patients' quality of life and bridge the gap between clinicians and families, between primary care and hospital care, and provide medical education to patients and caregivers. (HEPATOLOGY 2020;71:1106-1116).

Cirrhosis is common and is the twelfth-leading cause of death worldwide.<sup>(1)</sup> In most cases, cirrhosis is due to one of the following etiological factors or a combination of hepatitis C or B infection, excessive alcohol consumption, and nonalcoholic fatty liver disease (NAFLD), the latter usually associated with obesity and diabetes mellitus. These factors may lead to unrelenting fibrosis with formation of scars that progressively disrupt the normal liver architecture and function, eventually leading to cirrhosis unless the cause of injury is removed (e.g., elimination of hepatitis C virus by antiviral drugs).<sup>(2)</sup> Once established, if the cause is not removed, cirrhosis may progress to severe complications, which negatively affect patient health-related quality of life. Cirrhosis is a major cause of years of life lost and hospital readmissions, and ultimately leads to

death unless liver transplantation is performed.<sup>(2)</sup> In Europe and the United States, cirrhosis is responsible for approximately 170,000 and 50,000 deaths per year, respectively.<sup>(3,4)</sup> Because the prevalence of chronic liver diseases, particularly NAFLD, is increasing markedly worldwide, it is likely that burden related to cirrhosis will increase in the next few decades, even though control of hepatitis B and C will favorably affect the epidemiology of liver disease.

Despite the global burden of cirrhosis, much less attention has been paid to nursing care of patients with cirrhosis compared to other chronic diseases.<sup>(5)</sup> Moreover, nursing training in liver diseases has been remarkably limited compared with training in other specialties. Incorporation of nurses into multidisciplinary teams for hospital care of patients with

**Abbreviations:** AKI, acute kidney injury; ELPA, European Liver Patients Association; EKG, electrocardiogram; GI, gastrointestinal; HE, hepatic encephalopathy; HRS, hepatorenal syndrome; IV, intravenous; NASH, nonalcoholic steatohepatitis; NSAIDs, nonsteroidal anti-inflammatory drugs.

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cirrhosis has been insufficient in comparison with other chronic conditions, particularly diabetes, cardiovascular diseases, and neurological diseases.<sup>(6)</sup>

With this background, a meeting was organized by LiverHope, with the objective of standardizing nursing care for patients with cirrhosis. LiverHope is a seven-nation consortium consisting of nine European hospitals with extensive experience in hepatology that is aimed at exploring new therapies for cirrhosis.<sup>(7)</sup> The consortium includes hepatologists and nurses with expertise in the management of patients with liver diseases and an external advisory board, and is funded by the European Commission under the Horizon 2020 program. Within the consortium, patients are represented by the European Liver Patients Association (ELPA). The task forces to develop the consensus nursing guidelines were divided into the following areas of care: general care, ascites/edema, gastrointestinal bleeding, hepatic encephalopathy, bacterial infections, acute kidney injury, and quality of life and stigmatization. The team of nurses from the different hospitals worked in groups of 2, and each group was assigned one or two different areas. An extensive review of the literature in different databases, including Pubmed and Cinahl, was performed. After literature review, documents of the different parts were drafted and subsequently put together and discussed broadly afterward. Input was also obtained from ELPA and experts from the United States. The final document is organized into sections related to main complications of cirrhosis. Each section has an introductory portion that discusses briefly, as background, the pathogenesis of each complication and rational basis of nursing care, followed by proposed recommendations for inpatient care as well as outpatient care.

## GENERAL CARE

There are two broad stages of cirrhosis. In the first stage, known as compensated cirrhosis, patients have not yet developed complications of the disease, whereas in the second stage, known as decompensated cirrhosis, they have developed complications primarily related to portal hypertension or liver failure such as ascites, variceal hemorrhage, jaundice, and hepatic encephalopathy.<sup>(8,9)</sup> From the nursing care perspective, this classification into two stages is very useful, as approach to care is markedly different.

### Compensated Cirrhosis

Patients with compensated cirrhosis are generally without obvious signs of liver disease and do not have significant health issues related to their liver disease. However, they usually have comorbidities associated with the etiology of cirrhosis. Specifically, in patients with alcohol-associated cirrhosis, a major issue is the management of the underlying alcohol use disorder. The objective in these patients is achieving abstinence, which improves patient survival.<sup>(10,11)</sup> Although alcohol use disorder is managed by specialized teams, concerted efforts are of utmost importance. The nurse specialist in liver diseases provides coordination of care, support, and guidance to the patient not only during the initial phase of addiction treatment but also during follow-up, so that sustained sobriety can be achieved. In patients with nonalcoholic steatohepatitis (NASH)-related cirrhosis, associated comorbidities are common, particularly obesity, diabetes mellitus, arterial hypertension, kidney dysfunction, and hyperlipidemia.<sup>(12,13)</sup> The objectives of the nursing role for these patients are to

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help with management and follow-up of these comorbidities and suggest specialized consultations whenever needed. Assessment of cardiovascular risk followed by specific recommendations on how to reduce risks is of key importance. Nurses should also pay particular attention to specific aspects that are important in the follow-up of patients with compensated cirrhosis, particularly surveillance for gastroesophageal varices and hepatocellular carcinoma, and immunization for hepatitis A and B, pneumococcal pneumonia, and influenza. Nutritional counseling is also important to help patients maintain ideal body weight and avoid protein and calorie malnutrition. Nursing care should also include education about the complications of cirrhosis, prevention (if possible), and early detection through specific symptoms (see subsequent sections for specific complications). Nursing care for patients with compensated cirrhosis is summarized in Table 1.

## **Patients With Decompensated Cirrhosis**

Patients with decompensated cirrhosis are in a more advanced stage of the disease and may suffer from several complications that are specifically discussed in the following sections.<sup>(2,8,9)</sup> As a general concept, the nursing care for patients with decompensated cirrhosis should include frequent follow-up for disease assessment, either in regular visits or through telephone calls, and educational support in several aspects of the disease (Table 1). It is important that the main caregiver is present at each visit, so that major issues can be discussed with both the patient and the caregiver. The most important educational aspects are (1) enumerating the complications of cirrhosis with special emphasis on how to recognize and prevent them, (2) increasing awareness of falls and methods of falls prevention in patients with risk factors, and (3) discussing the effects and side effects of medications and compliance issues. Moreover, in each visit or call, the nurse should be ready to discuss any specific doubts or problems the patients or caregivers have.

Nurses should have specific offices that are ideally located in the Hepatology outpatient area next to the offices of hepatologists, to facilitate interaction and coordination of care. Moreover, meetings should be held at periodic intervals between nurses and hepatologists to discuss specific cases. Finally, nurses should

**TABLE 1. General Aspects of Nursing Care in Patients With Compensated and Decompensated Cirrhosis**

### **Compensated Cirrhosis**

#### *General measures*

Screening for gastroesophageal varices every 1-2 years in patients with no/ small varices

Screening for hepatocellular carcinoma every 6 months, usually with ultrasound

Screening for covert HE at every clinic visit

Assessment of cardiovascular risk in patients with NASH-related cirrhosis

#### *Specific nursing measures*

Regular follow-up with standard visits or phone calls

Support and guidance for treatment of alcohol use disorder in alcohol-associated cirrhosis

Control and counseling of comorbidities associated with NASH, such as obesity, diabetes mellitus, arterial hypertension, kidney dysfunction, and/or hyperlipidemia

Nutritional and dietary counseling, particularly in patients with alcohol and NASH etiologies

Nursing education of patients and caregivers regarding complications of cirrhosis and their early detection

### **Decompensated cirrhosis**

#### *General measures*

Assessment of general health status

Liver and renal tests measured frequently

Assessment of candidacy for liver transplantation

#### *Specific nursing measures*

Regular follow-up with standard visits or phone calls

Standard vital signs, weight, and abdominal girth

Nutritional and dietary counseling

Compliance with diet and medications

Assessment of quality of life, frailty, sleeping habits, depression, and anxiety

Nursing education to patients and caregivers on complications of cirrhosis and early detection and signs of alarm, awareness and prevention of falls, care of fragile skin, and effects and side effects of medications

be able to interact easily with nurse coordinators of clinical wards and case managers.

## **FLUID ACCUMULATION: ASCITES AND EDEMA**

Accumulation of fluid is the most common complication of cirrhosis and is a frequent cause of seeking attention, either in emergency room or in day care settings. Fluid accumulates in the extracellular space, particularly the peritoneal and pleural cavities and interstitial tissue of the legs, causing ascites, pleural effusion, and leg edema, respectively.<sup>(14,15)</sup> The intensity of symptoms is related to the severity of fluid retention. Ascites may cause abdominal discomfort, pleural effusion may lead to dyspnea, and leg edema may impair walking capacity because of “heavy legs.”

Actually, leg edema is one of the most important factors in the impairment of health-related quality of life in patients with cirrhosis.<sup>(16)</sup> In addition, persistence of edema in the legs may lead to irreversible skin alterations and is a risk factor for skin infections that may be life-threatening.<sup>(17)</sup>

The main mechanism responsible for fluid accumulation in cirrhosis is an impaired capacity to eliminate sodium by the kidneys.<sup>(15,16,18)</sup> In health, the kidneys eliminate an amount of sodium through the urine, which is identical to the oral intake, so that the sodium balance is neutral. In decompensated cirrhosis, the amount of sodium eliminated by the kidneys is markedly reduced, owing to an activation of the sodium-retaining mechanisms (particularly aldosterone); therefore, part of the sodium taken with the diet cannot be eliminated and is retained together with water, thus causing an accumulation of fluid in the extracellular space. In most instances, sodium is retained together with water at the same concentration as in plasma; therefore, the sodium concentration in plasma does not change despite water retention. However, in patients with very advanced cirrhosis, more water is retained as compared with sodium, so that plasma sodium decreases and patients develop so-called dilutional hyponatremia. In many patients with ascites/edema, fluid accumulation occurs despite that glomerular filtration is normal or only slightly impaired. Thus, most patients have ascites/edema but not kidney failure. Nevertheless, when patients develop a reduction in glomerular filtration, this aggravates ascites/edema because positive sodium balance increases due to the more marked impairment in sodium elimination by the kidneys.

## Nursing Assessment of Patients With Cirrhosis and Ascites/Edema

The main roles of nurses in the assessment of patients with cirrhosis and ascites/edema are to evaluate patients' history, check current status of ascites and edema, and plan future care to prevent recurrence. If the patient has significant lower extremity edema, leg wraps should be applied to prevent fluid from continuing to accumulate and to attempt to force the fluid to be re-absorbed. Leg wraps can be high-stretch (nonambulatory patient) or short-stretch (ambulatory patient). A foam or cotton wrap should be applied as a barrier between the patient's skin and the leg wrap

itself. Education should be provided to the patient's caregiver about how to successfully apply leg wraps and what complications to monitor for at home. While in hospital, nursing staff assess the patient's skin on their legs a minimum of 3 times per day to ensure that no wounds are forming and skin breakdown is not occurring. Any open wound is a contraindication to leg wrap application. Capillary refill, foot/leg/ankle mobility, sensation, and color should be monitored twice per day and as needed. As mentioned previously, hyponatremia is a common problem for patients with fluid overload. Nursing staff must become familiar with precautions taken for these patients, specifically the need for seizure precautions, although they are uncommon. In such situations, seizure pads should be placed on the patient's bed and suction should be set up at the bedside.

Other key aspects for patients with ascites and/or edema include education of the patient and caregiver on a low-sodium diet, importance of adherence to prescribed diuretics, avoidance of nonsteroidal anti-inflammatory drugs (NSAIDs), periodic evaluation of body weight, leg wrap application, and contact with the nurse when alarm signs are present, particularly a significant increase in body weight (Table 2).

## GASTROINTESTINAL BLEEDING

Gastrointestinal (GI) bleeding, a common complication of cirrhosis, represents a frequent cause of hospital admission and is associated with high morbidity and mortality.<sup>(19-21)</sup> There are several possible lesions that may cause GI bleeding in cirrhosis, most of them related to portal hypertension. GI bleeding is usually classified as upper or lower, according to whether the lesion responsible for bleeding is located above or below the angle of Treitz, respectively. The main causes of upper GI bleeding include gastric or esophageal varices and portal-hypertensive gastropathy, whereas those of lower GI bleeding include rectal varices and portal-hypertensive enteropathy or colopathy. Upper GI bleeding manifests as melena and/or hematemesis, whereas lower GI bleeding manifests as hematochezia. Although hematemesis and hemochezia are easily recognizable and usually prompt the patient to the emergency room, melena may not always be recognized as bleeding by some patients. As such, they may not seek attention immediately and treatment may be delayed. Symptoms of GI bleeding

**TABLE 2. Nursing Care of Patients With Cirrhosis and Ascites and/or Edema****Inpatient Care***General measures*

Quantify ascites/edema using 1-3 score\*

Confirm patient is on low-sodium diet (&lt; 100 mmol/day)

Start fluid restriction if hyponatremic and/or if patient is unable to use diuretics due to kidney dysfunction

Confirm monitoring of serum creatinine and electrolytes at admission and every 2-4 days

Check urine sodium in a 24-hour collection in all patients at admission and during hospitalization in those who do not lose weight

Start diuretics. Recommend large-volume paracentesis if large or tense ascites (grade 3)

*Specific nursing measures*

Monitor body weight and urine volume daily

Monitor edema in extremities and wrap legs as needed

Assist patient with application of an abdominal binder if umbilical hernia is present

Discuss modifications of diuretic doses with physician if weight gain, no loss of body weight, or decrease &gt; 500 g/day for 2 consecutive days in patients without lower limb edema, or &gt; 1 kg in patients with edema

Avoid bladder catheter

Avoid use of saline solutions

Monitor following paracentesis for leaks and/or infection from puncture sites

If the site is leaking, assist the patient with application of a wafer/urostomy bag to collect any leaking fluid. This way, the fluid can be measured and recorded. Moreover, if leakage is identified immediately after paracentesis, patient should be asked to lie on the opposite side for a few hours.

Repeat paracentesis is often required.

Monitor arterial blood pressure after large-volume paracentesis initially every 15 minutes for 2 hours and then every 30 minutes for a further 2 hours

Administer 25% albumin as ordered during or following large-volume paracentesis

**Outpatient care***Specific nursing measures*

Educate patients and caregivers on low-sodium diet and alternatives to salt

Educate on how to monitor body weight and consult when body weight increases &gt; 500 g/day for at least 3 consecutive days

Explain the use of diuretics and their possible side effects

Explain that NSAIDs (e.g., aspirin, ibuprofen) must be avoided and educate on alternative painkillers

Educate on the care of skin in edematous legs

Nutrition counseling. Request a nutritional consultation in malnourished patients or patients with poor response to diuretics

\*Ascites: 1, only identifiable with ultrasound; 2, moderate; 3, large or tense. Edema: 1, mild; 2, moderate; 3, large.

depend on the amount of blood loss and usually involve dizziness, lightheadedness, profuse sweating, loss of consciousness, and in most severe cases, hypovolemic shock. The severity of symptoms depends on various factors, particularly patient's age, rapidity of blood loss, and associated comorbidities. Supine tachycardia is specific for blood loss of 500-1,000 mL, but not sensitive. Postural tachycardia of more than 30 beats/minute and inability to stand due to dizziness represents blood loss of approximately 1,000 mL. In addition to symptoms related to depletion of intravascular volume, GI bleeding may induce hepatic encephalopathy (HE), because absorption of blood and associated proteins in the gut is similar to intake of a large protein load. Importantly, some patients may develop symptoms of HE before the loss of blood has been recognized. Finally, portal hypertension-related

GI bleeding has a high probability of recurrence unless measures to reduce its risk are established.

## Nursing Assessment of Patients With Cirrhosis and GI Bleeding

Inpatient nursing care of patients with cirrhosis and GI bleeding includes vital signs monitoring, particularly supine and standing blood pressure and heart rate, insertion of a peripheral intravenous (IV) line, and monitoring of mental status, skin color and temperature, and stool characteristics, among others (Table 3). Some patients may require a nasogastric tube to administer medications, particularly lactulose, if swallowing mechanisms are not intact. It is important for the inpatient nurse to be aware of the degree of severity of esophageal varices and communicate with the physician

**TABLE 3. Nursing Care of Patients With Cirrhosis and GI Bleeding**

Inpatient Care
<i>General measures</i>
Intravenous saline for volume resuscitation and red blood count transfusions if hemoglobin < 7 g/dL. Dextrose solutions preferred to saline solutions for initial resuscitation in patients with ascites or edema
Check blood tests, particularly hemoglobin, regularly
Check for possible infections (e.g., skin, urine, lungs, ascites)
Start oral or rectal lactulose or enemas to prevent hepatic encephalopathy
<i>Nutrition support</i>
<i>Specific nursing measures</i>
Insert large-bore peripheral IV (16-18 gauge)
Monitor vital signs, including EKG, arterial pressure, and heart rate
Evaluate mental status periodically
Monitor urine volume daily, usually by collection of spontaneous voiding. Bladder catheter may be useful in hemodynamically unstable patients
Monitor skin pallor and temperature
Monitor characteristics of emesis or stool if blood is present (black vs. bright red)
If varices are present, be aware of their severity while placing a nasogastric tube
Outpatient Care
<i>General measures</i>
Confirm all patients have an upper GI endoscopy at diagnosis of cirrhosis and at least every 2 years afterward, to check for presence and size of gastroesophageal varices
Confirm compliance with measures to prevent bleeding, either variceal band ligation or beta-blocker therapy
<i>Specific nursing measures</i>
Assess patients on beta-blocker therapy for an adequate beta-blocker effect (i.e., reduction in baseline heart rate of 25% to a value of approximately 55-60 bpm)
Educate patients and caregivers on how to identify GI bleeding, particularly the presence of melena, and how to monitor arterial pressure and heart rate regularly at home

to determine whether placement of a nasogastric tube is the safest option. The presence of esophageal and gastric varices can occasionally make a usually safe procedure quite dangerous. The risk of triggering the rupture of esophagogastric varices with the insertion of a nasogastric tube is difficult to appreciate and therefore unknown but likely small. It should not prevent from performing the procedure when indicated. Vigorous volume resuscitation may be associated with the development of ascites and recurrence of bleeding, and therefore should be avoided unless features of hypovolemia (and particularly hypovolemic shock) are present. Outpatient nursing care primarily involves education on how to identify bleeding early and ensuring compliance with methods to prevent bleeding (variceal band ligation or beta-blockers) (Table 3).

## HEPATIC ENCEPHALOPATHY

HE is characterized by neuropsychiatric symptoms including disorientation, inappropriate behavior, sleep disturbances, abnormalities in speech, and alterations in consciousness that may progress to coma.<sup>(22,23)</sup> In the most common form of HE, known as “overt HE,” symptoms may appear rapidly, in a matter of hours, are frequently related to a precipitating factor, and resolve spontaneously or with treatment. In some patients, however, symptoms are constant, not related to a precipitating factor, and do not disappear with therapy. This form is known as “persistent HE.” Finally, there is a third form, known as “covert HE,” in which patients have only subtle alterations in their mental status, but sufficient to alter certain activities that require great attention, such as intellectual activities or driving a vehicle.

HE occurs because substances present in the gut with the capacity to interfere with neuronal function, such as ammonia, bypass the liver and reach the brain due to the presence of shunts between the portal territory and systemic circulation, and hepatic dysfunction.<sup>(22,23)</sup> HE commonly occurs as a result of a precipitating event, particularly bacterial infections, GI bleeding, or acute kidney injury, which cause a further impairment in already impaired brain function associated with advanced cirrhosis. HE is very common in patients with advanced cirrhosis and is one of the most dreaded complications, because neuropsychological alterations impact very negatively on patients’ quality of life, and because the occurrence of HE bears very poor prognostic significance. Moreover, recurrence of overt HE is frequent and represents a major cause of hospital admission and readmission. Consequently, HE represents a heavy burden to the caregivers and families.

## Nursing Assessment of Patients With Cirrhosis and HE

Nursing care of patients hospitalized with HE includes evaluation of mental status, prevention of aspiration pneumonia, assessment of potential triggers of HE (particularly bacterial infections and GI bleeding), nutritional support, prevention of skin breakdown, and bowel cleansing. Proper administration of medications to control HE (including those that reduce ammonia buildup in the body) is key for

these patients. Parameters should be identified by the physician for the number of stools a patient should have per day. Extremely accurate intake and outputs should be recorded for these patients, as it is a sensitive balancing act to maintain adequate hydration while we are deliberately causing frequent, and often very loose stools with medications. A physician may require a patient to have 3–4 large, semiformed bowel movements per day. The inpatient nurse should recognize that this is both a limit and a requirement for the patient. If the patient's HE is still significant after the required number of bowel movements, the physician should be notified. Patients with HE should be reoriented to time, place, and person frequently. They should be encouraged to stay awake during the day and remain active so they can sleep at night. If they are impulsive, unable to safely call for help, or are picking at their lines, it is important for nursing staff to recognize the need for an individual assignment. This is when a personal care assistant sits in the room with the patient at all times to redirect them and to keep them safe. In countries or hospitals where this type of assistant is not available, one caregiver can be instructed to help in this situation. Accurate calorie counts and collaboration with dieticians is crucial to keep these patients free from malnutrition; constant reminders and assistance with eating may be required. Twice-per-day skin checks on pressure points should be completed to ensure that no wounds or pressure injuries are forming. For semicomatose or comatose patients, prevention of skin breakdown should include frequent repositioning and prophylactic skin barriers. These patients will likely have fragile skin due to nutritional deficiencies and muscle wasting with bone prominences; the inpatient nurse should use skin care products that are gentle, always prep the skin for tape/adhesive, and assess for wounds such as skin tears and treat appropriately. For outpatients, the main aspects of nursing care are to evaluate possible existence of covert HE and educate patients with previous HE and their respective caregivers on prevention of recurrence and early identification of HE (Table 4).

## BACTERIAL INFECTIONS

Bacterial infections are a potentially life-threatening complication of cirrhosis. The most common types of infections seen in patients with cirrhosis are urinary tract infections, respiratory infections, particularly

**TABLE 4. Nursing Care of Patients With Cirrhosis and HE**

### Inpatient Care

#### *General measures*

Intravenous dextrose solutions should be preferred to saline solutions, particularly in patients with ascites and edema

Use lactulose or lactitol to produce 3–4 bowel movements/day. If there are no bowel movements, consider cleansing enemas

Protect airway patency. Use Mayo tube (or similar) in patients with grade 3 HE. Patients in deep coma (grade 4) should be in intensive care and intubated

Nasogastric tube may be useful to aspirate gastric fluid if there is delayed gastric emptying, particularly in grade 3 and 4 HE

Nutrition support, particularly in patients with grade 2 or greater for more than 1 day

Check for possible infections (e.g., skin, urine, lungs, ascites)

Check blood tests regularly

#### *Specific nursing measures*

Insert a large-bore peripheral IV (18–20 gauge)

Monitor vital signs, including EKG, arterial pressure, heart rate

Monitor mental status

Aspirate nasopharyngeal and tracheal secretions in patients with grade 3 or greater

Use preventive measures for skin breakdown and pressure ulcers, especially in fragile and malnourished patients

Monitor urine volume daily. Avoid use of bladder catheter unless patient is incontinent and skin breakdown is present or the patient has a severe AKI, in which case exact intake and outputs are needed

### Outpatient Care

Evaluate presence of covert HE at every clinic visit in all patients

Education about nutrition and general care to patients' caregivers

Request a nutritional consultation in all patients with previous HE

Education about bowel movements and use of laxatives in all patients, particularly those with previous HE

Evaluate quality-of-life status at least once a year in all patients with previous HE and their caregivers

Assess the frailty index at least once a year in all patients with previous HE

Assess the burden of disease in caregivers by using Zarit test or similar

pneumonia, and skin infections that usually occur in the legs when edema is present. Of note, skin infection may occur in other areas as well. Other infections include sepsis without specific focus of infection, and infection of the ascitic fluid, the so-called spontaneous bacterial peritonitis.<sup>(15,18,24)</sup> Mechanisms responsible for the high risk of infections in patients with cirrhosis include impairment in immune function that involves macrophages, lymphocytes, and polymorphonuclear cells. In many instances, bacteria causing the infection arise from the patient's own microbiota, particularly from the gut. For this reason, infections may occur when patients are at home (community acquired), in the hospital (nosocomial), or within weeks and months after leaving the hospital (health

care associated). Nosocomial infections are associated with invasive procedures, such as IV catheters, bladder catheters, or tracheal intubation. *C difficile* infection may also occur. Because the impairment of immune function tends to progress with time, bacterial infections usually recur and are a major cause of hospital admissions and readmissions. Of particular concern is the increasing prevalence of multidrug-resistant bacterial infections worldwide in patients with cirrhosis.<sup>(25)</sup> Infections in cirrhosis may trigger complications of cirrhosis, primarily HE, GI bleeding, and acute kidney injury (AKI).

## Nursing Assessment of Patients With Bacterial Infections

The most important aspect of nursing care of patients hospitalized with bacterial infections involves prevention of infection, especially in patients with HE or leg edema, monitoring for signs of infections, early identification of possible complications of the disease, development of signs of systemic inflammatory response syndrome or sepsis, minimizing invasive procedures as much as possible, and antibiotic administration. The inpatient nurse should collaborate with the case manager or social worker to determine the most appropriate outpatient plan for antibiotic management (home health care for home infusions vs. infusion therapy center). From there, coordination of care will be required to ensure the patient has the appropriate resources to be able to be dismissed from the hospital. Education should be provided about central line care and maintenance if the patient requires a peripherally inserted central catheter line or other type of line following dismissal. If the infection involves a wound, collaboration with the unit's clinical nurse specialist and wound therapy will be crucial to ensure healing. Outpatient nursing care is related primarily to use of preventive measures against infections and patient and caregiver education on prevention and early identification of infections (Table 5).

## ACUTE KIDNEY INJURY

AKI, previously known as acute renal failure or acute renal insufficiency, represents an abrupt decrease in glomerular filtration rate (GFR), the main function of the kidney.<sup>(14,15,26)</sup> AKI is common in patients with decompensated cirrhosis, particularly after occurrence of ascites. AKI may develop when patients are at home

**TABLE 5. Nursing Care of Patients With Cirrhosis and Bacterial Infections**

### Inpatient Care

#### General measures

Start IV antibiotic therapy as early as possible after prescription

Avoid using central IV line unless there are specific indications for its use

Use prophylactic lactulose or lactitol to have 3-4 bowel movements/day. If there are no bowel movements, consider cleansing enemas

Measures to prevent nosocomial infections

#### Specific nursing measures

Insert an IV line; central access may be necessary if the patient is going to be dismissed from the hospital on IV antibiotics

Provide education about central line care, signs and symptoms of infection, and potential complications

Monitor signs of infection frequently (e.g., body temperature, heart rate)

Daily urine collection is important to identify oliguria promptly. Instruct patient/caregivers to collect urine by spontaneous voiding. Avoid using urinary bladder catheters, except in hemodynamically unstable, intubated patients or patients with severe AKI

Measure arterial pressure frequently. In very ill patients, arterial pressure should be monitored at very short intervals

Report any significant decrease in mean arterial pressure of greater than 10 mm Hg. Be aware that patients with advanced cirrhosis are usually hypotensive, and reductions in arterial pressure may be difficult to recognize

### Outpatient Care

Educate patients and caregivers on early identification of signs of infection (particularly fever, abdominal pain, initial signs of HE, dysuria, and/or respiratory symptoms). Patients with these symptoms should get in contact with their nurse for advice or, if not possible, go to the emergency room

Check if patients have indications for prophylactic antibiotic therapy and consult with their physician about its use

in apparently stable condition or in hospital admitted for other complications of cirrhosis. AKI usually occurs as a result of a precipitating event, particularly bacterial infections or acute volume loss (i.e., GI bleeding), which cause a further deterioration in the already impaired circulatory function characteristic of advanced cirrhosis. Patients or caregivers may identify AKI when they notice a reduction in the amount of urine eliminated; however, it is important to note that in many cases of AKI, at least in early stages, urine volume may be normal, while oliguria is only present in more severe cases. Patients with AKI may have nonspecific symptoms such as feeling unwell, but may also develop signs of HE.

Diagnosis of AKI is made by demonstration of increase in serum creatinine concentration equal to or greater than 0.3 mg/dL (31 µmol/L) that has occurred within a short period of time, usually fewer than 7 days. However, because most patients who are at home may not have a recent determination of serum creatinine, values within the previous 3 months

can be used as baseline.<sup>(15)</sup> The most common causes of AKI are (1) hypovolemia due to volume loss secondary to bleeding (usually from GI tract) or excessive losses by urine or diarrhea; (2) acute tubular necrosis, a severe form of AKI usually associated with shock; and (3) hepatorenal syndrome (HRS). HRS is a type of AKI, known as AKI-HRS with the current terminology, that is unique to patients with cirrhosis and is characterized by very intense reduction of GFR that occurs in the absence of volume losses and significant light-microscopic abnormalities in kidney histology.<sup>(14)</sup> Although less frequent, AKI may also occur as a result of NSAIDs that are prescribed for treatment of pain. NSAIDs cause inhibition of prostaglandin synthesis in the kidney, which may lead to AKI in decompensated cirrhosis. This type of AKI may be severe and progress despite withdrawal of the drug, and has a high mortality rate.

## Nursing Assessment of Patients With AKI

Nursing care of patients hospitalized with AKI involves monitoring of urine volume and characteristics, serum creatinine and electrolytes, early identification of potential associated complications, particularly HE, and early detection of signs of metabolic acidosis and cardiopulmonary congestion. Monitoring of volume of fluid losses is important in all patients hospitalized, as volume losses from variceal bleed, aggressive diuresis, and diarrhea with administration of lactulose can all contribute to AKI. As previously mentioned, fluid restriction may be required for patients with fluid volume overload and/or hyponatremia. It is important for nursing to collaborate with physicians to ensure appropriate fluid intake, while keeping the patient safe from becoming too fluid volume-overloaded. Adequate hydration is important during AKI and the inpatient nurse is faced with another balancing act to maintain hydration but preventing ascites or edema (including pulmonary edema) from getting out of hand. The inpatient nurse should become familiar with interventions for hyperkalemia, as this is a dangerous complication of AKI. These interventions should be carried out in a timely manner once the physician orders them. If a patient is hyperkalemic, the inpatient nurse should assess the patient's heart sounds, listen for any irregularities, and report them promptly to the physician and perform an

**TABLE 6. Nursing Care of Patients With AKI**

### Inpatient Care

#### General measures

Serum creatinine and electrolytes should be measured daily; more often if hyperkalemia is present

Administration of large amounts of IV fluids should be avoided, except in patients in whom AKI is due to volume depletion

IV saline solutions should be avoided, except in patients in whom AKI is due to dehydration; consider IV albumin replacement

Evaluate possible candidacy for liver transplantation

#### Specific nursing measures

Insert a short peripheral IV line (18-20 gauge); a large catheter may be needed in some patients

Monitor vital signs frequently

Monitor urine volume. Use of bladder catheter should be considered, as strict monitoring is necessary in these patients. Take measures to prevent urinary tract infections

Be ready for early identification of symptoms of HE

Look for signs or symptoms of bacterial infections

### Outpatient Care

Educate patients and caregivers on early identification of signs of AKI, particularly reduction in urine volume. Patients with oliguria should get in contact with their nurse for advice

Educate patients and caregivers on early identification of HE, which may be the first sign of AKI

electrocardiogram (EKG). If the patient is undergoing EKG monitoring, the presence of peaked T waves, PR prolongation, QRS widening, and disappearance of P waves raises the question of hyperkalemia. If hyperkalemia is noted during the hospitalization, discussion with the dietitian is crucial to assist in education on a low-potassium diet. Hyperkalemic emergencies may require intravenous administration of calcium, glucose, insulin and bicarbonate, and constant EKG monitoring as emergency treatment. Outpatient care is related primarily to nursing education about use of drugs such as diuretics or laxatives, and avoidance of NSAIDs (Table 6).

## QUALITY OF LIFE AND SOCIAL ISSUES

Health-related quality of life in both mental as well as physical components is frequently impaired in patients with cirrhosis, particularly in patients with decompensated cirrhosis.<sup>(16,27,28)</sup> The impairment in quality of life is related to several factors, particularly ascites, HE, leg edema, muscle cramps, insomnia, and low serum sodium concentration. In addition, untoward effects of treatments, associated conditions and their therapy, and general anxiety generated by concern

for disease outcome contribute to the alteration of the quality of life. Nurses should evaluate quality-of-life status regularly and educate patients on how to cope with more impaired aspects and prevent complications, particularly falls. Factors associated with an increased risk of falls are covert or overt HE and low serum sodium concentration.<sup>(16,29)</sup> Therefore, preventive measures should be taken particularly in patients with risk factors for falls.

Finally, patients with cirrhosis may suffer from social stigmatization, as they are usually perceived to have an alcohol use disorder even if they have other etiologies of cirrhosis. This may lead to impairment in quality of life and have a negative effect on self-esteem, personal management, and ability to cope with the disease.<sup>(30)</sup> Accordingly, nurses have an important role in the detection of the impact that stigmatization may have on their patients and seeking solutions to avoid harmful effects.

## COMMENTS FROM PATIENTS

The ELPA is well aware of the complexity and severity of cirrhosis, and one of its main objectives is help improve the management and quality of life of patients with cirrhosis. In this regard, ELPA enthusiastically supports a greater involvement of nurses in the care of patients with cirrhosis. Nurses should play a major role in the education of patients and caregivers by devoting a greater length of time to patient care compared to that of physicians and other health care professionals, thus improving patients' quality of life and reducing the burden on health care systems.

## Conclusions and Future Directions

Cirrhosis is a very frequent and devastating disease, as patients have a high number of complications, marked impairment in quality of life, frequent hospitalizations, and high mortality. In this context, nursing care to both hospitalized and nonhospitalized patients is of utmost importance to help manage and prevent complications of the disease and improve quality of life. Nurses play a pivotal role in the care of patients with cirrhosis not only by bridging the gaps between clinicians and families and between primary

and hospital care, but also by providing medical education to patients and caregivers. Despite the extreme importance of cirrhosis as a global disease, very little attention has been paid to the role of nurses by health and hospital authorities, national and international colleges of nurses, and national and international nursing or hepatology societies. In very recent years there have been some small movements to improve this situation, particularly after the first report of the UK Liver Lancet Commission,<sup>(31)</sup> but much remains to be done. Health and hospital authorities should stimulate the creation of positions of nurse liver specialists dedicated to caring for patients with cirrhosis. In the past, most liver nurse specialists were devoted to care of patients with hepatitis C or B infection or liver transplantation, but not to patients with complications of cirrhosis. This situation should be changed and multidisciplinary teams in all hospitals caring for patients with cirrhosis should include nurse liver specialists with special education in cirrhosis. In this regard, both national and international societies should develop education plans at the nurse practitioner or master level to fill this gap in education.

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## Appendix

### MEMBERS OF THE LIVERHOPE CONSORTIUM

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