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Dialysis Treatments and Nursing Care in Disasters

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Abstract

Disasters are situations that cause harm and loss of life and property that go beyond what a society can handle using its own resources to function. Earthquake victims are at risk of developing crush syndrome, so it is crucial that earthquake victims who are buried under the debris in collapsed buildings are taken to hospitals as quickly as possible after being freed from the debris. If the crush syndrome is not treated quickly and efficiently, it might result in acute kidney injury (AKI). Children, however, are at a lesser risk due to their smaller body surface area than adults. Dialysis is lifesaving when AKI is irreversible despite medical intervention. A holistic nursing approach is used to assess acute or chronic patients getting dialysis therapy, identify their care requirements, and deliver the necessary care. Patients receiving hemodialysis and peritoneal dialysis should be informed about what to do in case of an earthquake and should take the appropriate safety measures in case of emergencies in dialysis facilities in order to recover with the least amount of damage.

Keywords: Disaster, earthquake, crush syndrome, child hemodialysis, hemodialysis and nursing care

Introduction

Disasters include a broad range of natural and human-caused occurrences that outweigh a society's ability to respond by utilizing its own resources and result in injuries, loss of life and property, and halt or disrupt normal life.[1-4]

Those who are directly affected by disasters also experience health issues that require additional treatment. Particularly those earthquake victims who remain in the ruins of collapsing structures after tremors have occurred are at risk of experiencing crush syndrome.[5] According to Demirkiran et al,[6] 13 of the 25 patients admitted to the intensive care unit developed crush syndrome, and dialysis treatment was started.

Every year, huge disasters affect thousands of individuals all around the world. For those impacted by disasters, having access to food, clean water, shelter, and basic medical care services is of utmost importance.[7] Earthquakes are the most frequent and destructive sort of disaster in our country, regardless of their geographic location.

This study covers the aftermath of the earthquake's consequences, necessary safety measures, and nursing care, particularly for those who require dialysis.

Crush Syndrome

Literally, the word "crush" means to crush, squeeze, compress, and be under pressure. Only trauma is referred to as crush damage.[8] As a result of the rhabdomyolysis brought on by this trauma, crush syndrome develops, affecting numerous systems and organs and frequently leading to surgical and medical difficulties.[9] Hence, over the course of treatment, comprehensive multidisciplinary support is needed.[10] After triage planning, this category of patients should be referred to secondary and tertiary healthcare facilities within 12 hours at the latest.[8]

Acute kidney injury (AKI) is one of the most significant effects of crush syndrome. Dehydration, trauma, and hypovolemic shock brought on by hemorrhage are among the conditions that can lead to AKI. Organic renal failure owing to acute tubular necrosis may result if prompt and adequate medical care is not provided in the initial stage.[11,12] Children have a lesser risk of acquiring crush syndrome than adults because of their smaller body surfaces.[13] Nonetheless, due to their rapid metabolic rates and limited fluid stores, children are especially susceptible to malnutrition and dehydration.[12]

The continuation of dialysis treatment for acute or chronic patients encounters logistical and medical challenges. Planning for post-disaster logistics is essential to ensuring successful treatment.[14] While using cutting-edge technology, specialized tools, and medications is important even in normal circumstances, things get trickier in the event of a crisis.[15]

People on dialysis are affected both directly and indirectly from disasters. For their survivability, such patients not only depend on medical care and treatment but also on basic infrastructural support.

While dialysis centers may not suffer direct physical damage in the aftermath of a disaster, the very fact of water and electricity outages can impede the access of patients to treatment. In addition, the following problems make this patient group more vulnerable:

- Difficulty of access to the centers.
- The center is damaged or unusable.
- Difficulties in access to medical supplies and medicines.
- Missing dialysis sessions.
- Increase in hospitalization and emergency room admissions.[16,17]

Dialysis is life-saving in cases of AKI that are incurable despite medical intervention. The therapies employed include peritoneal dialysis, intermittent hemodialysis, and continuous slow

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treatments. Intermittent hemodialysis is preferable when medical and logistical considerations are taken into account.[11] Dialysis is used to treat acute renal failure brought on by crush syndrome, in order to lower the elevated potassium levels in the blood caused by the condition, maintain volume balance, and ensure that our disaster survivors undergoing chronic dialysis continue to receive treatment at the highest possible level.[18]

When scheduling patients in post-disaster dialysis centers, priority should be given to AKI patients who are in need of urgent dialysis. These patients should be followed by anuric and hypervolemic patients as well as those with uremic symptoms, electrolyte abnormalities, and those who are followed up in chronic dialysis program.[13]

Every patient's treatment plan needs to be customized.[13,18]

Indications for Emergency Hemodialysis in Disasters

- Serum potassium level ≥ 6.5 mmol/L or rapid increase in potassium despite medical treatment.
- Blood urea nitrogen ≥ 100 mg/dL or serum creatinine ≥ 8 mg/dL.
- Blood pH level ≤ 7.1.
- Signs of hypervolemia.
- Uremia-related uremic pericarditis, encephalopathy, persistent nausea, and vomiting.
- Persistence of oliguria or anuria despite adequate hydration.[10,18-20]

Contraindications of Hemodialysis Treatment in Disasters

Although dialysis can be administered to patients with AKI in every situation because it is a life-saving procedure, the following factors need to be taken into account:

- In a patient in shock.
- Patients at high risk of dialysis disequilibrium syndrome.
- When a catheter for emergency intravenous access is not available.
- Alternative dialysis methods in the absence of technical equipment and experienced personnel.[18]

Nursing Care During Dialysis Treatment

A holistic nursing approach is used to assess acute or chronic patients getting dialysis therapy, identify their care requirements, and deliver the necessary care. Our goals should be to hasten recovery, create a secure environment, avoid potential difficulties, ensure safe and efficient patient transport, and assist patients and their loved ones in dealing with their experiences from the moment we first meet the patient until the end of the session.

- The patient's identity should be confirmed first, and details regarding the drugs used, known ailments, whether this is the patient's first dialysis, the location of the earthquake, and the amount of time spent under the rubble should be gathered and recorded.
- To be able to determine the position we will take during dialysis, wound care, and follow-up, it is necessary to know whether there is crushing and how many extremities are involved.[21]
- If the patient requires ongoing dialysis, the fistula or catheter needs to be tested for functionality. If not, the physician should work with you to make the appropriate interventions.[22]
- To establish fluid balance in patients receiving dialysis for crush syndrome, the patient should, if at all possible, be weighed each day. Throughout dialysis, the patient's fluid intake and output should be monitored. In order to prevent the patient from becoming hypotensive or hypovolemic while receiving dialysis, the amount of ultrafiltration to be performed on the patient should be decided based on monitoring their fluid intake and output. Fluid balance of patients with crush syndrome should be kept positive.[11]
- Peripheral vascular access should be examined when a patient with crush syndrome receives dialysis, and if an intravenous treatment involves potassium, it should be stopped right away.[11]
- The acute dialysis application protocol should be followed to start the first dialysis time and blood flow rate in crush syndrome.[23] Treatment is based on the patient's tolerance, volume status, and potassium level in the following sessions. On the same day, extra dialysis sessions can be carried out if necessary.[18]
- On a doctor's prescription, anticoagulation should be given depending on the state of the patient's crush wounds. Those with bleeding disorders should not use anticoagulants. Without heparin, the system is flushed with 50-100 mL of 0.9% NaCl every 15-20 minutes, and coagulation should be monitored. During dialysis, it is also important to keep an eye out for bleeding and purulent discharge from existing wounds.[22]
- In terms of volume balance control, it is appropriate to undertake transfusions in dialysis for patients who need blood transfusions. Blood potassium levels need to be watched since blood transfusions can raise potassium levels, and patients should be kept an eye out for cardiac arrest.[10]
- Every 30 minutes throughout the dialysis session, the patient's vital signs should be obtained, and frequent checks should be made for early dialysis responses.
- Regarding infection symptoms and indicators, caution should be exercised. When signs of infection are present, the necessary cultures should be taken.
- Utilizing current scales, the patient's level of pain should be evaluated. When there is pain, the source, duration, and intensity are assessed, and any necessary actions are carried out in consultation with the doctor. Applications of nonsteroidal anti-inflammatory drugs ought to be avoided. It is important to assess the factors that affect pain and take the appropriate action.[24]
- In patients receiving total parental nutritional support, it should be given during dialysis treatment for volume balance control.
- In terms of hyperpotassemia, the patient and his/her relatives should be informed about potassium-rich foods.
- Protein intake of the patient should not be restricted, and adequate and balanced nutrition should be ensured.
- Patients should be supported psychologically in accordance with their age groups. Individuals should not be given promises that cannot be fulfilled; they should not be forced to tell about the traumatic event they have experienced; care should be taken for the confidentiality of the individual's information; and skills should be taken into consideration in the subjects to be supported. If possible, professional psychological support should be provided.[25,26]

Children in Disasters

Children make up a unique population that is more vulnerable than adults in terms of physical, psychological, and social factors after disasters, placing them at increased risk for morbidity and mortality.[12,27] Children may suffer a variety of risks during

catastrophes, including becoming hurt, becoming disabled, being unable to obtain medical care, getting lost, losing their parents, or being split up from their families, having to relocate, and having trouble getting access to food and clean water. Children make about one-third of the fatalities brought on by disasters.[13,28,29] For children who are totally dependent on their parents for food, shelter, communication, emotional support, and advocacy, the loss of parental assistance due to death, injury, or separation creates profound psychological trauma.[30] It is important to create a secure space where individuals can express their emotions, including sadness, anxiety, fear, and rage, and, if at all feasible, to offer expert psychological help.[31]

Dialysis Treatment of Children in Disasters

The care of pediatric patients is more difficult due to a lack of medical, logistical, and skilled people, despite the fact that the principles of dialysis treatment for adult and pediatric renal patients in catastrophes are comparable. For reasons connected to AKI, healthy children hurt during a disaster may need dialysis therapy (prerenal, postrenal, and intrinsic). Crush syndrome is one of the most typical causes of AKI. Children are less likely to get crush syndrome than adults because of their smaller body surface area.[13] Nonetheless, due to their rapid metabolic rates and limited fluid stores, children are especially susceptible to malnutrition and dehydration.[12] There are significant issues with the low number of pediatric dialysis centers available during a disaster, the inadequacy of pediatric dialysis equipment in each facility, and the lack of adequately qualified staff. Children's limited food tolerance and inadequate dialysis are other issues. They are therefore more impacted by issues with technology and infrastructure.[13]

While scheduling hemodialysis treatment, especially for young children, it is important to evaluate the compatibility of the dialysis equipment. The patient's weight should be taken into consideration when choosing the size of the catheter to be used for vascular access, and the patient's body surface area should be taken into consideration when choosing the dialyzer to be used. The extracorporeal blood volume in pediatric patients should not be more than 10% of the patient's overall blood volume. The set can be filled with erythrocyte suspension, fresh frozen plasma, or 5% albumin if adequate sets and dialyzers are unavailable. Blood flow rates should not exceed 3-5 mL/kg/min, dialysate flow rates should not exceed 300-500 mL/min, and ultrafiltration rates should not exceed 0.2 mL/kg/min in order to preserve hemodynamic stability.[32]

The nurse should introduce herself/himself and explain the process to be conducted in accordance with the child's age when the patient is admitted to the dialysis unit. The treatment will go more smoothly if the processes are explained and the patient cooperates.

Unaccompanied pediatric patients should continue receiving care after the disaster while being closely monitored at all times. In this situation, there is a much greater requirement for experienced personnel.

Disaster Preparedness of Dialysis Centers

Building security is the most crucial component of disaster preparedness in dialysis facilities. In order to be prepared for emergencies, medical supplies and medication should be kept on hand for at least one week. A generator should be accessible in case of power outages, and furniture and equipment that could topple over due to shaking should be fixed. In collaboration with regional and national dialysis facilities, treatment cards for patients should be developed on a monthly basis. At least once a year, disaster exercises must be held, and staff and patient training must be ongoing.[13]

Dialysis Centers During Disaster

A significant burden on the local health system might result from a massive influx of patients seeking care after major disasters like earthquakes. Intensive care units and dialysis centers are more necessary at this time. Patients with urgent hemodialysis demands could put pressure on nearby dialysis facilities, and their treatment could also be negatively impacted.[33]

After a disaster, it is important to examine the damage to the centers and decide whether they can continue to provide services or not. Utilizing the communication tools at hand, coordination centers, patients, and health personnel must all be kept in the loop. Planning the health workforce is necessary to establish the number of employees who can work actively, the shift list, the need for additional employees, or the number of employees who will be reassigned to another center. Local healthcare providers should be aware that they are also catastrophe victims, may have lost loved ones or have family buried under debris, and that working long hours can lead to great weariness and burnout. For this reason, the support of national and international health teams is of great importance.[13]

Planned patients should be sent to alternative dialysis facilities if the center is unable to run. The pediatric patients being transferred should, if at all feasible, be accompanied by a medical professional from the dialysis center, and the patient should also be sent with information on their therapy. Due to the rising patient population in the centers, triage is crucial. First, it is important to arrange the care of patients who require urgent dialysis. When patients have sufficient biochemical markers and remaining renal function, the length or number of dialysis treatments can be decreased. By paying close attention to the disequilibrium syndrome in these patients, the dialyzer surface area/blood flow rate can be raised. Water system issues are frequently observed in disasters. When the modality is changed from hemodiafiltration to hemodialysis, less water is preferred for efficient use of the water supply. When required, tanker water can also be used, but daily measurements are required. While experiencing typical symptoms such as fever, chills, or hemolysis, it is important to think about whether the water supply has been contaminated.[13]

Also, as patient demand rises, there is a growing shortage of medical supplies and equipment. By establishing center coordination, material shipments should be sent to the required centers.[13]

Disaster Training of Dialysis Patients

Dialysis patients need to be trained on what to do before, during, and after earthquakes in order to live with the least amount of harm. Dialysis patients should get training specific to their therapy in addition to the measures that healthy people should follow.[13,34,35]

Hemodialysis Patient Education

- Training should be given on keeping the information card containing identity information, information about the people who can be reached in case of emergency, and treatment information with him/her.[13,34,35]
- Drills involving possible disaster scenarios should be conducted.[13,34,35]

- They should be informed about emergency diets, and it should be ensured that the medicines used are backed up for 5-7 days.[34,35]
- Patients and their relatives should be given the contact information of health personnel and alternative dialysis centers that they can reach in case of an emergency.[13,34]

Leaving the Hemodialysis Machine in Emergency Situations

- The patient must stop the blood pump.[34,35]
- The fistula needle/catheter lumen clamps and A-V set clamps are closed, and the patient is allowed to take the fetal position on the edge of the bed and wait until the shaking passes.[34,35]
- After the tremor passes, the patient is separated from the machine by the healthcare personnel and taken to a safe area without removing the needles. In cases where the healthcare personnel cannot reach, the patient is separated/cut between 2 clamps and taken to a safe area.[34,35]
- Needles are removed by health personnel after all patients are taken to a safe area.[34,35]
- All process steps are taught to the patient practically.[34,35]

Post-Earthquake Dialysis Planning

- The patient/caregiver should contact the dialysis center to inform them about his/her condition, and the center should be trained to receive information about his/her condition.[13,35]

- Should the dialysis center be unavailable due to damage, they should be informed about contacting a predetermined alternative dialysis center.[13,35]

Peritoneal Dialysis Patient Education

- Training should be given on keeping the information card containing identity information, information about the people who can be reached in case of emergency, and treatment information with him/her.[13,35]
- Stockpile enough solutions and materials to last for 2 weeks after the earthquake.[13,35]
- Drills involving possible disaster scenarios should be conducted.[13,35]
- They should be informed about emergency diets, and it should be ensured that the medicines used are backed up for 5-7 days.[34,35]

Leaving an Automated Peritoneal Dialysis Device in an Emergency

- The patient is told to cease receiving treatment, close the catheter's clamp, and wait at the side of the bed until the shaking stops before exiting the machine and putting on a fresh protective cover.[34,35]

Continuation of Peritoneal Dialysis Treatment After Disaster

- By establishing connection a between the patient center and the patient, the supply of dialysis supplies can be shared between patients. The patient's solutions can be used to construct a new dialysis prescription, and the automated peritoneal dialysis (APD) period can be extended to make the most of the fluids on hand.[13,34]
- It should be known that dialysis in an inappropriate environment and failure to comply with hygiene conditions will increase the risk of peritonitis, catheter exit site infection, and sepsis.[13,34]
- Continuous ambulatory peritoneal dialysis (CAPD) can be performed by using hand antiseptic and a mask when dialysis must be performed under unhygienic conditions. A secluded area should be selected as much as possible for the application, and the patient should be informed that the inner surface of the dialysis solution bags can be used as a clean area.
- It should be explained that CAPD can be performed when APD is not possible, and in pediatric patients with low filling volumes, the same solution can be used for several changes with a single connection.[13]

Nutrition in Patients with Limited or No Dialysis

Patients should be informed about the following issues:

- Foods containing high potassium should be avoided; vegetables should be boiled, and the water should be poured. Prepared foods should be avoided as much as possible, and potassium-binding resins should be used.[13,34,35]
- For salt restriction, meals should be cooked without salt, flavored with spices, and processed foods should be avoided. The water from canned food should be poured out and consumed after washing.[13,34,35]
- The amount of fluid intake should be reduced and, if possible, recorded for follow-up. Chewing gum, ice, and lemon help to reduce the feeling of thirst.[13,34,35]

Conclusion

In general, earthquakes are unavoidable and have an impact on every aspect of society. Patients in chronic dialysis programs and those with acute dialysis demands as a result of post-earthquake crush syndrome find it particularly difficult. Also, the lack of pediatric dialysis units in our nation may have a greater impact on children who require dialysis. It is crucial that skilled healthcare professionals participate in the care of this particular patient population. The healing process is aided by continuing to provide these patients with care and therapy using a holistic nursing approach. Healthcare workers, patients, and the patient's family should receive training, and training should be updated by holding drills in order to reduce the effects of disasters on society.

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