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Rapid Recognition and Management of Critical Illnesses in Emergency Medicine

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Abstract: As an important part of clinical medicine, emergency medicine bears the important responsibility of rapid identification and effective treatment of patients with acute and critical illnesses. The purpose of this paper is to discuss the rapid identification of critical illnesses in emergency medicine and its treatment strategy, through the analysis of vital signs monitoring, identification of acute and critical symptoms, first aid skills and operation standards, etc., to provide emergency physicians with a set of scientific and systematic response program, with a view to improving the efficiency of emergency treatment and patient survival rate.

Keywords: Emergency Medicine; Critical Illness; Rapid Identification; Treatment

Introduction

Emergency medicine usually refers to patients with organ failure or severe ischemia and hypoxia, with rapid development and poor prognosis, requiring immediate medical intervention. Emergency physicians need to have a high degree of alertness and professionalism, and be able to make accurate judgment of the condition and take effective measures within a short period of time. This paper will discuss two aspects of rapid identification and treatment of critical illnesses.

1. Rapid Identification of Critical Illness

1.1 Vital Signs Monitoring

Vital signs are the basis for evaluating the patient's condition. Emergency physicians should pay close attention to the patient's temperature (T), pulse (P), respiration (R), blood pressure (BP) and other basic vital indicators. In addition, consciousness (C), pupil (A), urine (U), and skin mucosa (S) are also key signs to identify critical illnesses, collectively known as the "eight signs of life". Normal body temperature is 36-37 ℃, abnormal body temperature suggests infection, hypothermia or hyperthermia. Pulse is 60-100 beats/minute in normal adults; arrhythmia and weak pulse may indicate shock. Respiration is 16-20 breaths/minute in normal adults. Abnormal respiration, including abnormal frequency, rhythm, depth and sound, is an early sign of respiratory failure. Blood pressure <90mmHg systolic or <60mmHg diastolic may indicate shock. Blurring or drowsiness is a precursor to coma, and a Glasgow Coma Scale <9 requires high alert. Bilateral unequal, dilated, or fixed pupils suggest severe brain lesions or cardiac arrest. Decreased urine output is an early sign of shock and acute renal failure. Pale, clammy and cyanotic skin and mucous membranes suggest circulatory disorders or shock.

1.2 Recognition of Signs of Acute and Critical Diseases

In the rapid identification of critical illness, the assessment of the mental status of clinical symptoms is particularly critical, and is often quantitatively assessed using the Glasgow Coma Scale (GCS), which scores the patient's eye-opening response, verbal response, and limb movement, with a total score ranging from 3 to 15 points. Specifically, for eye-opening response, the patient scored 4 points for spontaneous eye-opening, 3 points for eye-opening after calling, 2 points for eye-opening after tingling, and 1 point for no eye-opening response at all; for verbal response, the patient scored 5 points for a relevant answer, 4 points for an irrelevant answer, 3 points for a word only, 2 points for a sound only, and 1 point for no verbal response at all; and for limb movement, the patient scored 6 points for being able to move according to the command, 5 points for being able to localize the painful stimulus, and 5 points for being able to locate the painful stimulus. The lower the GCS score, the worse the patient's mental status and the more critical his/her condition. In addition to the assessment of mental status, the observation of symptoms such as dyspnea, chest pain, and abdominal pain is also crucial. Dyspnea is a common manifestation of respiratory

system critical illness, and patients may have symptoms such as shortness of breath, labored breathing, and nasal flaring. Chest pain is an important signal of critical cardiovascular disease, and patients may feel pressure, tightness, or burning sensation in the chest, and the pain may radiate to the neck, jaw, or arms[1]. Abdominal pain may indicate the presence of critical illness in the digestive system, and the patient may feel dull, sharp, or colicky pain in the abdomen, and the pain may be accompanied by nausea, vomiting, and diarrhea. The main points are summarized in Table 1 below

Table 1 Disease Point Assessment Scale

Symptom	Evaluation Indicators	Critical Condition Judgment
Mental Status	GCS Score	GCS Score < 9: Condition is critical and requires immediate intervention.
Breathing Difficulty	Breathing rate, degree of respiratory effort	Breathing rate > 30 breaths per minute or significant respiratory effort: Condition is critical.
Chest Pain	Pain location, nature, radiation	Chest pressure, tightness, or burning sensation with pain radiating to the neck, jaw, or arms: Condition is critical.
Abdominal Pain	Pain location, nature, accompanying symptoms	Dull, sharp, or cramping abdominal pain with nausea, vomiting, or diarrhea: Condition may be critical.

Through careful observation and quantitative assessment of clinical symptoms, emergency physicians can more accurately determine the degree of criticality of the patient's condition and formulate timely and effective treatment plans accordingly.

2. Strategies for the Treatment of Critical Illnesses

2.1 First Aid Skills and Operation Standards

2.1.1 Cardiopulmonary Resuscitation (CPR)

CPR is a kind of emergency treatment for patients with cardiac arrest, aiming at restoring blood circulation and respiratory function by artificial means, so as to save patients' lives. The first step is to assess and check the patient's consciousness by tapping the patient's shoulder and calling out loudly to see if there is any response. Determination of respiration and pulse is usually accomplished by seeing, hearing, and feeling (observing the rise and fall of the chest, listening for breath sounds, and feeling the carotid artery pulsations). Next, lay the patient flat to loosen the collar and pants belt. The site of compression is the middle and lower 1/3 junction of the sternum vertically downward. Depth of compression is at least 5 cm for adults, 2-3 cm for children, and 1-2 cm for infants.The frequency of compression is at least 100 times/minute, which is kept even and strong, and the chest should be completely rebounded after each compression [2]. At the same time, artificial respiration is given, and the volume of each blow should cause the chest to lift, and the blowing time lasts for more than 1 second, with a frequency of 10-12 times/minute. AED can also be used, following the voice prompts of the AED.After the AED analyzes the heart rhythm, if defibrillation is recommended, defibrillation should be carried out immediately, and then CPR should be continued.

2.1.2 Airway Management

Ensuring that the patient's airway is clear is the first task of first aid. Airway obstruction can lead to hypoxia and asphyxia, seriously threatening the patient's life. In the process of first aid, a suction device or finger can be used to remove foreign bodies and secretions in the patient's mouth. For comatose or unconscious patients, suction operation should be routinely performed. When routine clearing of the airway is ineffective, the use of oropharyngeal airway, nasopharyngeal airway or tracheal intubation should be considered to establish an artificial airway. Oropharyngeal airway is suitable for patients who are unconscious but not in danger of vomiting; nasopharyngeal airway is suitable for patients who need prolonged ventilation and the mouth cannot be opened; tracheal intubation is suitable for patients who need prolonged mechanical ventilation or have severe airway obstruction. The established artificial airway should be properly secured to prevent dislocation or displacement. Regularly check the patency and fixation of the airway, and promptly clean up secretions and change the humidifying fluid.

2.1.3 Rapid Establishment of Intravenous Access

Intravenous access is an important way for infusion, blood transfusion and drug administration, especially when dealing with shock,

poisoning and other acute and critical patients, rapid establishment of intravenous access is crucial. Priority should be given to thick, straight and elastic veins, such as elbow median vein and noble vein. Prepare infusion sets, syringes, sterilization supplies (e.g., iodophor, alcohol), cotton swabs, adhesive tape, etc. Make sure all items are sterile. Sterilize the puncture site with iodophor or alcohol in an area large enough to reduce the risk of infection. For puncture, the needle is placed at an appropriate angle to the skin (usually 15-30 degrees) and the vein is rapidly punctured. After returning blood is seen, the needle is secured, the infusion set is connected, and the drip rate is adjusted. Secure the needle properly with adhesive tape to prevent it from moving or falling off. Closely observe the infusion, including the drip rate, any localized swelling and pain. Before establishing intravenous access, the patient's condition and venous status should be fully assessed, and the appropriate vein and puncture method should be selected.

2.2 Advanced Life Support Skills

2.2.1 Use of Emergency Medications

In emergency medical situations, the rapid and accurate use of emergency medications is crucial. This requires healthcare professionals to be familiar with the role and usage of commonly used emergency medications, as well as the related precautions. Commonly used first aid drugs include: epinephrine is used in emergencies such as anaphylactic shock and cardiac arrest, which can rapidly constrict blood vessels, elevate blood pressure, and help restore the heartbeat. Atropine is mainly used to relieve muscarinic symptoms caused by organophosphorus pesticide poisoning, such as narrowed pupils and difficulty in breathing. Before using any emergency medication, it is important to confirm the patient's identity and condition to ensure the correct choice of medication [3]. Administer the drugs in strict accordance with the dosage and method of use of the drug instructions or medical prescriptions. The patient's response needs to be closely observed during the process of drug administration, and the treatment program should be adjusted in a timely manner. Record the time, dose, route and patient response of drug administration to provide a basis for subsequent treatment.

2.2.2 Poisoning First Aid

Poisoning first aid requires medical personnel to quickly identify the source of poisoning and take effective measures to remove the poison, while giving antidotes and supportive treatment to minimize the damage of poison to the patient. Rapidly identify the source of poisoning by inquiring medical history, observing symptoms, and detecting poisons. Adopt different removal methods according to the route of poisoning, such as inducing vomiting, gastric lavage, and catheterization. For skin contact poisoning, remove contaminated clothing immediately and rinse the skin with water. Give appropriate antidotes according to the type of poisoning, such as atropine for organophosphorus poisoning. Give supportive treatment, such as oxygen, rehydration, correction of electrolyte disorders, etc., to maintain the patient's vital signs stable.

2.2.3 Trauma Treatment

Trauma treatment is an important part of first aid work, for bleeding wounds, immediate hemostatic measures need to be taken, such as compression hemostasis, tourniquet hemostasis and so on. Pay attention to the use time of the tourniquet, to avoid prolonged use leading to limb necrosis. After cleaning and treating the wound, bandage it with a sterile dressing to protect the wound and reduce the risk of infection. The dressing should be tightened appropriately to avoid over-tightening which may lead to local ischemia or over-loosening which may lead to dislodgement of the dressing. For fractures and other wounds that require immobilization, splints and bandages should be used to reduce pain and prevent further injury. When immobilizing, attention should be paid to the length and width of the immobilizer to avoid too tight or too loose [4]. When transporting trauma patients, care should be taken to protect the patient's wound and fixation to avoid secondary injury during transportation. According to the patient's injuries and handling conditions, choose the appropriate mode of transportation, such as stretcher, wheelchair and so on. In the process of transportation, the patient's vital signs and condition changes should be closely observed.

3. Clinical Response Strategies for Critical Illnesses in Emergency Medicine

3.1 Clinical Decision Making and Rapid Response

In emergency medicine, clinical decision-making and rapid response mechanism are crucial for the clinical response strategy of critical

illnesses. First, clinical decision support systems (CDSS) provide immediate and accurate decision support for healthcare professionals by integrating patients' clinical information and structured knowledge bases, helping doctors to quickly assess the condition and develop preliminary treatment plans. Such systems can significantly shorten decision-making time and improve treatment efficiency. Second, the establishment of rapid response mechanisms (e.g., Rapid Response Team RRT) ensures rapid and effective intervention when a patient's condition deteriorates rapidly.RRT members include experienced healthcare workers who have been professionally trained to quickly recognize a crisis situation and initiate the emergency treatment process.

3.2 Emergency Care Techniques and Operational Standards

Emergency physicians need to be proficient and up-to-date in a variety of first aid techniques and codes of practice. This includes, but is not limited to, cardiopulmonary resuscitation (CPR), airway management, rapid establishment of intravenous access, defibrillation by electric shock, and emergency surgical management. These techniques and codes of practice are fundamental to the management of critical illnesses, and doctors need to practice, be trained and assessed in practice to ensure that they can be performed quickly and accurately in emergencies and to minimize operational errors and risks.

3.3 Teamwork and Communication

Teamwork and communication are critical when dealing with critical illnesses. Emergency physicians need to work closely with other healthcare professionals, such as nurses, technicians, and pharmacists, to develop and implement treatment plans. Effective communication ensures that information flows freely between team members, avoiding misunderstandings and omissions, and thus improving the efficiency of treatment. A clear division of roles and collaborative mechanism should be established among team members to ensure rapid response and teamwork during emergencies. In addition, emergency physicians need to communicate and collaborate with physicians from other departments, especially those from intensive care units, operating rooms, and specialized wards. Through interdisciplinary cooperation and communication, patients can be provided with more comprehensive and personalized treatment plans to improve the success rate of treatment.

Conclusion

Rapid recognition and management of critical illnesses in emergency medicine is the core task of the clinical specialty of emergency medicine. By mastering basic skills such as monitoring vital signs, recognizing signs of acute and critical illnesses, first aid techniques and operation norms, as well as strengthening teamwork and communication, emergency physicians can significantly improve the efficiency of emergency treatment and the survival rate of patients. In the future, with the continuous progress of medical technology and the continuous improvement of emergency medicine system, we have reason to believe that the level of emergency treatment will be further improved.

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