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Review Article

TRAUMA UNVEILED: An In-Depth Review of Initial Treatment of Polytraumatized Patient

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Abstract

Wandering the plateau of the trauma realm, fast and precise treatment is vital for the outcome of polytraumatized patients. When these cannot give their entire medical history, different data sources become significant concerning insights. The priorities are assessment and approach to ensure the airway, breathing, circulation disorder, and exposure to the ABCDE method. Proper airflow is essential, and mechanical ventilation may be needed. The ATLS framework and POCUS are cornerstone tools in modern trauma care, improving the timeliness of diagnosis and treatment. Sepsis is one of the probable complications which need prompt diagnosis and intervention. Healthcare providers have a critical role in patient outcomes with polytrauma. Towards these endeavors, we will knowingly address adopting ATLS framework POCUS integration and a way to sepsis.

Keywords: Trauma; Polytrauma Assessment; ABCDE Protocol; Advanced Trauma Life Support (ATLS); Sepsis; SOFA Score; Airway Management; Resuscitation; Initial Assessment; Medical Protocols; Point-Of-Care Ultrasound (POCUS)

Introduction

Trauma is inferred as injuries caused by outside body forces ranging from physical, chemical, biochemical, or psychological. There are tremendous improvements in the treatments and intensive care of adult medical trauma patients, but it remains the number one cause of death and disability among adults. [1, 2]. Trauma encompasses a spectrum of injuries, ranging from isolated wounds to complex multi-system involvement [3]. Accordingly, trauma can be broadly categorized into two main entities: damage to one organ or system with the possibility of lethal outcome (severe trauma) and an injury of two or more organs/systems having a considerable mortality rate (polytrauma) [4].

The systematic approach in the assessment and management of traumatized patients improves the outcome for these patients while reducing the chances of overlooked injuries. The absence of a standard definition for polytrauma brings variations in the classification of patients with multiple injuries accompanied by high mortality risk.

As a result, Berlin's definition has attracted the attention of international experts who have introduced specific criteria and

parameters for identifying polytrauma cases. According to the Berlin definition, polytrauma is defined as injury involving at least two distinct body regions, each exhibiting an Abbreviated Injury Scale (AIS) score of 3 or higher, coupled with one or more abnormal physiological parameters, including hypotension (Systolic Blood Pressure ≤ 90 mmHg), altered state of consciousness (Glasgow Coma Scale ≤ 8), acidosis (Base Excess ≤ -6), coagulopathy (INR ≥ 1.4 or APTT ≥ 40 seconds), and advanced age (≥ 70 years) [5]. Injury Severity Score (ISS), derived from the Abbreviated Injury Scale (AIS) data, primarily evaluates the severity of trauma. According to the AIS, injuries fall into six distinct body regions whose respective scores are added to form the Injury Severity Score (ISS). An ISS of over 15 is denoting severe trauma [6].

Initial management of a polytraumatized patient plays an integral role in avoiding lethal results; at the same time, the quality of care in the first critical minutes and hours after trauma significantly affects further recovery. A multidisciplinary and teambased standard must be adopted for these patients. However, understanding the protocol for managing traumatized patients is vital to delivering care promptly and efficiently.

Epidemiology

Trauma still maintains its dreaded position as another global killer. The risk of death is remarkably high in the age group of 18 to 29 years across different demographic groups, with traffic-related trauma contributing significantly towards fatalities among them. 5.8 million people die per year as a byproduct of trauma-related events globally. By 2030, trauma is estimated to take the lead in being the third most common cause of disability. However, advancing age, obesity, and the presence of specific comorbidities have been described as independent determinants of worse outcomes among this patient cohort after trauma.

Further, deaths mainly occur from different causes, with hemorrhage followed by multiple organ dysfunction syndrome (MODS) and then cardiac arrest. Interestingly, some trauma-related deaths are preventable. These include accidental endotracheal extubation, technical mishaps in surgical operations, missed injury diagnoses, and intravascular catheterassociated problems. Many of these deaths take place in the first moments after the trauma or within 4 hours after injury. It has fewer patients experiencing death within the 24-hours of trauma. The association highlights the integral role of timely and efficient trauma care.

Essentially, the "golden hour" is used to highlight the need for medical assistance an hour after trauma. This means that it dramatically affects survival rates. [3].

Pathophysiology, Sepsis, and SOFA Score

Trauma has a tremendous effect on health outcomes in injured people. In the event of trauma, a series of complex processes are initiated to cut down on tissue damage. This process mobilizes innate immunity by recognizing key molecular patterns like pathogen associated molecular patterns (PAMPs) or damage associated molecular pattern molecules. The latter patterns initiate events involving diverse immune cells and soluble molecules, eventually leading to an inflammatory response. The integrity of skin and further mucous membranes is a critical barrier for innate immunity against infections. Regardless, if breached, the risk of infection rises drastically [7].

In response to a traumatic event with a large extent of tissue damage, the body initiates a complex response. The natural immune system functions as the first line of defense, and there is a cascade-relevant pathway that depends on the type or kind of tissue injury. Damage to tissue releases damage-associated molecular patterns (DAMPs) from such cells, and this process initiates inflammation through Toll-like receptors (TLR). This initiates a reaction using natural immune cells (neutrophils and monocytes), complement system, and acute phase proteins such as C3a and C5a. This consequences in the generation of pro-inflammatory mediators and the subsequent result in systemic inflammatory response syndrome (SIRS). When blood is exposed to tissue factors outside vasculature, for example, during endothelium damage, platelets are initiated into a coagulation cascade [8].

Trauma-induced cytokines incorporate proinflammatory (TNFα, IL-1, IL-6, IL-8. IFNγ) and anti-inflammatory (IL-10). Pro-inflammatory cytokines mediate the release of C-reactive protein (CRP) and procalcitonin. Rising does not imply an infection per se. Nevertheless, if on days when it is expected that these inflammatory markers will reduce their values, they continue to maintain high levels or a new spike occurs, then sepsis in polytrauma patients may be probable [8, 9]. This protective mechanism is autonomous; at some point, anti-inflammatory mediators get ahead, and the values of cytokines are gradually normalized for reparative processes. However, if the proinflammatory defense pathways play a dominant role, the development of SIRS and continued inflammation leading to immunosuppression would occur, predisposing towards sepsis with organ failure (MODS) [10, 11].

In addition, the interaction between the immune and central nervous/endocrine systems is a critical aspect of response to trauma. This interaction may promote or hinder the immune response depending on different conditions. In addition, trauma affects blood vessels' endothelium, which causes coagulopathy and hence initiates the systemic inflammatory response syndrome (SIRS). Diagnosing sepsis involves this syndrome with its particular criteria for clinical presentations. Healthcare professionals should comprehend these intricate processes to offer timely and efficient care to traumatized patients, improving the outcomes [7]. Sepsis

is a complex area where trauma meets immune response in practice. Trauma leading to systemic inflammation can stimulate an overwhelming immune response. This inflammatory cascade becomes deranged in sepsis and intertwines into poly-organ dysfunction. The Sequential Organ Failure Assessment (SOFA) score gauges the dysfunction. An immediate increase in the SOFA score indicates the onset of severe organ dysfunction, usually resulting from the systemic inflammatory response witnessed during sepsis. Therefore, SOFA scores play a convenient tool in the evaluation and manipulation of the immune response during trauma-complicated sepsis for a better understanding of this complex medical condition. [7].

The SOFA score also represents a gold standard for assessing organ dysfunction in the ICU. The process incorporates different elements related to the respiratory, cardiovascular, coagulation, renal, metabolic, and central nervous systems. An increase in scores of 2 or more depicts organ dysfunction. To show much dysfunction and a 10% mortality increase. The qSOFA score is also a subset of the SOFA score on low blood pressure, respiratory rate, and mental status [12].

Initial Approach to the Polytraumatized Patient

In polytrauma, every minute is vital, and well-timed, purposeful medical care influences prognosis greatly. Their supervision and monitoring should be continuous. It includes skillful taking and anamnesis, objective physical examination, and intelligent usage of diagnostic procedures to realize the injury's severity grade and how life-threatening it may be. It can be rather challenging to take complete anamnesis because polytraumatized patients fail either to report in detail or are not able to provide any information, so it is substituted by hetero-anamnesis data from accompanying persons (family members, friends). The significant information entails previous illnesses, chronic conditions, hospitalizations and surgeries, allergies, drug history, and alcohol abuse.

It is crucial to ascertain the context of such an injury and whether it followed a previous health condition. Such prior conditions involving Cardiac Arrhythmia, Heart Attack, Hypoglycemia, or Stroke should be learned [13].

ATLS protocol

The ATLS protocol, designed by the American College of Surgeons (American College of Surgeons) Committee on Trauma (Committee on Trauma) initially in 1976, was intended to enable healthcare practitioners to make more timely and appropriate initial assessments, resuscitation, stabilization of trauma patients and referred for further care effectively when injury occurs. The ATLS program, now in its tenth edition, allows for an organized approach to the critically injured patient [14]. The injured patient's care starts before they reach a health facility. A person at the scene of the injury can also offer first aid. A healthcare facility receives the call, and a trained team of professionals performs triage depending on the age of the injury, mechanism of injury, coagulation status, etc. The patient is transported while preparations are being done [15].

Primary Assessment

Upon the arrival of a traumatic patient in a health center, it should be ascertained that his status is decided promptly. In general, you can get information about the injured person, important academic data, and events that preceded his arrival at the institution.

Next, a preliminary evaluation of vital signs and injuries specified by the ATLS algorithm is conducted; it occurs in a particular order consisting of Airway, Breathing, Circulation, Disability, and Exposure (the ABCDE sequence). As with the ATLS protocol, electrodes are applied along with cuff monitoring and pulse oximeter on the patient. It should be noted that the assessment is not only carried out through these steps at the beginning of treatment. However, repeating the ABCDE assessment over time, as with any intervention, is desirable because the condition can change [14, 15].

Airway

The initial mandatory step of the primary assessment is to ensure airway patency. In polytraumatized patients, these may develop apnea or inadequate ventilation, hypoxemia, and death in a few minutes. The current maintainable prophecy and obstructions of the airway remain the leading cause of death trauma [16]. Thus, a prompt assessment is vital, which can be achieved in the following ways: To start with, engaging in conversation is the quickest way, and inspecting if there is any weakness, hoarseness, or stridor that may refer to airway obstruction. Second, the oropharyngeal region is examined for foreign objects, edematous tongue, blood or enlarging hematoma, dental injury, and vomitus/saliva. Lastly, the neck is examined to detect some anatomical asymmetry, any foreign body, hematoma or maxillofacial fracture, and subcutaneous emphysema. It is noteworthy that in case of suspected trauma, one should be cautious not to move the cervical part [15, 17]. In the case of polytraumatized patients, the most likely reason for airway patency impairment is the posterior displacement of the root of the tongue that contributes to hypotonia in such individuals. If the patency of the airways is assumed to be impaired, it can be easily rectified by a simple maneuver. Head-tilt/chin-lift is a technique that requires throwing the head back, lifting the chin, or depressing the jaw (preferred if cervical spine injury is suspected) to align the airway [18].

Oropharyngeal and nasopharyngeal tubes are other ways of establishing airway patency suitable for less skilled resuscitators. Another tube used is the oropharyngeal tube, which prevents the tongue from falling in unconscious patients. Otherwise, it may induce a reflex for coughing or vomiting. A nasopharyngeal tube is better tolerated by semiconscious patients [18].

Different position terms, such as extraglottic, glottic, and supraglottic, also form part of the descriptions used during airway securing procedures. "Extraglottic" deciphers the airway outside the glottis, while "glottic" refers to the glottis containing vocal cords or simply an LC. "Glottic" refers to the interventions or conditions involved above this region, while "supraglottic" is associated with devices or procedures placed over the vocal folds. Supraglottic airway devices are formulated to stay in the supra-laryngeal tract and are used for managing the airway if access to the trachea is unnecessary. Their purpose is to give a direct passage to ventilation.

A laryngeal mask is a supraglottic apparatus positioned above the epiglottis. Its usage is widespread: for short-term anesthesia, in cases of trauma of the cervical part of a spinal column ensuring an airway, without manipulation on the head and neck in impossible possibilities for endotracheal intubation, and finally, cardiopulmonary reanimation. The laryngeal tube is used in the same situations as the laryngeal mask. It is even more manageable to use than the laryngeal mask because of its placement. A combi-tube is a two-volume plastic tube with two cuffs that also blindly enters the laryngeal part of the pharynx, and its cuff is inflated to fix it. Chest movement indicates lung ventilation quality because combi-tubes are routinely positioned in the esophagus [19, 20]. In addition to the temporary securing of the airway above, combi-tubes add trustful patency of airspace since here there are such means as endotracheal intubation - the "gold standard." In other words, it is non-surgical. At the start, potential problems with intubation should be considered. The fastest assessment is done using the mnemonic method LEMON.

First, examine the patient's face to see if there are any indications of possible factors that might complicate intubation, such as micrognathia, maxillofacial injuries, a limited mouth opening, and other anesthetic room indicators [21]. Subsequently, analyze the "3-3-2" rule that measured various distances for appropriate intubation conditions. This entails verifying that the interspace amid the upper and lower incisors is a minimum of three fingers in width. Also, the upper incisor must be way off the thyroid gland and the oral cavity floor by approximately two fingers. These measurements must be described in the appropriate intubation criteria [22].

Another critical aspect of the assessment is the Mallampati score. This activity is based on the extent to which the hypopharynx is patent, as evidenced by visualization of opening into the oropharynx. The degree of patency is defined by four classes that define the relationship between the soft palate, uvula, and the basis of the tongue. This assessment assists in the ease of intubation [23].

Look for any obstructions in the patient's airway that may cause complications during intubation— preventing and Overcoming Potential Obstructions to Patient Safety. Finally, assess the patient's neck mobility. It should allow for proper movement, including chin-sternum movement and dorsiflexion of the head. Adequate neck mobility ensures a smooth intubation process [23].

Indications for endotracheal intubation in polytraumatized patients may be to protect and preserve airway patency and to ensure good ventilation and oxygenation. It is necessary for people with hypoxia, hypercapnia, cyanosis, tachypnea, respiratory muscle paralysis, apnea, impaired consciousness, neck injuries (edema, hematoma, foreign bodies can exert pressure on the airway lumen), maxillofacial region injuries (risk of blood aspiration and vomiting content), severe bleeding, as well as preoperative preparation [24,25].

Preparing for endotracheal intubation is essential, including gathering all required equipment. It is vital to adhere to the set protocol in this procedure to reduce any potential complications. A helpful mnemonic for recalling the primary steps during intubation is "STOP MAID," which breaks down as follows: The first step is to remove things from the oropharynx using a suction so the airway is not blocked. T - Tools for intubation: Make sure you have the necessary tools, such as a laryngoscope, light source, endotracheal tube, grippers for gripping the being inserted into trach hole to cough instrument patient uses and spits in gloves with gauze on top lubricating gel. O - Oxygen: Preoxygenation is crucial; it enhances the oxygen reservoir to ensure adequate apnea phase oxygen stores while intubating. P - Positioning: Place the patient's head in the required position for an atlantooccipital extension to allow this procedure. Monitoring: Crucial parameters should include continuous monitoring of ECG, pulse oximetry, blood pressure, and pCO_2 to evaluate the patient's conditions. A - Ambubag: Have your Ambu balloon with a mask ready for use during and postintubation.

IV access: Prepare to set up two distinct sites for intravenous access in case one fails. D - Drugs: Prepare the essential sedative and neuromuscular blockade therapy during intubation. Following these steps and the mnemonic guidance, you significantly improve the safety and efficacy of the procedure, always keeping patients' welfare first. When intubating, one needs an assistant. They are preparing all requisite tools, monitoring, and drug administration. Preoxygenate and position the patient. After the patient's mouth is open, the laryngoscope should be introduced

carefully, and the tongue should be gently moved to the left. The position of the epiglottis is identified, and the endotracheal tube advanced through between the vocal folds into the trachea under vision. Once the tube is in place, it must be assessed and made stable. The patient can be placed on mechanical ventilation and appropriate sedation and analgesia once successful intubation is performed [15]. Other alternatives to the orotracheal and nasotracheal route include intubation. The need for respiration during oral and maxillofacial surgery was the indication for nasotracheal intubation and a secured road to breathing in a transparent surgical field. Nasotracheal intubation is also indicated for trismus and oropharyngeal infections. It is essential to mention the presence of Bettle's sign (ecchymosis behind the auricle) in case of fracture floor baseline cranial fossa and other signs, such as bilateral periorbital hematomas (raccoon eyes), rhinorrhea proved traumatic damage to brain dura mater fractures in front partial basilar skull, otorrhea. Middle cuspid pneumatized CP sinus sinuses were variants warrant apicoectomy septum lesser extent rupture [26]. The final resolution is surgical airway management after the failure of all other techniques. Fractures, larynx or glottis edema, and profuse oropharyngeal bleeding are also taken care of surgically. There are two possible procedures: cricothyrotomy and tracheostomy. Cricothyrotomy is more straightforward and has lesser risks of complications in a situation of impossible intubation and oxygenation (cannot intubate, cannot oxygenate – CICO). It consists of an incision in the cricothyroid membrane followed by tube insertion to allow oxygenation and ventilation. Needle cricothyrotomy can also be performed in emergencies (a large-bore IV cannula without a needle could also do this procedure). A tracheotomy is done in cases of larynx foreign body and extensive larynx fracture [27].

Breathing

The second stage of primary assessment is ensuring adequate lung ventilation, tissue oxygenation, and blood. However, not only clearance of airways but also mechanical work of additional respiratory apparatus (diaphragm, external respiration muscles, and chest) and CNS function are essential for ventilation. As such, the assessment includes the observation of saturation and breath number (tachypnea, bradypnea), chest wall inspection for cyanosis, whether there is any injury on it or asymmetry or altered breathing movements (Flail chest-type of movement occurs when each half side of the patient's thorax can dance separately during pendent motivation inspirations; Symmetric respiration in diagonal axes will be noted up to normal state) and dilated neck veins. Following the inspection, auscultation of breath sounds and palpation is done to note crepitations or deformities. In unstable patients, a chest radiograph may be conducted, revealing rib fractures, diaphragm injury, pleural effusion, pneumothorax, lung parenchymal damage, and foreign bodies, among others. Nevertheless, several life-threatening severe conditions should not be excluded during the initial evaluation, such as tension pneumothorax, massive hemothorax, or cardiac tamponade. Ultrasound is likewise invaluable in diagnosis, especially for detecting air collections in pneumothorax [3, 15, 28].

The breathing pattern in polytrauma patients is particularly disturbed and can be diverged into central and peripheral types. Bradypnea, induced by offending substances like alcohol, opiates, and benzodiazepines, stands associated with central breathing disorders secondary to craniocerebral injuries. Hypoxia elicits rapid breathing or tachypnea, as do severe pain or stress, which are some manifestations of peripheral breathing disorders. Mechanical ventilation can be a crucial approach to patients with trauma and respiratory insufficiency, lung damage, or airway compromise so that mandatory oxygenation, airway protection, and complications prevention are provided. The personalized ventilation strategy is guided by each patient's unique condition, injury severity, comorbidities, and age. The Reanimation Ambulance of Urgent Center, University Clinical Center of Serbia: One Year Study on 468 Critically Injured Trauma Patients (April 1, 2021–April 1, 2022). More than 70% had significant trauma (Injury Severity Score >15). 72.6% of tracheal intubation patients were intubated in the reanimation ambulance or regional medical centers before transferring to the Urgent Center, where they received mechanical ventilatory support.

Primary indications for the intubation included neurosurgical trauma with altered consciousness and hypoxia associated with severe chest trauma combined with paradoxical breathing. Protective mechanical ventilation is being prioritized. Thus, ventilation with low tidal volume (LTVV) using limited volumes of up to 6 mL/kg of predicted body weight and plateau pressures below 30 cmH2O are essential in preventing the occurrence of ventilator associated lung injury (VALI), as well as increased intracranial pressure [20]. VALI mainly occurs in lung contusions that did not arise from ARDS. In the initial treatment, patients suffering from severe traumatic brain injury usually need to be intubated and mechanically ventilated to attain normoxia and normocapnia without raising ICP. As prophylactic hyperventilation causes cerebral vasoconstriction, leading to decreased CBF and increased ICP, it is discouraged. A vital part of severe trauma management is establishing an optimal, atraumatic airway. Ventilator settings should be tailored to the type of trauma and related comorbidities with adherence to a protective mechanical ventilation strategy. The purpose of treatment for critically ill trauma patients is to maintain sufficient cerebral oxygen, prevent hypoxia, and minimize secondary issues and further crises [29].

It all depends on the injury and its mechanism. Some patients will require merely analgesic therapy, while others may require

oxygen support. Obstacles in more severe cases are intubation or relative assisted ventilation. Decompression is necessary for tension pneumothorax and fluid drainage in case of pleural effusion. Some patients require urgent surgery. The outcome not only depends on the type and severity of the injury but also involves the knowledge and skill of an attending team [15].

Circulation

The initial assessment focuses on the airway, followed by breathing, and finally, circulatory. It involves palpating the pulses of the main blood vessels during evaluation. If the carotid and femoral pulsations are palpable, then circulatory status is said to be expected. It is essential for balanced comparisons to inspect the symmetrically located pulses. Blood pressure values should be taken after palpation when the color and heat of the skin indicate a circulatory disorder. In the absence of visible bleeding injuries, two peripheral venous lines are placed (usually in the elbow fold of both arms). A blood sample is collected from these sources for initial blood analysis to determine the blood group [15].

Traumatic Synergy - Lethal Triad and Crush Syndrome

However, the most problematic phenomenon in polytraumatized patients is undoubtedly bleeding. The bursting of blood vessels causes internal bleeding, which is especially dangerous. Depending upon the rupture area, it may result in cardiac tamponade, hemothorax, hemoperitoneum, or intracranial bleeding. Regardless, the bleeding treatment depends on its source; thus, treating superficial exterior bleeding requires gauze and mild compression. On the other hand, severe injuries with heavy bleeding need a long period of compression (digital compression, cuff pressure), raising, and even operation. Fluid losses will be significant through bleeding, requiring replacement with various infusion solutions and blood products. Initially, a bolus of crystalloid solution is given, and blood derivatives are utilized if the patient does not respond promptly.

Studies show that RBCs, fresh frozen plasma, and platelets in a 1:1:1 ratio provide a significant survival rate. Information is also needed on anticoagulant therapy (warfarin, thrombin inhibitors, factor Xa inhibitors, and heparin) to use their antidotes for neutralization [30, 31, 32].

According to the ATLS protocol, bleeding can be categorized into four stages. Factors defining the patient's stage are heart rate, arterial blood pressure, diuresis, state of consciousness (GCS), hemoglobin level, hematocrit, INR, anticoagulant status, blood group, and Rh-factor. Extensive multiple hemorrhages lead to the lethal triad: hypothermia, coagulopathy, and acidosis.

Disability

Once the ABC (airway, breathing, and circulation) impressed status has been handled in attempts to stabilize the patient's life, this examination includes determining the patient's level of consciousness, which is based on the GCS score, evaluating the size and reactivity of pupils, as well as assessing gross motor function and sensation in detail. However, where a spinal cord injury is suspected, it is also essential to observe for signs of lateralization and determine the level of intellect. In all cases of the possibility of a spinal cord injury, one must first maintain spinal immobilization. If there are any signs of a motor deficit or sensory level consistent with a spinal cord injury, imaging of the brain, spinal cord, and vascular supply should be done. A comprehensive evaluation is essential for guiding appropriate medical management and ensuring the highest quality of care for the patient.

Exposure

In trauma care, the primary survey requires a complete undressing of a victim for careful examination of their body from head to toe. While minor, oversight in detecting an injury can be rather dangerous. Some areas are often inadvertently missed, including the scalp, axillary folds, and perineum in obese patients. Wounds can show anywhere, surprisingly. In maintaining cervical spine precautions, the back of the patient must not be overlooked. The gluteal fold and the posterior scalp also need to be closely examined. More so, including the management of hypothermia is a vital element in trauma care. Coagulopathy and multiple organ dysfunction syndrome can develop due to hypothermia. This concern is more pronounced, especially in the winter months and with a hypothermic trauma patient prompted to keep warm in a resuscitation room.

POCUS

Incorporating point-of-care ultrasound (POCUS) for the initial evaluation of trauma patients provides valuable diagnostic information rapidly. Within trauma assessment, POCUS identifies the presence of free intraperitoneal, pericardial, and pleural fluid that are critical indicators of possible internal bleeding or organ damage crucial for assessing how best to deal with a traumatic situation. Furthermore, chest radiography may be in detecting a pneumothorax, which is a life-threatening condition in trauma situations; however, POCUS performance concerning this aspect of patient care achieves better success, showing off increased sensitivity compared to the former that makes diagnosis available right away for immediate intervention [33].

POCUS comes in handy in assessing Blunt Abdominal Trauma by affirming the presence of free abdominal fluid, solid organ injuries (liver, spleen, and kidneys), as well as intra-abdominal hemorrhage. Being an essential step in the diagnosis of major pelvic fractures, it is helpful as a marker for the presence of fluid around the pelvis, i.e., possible internal bleeding, which may influence further imaging or interventions [33].

POCUS also helps in the evaluation of cardiac function, like identification of pericardial effusion, a critical sign of cardiac injury among trauma cases. The findings from these assessments inform resuscitation and surgical decisions. Focused Cardiac Ultrasound (FoCUS) is a standardized point-of-care ultrasound examination that provides high specific value in traumatic, hypotensive, and dyspneic patients with urgent clinical decisions at hand. The right heart load, circulating volume adequacy, and possible thoracic aortic dissection indications are provided [34].

The standard FAST views concentrate on four distinct abdominal regions: Morison's pouch (also called hepatorenal recess), Koller's receptacle (splenorenal recesses), pericardial view, and the pelvic space. Such views help establish the presence of free intraperitoneal fluid and pneumothorax. Extended Focused Assessment with Sonography for Trauma (EFAST), by integrating standard FAST perspectives and a lung scan, affords detection of free fluid and pneumothorax over both abdominal and thoracic cavities [33]. Ultrasound is the imaging modality of choice in trauma care for its speed, portability, and lack of ionizing radiation. Real-time imaging facilitates quick evaluation and decision making. This portable device could be deployed faster at the bedside without transporting a patient.

Additionally, it is a safe imaging mode since it uses ultrasound, which is non-invasive. It is sensitive and specific in identifying free fluid and organ injuries from various body areas.

Conclusion

In conclusion, ultrasound is an indispensable tool in trauma care and provides rapid and accurate diagnostic data without transporting the patient or exposing them to ionizing radiation. Nonetheless, using POCUS and EFAST in practice is associated with some limitations. The provision of specialized training to healthcare providers and the existence of ultrasound machines may be quite varied. Result accuracy may be influenced by operator experience and patient factors. For the most part, CT scans and other forms of imaging are necessary in cases that call for comprehensive evaluation. However, standardization and consistency in POCUS and EFAST between different settings can be inconsistent but can only be resolved using standardized protocols and guidelines [33].

The Advanced Trauma Life Support (ATLS) course, NICE clinical guideline NG39, and the American College of Emergency Physicians (ACEP) already provide specific clinical guidelines and protocols for POCUS and EFAST. However, the most recent and relevant guidelines always need to be referred to for accurate clinical practice.

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