

advanced life support ems terms

The Essential Glossary of Advanced Life Support EMS Terms

advanced life support ems terms represent a critical cornerstone in the realm of pre-hospital emergency care. These specialized protocols and terminology are employed by highly trained paramedics and emergency medical technicians to manage life-threatening medical emergencies, stabilize critically ill or injured patients, and facilitate seamless transfer of care to advanced medical facilities. Understanding these terms is paramount for anyone involved in emergency medical services, from seasoned professionals to those seeking to comprehend the complex interventions happening at the scene of a medical crisis. This comprehensive guide aims to demystify the lexicon of ALS, covering everything from pharmacological interventions to advanced airway management and cardiac arrest algorithms, ensuring a clear grasp of the advanced practices that save lives.

Table of Contents

- Understanding Advanced Life Support (ALS)
- Key ALS Pharmacology and Medications
- Advanced Airway Management Techniques
- Cardiac Arrest Management and Protocols
- Trauma and Medical Emergencies in ALS
- Pediatric Advanced Life Support (PALS) Considerations
- Advanced Patient Monitoring and Assessment
- The Role of ALS in Inter-facility Transfers

Understanding Advanced Life Support (ALS)

Advanced Life Support (ALS) is a set of emergency medical protocols and procedures performed by trained healthcare professionals, typically paramedics, who have undergone specialized training beyond basic life support (BLS). ALS focuses on interventions that require a deeper understanding of physiology, pharmacology, and advanced medical equipment. The primary goal of ALS is to stabilize critically ill or injured patients in the pre-hospital environment, often bridging the gap between the onset of a medical emergency and definitive care at a hospital. This level of care is distinguished by its capacity to administer medications, perform invasive procedures, and utilize sophisticated monitoring devices.

The scope of ALS encompasses a wide range of critical interventions. These include but are not limited to, advanced airway management, intravenous (IV) access and fluid resuscitation, administration of a broad spectrum of emergency medications, cardiac rhythm interpretation and defibrillation, advanced trauma care, and management of severe medical conditions such as stroke, heart attack, and respiratory failure. The successful implementation of ALS requires rapid assessment skills, critical thinking, and the ability to make swift, informed decisions under pressure. The continuity of care is a vital aspect, with ALS providers meticulously documenting patient status and interventions to ensure effective handovers to hospital-based medical teams.

The Distinction Between BLS and ALS

The fundamental difference between Basic Life Support (BLS) and Advanced Life Support (ALS) lies in the level of training and the types of interventions that can be performed. BLS, often provided by first responders and EMTs, focuses on essential life-saving techniques such as cardiopulmonary resuscitation (CPR), the use of automated external defibrillators (AEDs), and basic airway adjuncts. These are crucial skills that can sustain life until ALS providers arrive. ALS, on the other hand, builds upon this foundation by introducing more complex procedures and pharmacological agents. This escalation in care is designed to address more severe physiological derangements and improve patient outcomes in critical situations.

For instance, while a BLS provider can administer oxygen and perform chest compressions, an ALS provider can establish intravenous access to deliver fluids and medications directly into the bloodstream, intubate a patient to secure an advanced airway, and administer advanced cardiac medications like epinephrine or amiodarone. This increased capacity allows ALS teams to manage a wider array of medical emergencies, including cardiac arrest, severe trauma, anaphylaxis, and diabetic emergencies, with a more comprehensive and aggressive treatment approach. The transition from BLS to ALS represents a significant step-up in the complexity and invasiveness of pre-hospital medical care.

Key ALS Pharmacology and Medications

Pharmacology is a central pillar of Advanced Life Support. ALS providers are trained in the administration of a wide array of medications essential for managing life-threatening conditions. This includes drugs used to support cardiovascular function, manage pain and anxiety, reverse the effects of certain toxins, and treat respiratory distress. The precise dosage, route of administration, and timing of these medications are critical for patient safety and therapeutic efficacy. Understanding the indications, contraindications, and potential side effects of each drug is a core competency for all ALS personnel.

The administration of medications in ALS often occurs via intravenous (IV) access, which allows for rapid delivery and predictable absorption into the patient's system. Other common routes include intraosseous (IO) access, particularly in pediatric patients or when IV access is difficult, and intramuscular (IM) or subcutaneous (SC) injections for specific medications. Nebulized medications for respiratory conditions and sublingual administration for cardiac emergencies are also part of the ALS pharmacopeia. Continuous assessment of the patient's response to medication is vital, allowing for adjustments in dosage or the addition of other agents as needed.

Commonly Administered ALS Medications and Their Uses

Several classes of medications are routinely encountered in ALS protocols. Analgesics, such as morphine and fentanyl, are used to manage pain, especially in trauma patients. Sedatives and anxiolytics, like midazolam and diazepam, are employed to calm agitated patients or facilitate procedures like intubation. Vasopressors, such as epinephrine and norepinephrine, are critical for

maintaining blood pressure in cases of shock. Antiarrhythmics, including amiodarone and lidocaine, are used to treat dangerous heart rhythm disturbances. Bronchodilators, like albuterol and ipratropium, are vital for managing severe asthma attacks and COPD exacerbations. Antiemetics help control nausea and vomiting, often associated with various medical conditions or treatments.

Beyond these, other essential medications include glucose for hypoglycemia, naloxone for opioid overdose, and activated charcoal for certain poisonings. The specific formulary of medications available to an ALS provider can vary by region and service, but the core principles of safe and effective drug administration remain universal. This includes meticulous attention to drug calculations, proper storage and handling of medications, and the ability to recognize and manage adverse reactions. The knowledge base required for ALS pharmacology is extensive and continuously updated with emerging evidence and clinical guidelines.

Advanced Airway Management Techniques

Securing an advanced airway is a critical intervention in ALS, enabling definitive ventilation and oxygenation for patients who cannot maintain their own airway or breathing. These techniques are designed to bypass obstructions, protect the airway from aspiration, and facilitate the delivery of high concentrations of oxygen and anesthetic gases when needed. The choice of airway management technique depends on the patient's condition, the acuity of the situation, and the provider's skill level and experience. Rapid sequence intubation (RSI) is a common method used to facilitate endotracheal intubation quickly and safely.

ALS providers are trained in the use of various supraglottic airway devices, such as the Laryngeal Mask Airway (LMA) and the King LT, as alternatives or adjuncts to endotracheal intubation. These devices are inserted into the pharynx and create a seal around the laryngeal opening, providing ventilation without direct visualization of the vocal cords. While effective for many patients, they may not offer the same level of protection against aspiration as an endotracheal tube. The decision-making process for airway management is complex, involving assessment of airway anatomy, patient physiology, and the anticipated duration of intervention.

Endotracheal Intubation and Laryngoscopy

Endotracheal intubation is considered the gold standard for definitive airway management in many ALS scenarios. This procedure involves inserting a cuffed endotracheal tube through the vocal cords into the trachea using laryngoscopy, a technique that uses a laryngoscope to visualize the vocal cords. The goal is to achieve a secure airway that allows for direct mechanical ventilation and suctioning of the tracheobronchial tree. Advanced techniques in laryngoscopy include the use of video laryngoscopes, which provide a magnified and often clearer view of the airway, potentially improving success rates and reducing complications.

Following successful intubation, ALS providers confirm tube placement through multiple methods, including auscultation of breath sounds, observation of chest rise, capnography (measurement of end-tidal carbon dioxide), and chest X-ray. Confirmation of proper placement is paramount to prevent esophageal intubation, which can lead to severe hypoxemia and gastric distension. Advanced airway

management also includes the use of medications for procedural sedation and paralysis, often employed in rapid sequence intubation (RSI) to facilitate rapid and safe intubation, especially in patients with a full stomach or other risk factors for aspiration.

Supraglottic Airway Devices

Supraglottic airway devices (SGADs) represent a valuable tool in the ALS armamentarium, offering a less invasive alternative to endotracheal intubation and a potentially faster method of establishing ventilation. These devices are designed to be inserted blindly into the pharynx and create a seal, allowing for positive-pressure ventilation without the need for direct visualization of the vocal cords. Popular examples include the Laryngeal Mask Airway (LMA), the i-gel, and the King LT airway. They are particularly useful in situations where intubation is difficult or impossible, or when time is of the essence.

SGADs are generally easier to insert and have a lower risk of esophageal intubation compared to endotracheal tubes. However, they do not offer the same degree of airway protection against aspiration as a cuffed endotracheal tube, and their effectiveness can be compromised by certain anatomical variations or patient conditions. ALS providers are trained in the selection and proper insertion of various SGADs, as well as in troubleshooting common issues such as air leaks or inadequate ventilation. Their use often facilitates initial oxygenation and ventilation while a more definitive airway is being secured or while the patient is being transported.

Cardiac Arrest Management and Protocols

Cardiac arrest management is a critical component of ALS, focusing on the immediate recognition and treatment of conditions where the heart has stopped beating effectively. ALS protocols for cardiac arrest are guided by the latest resuscitation guidelines from organizations like the American Heart Association (AHA) and the European Resuscitation Council (ERC). These protocols emphasize high-quality cardiopulmonary resuscitation (CPR), early defibrillation for shockable rhythms, administration of appropriate medications, and consideration of reversible causes.

The ALS approach to cardiac arrest involves a systematic evaluation of the patient's cardiac rhythm using an electrocardiogram (ECG). This allows for the differentiation between shockable rhythms, such as ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT), and non-shockable rhythms, like asystole and pulseless electrical activity (PEA). The treatment strategy is tailored to the specific rhythm identified, with immediate defibrillation being the cornerstone of management for VF and VT. High-quality chest compressions are the foundation of all cardiac arrest management, aiming to maintain blood flow to vital organs.

The Chain of Survival and CPR Quality

The Chain of Survival is a vital concept in cardiac arrest management, outlining the key steps that improve survival rates. The links in this chain include early recognition and activation of emergency

medical services, early high-quality CPR, rapid defibrillation, effective advanced life support, and integrated post-cardiac arrest care. ALS providers play a crucial role in the "advanced life support" and "integrated post-cardiac arrest care" phases, but their effectiveness is directly dependent on the quality of the preceding links, particularly early CPR. High-quality CPR involves adequate compression rate and depth, minimizing interruptions, and ensuring full chest recoil.

ALS providers are trained to optimize CPR delivery by rotating compressors to prevent fatigue, using feedback devices when available, and ensuring minimal pauses in chest compressions. The implementation of advanced interventions is timed to occur with minimal disruption to chest compressions, reflecting the understanding that continuous blood flow is paramount. The quality of CPR provided by ALS personnel is continuously monitored and improved through training and direct observation.

Shockable vs. Non-Shockable Rhythms

The management of cardiac arrest hinges on the distinction between shockable and non-shockable rhythms, as determined by ECG analysis. Shockable rhythms (VF and pulseless VT) are characterized by chaotic electrical activity or rapid, disorganized ventricular contractions that prevent effective pumping of blood. These rhythms are amenable to electrical defibrillation, which aims to reset the heart's electrical activity. ALS providers are trained to interpret these rhythms and deliver electrical shocks at appropriate energy levels, followed immediately by resumption of CPR.

Non-shockable rhythms include asystole (complete absence of electrical activity) and pulseless electrical activity (PEA), where there is organized electrical activity but no palpable pulse or effective mechanical contraction. Defibrillation is not indicated for non-shockable rhythms. Instead, management focuses on high-quality CPR, administration of medications such as epinephrine, and the critical process of identifying and treating the underlying reversible causes of the arrest, often referred to as the "Hs and Ts" (hypovolemia, hypoxia, hydrogen ion (acidosis), hypothermia, hyperkalemia/hypokalemia, tamponade (cardiac), toxins, thrombosis (pulmonary and coronary)).

Trauma and Medical Emergencies in ALS

Advanced Life Support extends beyond cardiac emergencies to encompass the management of critically injured trauma patients and individuals experiencing severe medical events. In trauma care, ALS providers focus on rapid assessment, hemorrhage control, stabilization of fractures, and advanced airway management if necessary. The principles of ATLS (Advanced Trauma Life Support) are often integrated into pre-hospital ALS protocols, emphasizing a systematic approach to identify and manage life-threatening injuries.

For medical emergencies, ALS is employed for conditions such as myocardial infarction (heart attack), stroke, diabetic emergencies, sepsis, anaphylaxis, and severe respiratory distress. The ALS provider's role involves rapid recognition of the signs and symptoms of these conditions, administration of targeted medications to stabilize the patient, continuous monitoring of vital signs, and efficient transport to the most appropriate medical facility. The ability to quickly differentiate between various medical emergencies and initiate appropriate interventions is a hallmark of advanced pre-hospital

care.

Hemorrhage Control and Shock Management

Controlling external hemorrhage is a primary objective in the initial management of trauma patients. ALS providers utilize direct pressure, elevation, and pressure dressings to manage bleeding. For more severe bleeding, techniques such as the application of tourniquets to limbs or the use of hemostatic agents may be employed. Internal hemorrhage is more challenging to manage pre-hospital, but ALS protocols include recognition of signs and symptoms of hypovolemic shock, such as rapid heart rate, low blood pressure, and altered mental status. Management typically involves rapid administration of intravenous fluids and, in some cases, blood products, along with rapid transport to a surgical facility.

Shock, a state of inadequate tissue perfusion, is a life-threatening condition that can result from various causes, including trauma, sepsis, cardiac events, and anaphylaxis. ALS providers are trained to identify the type and severity of shock and initiate appropriate interventions. This may involve fluid resuscitation to increase circulating volume, administration of vasopressors to improve blood pressure, and ensuring adequate oxygenation. The prompt and effective management of shock is critical for preventing irreversible organ damage and improving patient survival.

Management of Acute Stroke and Myocardial Infarction

The rapid identification and management of acute stroke and myocardial infarction (MI) are critical functions of ALS. For suspected strokes, ALS providers conduct specific neurological assessments, such as the Cincinnati Pre-hospital Stroke Scale, to identify potential candidates for reperfusion therapies like thrombolytics or mechanical thrombectomy. Time is brain, so rapid transport to a stroke-capable hospital is prioritized. ALS interventions may include oxygen administration, blood glucose monitoring and management, and preparation for advanced neurological assessment upon arrival at the hospital.

In suspected MIs, ALS providers perform 12-lead ECGs in the field to identify ST-elevation myocardial infarctions (STEMIs), which require immediate reperfusion therapy. Administration of aspirin and nitroglycerin, along with oxygen therapy, is common. IV access is established for potential administration of other medications, such as morphine for pain relief or antiplatelet agents. Early notification of the receiving hospital allows them to prepare for the patient's arrival, facilitating prompt intervention and improving outcomes for both stroke and MI patients.

Pediatric Advanced Life Support (PALS) Considerations

Pediatric Advanced Life Support (PALS) represents a specialized subset of ALS tailored to the unique physiological and anatomical differences of infants, children, and adolescents. The principles of PALS emphasize a systematic approach to assessment and management, recognizing that children often present with respiratory distress as the primary cause of arrest, unlike adults who more frequently present with cardiac issues. PALS protocols are designed to address the specific needs of this

vulnerable population, from medication dosages to equipment sizes.

Key differences in PALS include different drug dosages calculated based on weight, specialized equipment such as pediatric-sized airway adjuncts and defibrillation pads, and a greater emphasis on aggressive ventilation and oxygenation. Recognition of subtle signs of decompensation in children is crucial, as they may compensate for longer than adults before deteriorating rapidly. ALS providers trained in PALS are equipped to manage pediatric emergencies effectively, from respiratory distress and dehydration to trauma and cardiac arrest.

Pediatric Airway and Ventilation

Managing the pediatric airway requires specific knowledge and skills due to anatomical differences. Children have larger heads relative to their bodies, shorter necks, and larger tongues, which can make airway management challenging. PALS protocols stress the importance of proper head-tilt/chin-lift or jaw-thrust maneuvers to open the airway and the use of appropriately sized airway adjuncts. Ventilation with a bag-valve-mask (BVM) is a critical skill, with an emphasis on delivering gentle tidal volumes to avoid gastric distension and barotrauma.

When intubation is necessary, PALS providers use appropriately sized endotracheal tubes and laryngoscope blades. Confirmation of tube placement is paramount, utilizing capnography and other methods. In situations where intubation is difficult or unsuccessful, PALS providers may resort to supraglottic airways or cricothyrotomy (in older children and adolescents when indicated), always prioritizing the maintenance of adequate oxygenation and ventilation. The goal is to provide the highest possible oxygen saturation and ventilatory support while minimizing trauma.

Pediatric Medication Dosing and Administration

Medication dosing in PALS is a critical and complex aspect, as it is primarily based on the patient's weight. Unlike adults, where dosages are often standardized, pediatric dosages are precisely calculated using formulas or weight-based charts. ALS providers must be proficient in performing these calculations quickly and accurately, often using specialized reference tools or integrated device calculators. Incorrect dosing in children can lead to under-treatment or toxicity, with potentially severe consequences.

Commonly administered PALS medications include epinephrine for cardiac arrest and anaphylaxis, amiodarone for certain arrhythmias, and dextrose for hypoglycemia. Intravenous or intraosseous (IO) access is often established to facilitate rapid medication delivery. The use of IO access is particularly common in pediatric emergencies when IV access is challenging to obtain quickly. ALS providers trained in PALS are well-versed in the specific indications, contraindications, and appropriate dosages of these and other medications for pediatric patients.

Advanced Patient Monitoring and Assessment

Advanced patient monitoring and assessment are integral to ALS, allowing providers to continuously evaluate a patient's physiological status and the effectiveness of interventions. This goes beyond basic vital signs to include more sophisticated diagnostic tools and comprehensive physical examinations. The ability to accurately interpret data from these monitors and integrate it with clinical findings is crucial for making informed treatment decisions and adapting care as the patient's condition evolves.

These monitoring capabilities enable ALS teams to detect subtle changes in a patient's condition early, facilitating timely intervention and potentially preventing further deterioration. From continuous cardiac rhythm monitoring to end-tidal CO₂ monitoring and pulse oximetry, these tools provide real-time physiological data that guides ongoing patient care. A thorough and systematic assessment, coupled with advanced monitoring, forms the bedrock of effective ALS.

Electrocardiogram (ECG) Interpretation

A fundamental skill in ALS is the ability to interpret electrocardiograms (ECGs). ALS providers are trained to identify a wide range of cardiac rhythms, including normal sinus rhythm, various arrhythmias, and the specific rhythms associated with cardiac arrest (VF, pulseless VT, asystole, PEA). This interpretation is critical for guiding immediate treatment decisions, particularly in the context of cardiac arrest and acute coronary syndromes. For example, recognizing ST-elevation on a 12-lead ECG alerts the ALS team to a STEMI, prompting rapid transport to a cardiac catheterization lab.

Beyond identifying life-threatening rhythms, ALS providers can also monitor for changes in rhythm that indicate the effectiveness of medications or the development of complications. Continuous ECG monitoring allows for the detection of bradycardia, tachycardia, and other abnormalities that may require intervention. Proficiency in ECG interpretation requires ongoing training and practice to maintain accuracy and responsiveness to dynamic cardiac conditions.

Capnography and Pulse Oximetry

Capnography, the measurement of end-tidal carbon dioxide (ETCO₂), is an indispensable tool in ALS. It provides continuous, non-invasive monitoring of a patient's ventilation and perfusion. A key application of capnography is confirming the correct placement of an endotracheal tube; a sustained ETCO₂ reading indicates that the tube is in the trachea. It also provides a continuous assessment of the adequacy of chest compressions during CPR, as ETCO₂ levels will typically rise with effective compressions. A sudden drop in ETCO₂ can signal a critical change in the patient's condition, such as cardiac arrest or a dislodged airway device.

Pulse oximetry, another vital monitoring tool, measures the oxygen saturation of hemoglobin in arterial blood. This provides a real-time indication of how well the lungs are oxygenating the blood. While valuable, pulse oximetry can be affected by factors such as poor peripheral perfusion, hypothermia, and certain dyes. ALS providers use pulse oximetry in conjunction with other

assessments, such as capnography and clinical signs of respiratory distress, to evaluate the effectiveness of oxygenation and ventilation interventions. Both capnography and pulse oximetry are crucial for optimizing patient care and ensuring effective interventions.

The Role of ALS in Inter-facility Transfers

Advanced Life Support plays a crucial role not only in initial emergency response but also in inter-facility transfers. When a patient requires transport from one healthcare facility to another for specialized care, an ALS team ensures that the patient's medical needs are continuously met during transit. This is particularly important for critically ill or unstable patients who require ongoing monitoring, advanced interventions, or specialized equipment that may not be available at the originating facility.

ALS transfers allow for a seamless continuation of care, preventing any disruption to the patient's treatment plan. This can involve transporting patients from smaller community hospitals to larger tertiary care centers, or moving patients between specialized units within a large hospital system. The ALS team is responsible for managing the patient's condition, administering medications, operating complex medical equipment, and responding to any emergent changes that may occur during the transport. The detailed report provided to the receiving facility upon arrival is also a critical aspect of this process.

Stabilization and Continuous Care During Transport

Before initiating an inter-facility transfer, the ALS team is responsible for ensuring the patient is adequately stabilized. This involves confirming that all necessary medical interventions are in place, vital signs are within an acceptable range, and potential complications are anticipated and managed. During the transfer, the ALS crew continuously monitors the patient's condition, including vital signs, cardiac rhythm, oxygenation, and the effectiveness of any ongoing treatments. They are equipped to administer medications, adjust ventilator settings, and perform advanced procedures as needed to maintain the patient's stability.

The ALS team acts as a mobile critical care unit, providing a level of care comparable to that found in an ICU setting. This continuous monitoring and intervention are vital for patients who are at risk of decompensation, such as those recovering from major surgery, experiencing severe respiratory distress, or requiring vasopressor support. The expertise of the ALS team ensures that the patient's condition is actively managed throughout the transport process, contributing significantly to positive patient outcomes.

Communication and Handover of Care

Effective communication and a thorough handover of care are paramount during inter-facility transfers. The ALS team maintains open communication with the originating and receiving medical teams throughout the transport. Prior to departure, a detailed report is provided to the originating

facility regarding the patient's condition, interventions performed, and any ongoing concerns. Upon arrival at the receiving facility, the ALS crew provides a comprehensive report to the designated healthcare professionals, including all relevant patient information, vital signs, medications administered, procedures performed, and any changes in the patient's condition during transport.

This handover ensures that the receiving team has a complete understanding of the patient's history and current status, enabling them to seamlessly assume care and continue the patient's treatment without interruption or loss of critical information. Meticulous documentation by the ALS team is essential for this process and for subsequent medical record keeping. The professionalism and clarity of communication by the ALS team directly impact the continuity and quality of patient care.

FAQ

Q: What does ALS stand for in emergency medical services?

A: ALS stands for Advanced Life Support. It refers to a higher level of pre-hospital medical care provided by trained paramedics and EMTs, which includes interventions beyond basic life support, such as administering medications, advanced airway management, and cardiac monitoring.

Q: What is the primary difference between BLS and ALS?

A: The primary difference lies in the scope of interventions. BLS focuses on basic life-saving techniques like CPR and AED use, while ALS encompasses more advanced procedures, including IV access, medication administration, advanced airway management, and the interpretation of complex medical data.

Q: What are some common medications administered by ALS providers?

A: Common ALS medications include epinephrine, amiodarone, lidocaine, aspirin, nitroglycerin, morphine, fentanyl, midazolam, and albuterol. These are used to manage a wide range of emergencies from cardiac arrest to pain management and respiratory distress.

Q: What is considered the "gold standard" for definitive airway management in ALS?

A: Endotracheal intubation is generally considered the gold standard for definitive airway management in ALS, as it provides the most secure airway and allows for direct mechanical ventilation and suctioning.

Q: How is pediatric patient care different in ALS compared to adult care?

A: Pediatric Advanced Life Support (PALS) differs significantly in medication dosing (weight-based), equipment sizes, and a greater emphasis on respiratory causes for cardiac arrest. Children often

require specialized approaches due to their unique physiology.

Q: What is capnography, and why is it important in ALS?

A: Capnography measures end-tidal carbon dioxide (ETCO₂) and is crucial in ALS for confirming endotracheal tube placement, assessing the quality of CPR, and monitoring ventilation and perfusion status.

Q: What are "shockable" rhythms in cardiac arrest?

A: Shockable rhythms in cardiac arrest are ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT). These chaotic electrical rhythms can be treated with defibrillation.

Q: What is the significance of the "Hs and Ts" in ALS?

A: The "Hs and Ts" are reversible causes of cardiac arrest (specifically in non-shockable rhythms like PEA and asystole) that ALS providers are trained to identify and treat. These include Hypovolemia, Hypoxia, Hydrogen ion (acidosis), Hypothermia, Hyperkalemia/Hypokalemia, Tamponade, Toxins, and Thrombosis.

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