EMERGENCY ORTHOPEDIC CARE ALGORITHMS IN PATIENTS WITH MULTIPLE FRACTURES

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Annotation: *Emergency orthopedic care for polytrauma patients with multiple fractures requires careful decision-making that balances life-saving priorities with musculoskeletal recovery. Current evidence shows that using structured protocols like damage control orthopedics or early total care can reduce complications by 35–45% and improve outcomes. Treatment timing is guided by physiological status, injury severity, and available resources. Advances such as AI-assisted fracture detection have improved diagnostic accuracy to 92–98%, enabling quicker intervention. Effective management relies on coordinated teamwork between orthopedic surgeons, trauma teams, and critical care specialists.*

Keywords: *polytrauma, multiple fractures, damage control orthopedics, early total care, emergency algorithms, fracture prioritization, trauma management, decision-making protocols.*

Today’s patients with multiple fractures present a major challenge in emergency orthopedic care, requiring rapid, evidence-based decisions to optimize outcomes. Assessing the patient's resuscitation status is vital, as poorly timed interventions can lead to serious complications like ARDS, organ failure, or coagulopathy. Modern polytrauma management has shifted to algorithm-based strategies that factor in physiological stability, injury severity,

and available resources. The key decision lies between damage control orthopedics—temporary stabilization to avoid further deterioration—and early total care—definitive fixation within 24 hours. Advances in trauma systems show that using standardized algorithms improves care consistency, resource use, and overall outcomes.

The pathophysiology of multiple fracture management involves managing bleeding, controlling inflammation, and stabilizing injured limbs. Treating polytrauma patients remains complex, with ongoing debate between early total care and damage control orthopedics. A key concept is the "second hit" phenomenon—major surgery performed at the wrong time can worsen a patient's condition by intensifying systemic inflammation. Modern treatment algorithms rely on tools like the Injury Severity Score and Early Appropriate Care criteria to assess factors such as hemodynamic and respiratory stability, neurological function, and other injuries. For unstable patients, early temporary fracture stabilization through damage control orthopedics has proven effective in reducing complications and improving outcomes.

The implementation of artificial intelligence systems has revolutionized fracture detection and prioritization in emergency settings. Three artificial intelligence algorithms demonstrated high diagnostic performance across 13 body regions when analyzed by musculoskeletal radiologists, enabling rapid identification and classification of injuries to facilitate algorithmic decision-making. These technological advances support clinical algorithms by providing objective, reproducible assessments that enhance treatment prioritization accuracy.

Modern algorithmic approaches highlight the importance of multidisciplinary coordination through standardized communication and treatment protocols. Integrating orthopedic, trauma, anesthesia, and critical care teams within these frameworks enables thorough patient assessment and efficient use of resources. Timely fixation of major fractures remains central to

surgical management, with ongoing debate about optimal timing in high-level trauma centers. Quality improvement efforts show that implementing algorithms enhances outcomes by reducing delays, avoiding unnecessary procedures, and improving team communication. Customizing protocols to fit local resources and expertise further ensures effective and context-appropriate patient care.

In conclusion, emergency orthopedic care algorithms for multiple fractures have developed into effective frameworks that improve outcomes through prioritization and team-based coordination. Validated protocols using physiological data, injury severity, and available resources guide timely interventions. Artificial intelligence enhances diagnostic accuracy and treatment planning. Future directions may include machine learning for outcome prediction, real-time monitoring, and telemedicine support. Success depends on standardized protocols, quality improvement, and interdisciplinary collaboration.

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