



Case Study on Pediatric Polytrauma

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ABSTRACT: Polytrauma in pediatrics remains a leading cause of death and permanent disabilities in children. It requires a multidisciplinary team approach. The care of pediatric Polytrauma patients follows the principles of Paediatric Advanced Trauma Life Support (ATLS), which include rapid diagnosis of respiratory and circulatory compromise and correction of issues related to oxygenation, ventilation, and/or perfusion to prevent cardiorespiratory collapse.

OBJECTIVE: The objective of this study is to present the management of pediatric patients with Polytrauma, focusing on assessment, diagnostics, surgical interventions, and pediatric intensive care. **INCIDENCE** According to the American Academy of Paediatrics, the incidence of major paediatric trauma is 41.7%. In India, data regarding the number of children injured or hospitalized and the patterns of injuries remain limited. The National Crime Records Bureau reported 22,766 injury-related deaths in children under 14 years of age. The trauma burden, injury patterns, sites of injury, and outcomes vary by region and age group. **METHODS** Detailed assessment, resuscitation, clinical findings, imaging, nursing care, and surgical data was collected and analysed for a 3-year-old child who sustained injuries in a road traffic accident. **RESULTS** The child presented with severe Polytrauma, was immediately resuscitated, underwent surgical procedures, and experienced an uneventful post-operative period. The child was later discharged. **CONCLUSION:** Globally, road traffic accidents are the leading cause of death among adolescents. Motor vehicle-related injuries are the most common cause of death in children—whether as occupants, pedestrians, or cyclists. Failure to secure a compromised airway, support breathing, and identify and manage intra-abdominal or intracranial haemorrhage are major contributors to unsuccessful resuscitation in paediatric trauma. Applying ATLS principles to the care of injured children allows trauma teams to significantly improve survival rates and long-term outcomes.

KEYWORDS: Pediatrics, Polytrauma, ATLS (Advanced Trauma Life Support)

I.INTRODUCTION

Unknown child estimated age of 3 to 4 years was brought to Apollo hospitals Navi Mumbai by a bystander with alleged history of road traffic accident. On receiving the child in emergency room, the Pediatric initial assessment was conducted. The child appeared semi-conscious, had irregular breathing with tachypnea, and looked pale. **The primary assessment** of the pediatric patients includes (ABCDE) Airway, breathing circulation, disability, Exposure. Airway was maintained and patent, Breathing -tachypnea was present, on room air saturation was 88%. Sinus tachycardia was present with feeble peripheral pulses with delayed capillary refilling time which was more than 3seconds.The GCS was 8/15, blood sugar was within normal limits. In the exposure, there were multiple abrasions all over the body, severe large contaminated perineal injury with crush injury involving urethra, vagina and rectum. Open pelvic fracture was also noted.

A. RESUSCITATION

Oxygen was administered at 15Litre /minute via NRBM mask, Cervical spine stabilized using a cervical collar. Two wide-bore IV lines secured, and fluid resuscitation was initiated using the Holiday-segar formula. The child was electively intubated with 4.5mm cuffed tube, A Right internal jugular vein central line was inserted under ultrasound guidance. Massive blood transfusion protocol was activated: Paediatric transfusion includes replacement of entire blood volume (60–80 mL/kg) in 24 hours or >50% within 3 hours. Packed red blood cells (PRBCs): Fresh frozen plasma (FFP): Platelets in a 2:1:1 or 1:1:1 ratio. PRBC transfusion was initiated rapidly. Inotropes (Adrenaline and Noradrenaline) were started. Broad-spectrum antibiotics administered as per prescription. Prophylactic anticonvulsant (Levipil) given. Tetanus toxoid (TT), analgesics (Paracetamol, Diclofenac, Fentanyl), tranexamic acid, and Vitamin K were administered.

B.INVESTIGATIONS

Blood tests were sent for CBC, Liver function test, Kidney function test, PT, APTT, INR, blood grouping and cross matching, HIV, HBsAg, HCV, VBG. CBC revealed anemia; all other results were within normal limits.

Radiological Investigations:

Chest X-ray: Showed mid-zone opacity in the right lung.

Trauma Protocol Imaging:

eFAST: Bedside ultrasound showed no pericardial, perihepatic, peri splenic, pelvic, pleural fluid, or pneumothorax—normal findings.

CT Scans: Brain & Spine: No major abnormalities

Chest: Minimal right-sided pleural effusion and contusion, minimally displaced fracture of posterior right first rib

Abdomen & Pelvis: Pubic diastasis with comminuted, displaced sacral ala fracture. Extra pelvic hematoma in right presacral region. Minimally displaced fracture of anterior column of the right acetabulum.

C.SECONDARY SURVEY

After the initiation of resuscitative measures, the secondary survey was performed using the extended ABCDE mnemonic:

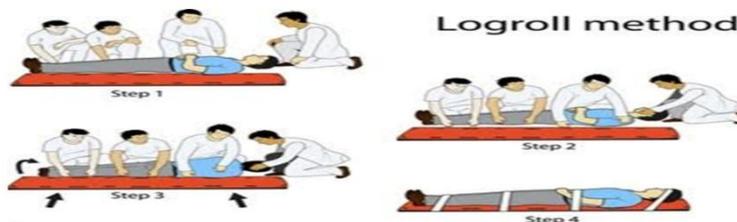
F – Full set of vitals & Family update: The child was hemodynamically stable.

G – Get monitoring devices: Monitoring devices were attached, including a multiparameter monitor. A nasogastric tube was inserted. The child remained on oxygen support via ventilator. Pain assessment was done using a validated scale; the score was 4/12.



H – History and Head-to-toe assessment: A detailed history was obtained using the SAMPLE format: **S:** Signs and symptoms-Tachypnoea, Bleeding, Shock. **A:** Allergies-Not known. **M:** Medications-NIL. **P:** Past medical history-No significant past history. **L:** Last oral intake- Not known. **E:** Events leading to the incident-Road traffic accident.

I – Inspect posterior surfaces: A full log roll examination was done; no significant injuries were noted posteriorly



J – Just keep evaluating: Ongoing reassessments were done using the VIPP approach:

V: Vital signs – stable

I: Injuries and interventions documented

P: Primary survey reviewed

P: Pain reassessed and managed accordingly

II. SURGICAL MANAGEMENT

An exploratory laparotomy was performed. Findings and procedures included: Stabilization of pelvic hematoma. Inspection of bowel integrity. Diversion of urine via suprapubic catheterization. Diversion of stool through a sigmoid colostomy. Haemostasis achieved with thorough irrigation and wound cleaning. Repair of rectal wall and perineal body. Forehead laceration was sutured.



III. NURSING MANAGEMENT

The nursing care of the pediatric Polytrauma patient was intensive, dynamic, and multidisciplinary, adapting to the child's evolving clinical condition throughout the hospital stay. Nursing interventions were grounded in evidence-based paediatric trauma protocols and guided by continuous assessments.

Initial Critical Care (Day 1–3) :Ventilator and Hemodynamic Support: The child was received in the PICU intubated on PRVC mode. Nurses monitored ventilator parameters, airway pressures, and oxygen saturation continuously. Inotropes (Adrenaline and Noradrenaline) were administered via infusion pumps and titrated based on blood pressure and central venous pressure trends. Continuous hemodynamic monitoring was performed through arterial and central lines, with hourly charting. **Neurological Monitoring:** Paediatric Glasgow Coma Scale (GCS) assessments were performed every hour. Seizure prophylaxis with Levetiracetam was monitored, and an EEG was conducted to rule out seizure activity. **Nutrition and Fluid Balance:** The child was kept NPO (nil per oral) as per surgical instructions. Total Parenteral Nutrition (TPN) was initiated and adjusted daily. Strict intake-output monitoring was performed, and daily weights were recorded. Electrolyte corrections were administered based on VBG and laboratory finding. **Infection Control and Line Care:** Care bundles (CLABSI, CAUTI, VAP) were rigorously implemented. Dressing integrity was checked every shift. Hand hygiene compliance and closed suctioning systems were maintained to prevent nosocomial infections.

Ongoing Supportive Care (Day 4–15):Respiratory Care: The child was extubated on Day 3 to High-Flow Nasal Cannula (HHHFNC) at 15 L/min (FiO₂ 60%) and gradually weaned off. Air entry was monitored; USG-guided pleural tapping was performed on Day 5 to remove 300 mL hemorrhagic pleural fluid. **Pain Management:** Pain was assessed every 4 hours using age-appropriate scale. Analgesics (Paracetamol, Fentanyl) were administered as per the pain score. Non-pharmacological methods like repositioning and parental touch were used as adjuncts. **Wound and Stoma Care:** Perineal wounds and surgical sites were cleaned daily using aseptic techniques. Colostomy care was performed with special attention to flange sealing, despite the difficulty imposed by the external pelvic fixation. Output was monitored, and skin integrity around the stoma was preserved with barrier creams. **Mobility and Skin Care:** Pressure injury prevention included turning every 3 hours (as tolerated), use of air mattresses, and silicon dressings on bony prominences. The child did not develop any pressure ulcers over the two-month PICU stay. Limb splinting and cast care were provided after tibial and pelvic fractures were identified and treated.



Post-Operative and Rehabilitation Phase (Day 16 onwards):
Post-Surgical Monitoring: Following pelvic external fixation, neurovascular assessments of the lower limbs were done every 2 hours for the first 24 hours. Skin checks under the fixator pins were conducted daily. **Physiotherapy Coordination:** The child was mobilized with the help of paediatric physiotherapists. Nurses coordinated therapy timings and assisted with exercises as per schedule. **Psychological and Family-Centred Care:** The PICU team, including the primary nurse, maintained regular communication with the family. Parents were educated on colostomy care, line care, and signs of infection or distress. Emotional support was provided to help them cope with the trauma of the incident.

Expanded Role Of Nurses In Paediatric Polytrauma Care:

Comprehensive Assessment: Nurses performed ongoing assessments including vitals, neurological status, compartment syndrome checks, wound and drain evaluations, and signs of sepsis or shock. **Pharmacological Proficiency:** Medications were weight-based. Nurses ensured correct dilution, administration, and monitoring of side effects, especially for high-alert drugs like inotropes, anticonvulsants, and sedatives. **Procedural Assistance and Wound Management:** Nurses assisted in bedside procedures like dressing changes, pleural tapping, and line insertions. Aseptic non-touch technique (ANTT) was maintained during all interventions. **Patient and Family Education:** Nurses played a crucial role in training caregivers on post-discharge care, including stoma maintenance, medication adherence, and warning signs to report. **Interdisciplinary Coordination:** Active communication with intensivists, surgeons, physiotherapists, and dietitians ensured continuity of care and optimal outcomes. **Psychosocial Support and Advocacy:** Nurses provided emotional support to both the patient and family, recognizing the psychological trauma associated with pediatric polytrauma. They facilitated communication between the medical team and caregivers, advocated for the child's needs during multidisciplinary rounds, and ensured the family's concerns were acknowledged and addressed. **Coordination of Multidisciplinary Care:** Nurses acted as the central point of contact among various specialties—paediatric surgery, orthopaedics, neurosurgery, critical care, and physiotherapy—ensuring timely interventions, continuity of care, and unified treatment goals. **Infection Control and Prevention:** Strict adherence to infection control protocols was maintained. Nurses ensured hand hygiene compliance, proper line care, and isolation precautions when required, minimizing the risk of hospital-acquired infections. **Nutritional Monitoring and Support:** Nurses monitored dietary intake and collaborated with dietitians to ensure adequate nutritional support for healing and growth, including managing nasogastric or parenteral feeds when needed. **Pain and Sedation Management:** Pain scores were routinely assessed using age-appropriate scales. Nurses adjusted and titrated sedation under supervision, and provided non-pharmacological comfort measures, such as positioning, swaddling, or distraction techniques. **Rehabilitation and Mobilization Support:** Nurses initiated early mobilization protocols in coordination with physiotherapists, supported splint care, and encouraged activities suited to the child's developmental stage to prevent deconditioning and promote recovery.

IV. FAMILY EDUCATION

Parents were educated on wound and stoma care, maintenance of external fixators, line care, and the importance of strict hand hygiene to prevent infections. They were instructed on medication adherence, recognition of warning signs such as fever, abdominal distension, altered sensorium, or difficulty breathing, and when to seek urgent medical attention. Nutritional advice was given, including high-protein, calorie-dense food for recovery, with monitoring of weight gain. Education on mobilization, safe handling, and gradual physiotherapy was reinforced



to prevent contractures and promote functional recovery. Psychological support was offered to parents to address anxiety, guilt, or trauma after the accident, and counselling services were made available.

V. DISCUSSION

Polytrauma in children presents unique challenges due to anatomical and physiological differences compared with adults, such as smaller circulating blood volume, higher metabolic demand, and reduced compensatory mechanisms. In this case, the child sustained multiple life-threatening injuries involving the abdomen, chest, and extremities, necessitating a rapid multidisciplinary approach. Early airway stabilization, aggressive fluid resuscitation, and prompt surgical intervention were critical in preventing deterioration. The principles of Pediatric Advanced Trauma Life Support (PATALS) guided management—prioritizing airway, breathing, and circulation—while simultaneously addressing life-threatening injuries. The coordination among paediatric surgeons, neurosurgeons, orthopaedic surgeon, anaesthesiologists, and intensivists ensured timely interventions. Nursing care played a pivotal role in continuous monitoring, early recognition of complications (e.g., bleeding, sepsis, compartment syndrome), and implementation of infection prevention strategies. Psychosocial support for the family was equally important, as paediatric trauma often results in parental anxiety, guilt, and long-term stress. Rehabilitation and physiotherapy interventions initiated early helped in functional recovery and prevention of long-term disabilities. Literature highlights that survival and favourable outcomes in paediatric Polytrauma are directly linked to early resuscitation, multidisciplinary care, and vigilant postoperative nursing interventions.

VI. CONCLUSION

This case highlights that pediatric Polytrauma requires a comprehensive and coordinated multidisciplinary team approach. Early resuscitation, timely surgical intervention, and vigilant nursing care contributed significantly to the favourable outcome in this child. The case emphasizes the importance of continuous monitoring, infection prevention, pain management, rehabilitation, and family education in improving recovery and quality of life. Nurses, being at the bedside round-the-clock, play a crucial role not only in clinical management but also in providing emotional support to the child and family. Strengthening trauma systems, ongoing training in paediatric advanced life support, and involving families in care are key to improving outcomes in pediatric trauma patients.

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