A Systematic Approach to the Management of Multi-Organ Failure

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Introduction

PURPOSE

- Define importance of topic
- Review background and definitions
- Review pathophysiology briefly
- Contrast Adult vs Pediatric MOSF
- Systematic approach to management
- Future directions
- Summary/Questions / Comments
Topics of Discussion

- MOSF background
- MOSF/MOSD definitions
- Pathophysiology
- Adult vs Pediatric criteria (What is organ FAILURE?)
- Application to case example
- Systematic approach
- Summary / Questions / comments
MOSF: Definition:

- Progressive concurrent failure of two or more organ systems.
  - Nonspecific expression of critical illness
  - Leading cause of death in critical care setting
- Is it really a distinct “syndrome” or just a convenient label for end-stage total body failure?
Historical Perspective:

- Initially identified in critically ill adults (1960-1970)
- Mid-1970’s: specific syndrome identified: Lungs ...Liver...Kidney....death
- Mid-1980’s: MOSF syndrome explored in children with different criteria and outcomes
- 1990’s: Blossoming of technological support and strategies for treatment of organ system dysfunction
MOSF impact:

- High associated mortality rate
- 25% of PICU patients have MOSF
- No change in prevalence despite advancing technologic support of the critically ill
CASE EXAMPLE:

- 8 year old with ALL in remission, develops varicella and fever, sepsis syndrome with tachypnea, tachycardia, decreased urine output and decreased capillary refill. On arrival to the PICU, he is starting to show lethargy and waxing and waning mental status.
CASE PROGRESSION

- Treated with oxygen, isotonic crystalloid boluses and antibiotics
- Patient worsens with cyanosis, retractions, nasal flaring and tachycardia (HR 180)
- What would you do now?
SUMMARY

- MOSF is an important cause of morbidity and mortality in the PICU
- Pathophysiology follows patterns associated with systemic inflammatory response
- New interventions may change the course and mortality associated with MOSF
- A systematic approach to MOSF may be beneficial to both the individual patient and the understanding of the entity
A systematic approach to the management of multi-organ failure:

Summary

- Defined importance of MOSF
- Reviewed background and definitions
- Reviewed pathophysiology
- Contrasted adult and paediatric MOSF
- Described systematic approach
- Explored future directions for support, treatment and research
- Questions / Comments?
PAEDIATRIC INTENSIVE CARE
October 10-11, 1996

- Liquid ventilation and advanced techniques: Mr. Wilcox
- Nitric oxide: Dr., Macrae
- Surfactant therapy in bronchiolitis: Dr Skelton
- New strategies for ventilatory support: Dr. Samuels
- ECMO: Dr. Field
- Cerebral protection strategies: Dr. Tasker
- Sepsis, Trauma and etiologies: Dr Derkx, Dr. Lord
- National data set for PICU: Dr. Rowan
- Evaluation of Outcomes: Dr Ross Russell
Logistic Organ Dysfunction System: 
A new way to assess organ dysfunction
Le Gall et al. JAMA 1996;276:802-810

- **Objective:** develop objective assessment organ dysfunction
- **Methods:** 6 organ systems, Logistic regression determine relative weights of organ system dysfunction
- **Outcome:** measured at hospital discharge
- **Conclusions:** LOD system is a tool that quantifies severity levels for organ dysfunction.
  - Neuro>CV>Renal >> Lung>Hepatic
MOSF Criteria:

**Cardiovascular**

- MAP < 40 mmHg (infants)
- MAP < 50 mmHg (children)
- HR < 50 beats/min (infants)
- HR < 40 beats/min (children)
- Cardiac arrest
- Continuous vasopressor infusion
MOSF Criteria: Cardiovascular

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- MAP < 50 mmHg (children)
- HR < 50 beats/min (infants)
- HR < 40 beats/min (children)
- Cardiac arrest
- Continuous vasopressor infusion
MOSF Criteria: Respiratory

- RR > 70/min (children)
  - RR > 90/min (infants)
- PaO2 < 40 mmHg (if no CHD)
- PaCO2 > 65 mmHg
- PaO2/FiO2 < 250
- Mechanical ventilation (post-op > 24 hrs)
- Intubation for Acute Resp Failure
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- Mechanical ventilation (post-op > 24 hrs)
- Intubation for Acute Resp Failure
MOSF Criteria: Neurologic

- Glasgow coma score < 5
- Fixed, dilated pupils
- Persistent Increased ICP > 20 mmHg or requiring therapy for ICP
MOSF Criteria: Neurologic

- Glasgow coma score < 5
- Fixed, dilated pupils
- Persistent Increased ICP > 20 mmHg or requiring therapy for ICP
MOSF Criteria: Hematologic

- Hemoglobin < 5 g/dL
- WBC < 3,000
- Platelets < 20,000
- DIC (PT > 20 sec or PTT > 60)
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MOSF Criteria:

Renal

- BUN > 100 mg/dL
- Creatinine > 2 mg/dL
- Dialysis
MOSF Criteria:

Renal

- BUN > 100 mg/dL
- Creatinine > 2 mg/dL
- Dialysis
MOSF Criteria:

Gastrointestinal

- GI Hemorrhage requiring > 20 mL/kg of RBC transfusion/24 hrs
- Total Bilirubin > 5 mg/dL and AST or LDH > 2X normal value
- Hepatic encephalopathy > grade I
MOSF Criteria: Gastrointestinal

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MOSF Criteria:

- Respiratory (2-3 days)
- Gastrointestinal
  - Hepatic (7-10 days)
- Renal (14-21 days)
- Cardiovascular
- Hematologic
- Neurologic
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MOSF

Insult
Trauma, sepsis, shock

Response
Inflammation, mediators, hypermetabolism

Recovery

MOSF

DEATH
MOSF

**Insult**
- Trauma,
- sepsis,
- shock

**Response**
- Inflammation,
- mediators,
- Hypermetabolism

**Recovery**

**MOSF**

**DEATH**