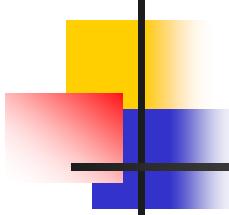


Organ/System Function evaluation-MODS/MOFS

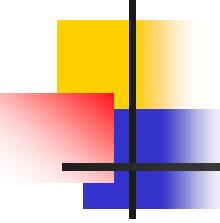
臨床數據判讀與護理意涵課程

邱艷芬教授



長期重症病人的兩大死因

- 多器官衰竭症候群
- 菌血症 - immune failure

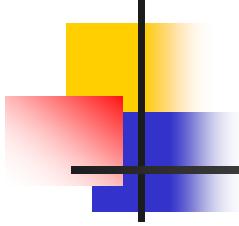


急重症病患器官系統急性衰竭之定義

Definition of organ system failure (Knaus, 1985)

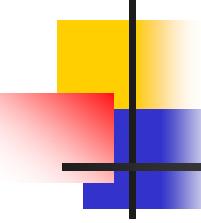
- 器官衰或系統衰竭
- 依每日該器官系統之功能而定
- 若病患在一天的時間中，出現以下一種或一種以上的器官功能異常，無論其它數值如何，當天即存在器官系統衰竭

Normal → dysfunction → failure



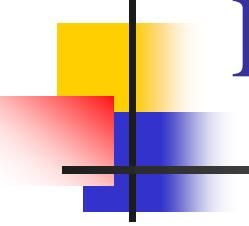
Respiratory

- **Dysfunction**
 - $\text{PaO}_2 < 60 \text{ mmHg}$ on $\text{FIO}_2 = 0.2$
 - $\text{PaO}_2 / \text{FiO}_2 < 300$
 - Need for ventilatory support
- **Failure**
 - Respiratory rate $< 5 \text{ bpm}$ or $> 49 \text{ mmHg}$
 - $\text{PaCO}_2 > 50 \text{ mmHg}$
 - $\text{AaDO}_2 > 350 \text{ mmHg}$
 - Dependent on ventilator or CPAP on the 4th day of OSF



Cardiovascular

- Dysfunction
 - SBP <90mmHg with signs of peripheral hypoperfusion
 - MBP < 60mmHg
 - CI < 2 L/min/m²
 - 可逆性心室纖維顫動或心跳停止
- Failure
 - Heart rate<54bpm
 - Mean arterial pressure< 49 mmHg (SBP<60mmHg)
 - Occurrence of ventricular tachycardia and /or VF
 - Serum pH< 7.24 with a Pa CO₂ ≤49 mmHg



Renal

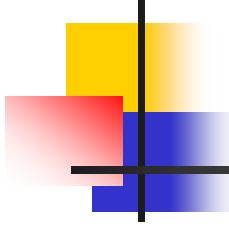
- **Dysfunction:**

- Serum creatinine > 2.0 mg/dl
- Urine output < 500ml/24h or < 180ml/8h
- Need for hemodialysis or peritoneal dialysis

- **Failure**

- Urine output <479ml/24hr or <159ml/8hr
- Serum BUN >100mg/dl
- Serum creatinine>3.5mg/dl

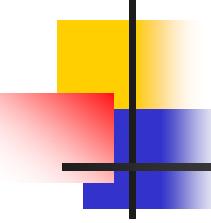
(Excluding patients on chronic dialysis before hospital admission)



Neurologic

- Dysfunction
 - Glasgow coma scale ≤ 6
 - Sudden onset of confusion or psychosis
- Failure
 - Glasgow coma scale <6

(in the absence of sedation)



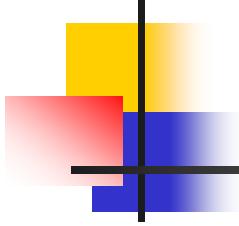
Hepatic

■ Dysfunction

- Serum bilirubin > 4 mg /dl
- Alkaline phosphatase > 3 x normal or psychosis
- Jaundice
- coagulopathy, stress bleeding : PT > 1.5 of control
- Hepatocyte depression: 白蛋白 < 2.0 g/dl
- Peripheral catabolism
- microvascular emboli

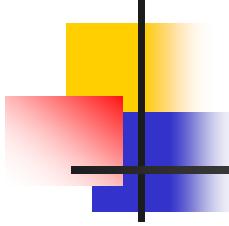
■ Failure

- Bilirubin >6mg/dl
- Prothrombin time>4sec



Hematologic

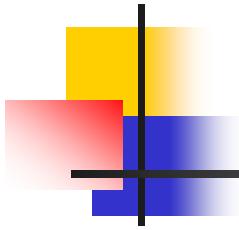
- **Dysfunction**
 - Hematocrit < 20%
 - White blood cell count < 2000/mm³
 - Platelet count < 50000/mm³
 - Fibrinogen < 100mg/dl
- **Failure**
 - WBC < 1000/mm³
 - Platelets < 20000/mm³
 - Hematocrit < 20%



Immune failure-Sepsis

■ Definition

- 2 or more positive blood cultures
- Presence of gross pus in a closed space
- Source of the infection determined during hospitalization or at autopsy in case of death within the 24h



SOFA

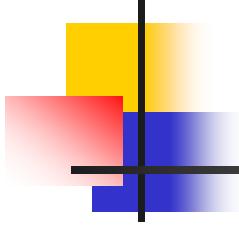
- Sepsis-related Organ Failure Assessment (Vincent et al, 1996)

SOFA Score		1	2	3	4
Resp.	PaO ₂ /FiO ₂	>400	<300	<200	<100
Coagulation	PLT	<150K	<100K	<50K	<20K
Liver	Bil (mg/dl)	1.2-1.9	2.0-5.9	6.0-11.9	>12.0
CV	BP	<70mmHg	DA/Dobu ≤ 5	DA>5 or levo.	DA>15 or levo.
CNS	GCS	13-14	10-12	6-9	<6
Kidney	Cre (mg/dl)	1.2-1.9	2.0-3.4	3.5-4.9	>5
	Urine (cc/d)			<500	<200

多重器官功能障礙評分表

MODS (Marshall et al, 1995)

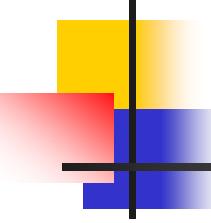
Organ system	score				
	1	2	3	4	5
Respiratory (PO_2/FIO_2)	> 300	226-300	151-225	76-150	< 75
Renal (serum creatinine)	< 1.13	1.14-2.26	2.27-3.96	3.97-5.65	> 5.66
Hepatic (serum bilirubin)	< 1.17	1.18-3.5	3.6-7	7-14	> 14
Cardiovascular (PAR)*	< 10.0	10.1-15.0	15.1-20.0	20.1-30.0	> 30.0
Hematologic (platelet) $\times 10^3$	> 120	81-120	51-80	21-50	< 20
Neurological (Coma scale)	15	13-14	10-12	7-9	< 6



多重器官功能障礙評分表 MODS

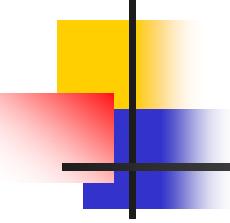
- MODS 零分者，無人死亡
- 任何系統> 4 ，嚴重organ dysfunction
- 9-12分者，死亡率25%
- 13-16分者，死亡率50%
- 17-20分者，其死亡率增為75%
- 高達20分者，死亡率百分之百

$$\text{Pulse adjusted Heart rate} = \text{HR} \times \text{RAP} \div \text{MAP}$$



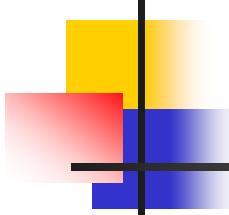
多器官衰竭症候群的病理

- 器官炎症反應，組織受損
- 器官質塊耗竭，組織無法負擔代謝需求
- 引起原因
 - 發炎反應疾病急性期過渡激活多形核白血球(PMN)與巨噬細胞
 - 長期代謝高亢，耗盡體蛋白
 - 長期營養素攝取不足，體蛋白不足



MOFS危險群病人

- >65歲，重大手術者
- 由於Reperfusion Injury者
 - 經歷 BP down, ebb phase長者
 - 處於SIRS者
- 由於組織質塊耗竭者
 - malnutrition
 - 重症期長者



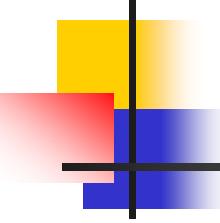
多重器官功能障礙的相關因素

內在因素：

- 疾病的嚴重度
- 年齡
- 營養狀態
- 先前器官功能

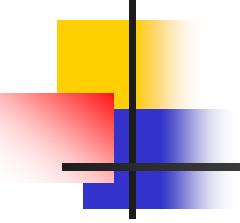
外在因素：

- 感染
- 血循停止時間
- 重大手術



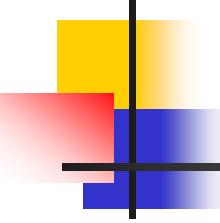
病人評估與處置

- 急性期
 - 縮短ebb phase(盡早恢復BP)
 - 減輕缺氧
- 慢性期
 - 提供足夠營養
 - 保存器官質塊與功能



急性期護理

- 儘量縮短 ebb phase
 - 矯正休克:血量，心縮力，血管阻力
 - 維持最佳氧氣輸送供應
 - $\text{CaO}_2 = \text{Hgb} \times 1.34 \times \text{SaO}_2 + 0.003 \times \text{PaO}_2$
 - 維持Hgb 10~12， $\text{PaO}_2 > 80\text{mmHg}$
- 穩定病情，縮短hypermetabolic state
 - 穩定心肺功能
 - 矯正酸鹼電解質之不正常
 - 控制感染
- 監測 SIRS to MODS



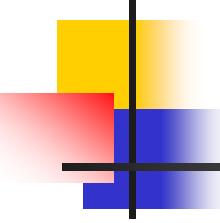
維持組織氧合

■ 調整氧氣遞送至最佳狀況

- 純予足夠的FiO₂，以SpO₂及ABG來監測
- 調整Hb值，理想上為15mg/dl，但可能會使血液太稠，所以最佳的狀態是10-12mg/dl
- 使用鎮靜和肌肉鬆弛劑、疼痛控制，以減少耗氧。

■ 調整血液動力至最佳狀況

- 調整血量、心輸出、灌流壓至最佳狀態
- 評估灌流狀態
 - 體表溫度、脈搏、血壓、尿排出量等
- 評估病患的血流動力
 - CVP、PAWP、A-line、CO、CI、SV、SVI、SVR、SVRI



慢性期之護理

- 評估營養狀況與代謝需求
 - 營養狀況是 resistance factor，決定耐病力
 - Assess by %IBW, Albumin, TLC, Nitrogen balance
 - 營養供應是 supporting factor
 - Assess by energy balance與nitrogen balance
- 提供足夠非蛋白質性熱量與蛋白質量
- 儘可能採腸道營養，保存腸功能