Journal Meeting

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Safety of Assessment of Patients With Potential Ischemic Chest Pain in an Emergency Department Waiting Room: A Prospective Comparative Cohort Study

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背景

- 目前針對潛在 ischemic chest pain 的 guideline 指出應立即接受評估和治療，並積極診斷可能的 acute coronary syndrome
- 可能因急診過份擁擠造成治療延誤

研究目的

- 本文目的在於建立一個：當病人因床位不夠而必須在等候室時，所應用的評估流程

方法

- 本研究爲 prospective comparative cohort study
  - 完成於郊區一間三級照護急診
- 建立明確的檢傷分類和等候室評估流程
- 共 1107 個潛在有心因性胸痛的病人，依檢傷及床位有無作分類
- 診斷評估後，追蹤 30 天以確定是否有遺漏的 ACS 診斷 (primary outcome)；以治療方針作爲判斷基礎

Acute Myocardial Infarction

Troponin I level >1.0L

Troponin I level between 0.1L and 1.0L and one of the following:

- Dynamic ECG changes consistent with ischemia
- Positive coronary angiogram result (>70% lesion)
- Positive provocative stress test result (nuclide scan or stress ECG)

ECG changes consistent with acute myocardial infarction (MI), including:

- New pathologic Q waves
- New left bundle-branch block (LBBB)
- ST-segment elevation (measured 60 ms after J point) (with no LBBB, paced or ventricular rhythm, benign early repolarization, pericarditis, or left ventricular hypertrophy with strain)
  - >2 mm in 2 contiguous precordial leads
  - >1 mm in 2 contiguous interior or lateral leads
  - >1 mm in V8,V9 (posterior MI)
  - >1 mm in V4R (right ventricular MI)
- Tall R wave in V1 with precordial ST depression (posterior MI)

Thrombolysis with no other cause evident

Death with no other cause evident

Definite Unstable Angina

Rest pain >20 minutes and at least one of the following:

- Troponin between 0.1L and 1.0L with no other criteria for acute myocardial infarction
- ECGs with no persistent ST-elevation but with other reversible changes consistent with ischemia
  - Transient ST elevation >1.0 mm in 2 contiguous leads
  - Dynamic ST depression >0.5 mm in 2 contiguous leads
  - Dynamic T-wave inversion in 2 contiguous leads
- Hospital admission and treatment for acute coronary syndrome with at least one of the following:
  - Positive coronary angiogram test result
  - Positive provocative stress test result

Possible Unstable Angina

Rest pain >20 minutes and hospital admission and treatment for acute coronary syndrome without

- Objective ECG criteria
- Troponin increase
- Positive coronary angiogram test result
- Positive provocative stress test result

No acute coronary syndrome will be assigned if none of the above apply or in the following situations:

- Troponin I level between 0.1L and 1.0L but stress test or angiogram result negative
- If other criteria are unclear but stress test or angiogram result negative

- Tachycardia requiring medical intervention or cardioversion
- Bradycardia requiring medical intervention or pacing
- Respiratory failure requiring assisted ventilations by
  - Bag valve mask
  - Noninvasive positive-pressure ventilation
  - Tracheal intubation
- New congestive heart failure requiring intravenous medications
- Hypotension requiring vasoactive agents
- Chest compressions
- Death

Figure 2. Adverse events.

結果

- 804 個病人分類至 monitored bed；303 個至等候室
  - 初始的 vital signs 皆類似，但等候室的較年輕且也較少心血管疾病的危險因子

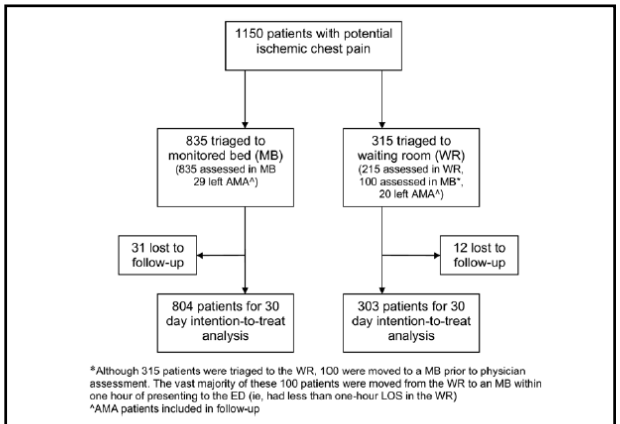

Figure 3. Patient enrollment. *AMA*, Against medical advice.

結果

- ACS 的發生率定義爲 acute myocardial infarction 或客觀上的 unstable angina
  - 兩者皆無遺漏的 ACS 診斷
    - Monitored bed 群: 0%; 95% confidence interval [CI] 0% to 0.4%
    - 等候室群: 0%; 95% CI 0% to 1.0%
  - 不良結果
    - Monitored bed 群有 32 個: 4.0%; 95% CI 2.6% to 5.3%
    - 等候室群有 2 個: 0.7%; 95% CI 0% to 1.6%

Table 3. ED adverse events stratified by cohort.

Adverse Event, No.	Monitored Bed (%, 95% CI)	Waiting Room (%, 95% CI)	Difference (95% CI)*
Number of patients	804	303	
Death in ED	0 (0, 0 to 0.4)	0 (0, 0 to 1.0)	0 (–1.6 to 0.6)
Chest compressions in ED	0 (0, 0 to 0.4)	0 (0, 0 to 1.0)	0 (–1.6 to 0.6)
Hypotension in ED	1 (0.1, 0 to 0.2)	0 (0, 0 to 1.0)	0 (–1.6 to 0.6)
Assisted ventilation in ED	0 (0, 0 to 0.3)	0 (0, 0 to 1.0)	0 (–1.6 to 0.6)
Tachyarrhythmia in ED	29 (3.6, 2.3 to 4.9)	2 (0.7, 0 to 1.6)	2.9 (0.7 to 4.6)
Bradyarrhythmia in ED	2 (0.2, 0 to 0.4)	0 (0, 0 to 1.0)	0.2 (–1.3 to 1.0)
New severe CHF in ED	1 (0.1, 0 to 0.2)	0 (0, 0 to 1.0)	0 (–1.6 to 0.6)
Total adverse events	32 (4.0, 2.6 to 5.3)	2 (0.7, 0 to 1.6)	3.3 (1.3 to 5.0)

CHF, Congestive heart failure.
*Monitored bed group minus waiting room group.

Table 4. Diagnostic utilization and hospital resource use.*

Utilization	Monitored Bed	Waiting Room	Difference (95% CI)*
Number	804	303	
Diagnostic test at index visit, No. (%)			
0-h ECG performed	798 (99.3)	293 (96.7)	2.5 (0.7 to 5.4)
6-h ECG performed	327 (40.7)	91 (30.1)	10.6 (4.1 to 16.8)
0-h cardiac biomarker performed	691 (86.0)	223 (73.6)	12.3 (6.9 to 18.2)
6-h cardiac biomarker performed	368 (45.8)	118 (38.9)	6.8 (0.1 to 13.3)
Provocative testing, at index ED visit	10 (1.2)	2 (0.7)	0.6 (–1.4 to 1.8)
Provocative testing, within 30 days	188 (23.3)	64 (21.1)	2.2 (–3.6 to 7.6)
ED cardiology consultation	215 (26.7)	54 (17.8)	8.9 (3.2 to 14.1)
Hospital utilization			
Patients discharged within 3 h, No. (%)	138 (17.2)	85 (28.0)	10.9 (5.2 to 16.9)
Admission during index visit, No. (%)*	158 (19.7)	36 (11.8)	7.8 (2.9 to 12.0)
Admission during 30-day follow-up	200 (24.9)	39 (12.9)	12.0 (6.9 to 16.9)

Table 1. Baseline characteristics.

Characteristics	Monitored Bed	Waiting Room	Difference (95% CI)*
Number of patients	804	303	
Age, y, mean (SD)	56.6 (15.1)	49.7 (14.8)	6.9 (4.9 to 8.9)
Male sex, No. (%)	488 (60.7)	172 (56.7)	3.9 (−2.6 to 10.6)
EMS arrival, No. (%)	260 (32.3)	60 (20.0)	12.3 (6.6 to 18.0)
Ongoing chest pain at triage, No. (%)	650 (80.9)	216 (71.3)	9.6 (3.8 to 15.7)
Median time to physician,† min (IQR)	28 (17 to 46)	25 (12 to 45)	3 (2 to 4)
Median time to first ECG, min (IQR)	37 (27 to 57)	51 (21 to 73)	14 (12 to 16)
Mean initial pulse rate (SD)	79.9 (19.5)	81.0 (16.8)	1.1 (−1.2 to 3.4)
Mean initial systolic blood pressure, mm Hg (SD)	142.7 (26.6)	140.6 (24.8)	2.1 (−1.2 to 5.4)
Mean initial diastolic blood pressure, mm Hg (SD)	79.3 (14.1)	81.2 (13.8)	1.9 (0.0 to 3.8)
Mean initial respiratory rate, breaths/min (SD)	18.6 (3.3)	18.0 (2.0)	0.6 (0.3 to 0.9)
Initial abnormal ECG result, No. (%)‡	223 (27.7)	45 (14.9)	12.9 (7.4 to 17.8)
Previous ACS, No. (%)	224 (27.9)	41 (13.5)	14.4 (9.1 to 19.0)
Smoker,† No. (%)	250 (31.1)	101 (33.3)	2.2 (−3.8 to 8.5)
Hypertension, No. (%)	327 (40.7)	92 (30.4)	3.3 (4.0 to 16.3)
Diabetes, No. (%)	117 (14.6)	34 (11.2)	3.3 (−1.3 to 7.4)
Hyperlipidemia, No. (%)	235 (29.2)	66 (21.8)	7.5 (1.4 to 13.0)

ACS, Acute coronary syndrome.
*Continuity correction applied for differences between proportions.
†Indicates that the proportion of waiting room patients exceeds the proportion of monitored bed patients.
‡ST-segment deviation and T-wave inversion considered abnormal, regardless of conditions such as left ventricular hypertrophy or left bundle-branch block. T-wave flattening considered normal.

結論

- 此用以檢傷分類和等候室評估的流程是安全且有效的
- 此流程雖不盡理想，但爲一在忙碌急診可用的評估流程

Extracorporeal Removal Techniques for the Poisoned Patient: A Review for the Intensivist

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簡介

- **Extracorporeal Removal (ECR) techniques** 包含hemodialysis (HD), charcoal hemoperfusion (HP), continuous renal replacement therapy (CRRT)
- 在 xenobiotics 血中濃度過高或甚功能不佳的情況下，ECR 可增加其清除率
- 由於花費昂貴，通常在臨床上中毒情形嚴重時才會使用
- 目前尚未有實證或理論支持其臨床使用
- 本文將回顧何時、如何應用，以及應避免的情況

Xenobiotics 的特性與 ECR

- Volume of Distribution (Vd): 物質在人體中未經代謝及排除下的分布容量
- Plasma Protein Binding: 會降低物質擴散能力
- 分子量 (MW): 分子量大小與 HD 半透膜的通透性有關

Methods of ECR

- Hemodialysis (HD)
  - 半透膜 + 濃度梯度
  - High-Flux Dialyzers: 孔隙、通透面積大，清除率更高；biocompatibility 更好
- Charcoal Hemoperfusion (HP)
  - 由活性碳直接吸附
  - 不受 high protein-bound xenobiotics 影響
  - 血液中細胞碎片、蛋白質、或 xenobiotics 的 binding site 飽和都會影響其效果

Methods of ECR

- Continuous Renal Replacement Therapies (CRRTs)
  - 包含 Hemofiltration (如 CVVH) 及 Hemodiafiltration (如 CVVHDF)
    - Hemofiltration 利用靜水壓力差產生對流；
    - Hemodiafiltration 則在加上透析液產生濃度梯度
  - 時間長、單位時間脫水少，適用於**血行不穩定**的病人
  - 可用於 HD 治療後的 rebounding rise

Methods of ECR

- Peritoneal Dialysis (PD)
  - 利用腹膜作爲半透膜，在腹中注入透析液與腹膜中血管進行物質交換
  - 只適用於水溶性、Vd 小、protein-bound 不佳、分子量小的 xenobiotics
  - 若病人有 hypotensive 的情形，PD 的效果不佳
  - 物質交換緩慢，不適用臨床危及的病人
  - 通常應用在無法及時 HD、轉院的情況

ECR 的適應症

- 病人
  - 病人對支持性治療反應不佳，且併有其他嚴重 comorbidities
  - 正常內生性代謝路徑有損傷
  - 老人
- Xenobiotics
  - 原本人體內生性路徑代謝排除不佳
- 若 ECR 介入可增加其清除率 30% 以上才算有其實際效益

可由 HD 洗出的 Xenobiotics

- Aspirin, Acetylsalicylic Acid (ASA)
  - MW 180 Da, Vd 0.2 L/Kg, Protein-bound: 80-90%
  - 中毒症狀比實際血中濃度重要；濃度可作爲確診及評估治療結果的依據
  - 肝、腎功能不佳或併有其他嚴重 comorbidities 應立即 HD
- Lithium
  - MW 6.94 Da, Vd 0.6-0.9 L/Kg, No protein-bound
  - 若有症狀加上濃度超過一般治療濃度；或濃度大於 4 mEq/L 應 HD
  - Redistribution 慢，會有 rebounding rise 現象
  - 大部分由尿液排出，故任功能受損病人應 HD

可由 HD 洗出的 Xenobiotics

- Toxic Alcohol: Methanol, Ethylene glycol, Isopropanol
  - MW、Vd、protein-bound 皆不高，適合 HD
  - Antidote
    - 第一線 Fomepizole: 有效但昂貴
    - 第二線 Ethanol: 使血中濃度大於 100 mg/dL
- Valproic Acid
  - MW 144.2 Da, Vd 0.1-0.2 L/Kg, Protein-bound 90%
  - 若 toxic level 很高，HD 效果較佳
  - High-flux HD 較理想

HD 非第一線治療

- 其他可能
  - 造成 morbidity 有限 (eg. ethanol)
  - 內生性清除率高 (eg. ethanol)
  - 有其他更好的治療方案 (eg. acetaminophen, carbamazepine)
- Metformin-associated lactic acidosis (MALA)
  - 若併腎功能不佳應 HD

無法以 ECR 排除

- **Digoxin**
  - MW 781 Da, Vd 6 L/Kg
  - MW 和 Vd 都很高，不適合 HD
  - Digoxin specific Fab Antibody Fragments

結論

- ICU 的病人中毒較需要 ECR
- MW、Vd、protein binding 較小的物質多建議以 ECR 清除較有效率
- 若病人狀況無法接受 HD 得可以考慮使用 CRRT 作爲第一線使用