衛生福利部雙和醫院
(委託臺北醫學大學興建經營)
Taipei Medical University - Shuang Ho Hospital,
Ministry of Health and Welfare

# Surviving sepsis campaign 2026
## From Guidelines to Bedside – Transforming Clinical Practice

115年8月23日 10:30-11:10
課程地點： 台中榮總研究大樓1樓第二會議室

曾健華醫師
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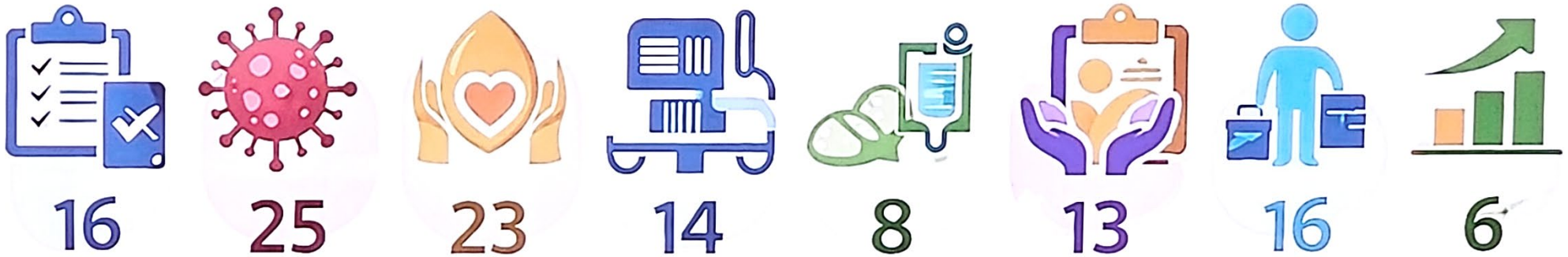
雙和醫院 重症醫學科主任

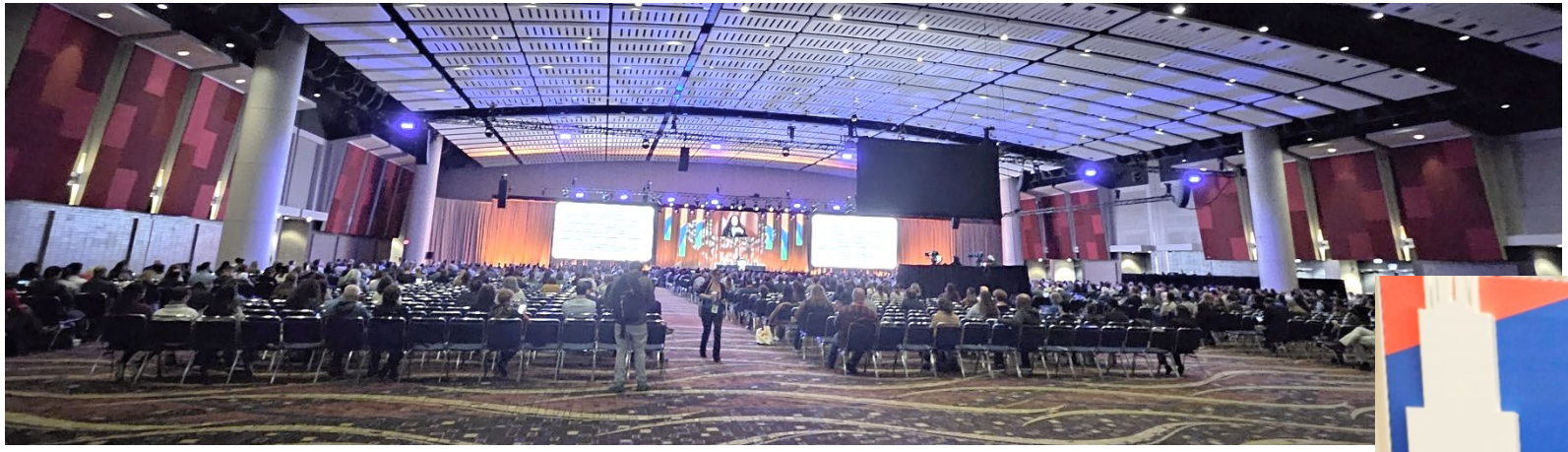
# The 2026 guidelines include 129 statements

covering **screening and early management** (16 statements) infection (25), hemodynamic management (23), respiratory support (14), adjunctive therapies for sepsis (8), additional supportive management **13**). **goals of care** (8), transitions of care (16), and long-term outcomes (6).



| 16 | 25 | 23 | 14 | 8 | 13 | 16 | 6 |
|---|---|---|---|---|---|---|---|
| Screening and early management | Infection | Hemodynamic management | Respiratory support | Adjunctive therapies for sepsis | Additional supportive management | Transitions of care | Long-term outcomes |

# 出去聽世界的邏輯，回來想床邊的難題，涵養一生臨床洞察




# Surviving sepsis campaign 2026

## From Guidelines to Bedside – Transforming Clinical Practice

1. How to interpretation “Blood pressure”(ANDROMEDA-SHOCK 2 trial, JAMA 2025)
2. How to titrate Vasopressor (OVISS, JAMA 2025)
3. Steroid use in Sepsis and ICU (REMAP-CAP Trial, ICM 2025)
4. Rapid sequencing intubation (NEJM 2025)

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# Surviving sepsis campaign 2026

## From Guidelines to Bedside – Transforming Clinical Practice

1. **How to interpretation “Blood pressure”(ANDROMEDA-SHOCK 2 trial, JAMA 2025)**

   (1) 一定要先給水嗎? (2) From **Mean arterial Pr. (MAP), Systolic AP (SAP)** to **Pulse pressure (PP) , Diastolic AP (DAP)**

2. How to titrate Vasopressor (OVISS, JAMA 2025)

3. Steroid use in Sepsis and ICU (REMAP-CAP Trial, ICM 2025)

4. Rapid sequencing intubation (NEJM 2025)

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JAMA Network™

# 每2小時抽血 vs 每30分壓指尖 (右手食指腹施壓至泛白維持 10 秒放開，恢復時>3秒為異常)

**QUESTION** Does a resuscitation strategy targeting normalization of capillary refill time, compared with targeting serum lactate levels, reduce mortality in patients with septic shock?

**CONCLUSION** This randomized clinical trial of adults with septic shock found that use of a peripheral perfusion–targeted resuscitation strategy, compared with targeting serum lactate, did not significantly reduce mortality.

## POPULATION

198 Men 226 Women

Adults in the ICU with septic shock

Mean age: 63 years

## LOCATIONS

28 ICUs in 5 countries in South America

## INTERVENTION

424 Patients randomized

212

**Peripheral perfusion group**

Resuscitation protocol of normalizing capillary refill time (measured in seconds)

212

**Lactate group**

Resuscitation protocol of normalizing or decreasing lactate levels (>20% per 2 hours)

## PRIMARY OUTCOME

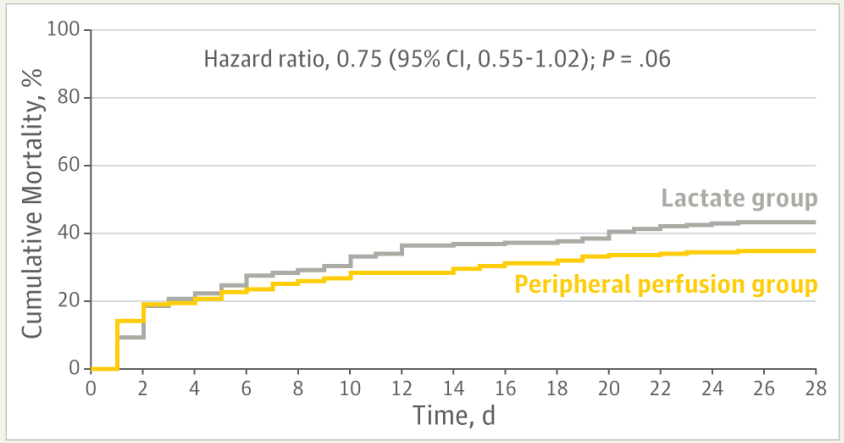
All-cause mortality at 28 days

## FINDINGS

All-cause mortality at 28 days

**Peripheral perfusion group**
34.9% (74 patients died)

**Lactate group**
43.4% (92 patients died)




No significant risk difference between groups:
**-8.5%** (95% CI, -18.2% to 1.2%),



Hernández G, Ospina-Tascón GA, Petri Damiani L, et al. Effect of a resuscitation strategy targeting peripheral perfusion status vs serum lactate levels on 28-day mortality among patients with septic shock: the ANDROMEDA-SHOCK randomized clinical trial [published February 17, 2019]. *JAMA*. doi:10.1001/jama.2019.0071

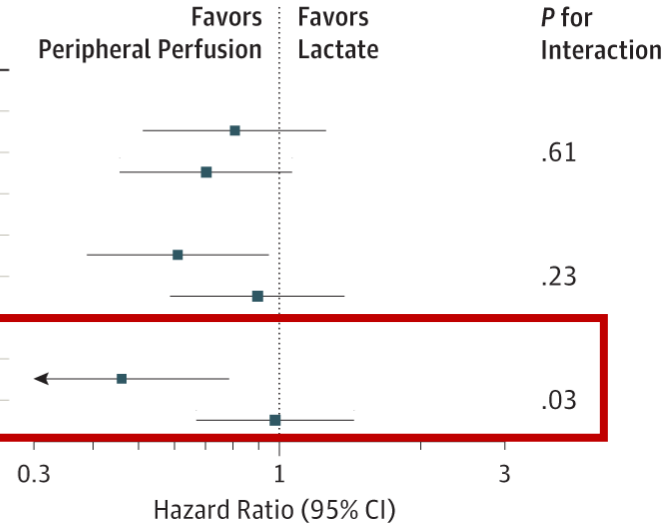
| Outcome | Peripheral Perfusion-Targeted Resuscitation (n = 212) | Lactate Level-Targeted Resuscitation (n = 212) | Unadjusted Absolute Difference (95% CI) | Adjusted Relative Measure (95% CI) | *P* Value |
|---|---|---|---|---|---|
| **Primary Outcome** | | | | | |
| Death within 28 d, No. (%) | 74 (34.9) | 92 (43.4) | −8.5 (−18.2 to 1.2)[b] | HR, 0.75 (0.55 to 1.02)[a] | .06[a] |
| **Secondary Outcomes** | | | | | |
| Death within 90 d, No. (%) | 87 (41.0) | 99 (46.7) | −5.7 (−15.6 to 4.2)[b] | HR, 0.82 (0.61 to 1.09)[a] | .17[a] |
| SOFA at 72 h, No.[d] | 165 | 166 | | | .045 |
| Mean (SD) | 5.6 (4.3) | 6.6 (4.7) | −1.00 (−1.97 to −0.02) | | |

每30分壓指尖組，3天後SOFA 較佳 (5.6 vs 6.6; -1.00 (-1.97 to -0.02); p=0.045)

8 小時內接受了較少的輸液量 (平均 2359 mL vs 2767 mL；P = .01)

需要進行 vasopressor test 的比例較低 (28.8% vs 40.1%；P = .02)

| Subgroup | No. of Events/Total (%) | | Hazard Ratio (95% CI) | *P* for Interaction |
|---|---|---|---|---|
| | Peripheral Perfusion-Targeted Resuscitation | Lactate Level-Targeted Resuscitation | | |
| Baseline lactate, mmol/L | | | | |
| >4 | 37/85 (43.5) | 41/88 (46.6) | 0.82 (0.52-1.28) | .61 |
| ≤4 | 37/127 (29.1) | 51/124 (41.1) | 0.70 (0.46-1.07) | |
| APACHE II | | | | |
| <25 | 32/130 (24.6) | 49/135 (36.3) | 0.61 (0.39-0.96) | .23 |
| ≥25 | 42/82 (51.2) | 43/77 (55.8) | 0.90 (0.59-1.38) | |
| SOFA | | | | |
| <10 | 21/103 (20.4) | 42/107 (39.3) | 0.46 (0.27-0.78) | .03 |
| ≥10 | 53/109 (48.6) | 50/105 (47.6) | 0.98 (0.67-1.45) | |




每30分壓指尖組，在SOFA<10分組，可降低死亡率

Hernández G, Ospina-Tascón GA, Petri Damiani L, et al. Effect of a resuscitation strategy targeting peripheral perfusion status vs serum lactate levels on 28-day mortality among patients with septic shock: the ANDROMEDA-SHOCK randomized clinical trial [published February 17, 2019]. *JAMA*. doi:10.1001/jama.2019.0071

RESEARCH Open Access

# Diastolic shock index and clinical outcomes in patients with septic shock

心因性休克、

低血容性休克

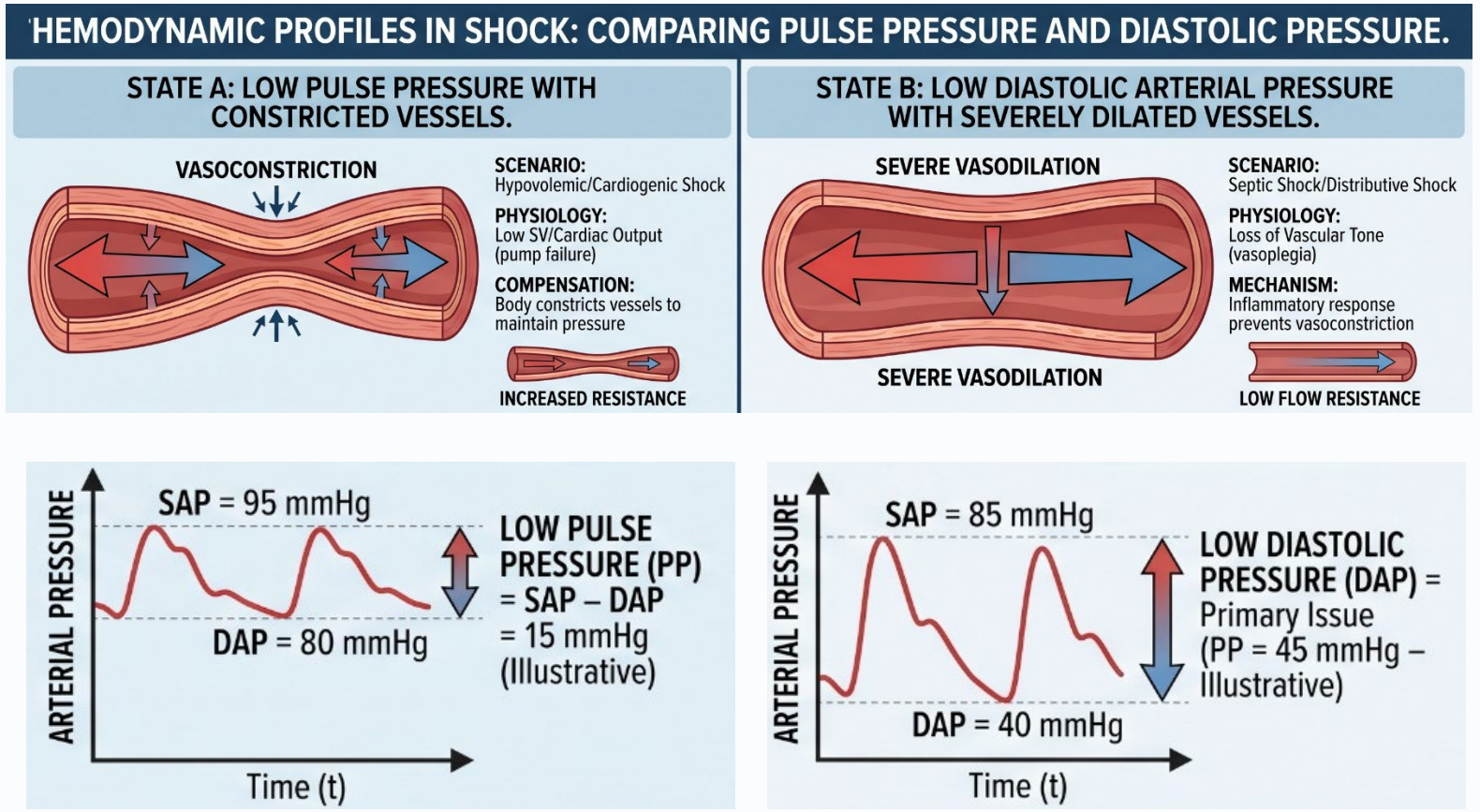
⇒ 心博出量下降

⇒ 收縮壓下降

⇒ 交感刺激

⇒ 舒張壓上升

⇒ 脈壓下降 (<40)




敗血性休克、

過敏等分佈性休克

⇒ 全身發炎

⇒ 血管過度鬆弛

⇒ 舒張壓下降 (<50)

**加護病房處理的休克病人何嘗不是不同比例混和著以上各類型的休克，心臟不夠力、水不夠、血管張力不足，應該給予不同的介入**

Ospina-Tascón *et al. Ann. Intensive Care* (2020) 10:41
https://doi.org/10.1186/s13613-020-00658-8

Annals of Intensive Care

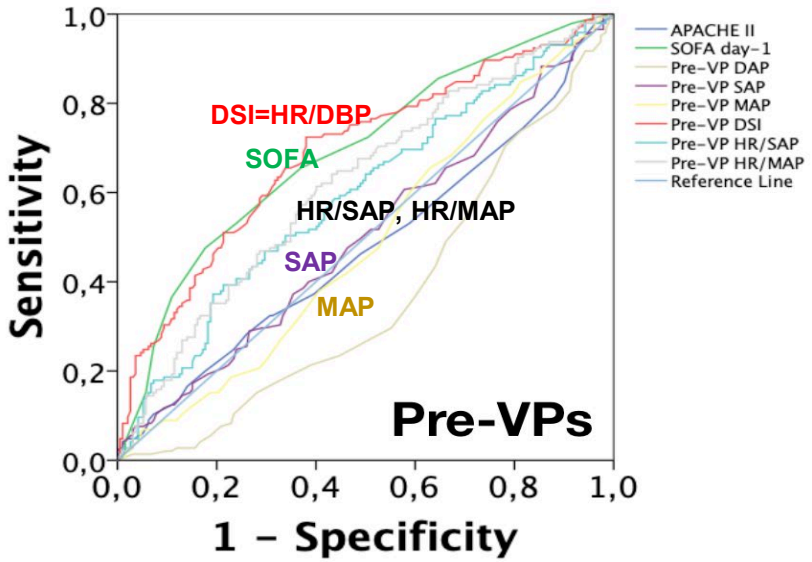
RESEARCH Open Access

# Diastolic shock index and clinical outcomes in patients with septic shock

## 給升壓劑前的 HR/DAP、SOFA最能顯著預測死亡
## SAP、MAP則無法預測死亡

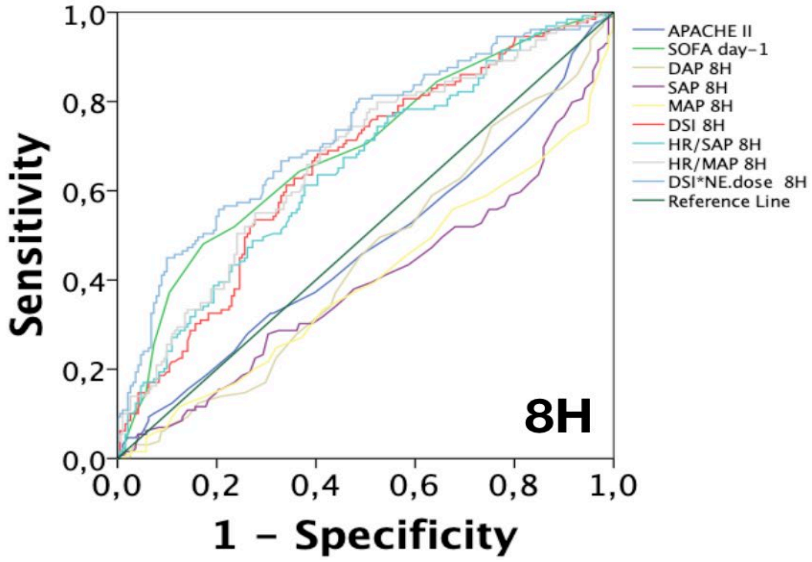
### AUC – ROC Preliminary cohort (Pre-VPs): mortality day-28

| Variables | AUC | Error tip. | p | 95% CI | |
|---|---|---|---|---|---|
| | | | | Lower Limit | Upper Limit |
| APACHE_II | 0.495 | 0.033 | 0.865 | 0.429 | 0.56 |
| **SOFA day-1** | **0.693** | **0.029** | **0.000** | 0.636 | 0.751 |
| **Pre-VP DAP** | **0.377** | **0.031** | **0.000** | 0.318 | 0.437 |
| **Pre-VP SAP** | **0.496** | **0.033** | **0.902** | 0.432 | 0.56 |
| **Pre-VP MAP** | **0.488** | **0.032** | **0.707** | 0.425 | 0.55 |
| **Pre-VP DSI** | **0.681** | **0.030** | **0.000** | 0.622 | 0.74 |
| Pre-VP HR/SAP ratio | 0.593 | 0.032 | 0.004 | 0.53 | 0.656 |
| Pre-VP HR/MAP ratio | 0.616 | 0.032 | 0.000 | 0.555 | 0.678 |




### AUC – ROC Preliminary cohort (8-HOURS): mortality day-28

| Variables | AUC | Error tip. | p | 95% CI | |
|---|---|---|---|---|---|
| | | | | Lower Limit | Upper Limit |
| APACHE II | 0.495 | 0.034 | 0.888 | 0.429 | 0.562 |
| SOFA day-1 | 0.690 | 0.030 | 0.000 | 0.631 | 0.748 |
| DAP 8H | 0.420 | 0.032 | 0.015 | 0.357 | 0.484 |
| SAP 8H | 0.398 | 0.034 | 0.002 | 0.332 | 0.464 |
| MAP 8H | 0.383 | 0.033 | 0.000 | 0.319 | 0.448 |
| DSI 8H | 0.692 | 0.030 | 0.000 | 0.634 | 0.75 |
| HR/SAP 8H | 0.669 | 0.031 | 0.000 | 0.609 | 0.729 |
| HR/MAP 8H | 0.700 | 0.030 | 0.000 | 0.642 | 0.758 |



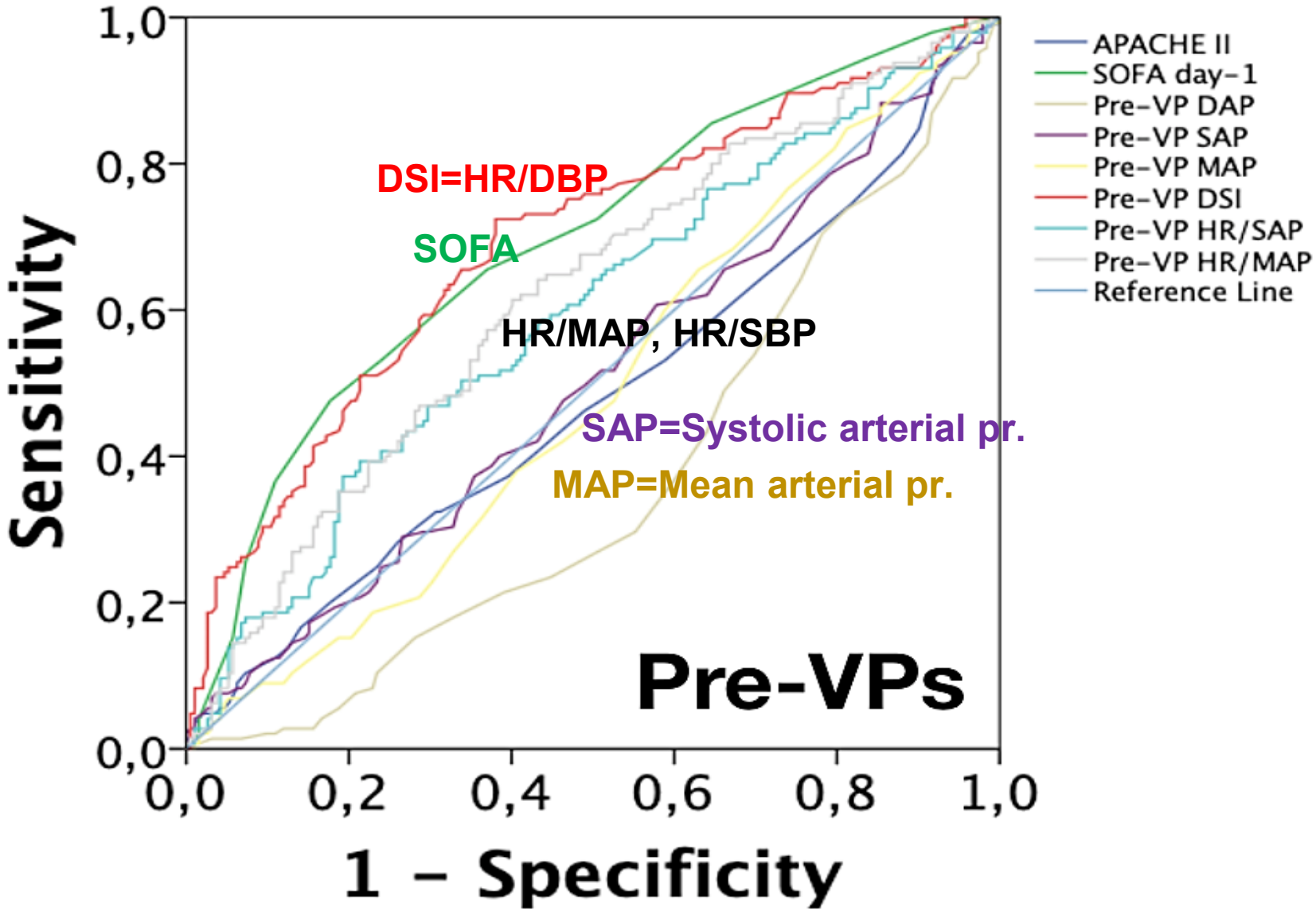

Ospina-Tascón *et al. Ann. Intensive Care* (2020) 10:41
https://doi.org/10.1186/s13613-020-00658-8

Annals of Intensive Care

RESEARCH Open Access

Diastolic shock index and clinical outcomes in patients with septic shock

## 給升壓劑前的 HR/DAP、SOFA最能顯著預測死亡
## 更積極給予NE提升舒張壓可改善預後 (ANDROMEDA-SHOCK 2)

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Annals of Intensive Care

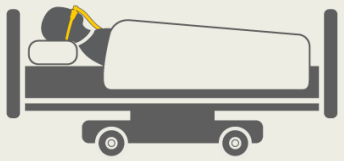
JAMA

# ANDROMEDA-SHOCK 2 強調個人化血流動力學復甦策略

**QUESTION** Does a personalized hemodynamic resuscitation strategy targeting capillary refill time improve outcomes in patients with early septic shock vs usual care?

**CONCLUSION** In patients with early septic shock, a personalized hemodynamic resuscitation protocol targeting capillary refill time (CRT-PHR) was superior to usual care.

## POPULATION



831 Men 636 Women

Adults 18 years or older with septic shock

Mean age: 66 years

## LOCATIONS

86
Sites in
19 countries

## INTERVENTION

1501 Patients randomized
1467 Patients analyzed

**720**
**CRT-PHR**
Underwent PHR targeted at normalizing CRT over a 6-hour period

**747**
**Usual care**
Treated according to local protocols or international guidelines over a 6-hour period

## PRIMARY OUTCOME

Hierarchical composite outcome: all-cause mortality, duration of vital support, and length of hospital stay at 28 days as an overall win ratio

## FINDINGS

Total No. of wins

| CRT-PHR | Usual care |
|---|---|
| 131 131 (48.9%) | 112 787 (42.1%) |

CRT-PHR was superior to usual care:

**Win ratio, 1.16**

(95% CI, 1.02 to 1.33; *P* = .04)

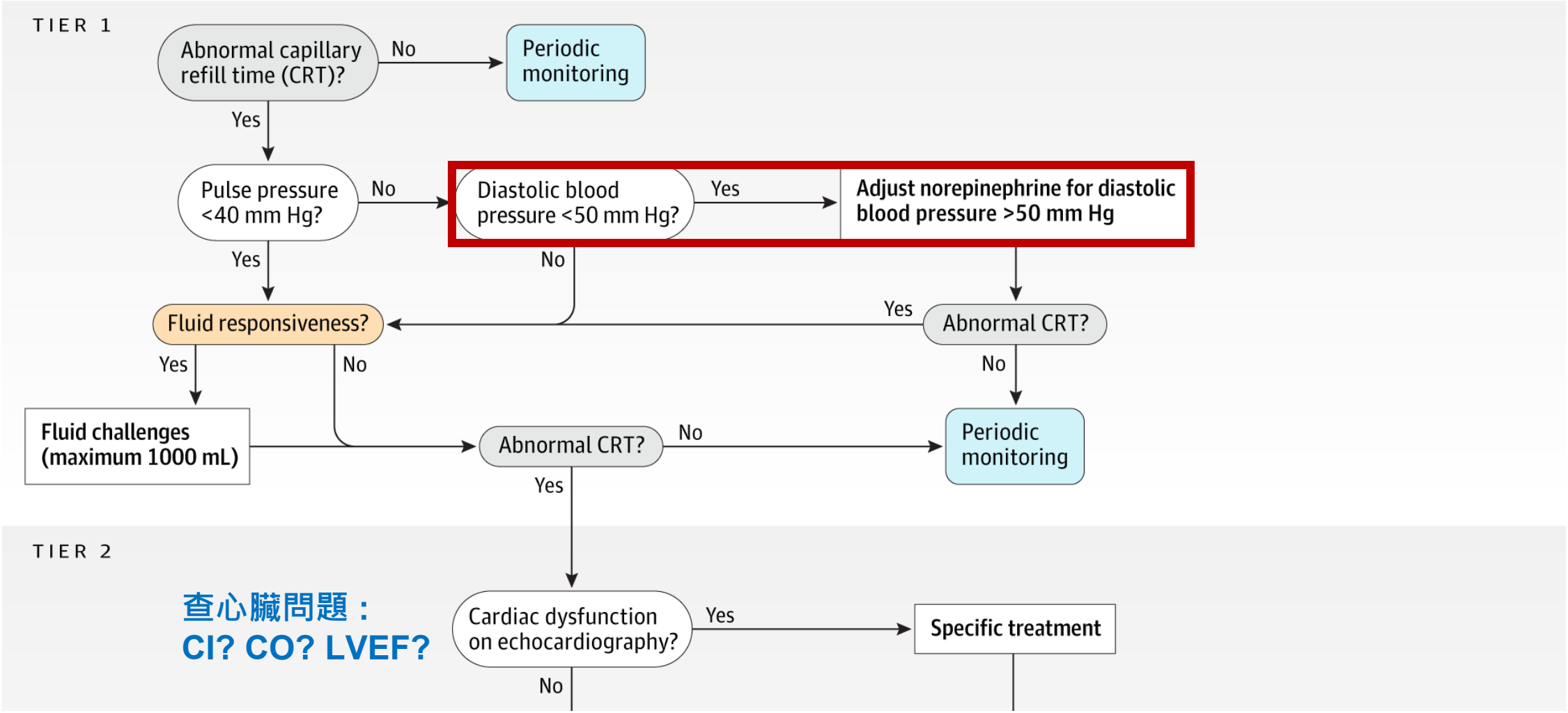


The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

JAMA

# CRT : Capillary refill time, PHR : Personized hemodynamic resuscitation
# PP>40mmHG, DPB<50mmHg 優先調整NE；PP<40mmHg 給水或查心臟問題

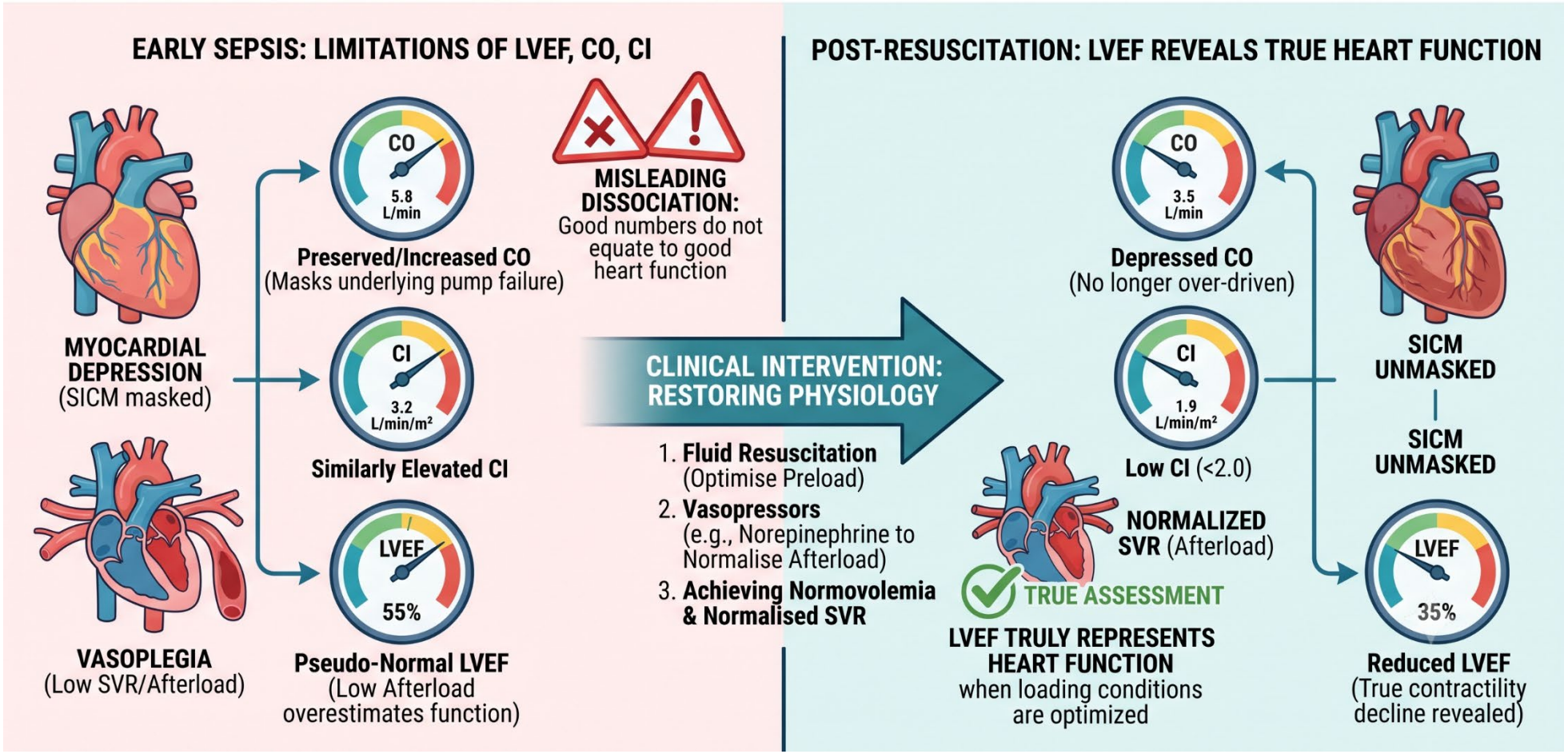
Personalized hemodynamic resuscitation protocol targeting capillary refill time (CRT-PHR)




The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

JAMA

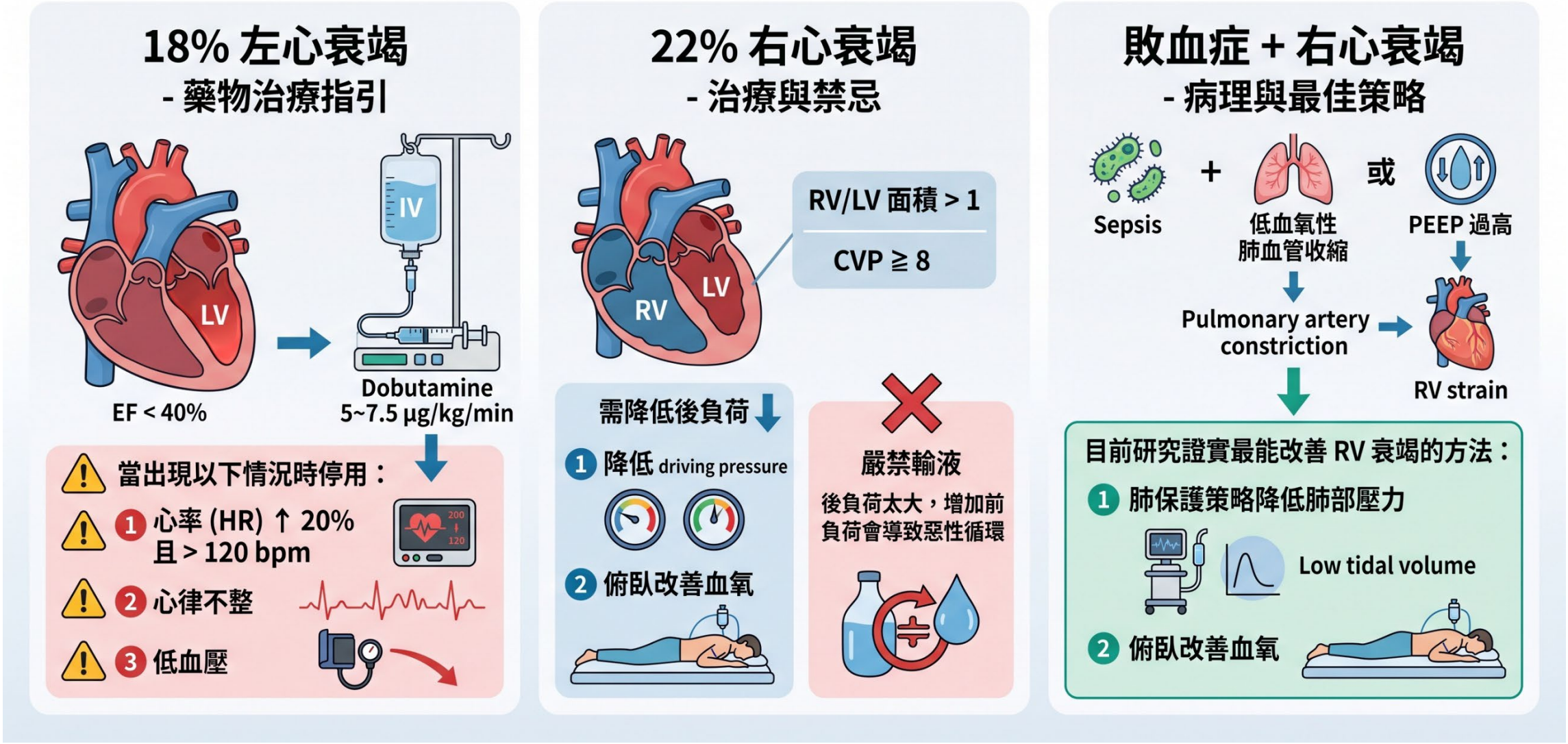
# The Misleading Trio in Early Sepsis & The Path to True LVEF Assessment




**GLS (Global Longitudinal Strain)，動得好不好(收縮變形)其實更準。**

The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

# JAMA 左心問題(EF<40%)給Dobu.、右心問題(RV>LV)改善VQ mismtach、肺保護策略降後負荷




The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

JAMA

# 個人化血流動力學(PHR)組，Dobutamine用得比較多、Volume給得比較少

**Table 2. Hemodynamic Therapies and Resuscitation-Related Variables at Hour 6**

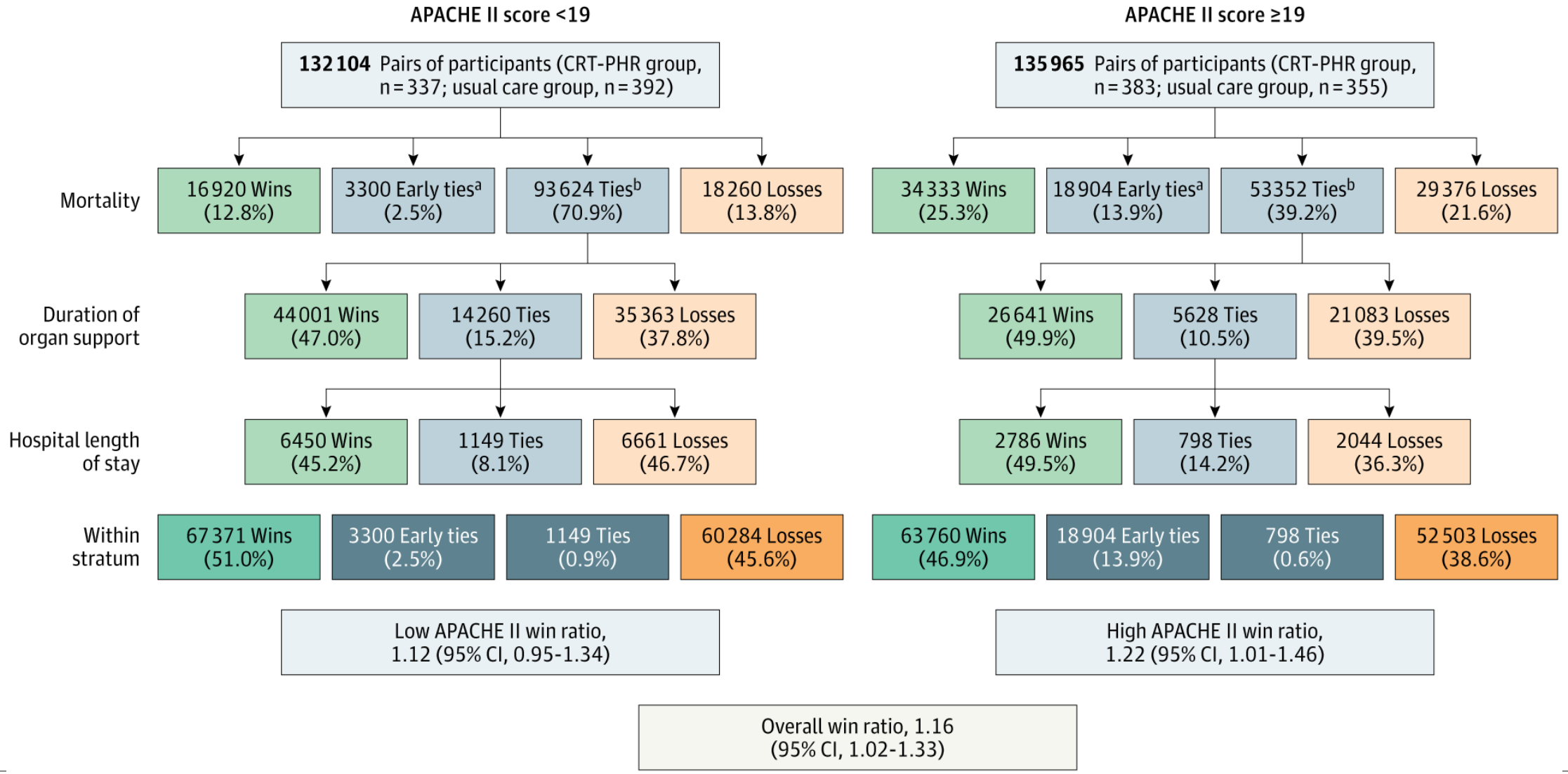
| | CRT-PHR group | Usual care group | Absolute difference (95% CI) |
|---|---|---|---|
| Therapy | | | |
| Norepinephrine, No./total No. (%) | 648/684 (94.7) | 634/694 (91.4) | 3.4 (0.7 to 6.1) |
| Norepinephrine dose, mean (SD), μgr/kg/min | 0.28 (0.34) [n = 655] | 0.27 (0.41) [n = 634] | −0.01 (−0.05 to 0.03) |
| Vasopressin, No./total No. (%) | 251/684 (36.7) | 229/694 (33.0) | 3.7 (−1.3 to 8.7) |
| Dobutamine, No./total No. (%) | 84/684 (12.3) | 37/694 (5.3) | 7.0 (4.0 to 9.9) |
| Volume of resuscitation fluids, mean (SD), mL | 595 (679) [n = 672] | 847 (832) [n = 676] | −251 (−316 to −187) |
| Net fluid balance, mean (SD), mL | 990 (1016) [n = 629] | 1227 (1225) [n = 622] | −242 (−385 to −99) |
| Hemodynamic and perfusion-related variable | | | |
| Central venous pressure, mean (SD), mm Hg | 9.1 (4.1) [n = 541] | 9.8 (4.8) [n = 544] | −0.6 (−1.1 to −0.1) |
| Mean arterial pressure, mean (SD), mm Hg | 74.1 (9.4) [n = 682] | 73.6 (9.0) [n = 690] | 0.6 (−0.5 to 1.7) |
| Capillary refill time, mean (SD), s | 2.8 (1.4) [n = 679] | 3.4 (1.9) [n = 684] | −0.6 (−0.7 to −0.4) |
| Lactate level, mean (SD), mmol/L | 3.2 (2.4) [n = 659] | 3.5 (3.0) [n = 664] | −0.3 (−0.5 to −0.1) |
| Central venous oxygen saturation, mean (SD), % | 74.4 (8.9) [n = 588] | 72.4 (9.9) [n = 596] | 1.9 (0.8 to 3.0) |

Abbreviation: CRT-PHR, capillary refill time personalized hemodynamic resuscitation.

The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

JAMA

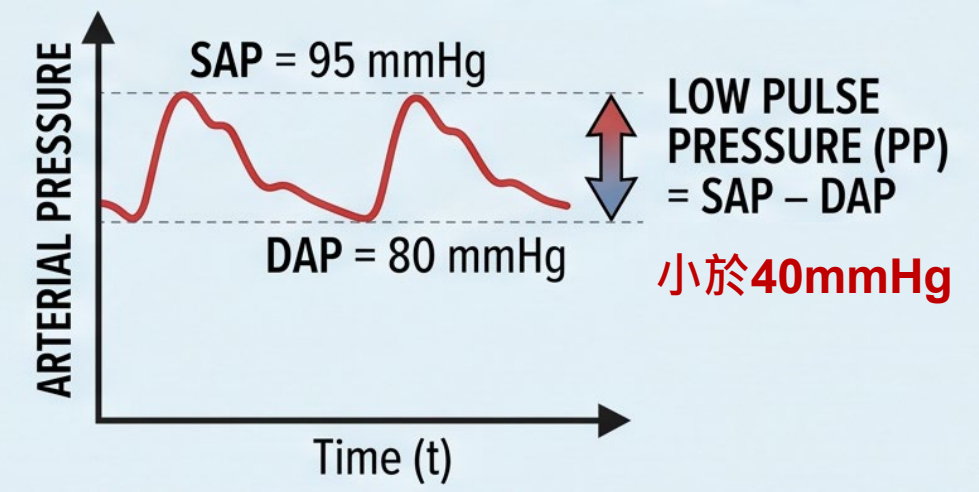
# 個人化血流動力學(PHR)組，APACHE II>19分的嚴重族群，降低死亡好處更明顯

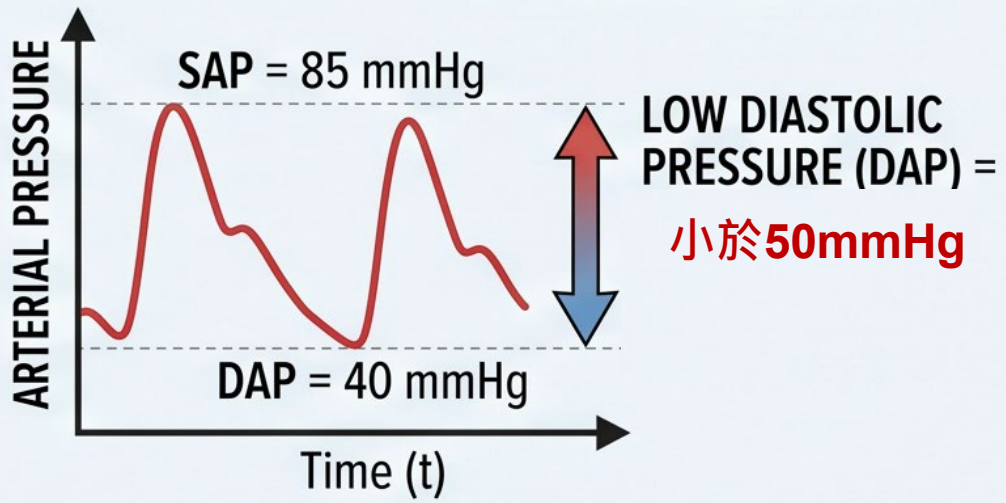


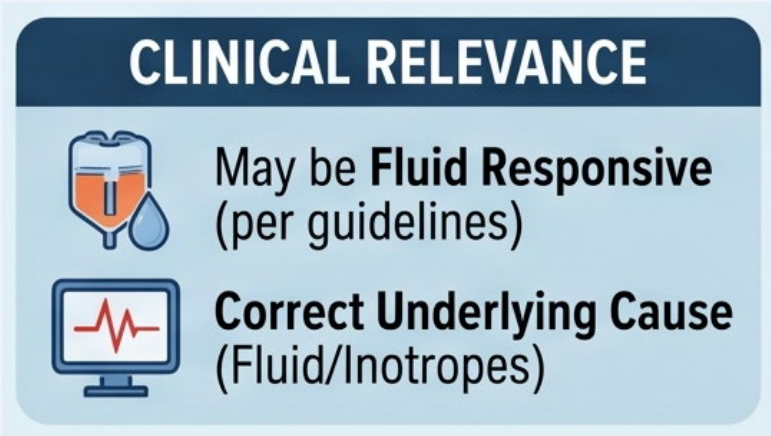

The ANDROMEDA-SHOCK-2 Investigators. Personalized hemodynamic resuscitation targeting capillary refill time in early septic shock. *JAMA*. Published online October 29, 2025. doi:10.1001/jama.2025.20402

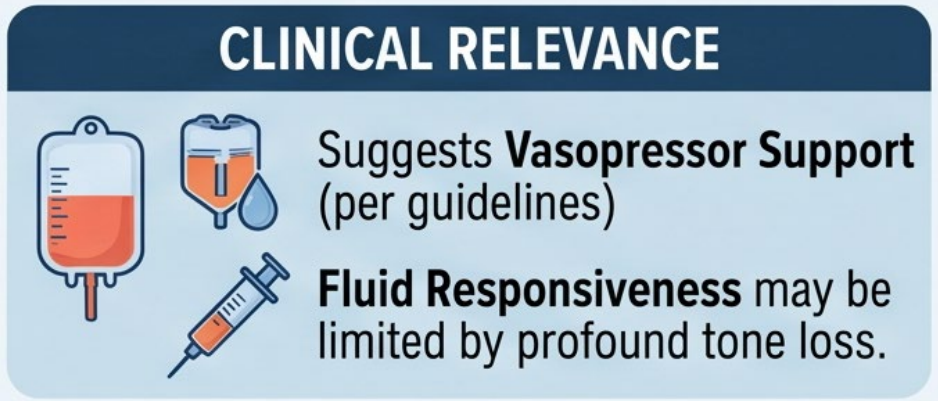
JAMA

# 用NE優化舒張壓、給水優化脈壓，處理左心動得差、右心比左心大找胸腔科調呼吸器

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# Surviving sepsis campaign 2026

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2. **How to titrate Vasopressor (OVISS, JAMA 2025) 心因性休克會用NE? Dopa? Dobu?**
3. Steroid use in Sepsis and ICU (REMAP-CAP Trial, ICM 2025)
4. Rapid sequencing intubation (NEJM 2025)

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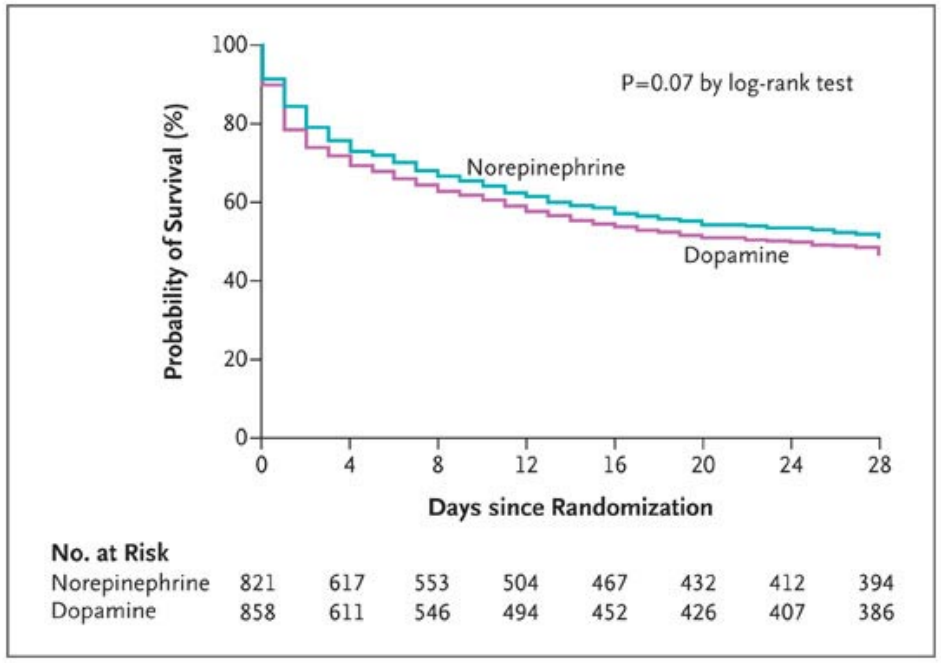
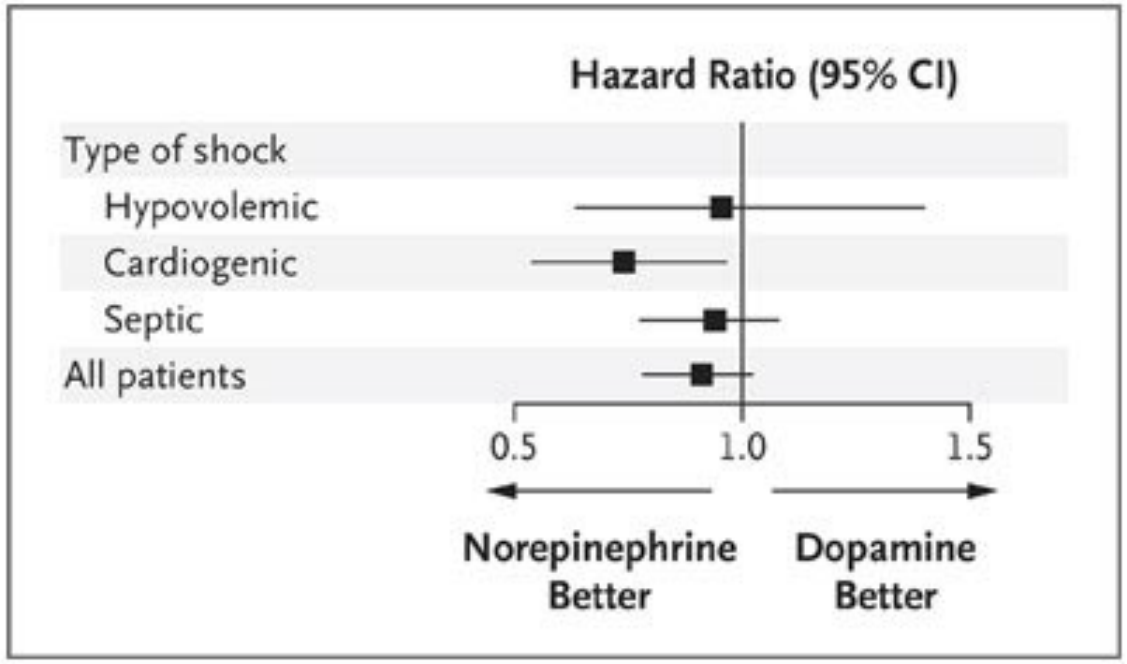
雙和醫院 重症醫學科主任

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 4, 2010 VOL. 362 NO. 9

# Comparison of Dopamine and Norepinephrine in the Treatment of Shock




**心因性休克，使用Norepinephrine比Dopamine能顯著下降死亡率!**

N Engl J Med 2010;362:779-89.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 4, 2010 VOL. 362 NO. 9

# Comparison of Dopamine and Norepinephrine in the Treatment of Shock

**Table 3. Secondary Outcomes and Adverse Events.***

| Variable | Dopamine (N=858) | Norepinephrine (N=821) | P Value |
|---|---|---|---|
| Adverse events | | | |
| Arrhythmias — no. (%) | 207 (24.1) | 102 (12.4) | <0.001 |
| Atrial fibrillation | 176 (20.5) | 90 (11.0) | |
| Ventricular tachycardia | 21 (2.4) | 8 (1.0) | |
| Ventricular fibrillation | 10 (1.2) | 4 (0.5) | |

**Dopamine顯著增加心律不整。**

**心因性休克Norepinephrine比Dopamine提降低死亡率。**

N Engl J Med 2010;362:779-89.

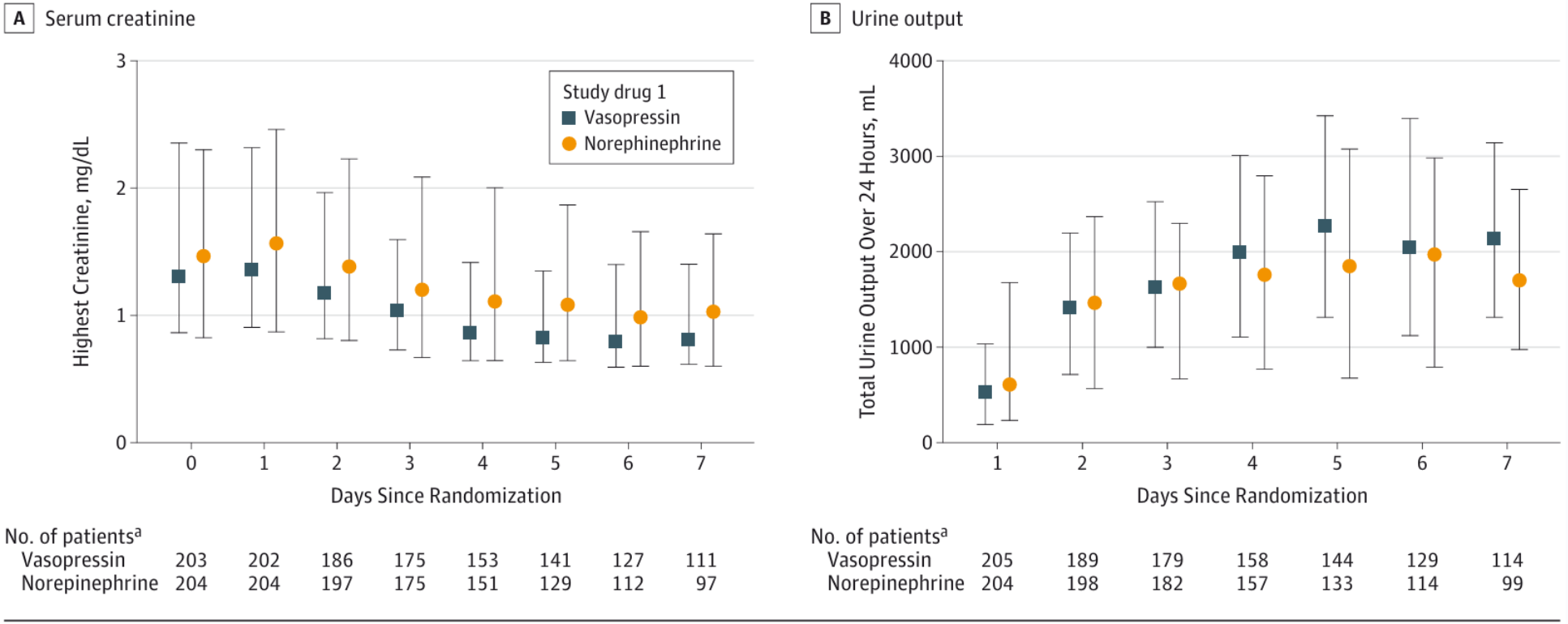
JAMA | Original Investigation

# Effect of Early Vasopressin vs Norepinephrine on Kidney Failure in Patients With Septic Shock

## The VANISH Randomized Clinical Trial

**Norepinephrine or Vasopressin 哪個好?**

Figure 4. Serum Creatinine and Urine Output Over the First 7 Days by Study Drug 1




JAMA.2016;316(5):509-518. doi:10.1001/jama.2016.10485

JAMA | Original Investigation

# Effect of Early Vasopressin vs Norepinephrine on Kidney Failure in Patients With Septic Shock

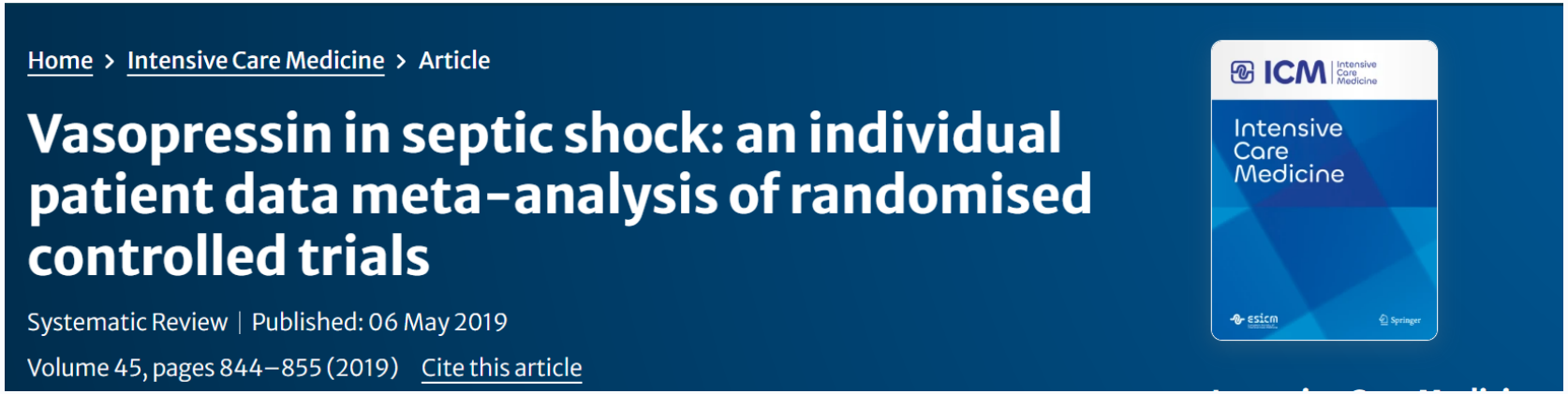
## The VANISH Randomized Clinical Trial

Table 2. Outcome Data in the 4 Treatment Groups and Comparison of the Vasopressin Group With the Norepinephrine Group

| | Vasopressin | | | Norepinephrine | | | Vasopressin vs Norepinephrine, Absolute Difference (95% CI)[b] |
|---|---|---|---|---|---|---|---|
| | Hydrocortisone[a] | Placebo | Total[a] | Hydrocortisone | Placebo | Total | |
| Use of RRT, No./total (%) | 29/101 (28.7) | 23/104 (22.1) | 52/205 (25.4) | 32/101 (31.7) | 40/103 (38.8) | 72/204 (35.3) | −9.9 (−19.3 to −0.6) |
| Survivors | 15/67 (22.4) | 13/74 (17.6) | 28/141 (19.9) | 15/72 (20.8) | 18/76 (23.7) | 33/148 (22.3) | −2.4 (−12.5 to 7.7) |
| Nonsurvivors | 14/33 (42.4) | 10/30 (33.3) | 24/63 (38.1) | 17/29 (58.6) | 22/27 (81.5) | 39/56 (69.6) | −31.5 (−50.2 to −12.9) |

**Vasopression比Norepinephrine能顯著減少RRT比例**

JAMA.2016;316(5):509-518. doi:10.1001/jama.2016.10485




- Four trials were included with a total of 1453 patients. Vasopressin led to
- More digital ischaemia [absolute risk difference (ARD) 1.7%, 95% CI 0.3%–3.2%]
- Fewer arrhythmias (ARD − 2.8%, 95% CI − 0.2% to − 5.3%).
- Reduced the requirement for renal replacement therapy (RRT) (RR 0.86, 95% CI 0.74–0.99)
- Mesenteric ischaemia and acute coronary syndrome events were similar between groups.

## Norepinephrine刺激心臟多一點、 Vasopressin 收縮血管多一點

Intensive Care Med. 2019 Jun;45(6):844-855.

Research

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

# Optimal Vasopressin Initiation in Septic Shock

## The OVISS Reinforcement Learning Study

**Norepinephrine 早點加 Vasopressin?**

**IMPORTANCE** Norepinephrine is the first-line vasopressor for patients with septic shock. When and whether a second agent, such as vasopressin, should be added is unknown.

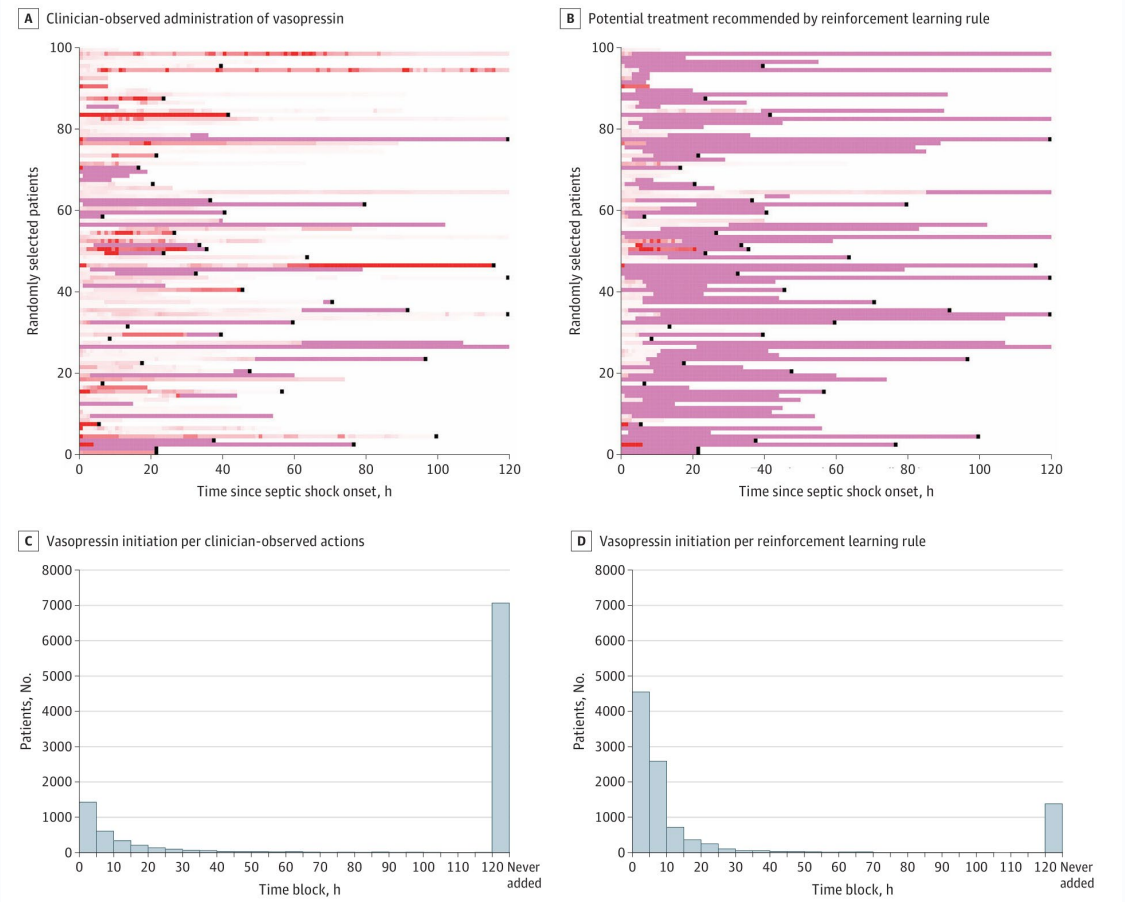
**OBJECTIVE** To derive and validate a reinforcement learning model to determine the optimal initiation rule for vasopressin in adult, critically ill patients receiving norepinephrine for septic shock.

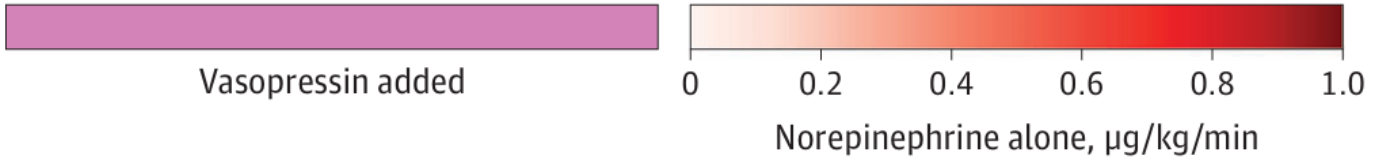
**DESIGN, SETTING, AND PARTICIPANTS** Reinforcement learning was used to generate the optimal rule for vasopressin initiation to improve short-term and hospital outcomes, using electronic health record data from 3608 patients who met the Sepsis-3 shock criteria at 5 California hospitals from 2012 to 2023. The rule was evaluated in 628 patients from the California dataset and 3 external datasets comprising 10 217 patients from 227 US hospitals, using weighted importance sampling and pooled logistic regression with inverse probability weighting.

JAMA.2025;333(19):1688-1698

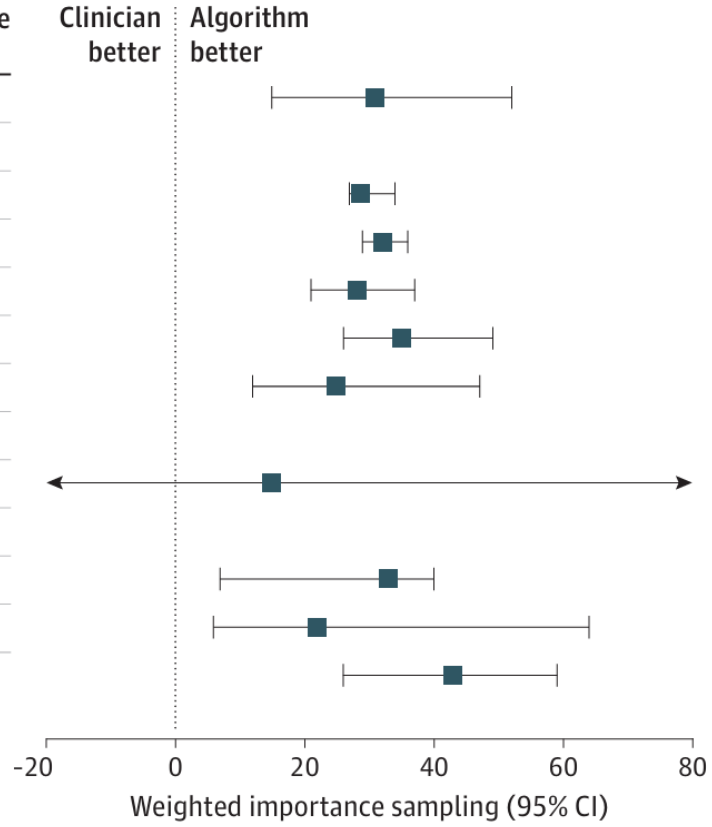
JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

# Optimal Vasopressin Initiation in Septic Shock
## The OVISS Reinforcement Learning Study




| Category | Weighted importance sampling (95% CI) |
|---|---|
| Overall reward | 31 (15 to 52) |
| Reward component | |
| In-hospital mortality | 29 (27 to 34) |
| Mean arterial pressure | 32 (29 to 36) |
| SOFA score | 28 (21 to 37) |
| Norepinephrine dose | 35 (26 to 49) |
| Serum lactate | 25 (22 to 27) |
| Internal validation | |
| UCSF | 15 (-48 to 129) |
| External validation | |
| MIMIC-IV | 33 (7 to 40) |
| eICU-CRD | 22 (6 to 64) |
| UPMC | 43 (26 to 59) |




**更早、更多使用Vasopression比能顯著減少死亡**

JAMA.2025;333(19):1688-1698

GUIDELINES

# Surviving Sepsis Campaign: international guidelines for management of sepsis and septic shock 2026

*Intensive Care Med (2026) 52:863–936*
https://doi.org/10.1007/s00134-026-08361-1

## 加入 Vasopressin 的時機

### 專家共識

**Concentration:**
16mg Norepinephrine in 250ml D5W
**= 64 mcg/mL**

Norepinephrine 劑量
**0.3 μg/kg/min**
(IQR: 0.2–0.5 μg/kg/min)
**加用 Vasopressin**

### 近期觀察性研究

強化學習機器模型

建議在 Norepinephrine 中位數
**0.20 μg/kg/min** 時開始使用 Vasopressin
**可降低死亡率**

## 加入 Vasopressin 時機

85% 專家小組成員

## 加入 Epinephrine 時機

55% 的小組成員

| 身重 (kg) | 0.2 | 0.3 | 0.8 |
|---|---|---|---|
| 50 | 9.4 mL/hr | 14.1 mL/hr | 37.5 mL/hr |
| 60 | 11.3 mL/hr | 16.9 mL/hr | 45.0 mL/hr |
| 70 | 13.1 mL/hr | 19.7 mL/hr | 52.5 mL/hr |
| 80 | 15.0 mL/hr | 22.5 mL/hr | 60.0 mL/hr |
| 90 | 16.9 mL/hr | 25.3 mL/hr | 67.5 mL/hr |

# Surviving sepsis campaign 2026

## From Guidelines to Bedside – Transforming Clinical Practice

1. How to interpretation “Blood pressure”(ANDROMEDA-SHOCK 2 trial, JAMA 2025)
2. How to titrate Vasopressor (OVISS, JAMA 2025)
3. **Steroid use in Sepsis and ICU (REMAP-CAP Trial, ICM 2025)**
4. Rapid sequencing intubation (NEJM 2025)

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雙和醫院 重症醫學科主任

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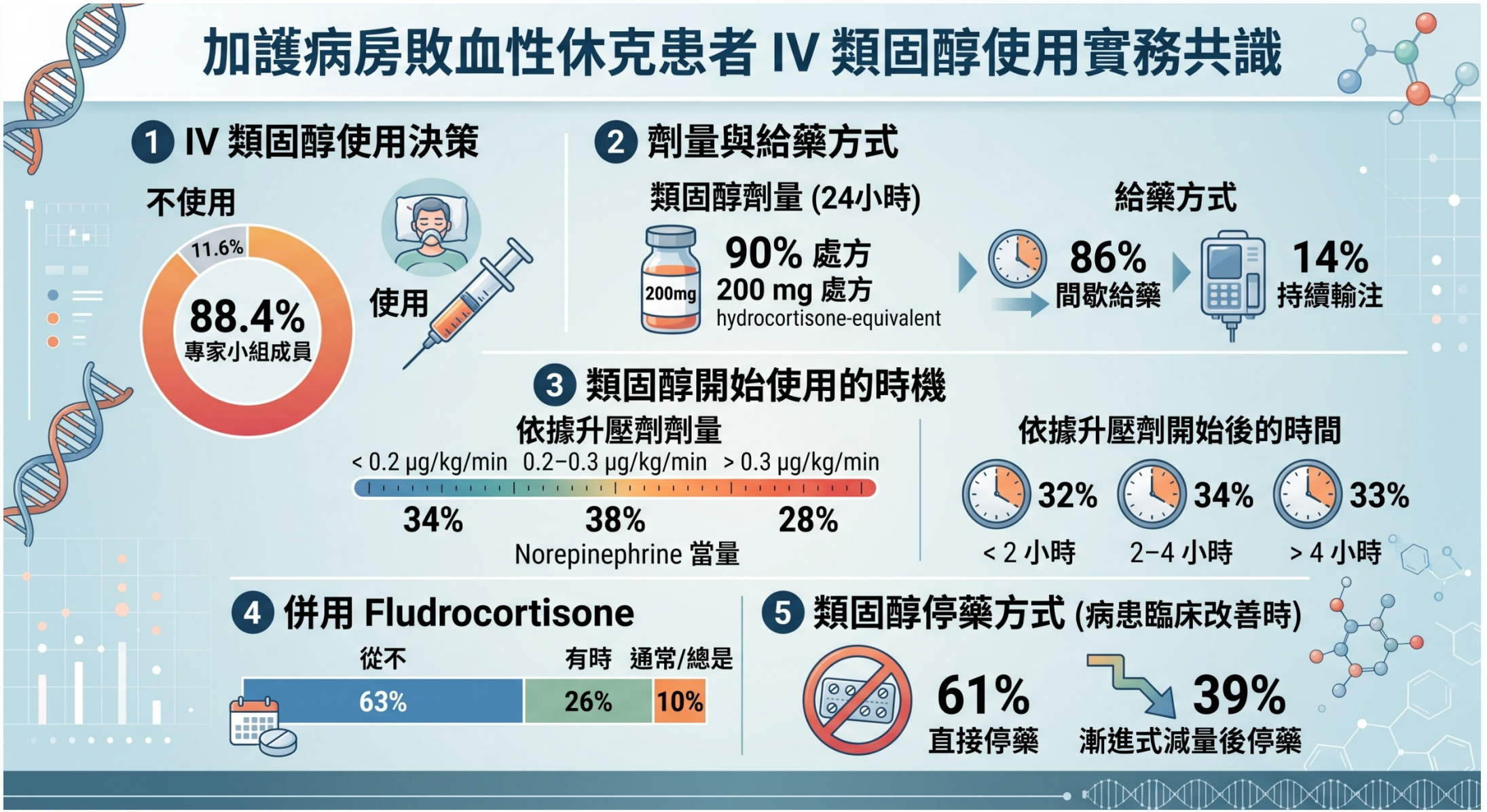


# COMPARATIVE ANALYSIS OF CORTICOSTEROID TRIALS IN SEVERE RESPIRATORY ILLNESS

## TONGYOO ET AL. (CRITICAL CARE 2016)

**PATIENT POPULATION**

N Patients: 197 Patients ARDS

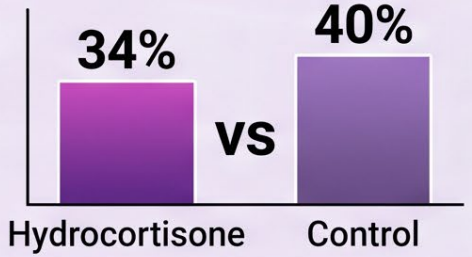
**INTERVENTION**

Hydrocortisone 50 mg q6h (D1-D7)

**CONTROL**

Control

**60-DAY MORTALITY**




**RESULTS**

RR = 0.86 (0.60-1.23), p=0.47

No statistically significant difference

## VILLAR ET AL. (LANCET RESPIR MED 2020)

**PATIENT POPULATION**

N Patients: 277 Patients ARDS

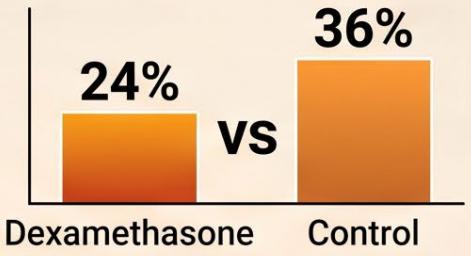
**INTERVENTION**

Dexamethasone 20 mg qd (D1-D5) + 10 mg qd (D6-D10), DC if extubation

**CONTROL**

Control

**60-DAY MORTALITY**




**RESULTS**

Absolute difference:

**-12.5%**

(-22.9 to -1.7), p=0.0047

## CAPE COD TRIAL (NEJM 2023)

**PATIENT POPULATION**

N Patients: 800 Patients ICU Severe CAP

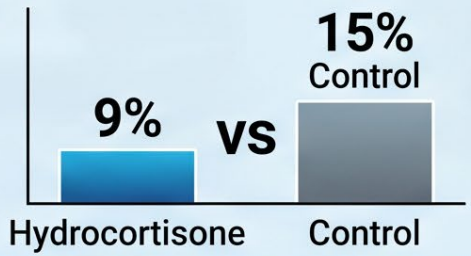
**INTERVENTION**

Hydrocortisone 200 mg qd (4-7 days based on improvement, then taper, total 8-14 days)

**CONTROL**

Placebo

**90-DAY MORTALITY**




**RESULTS**

Absolute difference:

**-5.4%**

(95% CI -9.9 to -0.8)

## REMAP-CAP TRIAL (ICM 2025)

**PATIENT POPULATION**

N Patients: 658 Patients ICU CAP

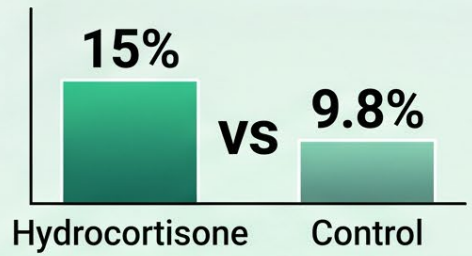
**INTERVENTION**

Hydrocortisone 50 mg IV q6h for 7 days

**CONTROL**

Control

**90-DAY MORTALITY**




**RESULTS**

Adjusted OR: 1.52-1.63, all 95% CrI crossing 1

No statistically significant difference

# Surviving sepsis campaign 2026

## From Guidelines to Bedside – Transforming Clinical Practice

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雙和醫院 重症醫學科主任

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CASE 1

# 林O昌 · 55歲男性

病歷號：16707281, BMI：23.4

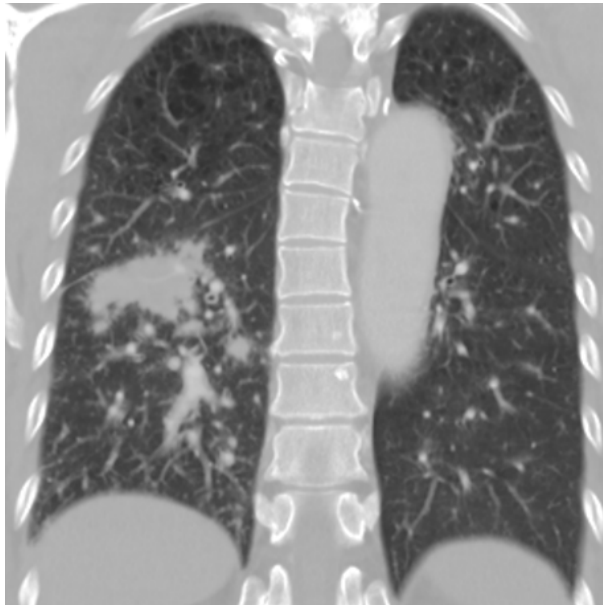
**CC: 急性發作呼吸困難（1天），無發燒、胸悶或胸痛。**

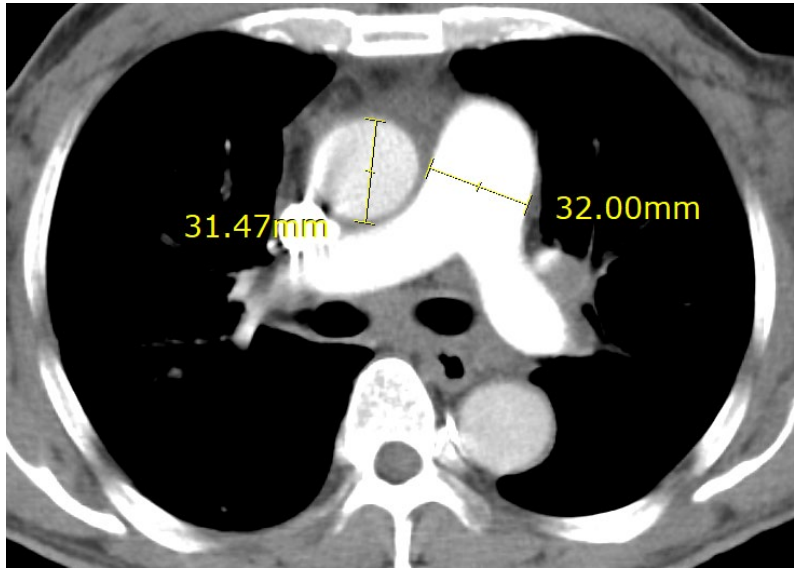
**PH: 右肺腺癌 cT1aN3M1b，Stage IVA s/p AB122+AB154 治療中**

**Impression: 肺炎收入院**

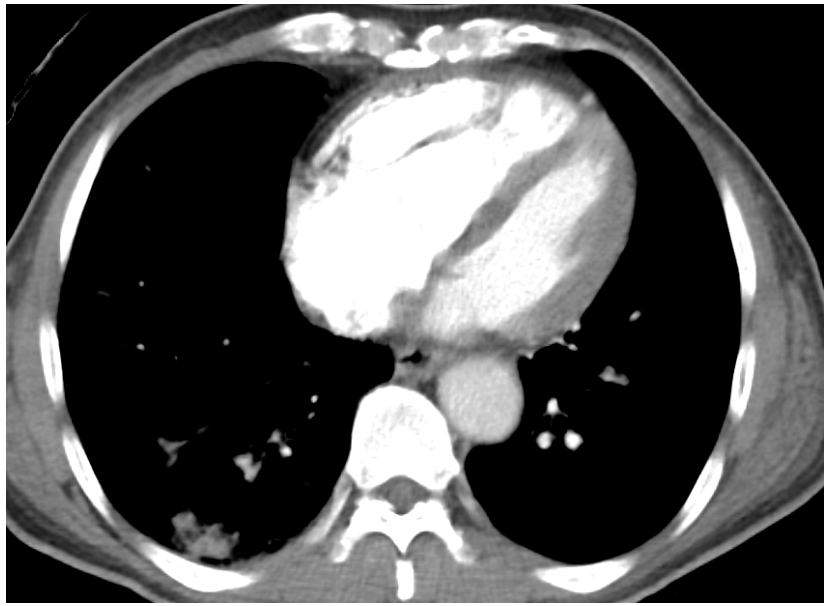
**04/04 急診入院血氧尚可（$SpO_2$ 96%）**

**04/05 病房清晨急速惡化，$SpO_2$ 測不到，呼吸 35 次/分，脈搏降至 41 次/分。**






Pul trunk/Aorta = 32/31=1 (正常<0.9)



Right ventricle > Left ventricle

CASE 1 · 急救經過

# 插管後心跳停止與 CPCR

1

## 08:05

病人躁動、張口呼吸、使用輔助呼吸肌，
血氧測不到，病人點頭同意插管

2

## 08:23–08:25

**脈搏 70 次/分，血壓 112/92 mmHg**

給予 Midatin（Midazolam）1 amp IV +
Relaxin（Succinylcholine）0.1 vial IV stat

3

## 08:29

置入 7.0 號氣管內管，固定 23 cm；
**脈搏 41 次/分，血壓 115/91 mmHg**

4

## 08:30

**心搏過緩（脈搏 29 次/分）**

→ Atropine 1 amp IV → CPCR 開始（Asystole）

5

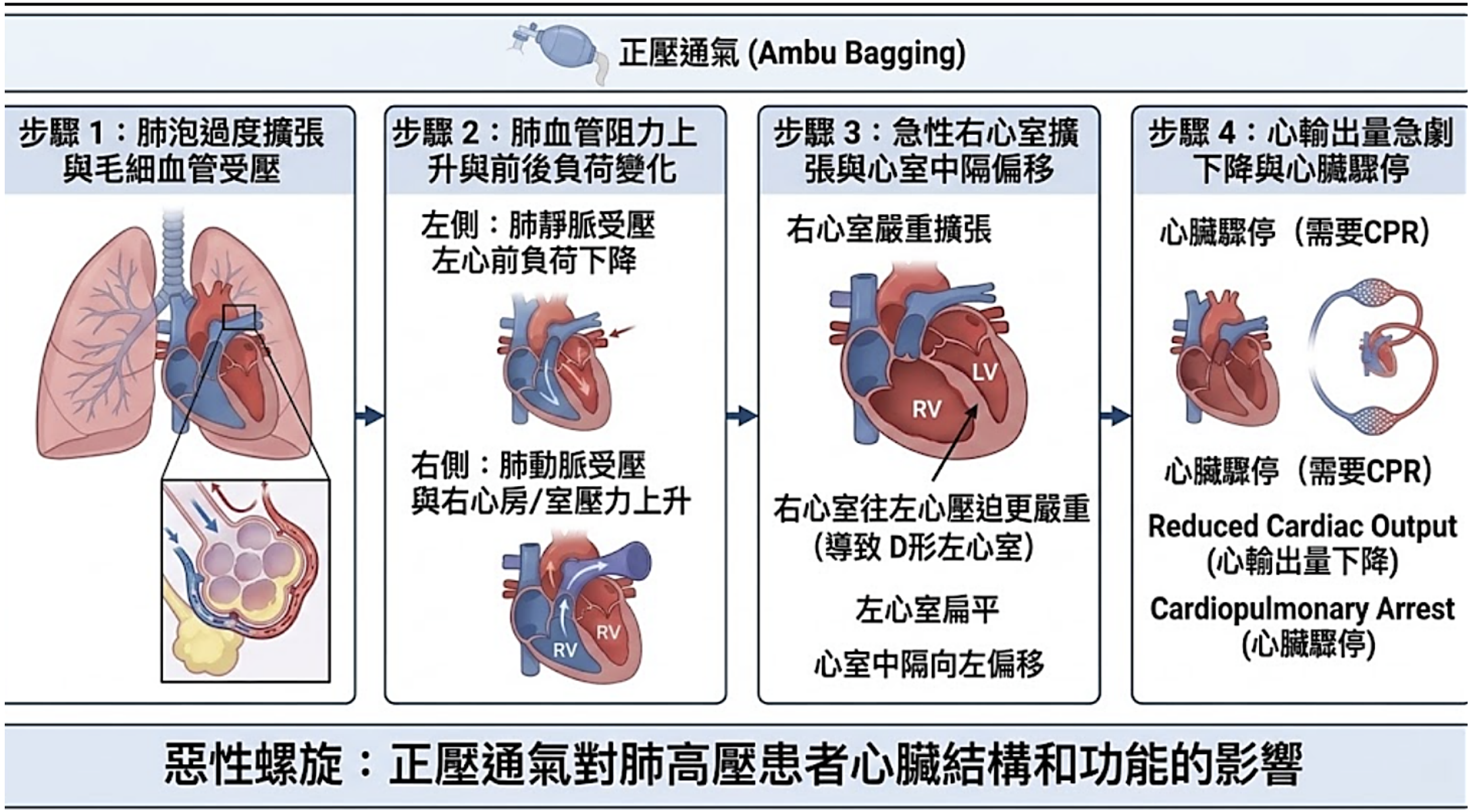
## 08:33–09:00

多次 Epinephrine 1mg IV STAT（共 8 次），
持續心外按摩，中心靜脈導管放置失敗

6

## 09:14–09:38

急救 30 分鐘無效，
家屬同意停止急救；09:38 宣告死亡




調整SOP : 針對肺高壓病患，以100% O2 Nasal high flow取代正壓通氣維持血氧濃度，進行插管前/中給氧。

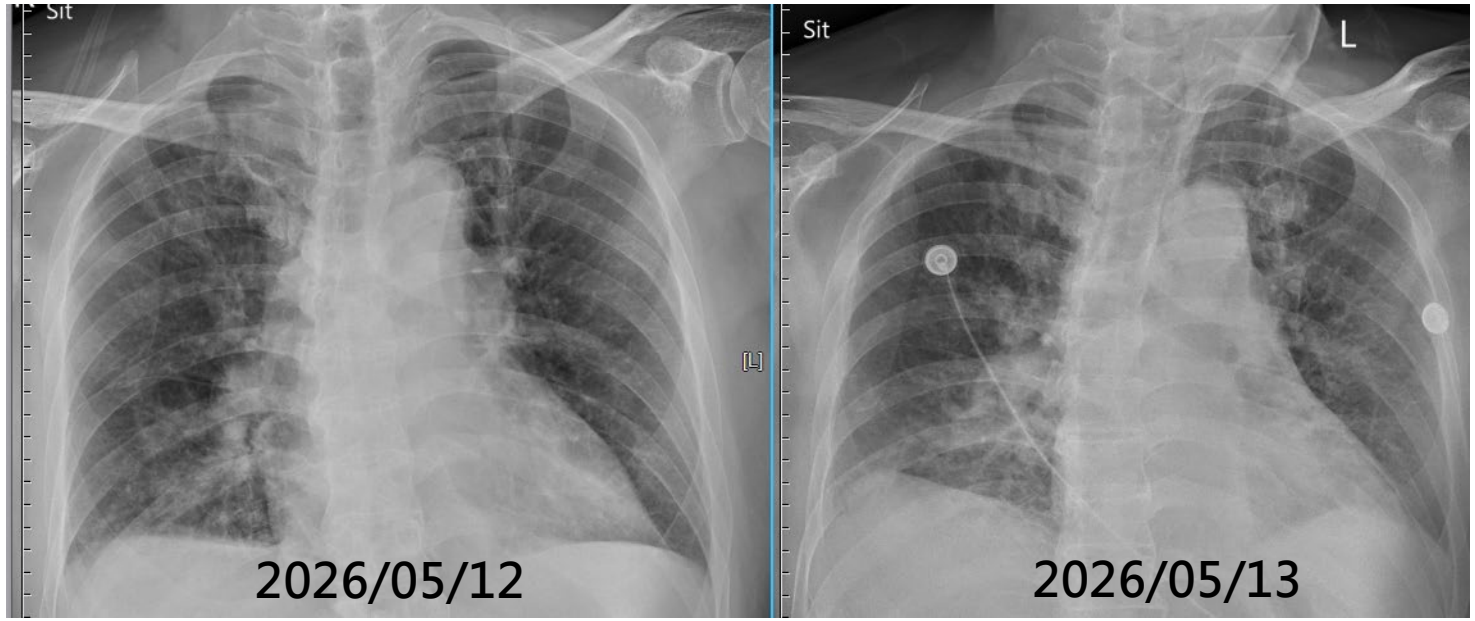
# 丁O璧 · 68歲男性

病歷號：02167422 BMI：25

**主訴 : 偶然發現血小板低下，活動性呼吸困難**

**診斷 : Thrombotic Thrombocytopenic Purpura (ADAMST13 activity 0 on 2026/5/14),**

**status post IVIG on 2026/05/11 and plasma exchange on 2026/05/12**



# 插管完整流程紀錄

1 08:30 前

插管前評估：病人出現意識障礙加重、活動性呼吸困難，$SpO_2$ 下降，決定進行緊急插管（RSI）。

2 08:30

- Midazolam 5mg IV → 強效鎮靜
- Morphine 10mg IVD → 組織胺釋放
- Succinylcholine（Relaxin）0.1 vial IV → 肌肉鬆弛劑，劑量偏低

3 08:44

第一次插管嘗試失敗

4 08:47

移除第一次插管, 2nd dose Midazolam 5mg IV → 強效鎮靜

5 08:56

第二次插管成功：7.5 Fr 氣管內管，固定深度 22 cm

6 插管後即刻

7 09:40

血壓驟降至 70/48 mmHg，需緊急升壓：
Norepinephrine 從 5 ml/hr 快速上調至 30 ml/hr

插管後 ECG 顯示：
竇性心搏過速 123 bpm，
前外側急性梗塞（ST 上升 V2-V6、aVL）
下壁損傷（ST 上升 II、III、aVF），QTc 490 ms

8 09:30（CPCR）

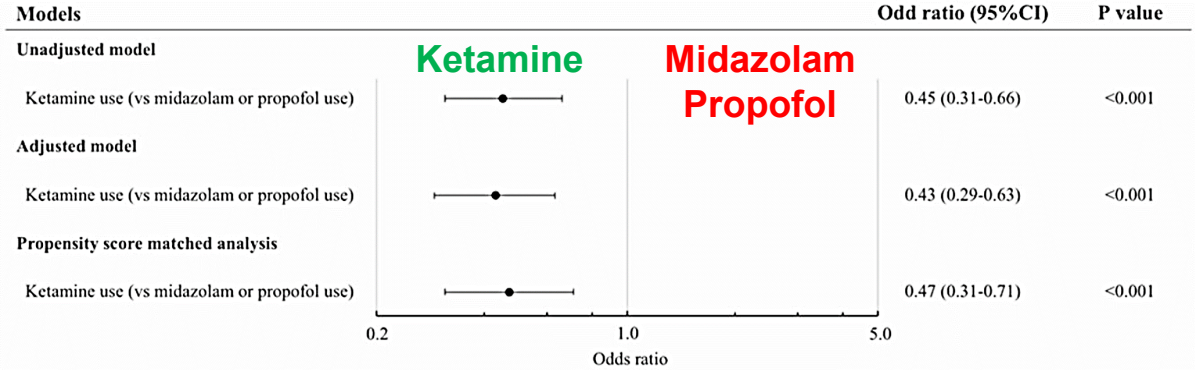
Asystole → CPCR 開始，Epinephrine 1mg IV

CLINICAL POLICY

# Clinical Policy: Critical Issues in the Management of Adult Patients Requiring Endotracheal Intubation in the Emergency Department

From the American College of Emergency Physicians Clinical Policies Subcommittee (Writing Committee) on

**JEAN-2 Study 分析 977 ED patients (2019)**




**Ketamine (15%) 較 Midazolam (27%) 顯著減少插管後低血壓**

**OR 0.45 (0.31-0.66), p<0.001**

- Use **etomidate or ketamine** as an induction agent to **reduce the risk of peri-intubation hypotension** in patients requiring endotracheal intubation in the ED.
- **Avoid** the use of **fentanyl, midazolam, or propofol** as an induction or coinduction agent in patients requiring endotracheal intubation in the ED **who are at increased risk for postintubation hypotension**.
- Potential Benefit of Implementing the Recommendations: **Fewer episodes of hypotension** during and immediately after intubation; **reduced mortality.**

**Annals of Emergency Medicine, 2025**: 86(2), E29-E68

# Society of Critical Care Medicine Clinical Practice Guidelines for Rapid Sequence Intubation in the Critically Ill Adult Patient.

- **Etomidate** has a favorable hemodynamic profile.
- **Ketamine** may be a reasonable option for RSI because of its quick onset and short duration of action, its preservation of respiratory drive, and its sympathomimetic properties.
- **Midazolam** may be less desirable for RSI as it has a longer onset of action compared with etomidate and ketamine and is **a potent venodilator at RSI doses**.
- **Propofol**, although having a quick onset and short duration of action, has the **most profound effect on blood pressure**, which may limit its use in critically ill patients.

**Critical Care Medicine 2023**:51(10): 1411-1430

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

# Ketamine or Etomidate for Tracheal Intubation of Critically Ill Adults

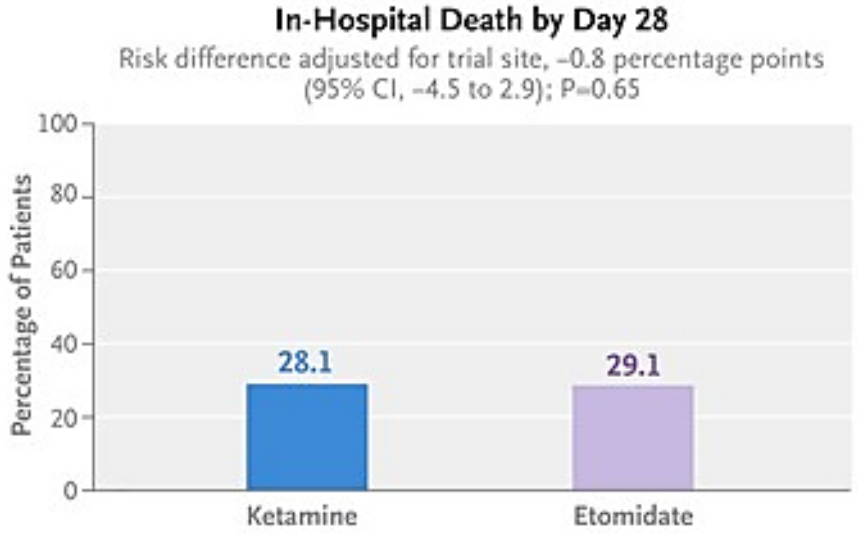



**Table 3. Outcomes.**

| Outcome | Ketamine (N=1176) | Etomidate (N=1189) | Difference (95% CI)* |
|---|---|---|---|
| Primary outcome: in-hospital death from any cause by day 28 — no. (%)† | 330 (28.1) | 345 (29.1) | −0.8 (−4.5 to 2.9)‡ |
| Secondary outcome: cardiovascular collapse during the interval between induction of anesthesia and 2 minutes after intubation — no. (%) | 260 (22.1) | 202 (17.0) | 5.1 (1.9 to 8.3) |
| Systolic blood pressure <65 mm Hg§ | 73 (6.4) | 64 (5.5) | 0.9 (−1.0 to 2.8) |
| Receipt of a new or increased dose of vasopressors | 251 (21.3) | 189 (15.9) | 5.4 (2.3 to 8.6) |
| Cardiac arrest¶ | 12 (1.0) | 10 (0.8) | 0.2 (−0.6 to 1.0) |

N Engl J Med 2026;394:1608-20

**雙和醫院 : 急重症、麻醉科、藥劑部共識**

1. 現況 :急診九成以上皆已用Etomidate、Ketamine進行插管，病房仍主要使用Midazolam進行插管
2. 建議 : ICU/病房，針對肺炎、低血壓需快速插管病患，依據實證指引使用Etomidate+NMBA
3. **行動 : 將Etomidate設為急救藥車常備藥 (藥劑部評估可行)**
4. **宣導 : 病房插管時使用急救藥車上 Etomidate** (0.15~0.3mg/kg, 20mg/支, **0.5~1支 iv push**)

   **+ Succinylcholine** (1.5mg/kg, 200mg/支, **0.5支 iv push**)
5. ICU急救車有Etomidate、ICU 麻藥櫃有Ketamine，可依狀況選擇。
6. 急診經驗 : Etomidate 藥效僅5~10分鐘，病人發生自拔氣管內管。針對插管後，躁動、血壓穩定，可給予Midazolam進行鎮靜。

# Surviving sepsis campaign 2026
## From Guidelines to Bedside – Transforming Clinical Practice

**How to interpretation “Blood pressure” (ANDROMEDA-SHOCK 2 trial, JAMA 2025)**

•用NE優化舒張壓(DAP>50)、給水優化脈壓(PP>40)，處理左心動得差、右心比左心大找胸腔科調呼吸器

**How to titrate Vasopressor (OVISS, JAMA 2025)**

•心因性休克用Norepinephrine可下降死亡率

•Norepinephrine >10ml/hr, 早點給Vasopressin

**Steroid use in Sepsis and ICU (REMAP-CAP Trial, ICM 2025)**

•Septic shock : Hydrocortisone 50mg q6h after NE for 2 hour/NE>10ml/hr; **DC after shock reverse**

•ARDS: Dexa 20mg qd D1-D5, 10mg D6-D10, **DC if extubation (個人建議 PF>200 or FiO2<40 盡快停)**

•ICU CAP: Methypred 80mg qd **4~7days then taper**, total 8-14 days

**Rapid sequencing intubation (NEJM 2025)**

•Etomidate (0.15~0.3mg/kg, 20mg/支, 0.5~1支 iv push)+ Succinylcholine (1.5mg/kg, 200mg/支, 0.5支 iv push)

# Taiwan Pathogen Distribution: 2022 Chang Gung Study

A 2022 prospective study from **Chang Gung Memorial Hospital (Linkou and Keelung)** enrolled 212 hospitalized adult CAP patients, achieving an overall pathogen detection rate of **70.7%** using combined culture and molecular testing—**significantly higher than traditional culture alone (36.7%).**

### Influenza

**16.1%** — Most common pathogen detected in this cohort

### K. pneumoniae

**14.1%** — Second most common; dominant in mixed infections

### P. aeruginosa

**13.6%** — Third most common bacteria

### Human Rhinovirus

**11.8%** — Major viral contributor; co-infects with K. pneumoniae

### S. pneumoniae

**9.9%** — Less dominant than in Western cohorts

Lin WH, Chiu HC, Chen KF, et al. J Microbiol Immunol Infect. 2022;55(5):829-837.

# Influenza Testing Clinical Guidelines

## 1. Target Patients

**Hospitalized Patients** Test ALL admissions with acute respiratory illness, pneumonia, or acute worsening of cardiopulmonary disease (e.g., COPD, heart failure).
**Outpatients (ED/Clinic)** Test high-risk or immunocompromised patients if results will influence antiviral treatment or clinical management decisions.

## 2. Specimen Choice

**Non-Severe Disease**
Nasopharyngeal (NP) swabs are strongly preferred over throat swabs. Flocked swabs increase detection accuracy.
**Severe Disease (Ventilated)** Collect **endotracheal aspirate or bronchoalveolar lavage (BAL) fluid ASAP**. This is crucial **even if upper respiratory testing was negative**.

## 3. Diagnostic Assay

**Gold Standard** **Always use RT-PCR** or rapid molecular assays(快速PCR). Use **multiplex PCR panels** for hospitalized immunocompromised patients.
**What to Avoid** **Do NOT use Rapid Influenza Diagnostic Tests (RIDTs)(流感快篩)**, immunofluorescence, viral culture, or serology for initial primary diagnosis.

Ref. IDSA 2018

# INHALE WP3, impact of rapid, ICU-based, syndromic PCR on clinical outcomes in HAP and VAP

## TABLE 2: Antibiotic Stewardship Outcomes - Key Significant Data.

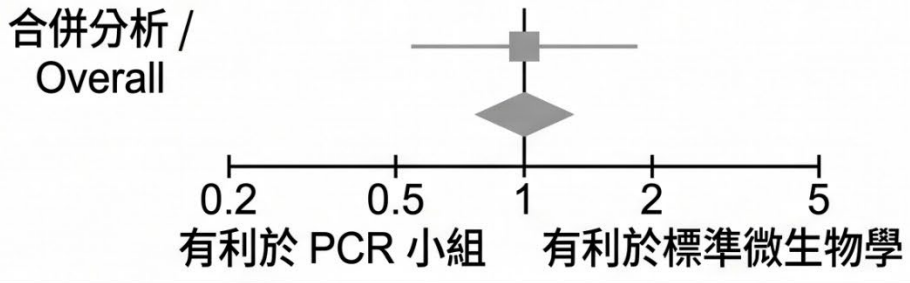
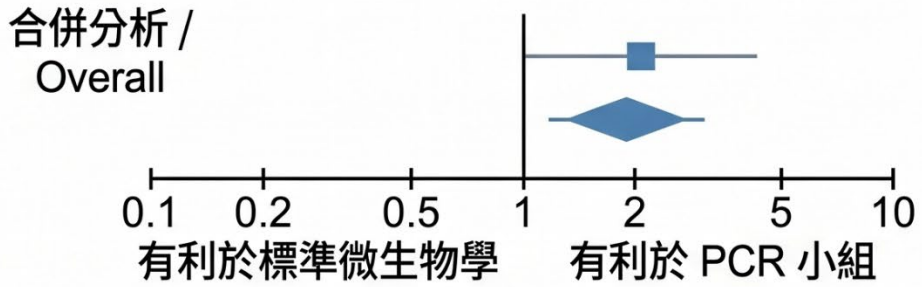
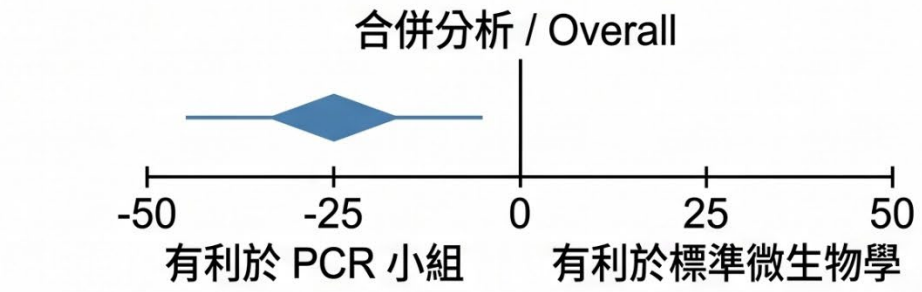
**KEY SIGNIFICANT FINDINGS SUMMARY** (Only treatment effect. (odds ratios/differences with CIs not overlapping 0/1)

| | | |
|---|---|---|
| **Antibacterially Appropriate & Proportionate Antibiotics at 24h** | Intervention (76.5%) vs Standard of Care (55.9%) | Effect: Difference +0.21 (CI 0.13 to 0.28)<br>Odds Ratio: 2.57 (CI 1.77 to 3.73) |
| **Appropriate Antibiotics at 24h** | Intervention (91.4%) vs Standard of Care (77.6%) | Effect: Difference +0.13 (CI 0.07 to 0.20)<br>Odds Ratio: 3.12 (CI 1.86 to 5.25) |
| **Appropriate & Proportionate at 72h** | Intervention (73.4%) vs Standard of Care (58.8%) | Effect: Difference +0.15 (CI 0.07 to 0.23)<br>Odds Ratio: 1.95 (CI 1.34 to 2.85) |
| **Appropriate at 72h** | Intervention (91.3%) vs Standard of Care (81.6%) | Effect: Difference +0.10 (CI 0.04 to 0.16)<br>Odds Ratio: 2.36 (CI 1.38 to 4.06) |
| **Narrow-spectrum at 72h**<br>(Non-significant but notable) | Comc (28.8% vs 23.6%) | Effect: Odds Ratio 1.32 (CI 0.88 to 1.97) |



Intensive Care Med (2025) 51:272–286

# Impact of syndromic molecular diagnostics on antimicrobial adequacy and time to therapy in critically ill patients with pneumonia: a SR and MA

| 結果類別 | 統計摘要 | 解讀與異質性 | 簡化森林圖可視化 |
|---|---|---|---|
| 醫院內死亡率 | **RR = 1.04** [95% CI 0.90, 1.21] | 無統計學顯差著<br>異質性<br>$I^2$ = 0% |  |
| 初始抗菌治療的適當性 | **RR = 1.78** [95% CI 1.23, 2.57] | 顯著提高<br>(有利)<br>異質性<br>$I^2$ = 95% |  |
| 到有效抗菌治療的時間 | **MD -28.03 h** [95% CI -47.49, -8.58] | 顯著縮短<br>(有利)<br>異質性<br>$I^2$ = 95% |  |



* 統計方法包括 Wald 型置信區間和 DerSimonian and Laird 隨機效應模型。



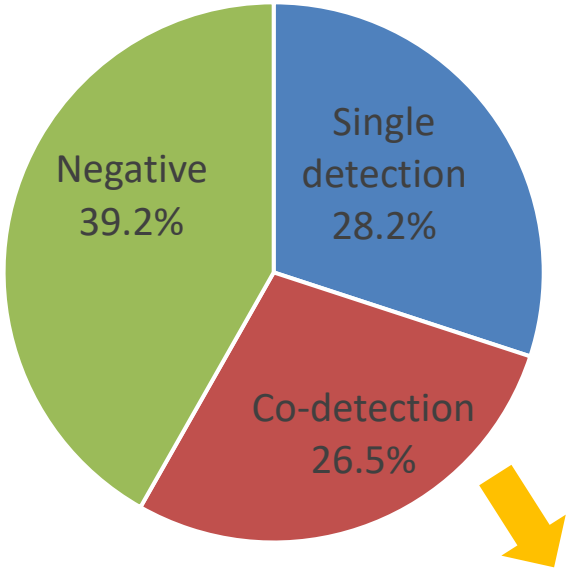
*Critical Care* (2025) 29:379

# 30% Co-detection. Judge by quantity results.

TMU-SHH experience

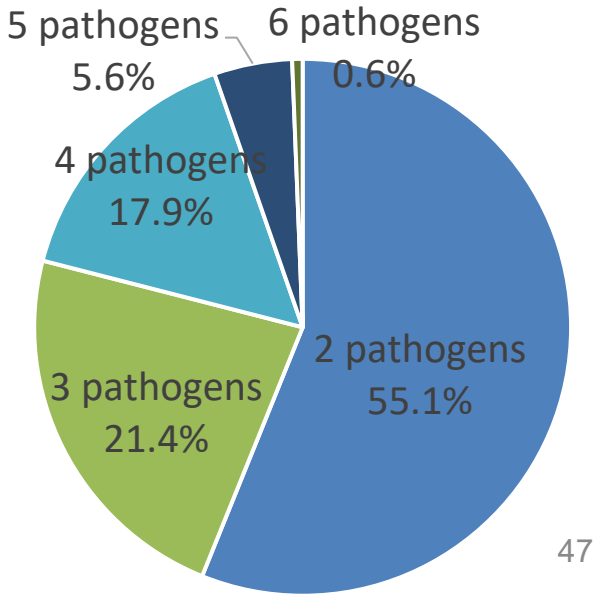
Overall PN panel detected (n=1206)

| | | |
|---|---|---|
| **Single detection** | **340** | **28.2%** |
| **Co-detection** | **319** | **26.5%** |
| **Negative** | **473** | **39.2%** |




PN panel co-detected (n=319)

| | | |
|---|---|---|
| 2 pathogens | 179 | **56.1%** |
| 3 pathogens | 73 | **22.9%** |
| 4 pathogens | 50 | **15.7%** |
| 5 pathogens | 15 | **4.7%** |
| 6 pathogens | 2 | **0.6%** |



| | |
|---|---|
| Chlamydia pneumoniae | Not Detected |
| Legionella pneumoniae | Not Detected |
| Mycoplasma pneumoniae | Not Detected |
| Acinetobacter calcoaceticus-baumanni complex | Detected |
| A. calcoaceticus-baumanni complex価数 | 10^4 copies/mL |
| Enterobacter cloacae complex | Not Detected |
| Enterobacter(Klebsiella) aerogenes | Not Detected |
| Escherichia coli | Not Detected |
| Haemophilus influenzae | Detected |
| Haemophilus influenzae価数 | >=10^7 copies/mL |
| Klebsiella oxytoca | Not Detected |
| Klebsiella pneumoniae group | Not Detected |
| Pseudomonas aeruginosa | Detected |
| Pseudomonas aeruginosa価数 | 10^5 copies/mL |
| Serratia marcescens | Not Detected |
| Staphylococcus aureus | Not Detected |
| mec A/C and MREJ(MRSA) | Not Detected |
| Streptococcus agalactiae | Not Detected |
| Streptococcus pneumoniae | Not Detected |
| Streptococcus pyogenes | Not Detected |
| 抗菌性基因CTX-M | Not Detected |
| 抗菌性基因KPC | Not Detected |
| 抗菌性基因VIM | Not Detected |
| 抗菌性基因IMP | Not Detected |
| 抗菌性基因NDM | Not Detected |
| 抗菌性基因OXA-48 like | Not Detected |
| CMV DNA 定量 | |

# How to interpret culture reports, PCR results?

## Culture Report

| Specimen | Likely to be significant |
|---|---|
| Sputum (expectorated or induced) | Predominant pathogen on Gram stain and culture |
| Quantitative culture | ≥$10^6$ cfu/mL |
| Neutrophils | Abundant |
| Endotracheal tube aspirate | Predominant pathogen on Gram stain and culture |
| Quantitative culture | ≥$10^6$ cfu/mL |
| Neutrophils | Abundant |
| Bronchial alveolar lavage | Predominant pathogen seen in every 100x field on Gram stain |
| Quantitative culture | ≥$10^4$ cfu/ml |

Baron. EJ. Chapter 18. 11th Edition. Adapted Manual of Clinical Microbiology. ASM Press. 2015
Miller *et al.*, CID, 2018

## PCR Report

- **1.5-log higher than culture results**
- **Negative (BAL)**

  PCR $\leqq 10^4$ CFU/mL

- **Positive (BAL)**

  PCR $\geqq$ **$10^5$** CFU/mL

Ginocchio CC, et al. Multinational evaluation of the BioFire® FilmArray® Pneumonia plus Panel as compared to standard of care testing. Eur J Clin Microbiol Infect Dis. 2021 Aug;40(8):1609-1622.
Murphy CN, et al. Multicenter Evaluation of the BioFire FilmArray Pneumonia/Pneumonia Plus Panel for Detection and Quantification of Agents of Lower Respiratory Tract Infection. J Clin Microbiol. 2020 Jun 24;58(7):e00128-20.

| 藥物 | Enterobacterales<br>E. Coli, Klebsiella spp., Proteus spp., Serratia marcesens | | | DTR P. aeruginosa (綠膿桿菌) | CRAB (鮑氏不動桿菌) |
|---|---|---|---|---|---|
| | Class A 碳青黴烯酶 (如 KPC, IMI) | Class D 碳青黴烯酶 (如 OXA-48) | MBL 金屬 β-內醯胺酶 (如 NDM, VIM, IMP) | | |
| Ceftolozane/Tazobactam (Zerbaxa) | 🔴 | 🔴 | 🔴 | 🟢 | 🔴 |
| Imipenem/Relebactam (Recabrio) | 🟢 | 🔴 | 🔴 | 🟡 | 🔴 |
| Ceftazidime/Avibactam (Zavicefta) | 🟢 | 🟢 | 🔴 | 🟡 | 🔴 |
| Cefiderocol (Fetroja) | 🟡 | 🟡 | 🟡 | 🟡 | 🟡 |
| Aztreonam-avibactam (Emblavio) | 🟢 | 🟢 | 🟢 | 🟡 | 🔴 |

Multidrug-resistant Gram-negative bacterial infections; Lancet 2025; 405: 257–72