SCORING SYSTEMS IN SURGICAL PATIENTS (CRITICALLY ILL)

PRESENTER: KELLY HOFFMANN
APACHE

- **APACHE II** (Acute Physiology and Chronic Health Evaluation II) is a severity of disease classification system, *Knaus et al, 1985*
- After admission of a patient to an ICU, an integer score from 0 to 71 is calculated based on several measurements.
- Higher scores imply a more severe disease and a higher risk of death.
- The lower age is not specified in the original article, but a good limit is to use Apache II only for patients age 15 or older.
**ACUTE PHYSIOLOGIC ASSESSMENT AND CHRONIC HEALTH EVALUATION (APACHE II) SCORING SYSTEM**

<table>
<thead>
<tr>
<th>PHYSIOLOGIC VARIABLE†</th>
<th>POINTS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Temperature, core (°C)</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
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<tr>
<td>2. Mean arterial pressure (mm Hg)</td>
<td>160</td>
<td>150</td>
<td>120</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>20</td>
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<tr>
<td>3. Heart rate</td>
<td>180</td>
<td>179</td>
<td>139</td>
<td>109</td>
<td>89</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>4. Respiratory rate (nonventilated or ventilated)</td>
<td>50</td>
<td>49</td>
<td>34</td>
<td>24</td>
<td>14</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>2</td>
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<td>5. Oxygenation:</td>
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<tr>
<td>a. PAO₂ ≥ 50 mm Hg</td>
<td>500</td>
<td>349</td>
<td>200</td>
<td>70</td>
<td>70</td>
<td>30</td>
<td>15</td>
<td>15</td>
<td>15</td>
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<tr>
<td>b. PaO₂ &lt; 50 mm Hg</td>
<td>—</td>
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<tr>
<td>7. Serum Na (mmol/L)</td>
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<td>—</td>
<td>—</td>
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<td>8. Serum K (mmol/L)</td>
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<tr>
<td>9. Serum creatinine (mg/dL); double point score for acute renal failure</td>
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<td>—</td>
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<tr>
<td>10. Hct (%)</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>11. WBC (in 1000s)</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>12. Glasgow coma score (GCS)</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
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Acute physiology score is the sum of the 12 individual variable points.

Add 0 points for age <44; 2 points, 44-54 yr; 3 points, 55-64 yr; 5 points, 65-74 yr; 6 points ≥ 75 yr.

Add chronic health status points: 2 points if elective postoperative patient with inappetence or history of severe organ insufficiency; 5 points for nonoperative patient or emergency postoperative patient with inappetence or severe organ insufficiency.

(13)² Serum HCO₃ (venous-mmol/L) ≥ 22 — 22 — 22 — 22 — 22 — 22 — 22 — 22 — 22

²APACHE II score = acute physiology score + age points + chronic health points. Minimum score = 0; maximum score = 71. Increasing score is associated with increasing risk of hospital death.

†Choose worst value in the past 24 h.

‡Chronic health status: Organ insufficiency (e.g., hepatic, cardiovascular, renal, pulmonary) or immunocompromised state must have preceded current admission.

³Optional variable; use only if no ABGs.

A-aDO₂ = Arterial–alveolar oxygen gradient; Fio₂ = fractional inspired O₂.

The following defines "chronic organ insufficiency" and immunocompromise:

- **Liver insufficiency**
  - Biopsy proven cirrhosis
  - Documented portal hypertension
  - Episodes of past upper GI bleeding attributed to portal hypertension
  - Prior episodes of hepatic failure / encephalopathy / coma.

- **Cardiovascular**
  - New Heart Association Class IV Heart Failure

- **Respiratory**
  - Chronic restrictive, obstructive or vascular disease resulting in severe exercise restriction, i.e. unable to climb stairs or perform household duties.
  - Documented chronic hypoxia, hypercapnia, secondary polycythaemia, severe pulmonary hypertension (> 40 mmHg), or respirator dependency

- **Renal**
  - Receiving chronic dialysis

- **Immunosuppression**
  - The patient has received therapy that suppresses resistance to infection e.g. immuno-suppression, chemotherapy, radiation, long term or recent high dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection, e.g. leukaemia, lymphoma, AIDS
The APACHE II severity of disease classification system was tested for its ability to identify ICU patients who would not benefit from treatment with total parenteral nutrition. The classification was validated by testing it on 210 consecutive ICU admissions. Then a retrospective study was done on 89 ICU patients who had received TPN, to define APACHE II selection criteria. When the APACHE II system was tested prospectively on 26 ICU patients treated with TPN it predicted, with a specificity of 100%, the half of the patients who died.
The **Sequential Organ Failure Assessment score** is used to track a patient's status during the stay in an (ICU).

- It is a scoring system to determine the extent of a person's organ function or rate of failure.
SOFA

- Respiratory System:
  - \( \text{PaO}_2/\text{FiO}_2 \) (mmHg)
    - \(< 400 = 1\)
    - \(< 300 = 2\)
    - \(< 200 \text{ and mechanically ventilated} = 3\)
    - \(< 100 \text{ and mechanically ventilated} = 4\)
SOFA

- **Neurological system: GCS**
  - 13 – 14 = 1
  - 10 – 12 = 2
  - 6 – 9 = 3
  - < 6 = 4

- **Liver: Bilirubin (mg/dl)**
  - 1.2 – 1.9 = 1
  - 2.0 – 5.9 = 2
  - 6.0 – 11.9 = 3
  - > 12.0 = 4
SOFA

- Cardiovascular: Mean Arterial Pressure OR administration of vasopressors required (mcg/kg/min) MAP < 70 mm/Hg = 1
  - dopamine <= 5 or dobutrex (any dose) = 2
  - dopamine > 5 OR epinephrine <= 0.1 OR norepinephrine <= 0.1 = 3
  - dopamine > 15 OR epinephrine > 0.1 OR norepinephrine > 0.1 = 4
SOFA

- Coagulation: Platelets×103/mcl
  - < 150 = 1
  - < 100 = 2
  - < 50 = 3
  - < 20 = 4

- Renal system: Creatinine (mg/dl) (or urine output)
  - 1.2 – 1.9 = 1
  - 2.0 – 3.4 = 2
  - 3.5 – 4.9 (or < 500 ml/d) = 3
  - > 5.0 (or < 200 ml/d) = 4
SOFA

- High accuracy:
  - the platelet count
  - bilirubin level
  - administered dose of epinephrine
  - administration of dobutamine
  - creatinine level
- Low accuracy:
  - Pao2/Fio2 ratio
  - GCS score
  - urine output

  The less accurate variables appear to be those that require judgment on the part of the abstractor (GCS score) and those that require calculations (Pao2/Fio2 ratio and urine output).

  Many errors were made during the calculation of the Pao2/Fio2 ratio due to incorrect selection of Pao2 or Fio2 values.
<table>
<thead>
<tr>
<th>CPIS</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRACHEAL SECRETIONS</td>
<td>RARE</td>
<td>ABUNDANT</td>
<td>ABUNDANT + PURULENY</td>
</tr>
<tr>
<td>CXR INFILTRATES</td>
<td>NONE</td>
<td>DIFFUSED</td>
<td>LOCALISED</td>
</tr>
<tr>
<td>TEMP</td>
<td>&lt;36.5 and &gt;38.4</td>
<td>&lt;38.5 and &gt;38.9</td>
<td>&lt;39 or &gt;36</td>
</tr>
<tr>
<td>WCC</td>
<td>&gt;4,000 and &lt;11,000</td>
<td>&lt; 4,000 or &gt; 11,000</td>
<td>&lt; 4,000 or &gt; 11,000 + band forms 500</td>
</tr>
<tr>
<td>PF RATIO</td>
<td>&gt; 240 or ARDS</td>
<td></td>
<td>&lt;240 and no evidence of ARDS</td>
</tr>
<tr>
<td>MICRO</td>
<td>NEGATIVE</td>
<td></td>
<td>POSITIVE</td>
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</tbody>
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Serial measurements of the CPIS could be used to identify survivors versus non-survivors as early as day 3 of therapy.

The evolution of the CPIS (improving or worsening) correlated with mortality rate, making serial measurement of CPIS an important variable to monitor during VAP therapy.

One explanation for the good correlation between CPIS and outcome was that adequacy of antibiotic therapy was a predictor of changes in one variable of the CPIS, the PF ratio, with that value improving rapidly in patients on adequate therapy.

We also found that improvement in the PF ratio was the best correlate of clinical response and outcome.
SUMMARY

- Data exists to support the use of scoring systems in the critically ill
- They can be used to track and predict patient outcome
- They offer the best information when re-calculated daily
REFERENCES


REFERENCES

2. D G. T. Arts, MSc; N F. de Keizer, PhD; M B. Vroom, MD; E de Jonge, MD, Reliability and Accuracy of SOFA Scoring: Discussion
3. R. W. S. Chang, S. Jacobs and Bernie Lee, USE OF APACHE II SEVERITY OF DISEASE CLASSIFICATION TO IDENTIFY INTENSIVE-CARE-UNIT PATIENTS WHO WOULD NOT BENEFIT FROM TOTAL PARENTERAL NUTRITION