APACHE (Acute Physiology and Chronic Health Evaluation)

Severity of disease classification system:

- Applied within 24 hours of admission to the intensive care unit (ICU). The worst value should be used!
- Takes into account both lab values and acute, chronic disease:
    - Liver insufficiency, cardiovascular, respiratory, renal, immunosuppression
- Designed to measure the severity of disease for adult patients. Therefore, it has *not been validated for children/ young people under age 16*.
- The higher score, the more severe the disease and a higher risk of death
- Three types: APACHE II, III AND IV (III and IV are less used since copyrights are under controlled)
- APACHE II is based on patients **newly admitted to the ICU**, hence it is *not accurate when dealing with patients transferred from another unit or hospital*.
- However, APACHE III takes care of such a lead time bias.
- Downsides: must be recalibrated before it can be used:
    - in a population other than the one was derived in.
    - and to reflect change in practice and patient demographics
- If a patient is discharged from the ICU and readmitted, a new APACHE II score is calculated
- APACHE score is also benefit for:
    - Reduces frequency of complication
    - Evaluate and improve ICU performance
    - Optimize ICU resource allocation

Cited from NICH paper:

- *"APACHE II should not be used as a benchmarking tool in the ICU because almost any ICU today would be considered "high performance" based on having hospital mortality much lower than that expected in 1985"*
- *"APACHE II model generally overestimates mortality in many scenarios in which it is applied. Subsequent versions of this model, such as the most recent variant, APACHE IV correct this problem, at least in part"*
- *"have been developed from an exclusively North American database. This fact introduces a large bias due to region-specific differences in the availability of different technologies and in patient characteristics"*

APACHE II:

- Scores range from 0-71
- Calculated based on age and 12 routine physiological measurements:
    1. AaDO2 | PaO2 (depending on FiO2)
    2. Temperature (rectal)
    3. Mean arterial pressure
    4. pH arterial
    5. Heart rate

6. Respiratory rate
7. Sodium
8. Potassium
9. Creatine
10. Hematocrit
11. White blood cell count
12. Glasgow Coma Scale
13. Acute renal failure: not in original study but some add in to determine whether patient has acute kidney injury

APACHE III:

- Validated on dataset from 17,440 **adult** medical/ surgical **intensive care unit** at 40 US hospital
- Scores range from 0 -299
- Using 20 physiologic variable

APACHE IV:

- Using data from 104 ICUs in 45 hospitals. Recommended to use in US.ICUs.