

*Behavioral Definition of Expertise
in the Absence of External Criteria*

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with the assistance of

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*We have more degrees, but less sense;
more knowledge, but less judgment;
more experts, but more problems;
more medicine, but less wellness*

(Anonymous Columbine High School Student)

Why a Performance-Based Measure (PBM) of Expertise?

- PBM needed when there is no Gold Standard (correct answer), eg, aesthetic judgment
- PBM necessary when Gold Standard has yet to be defined, eg, initial pricing of IPO's
- PBM required when there are more than one Gold Standard, eg, Air Traffic Control
- PBM useful when Gold-Standard only available later, eg, after an autopsy

Previous Approaches to PBM

- **Ask an Expert:** Subject Matter Experts (SME)
 - *But SME's are expensive and extremely rare*
- **Between-Expert Reliability:** *Agreement*
 - *But premature consensus, eg, Groupthink*
- **Within-Expert Reliability:** *Use consistency*
 - *Necessary, but not sufficient*
- **Discrimination:** Experts make distinctions
 - *Necessary, but not sufficient*

Cochran-Weiss-Shanteau (CWS)

- Weiss & Shanteau (1999) proposed using two necessary conditions in a ratio (as suggested by Cochran (1943) to compare rating scales):

$$CWS = \textit{Discrimination} / \textit{Consistency}$$

- Comments:
 - *Typically use variances, but not required*
 - *CWS is a relative, not absolute measure*
 - *Cannot compare CWS across domains*

Example Calculation of CWS

Doctor #18:	A	B	C	D	E
Repl # 1:	96	18	94	95	25
Repl # 2:	96	12	91	98	27

(from *Skånér, et al, 1998*)

Discrimination = ? $(M_i - GM)^2 / n - 1 = 3365.15$

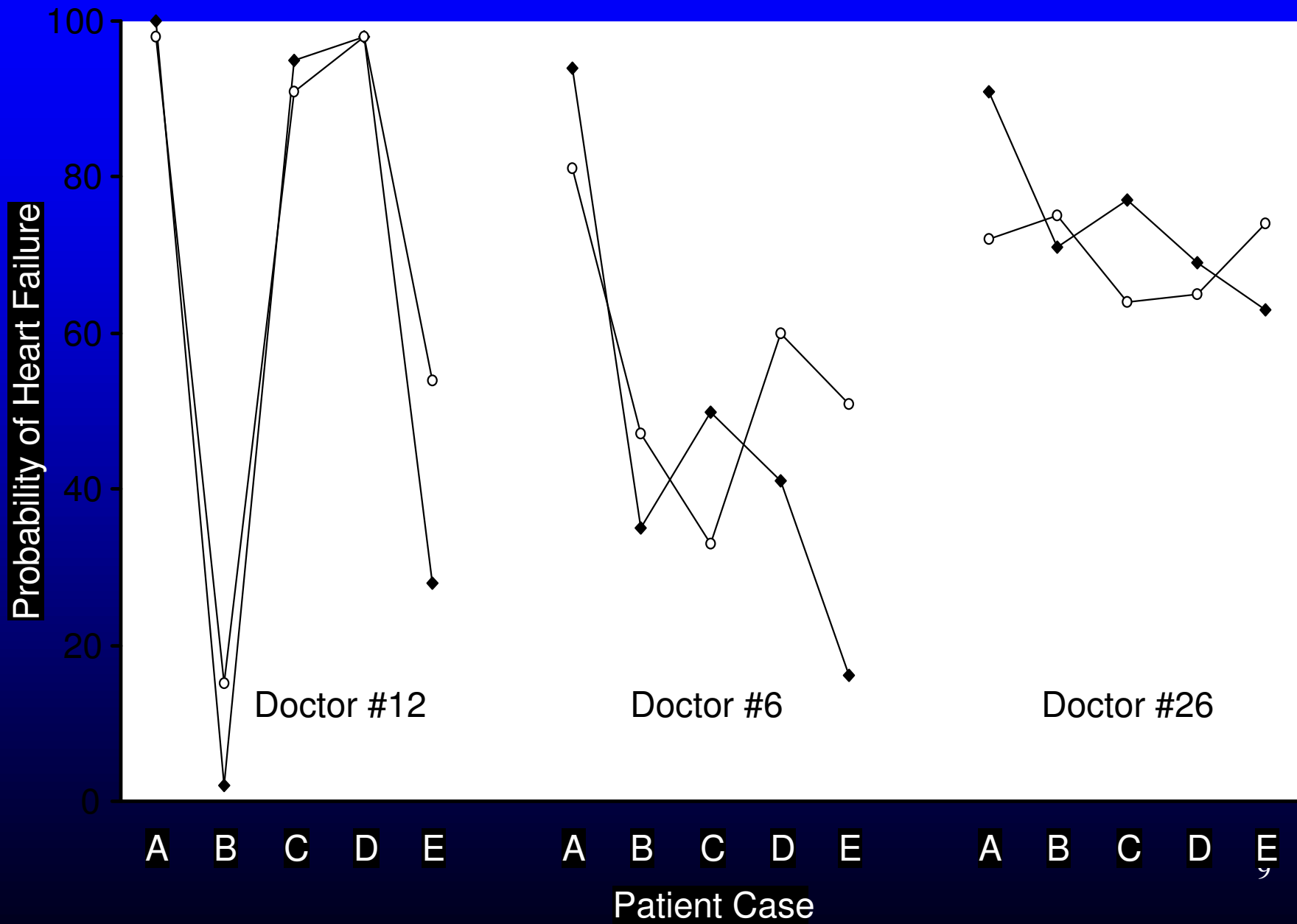
Consistency = ? $(d_j^2) / n = 5.80$

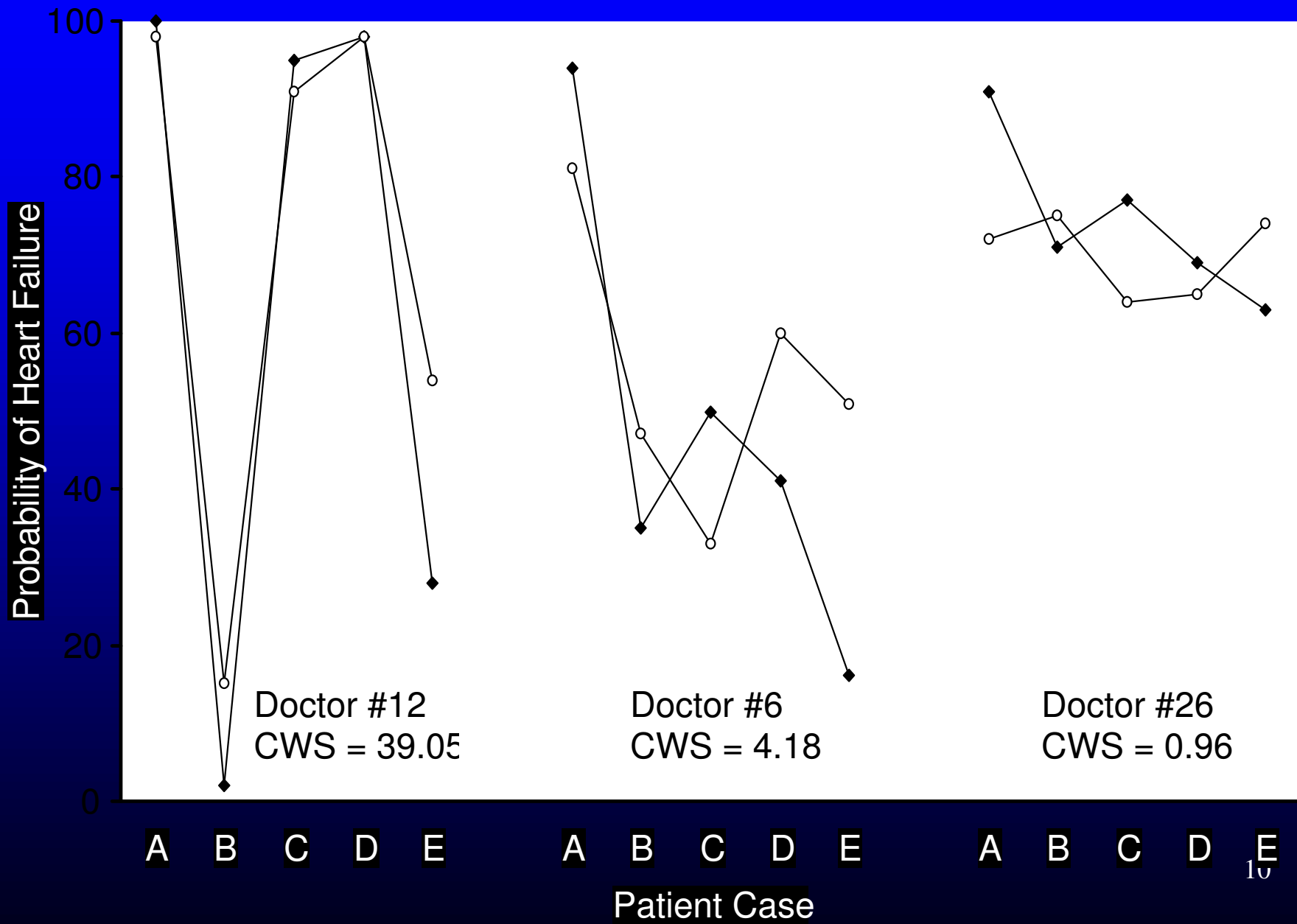
CWS = 3365.15 / 5.80 = 580.20

Skånér, Strender, & Bring (1998)

- **Study:** 27 GP's evaluated 45 real case files
- **Response :** GP judged heart-failure probability
- **Design:** 5 cases were replicated
- **Experience:** GP's had 2 to 22 years of practice
- **Results:** Unexplained individual differences

- **Background:** Patient complain of fatigue
- **Examination:** No further pathological findings
- **Tests:** Normal hemoglobin, electrolytes, & TSH
- **Case-Specific Information:**
 - **Age:** *60-70 or 80-90*
 - **Gender:** *M or F*
 - **History of MI:** *Y or N*
 - **Dyspnea:** *Moderate or None*
 - **Edema:** *Moderate or None*
 - **Lung Sounds:** *No Rales or Basal Rales*
 - **Cardiac Rhythm:** *Regular or Irregular*
 - **Heart Rate at Rest:** *<90 or >110*
 - **Heart X-Ray:** *Enlargement or Not*
 - **Lung X-Ray:** *Stasis or Not*





Results

- Mean Discrimination value = 1321.28, with low = 65.35, median = 1160.25, high = 3377.60
- Mean Consistency value = 135.25, with low = 5.80, median = 82.60, high = 583.50
- Mean CWS value = 39.61, with low = .76, median = 9.12, high = 580.20

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- Mean CWS value = 39.61, with low = .76, median = 9.12, high = 580.20
- Correlation (Discr – Cons): $r = - .03$
- Correlation (CWS – Discr): $r = + .49$
- Correlation (CWS – Cons): $r = - .26$
- Correlation (CWS – Exp): $r = - .25$

Comments from Dr. Skånér

- Dr #26 “judges nearly all the patients as having a very high probability of heart failure – why?”
- Patient B does have an unusual combination of symptoms: “The normal X-ray together with the sick history and findings could make this case difficult”
- The inconsistency of judgments for Patient E are harder to interpret: “This case should not be that difficult!”

Conclusions

- CWS based on 2 necessary conditions:

Discrimination & Consistency

- CWS applied to medicine, auditing, ag, ATC
- CWS provides novel insights into expertise
- CWS useful when there are no correct answers

For More Information

- ♣ There are downloadable papers and free programs to compute CWS
- ♣ There is a Workbook (pdf format) on how to use and interpret CWS
- ♣ All of these can be obtained at our website:
<http://www.ksu.edu/psych/cws/>