Comparison of Whisper® scoring versus human auscultation scoring.

Cumulative Distributions for Lung Scores

Cumulative Probability of "Worse Case" Lung Sound for 445 Hospital Animals

Legend: Cowboy (blue), Whisper (red)

Lung score regions: Chronic, Severe Acute, Moderate Acute, Mild Acute, Normal

Cowboy Raw Scores (left axis): 0, 1 [4%], 2 [13%], 3 [7%], 4 [5%], 5 [15%], 6 [23%], 7 [31%]

Whisper® Raw Scores (right axis): 0, 1 [0%], 2 [11%], 3 [15%], 4 [27%], 5 [54% Case Fatality]
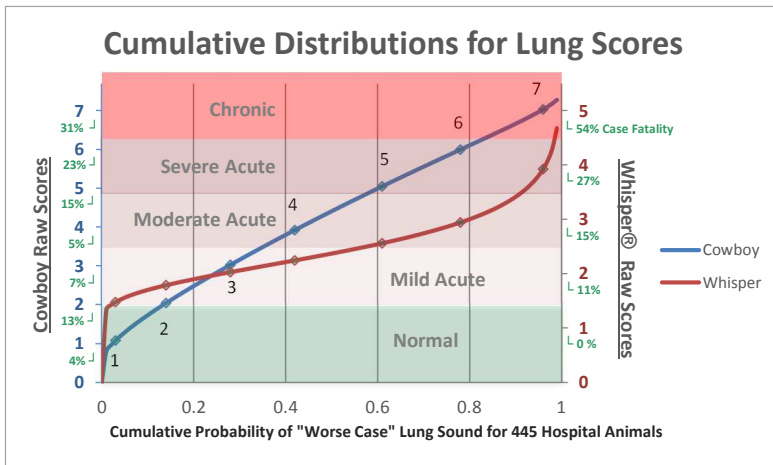
What this graphs says:

Whisper's distribution of scores demonstrates decisive breakpoints that are clinically and operationally relevant and supported by case fatality rates.

How to read this graph:

Notice the curves show different patterns across the cumulative distributions. This helps us understand the general nature of the lung scoring scales for the cowboy and Whisper®. Also, notice specific points along the x-axis where we can directly compare and therefore convert from one scale score to the other.

The blue line is the cowboy cumulative distribution curve with left y-axis as the cowboy scale. The red line is Whisper's cumulative distribution curve with the right y-axis as Whisper's scale.

The curves have been matched up by using normalized distribution curves for each scale (see yellow graphs below).

The cumulative distribution can be thought of as the probability of a worse-case lung sound. The higher the score the more likely it's a worse case sound. Worse case sounds should associate with more severe disease and therefore be reflected by higher case fatality rates.

Example: Pick a point on the x-axis. E.g. 0.6 = point where 60% of the lung scores fall at or below on either curve. For the Cowboy that's a score of 4.99 (just under 5) for Whisper that's a score of 2.5.
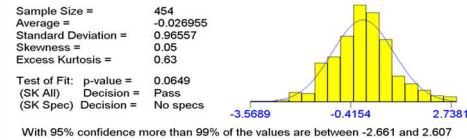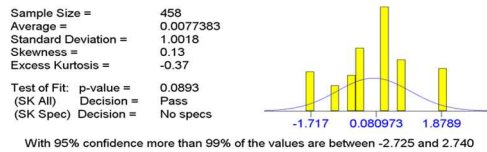
Interpretation:

The cowboy cumulative distribution curve is quite linear which doesn't allow for readily identifiable break points (even at the extremes) to make clinical/operational/financial decisions on. The Whisper distribution curve on the other hand clearly indicates points of rapidly changing probabilities at the "worse-case" and "best-case" regions (extremes) with sharp changes in its scaled probability curve. Also, the Whisper® distribution shows increasing case fatality rates with increasing scores. This validates Whisper's scoring.

This data comes from "1st pulled" hospital animals.

Rank order of lung scores by case fatality rate

Cowboy	1 [4%] < 4 [5%] < 3 [7%] < 2 [13%] < 5 [15%] < 6 [23%] < 7 [31%]
Whisper®	1 [0%] < 2 [11%] < 3 [15%] < 4 [27%] < 5 [54%]

Cowboy Data

Sample Size = 458
Average = 0.0077383
Standard Deviation = 1.0018
Skewness = 0.13
Excess Kurtosis = -0.37

Test of Fit: p-value = 0.0893
(SK All) Decision = Pass
(SK Spec) Decision = No specs

-1.717   0.080973   1.8789

With 95% confidence more than 99% of the values are between -2.725 and 2.740

Sample Size = 458
Average = 4.4
Standard Deviation = 1.8
Skewness = -0.44
Excess Kurtosis = -0.65

Test of Fit: p-value = 0.0893
(SK All) Decision = Pass
(SK Spec) Decision = No specs

1.00   4.00   7.00

With 95% confidence more than 99% of the values are between -0.15 and 7.33

Whisper® Data

Sample Size = 454
Average = -0.026955
Standard Deviation = 0.96557
Skewness = 0.05
Excess Kurtosis = 0.63

Test of Fit: p-value = 0.0649
(SK All) Decision = Pass
(SK Spec) Decision = No specs

-3.5689   -0.4154   2.7381

With 95% confidence more than 99% of the values are between -2.661 and 2.607

Sample Size = 454
Average = 2.4632007
Standard Deviation = 0.6762812
Skewness = 1.10
Excess Kurtosis = 1.86

Test of Fit: p-value = 0.0649
(SK All) Decision = Pass
(SK Spec) Decision = No specs

1.07213000   3.06318400   5.05423800

With 95% confidence more than 99% of the values are between 1.23658707 and 4.88671389

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