LETTER TO THE EDITOR

WILEY

Inconsistencies in the sensitivity and specificity values in an Review Paper published in the Journal of Clinical Hypertension

To the Editor

A research Review Paper published in your Journal[1] reported on the use of the 8-item Morisky Medication Adherence Scale (MMAS-8) as a diagnostic tool to identify patients with uncontrolled hypertension (BP > 140/90 mm Hg) who were treated with medication for hypertension. This Review Paper contains mathematically implausible results for the Sensitivity and Specificity (S&S) based on the following evidence:

1. The publication described a "**sensitivity of 93%**[1]" with a specificity of **53%** (pubS&S) and an accuracy of **80**% that "indicates that the scale is good at identifying patients who have low medication adherence and have uncontrolled blood pressure".[1]
2. Using the 3 × 2 percentage data in Table 1 to calculate number of people in each medication adherence category (page 4 of the text) and blood pressure control (Table 4 on page 13), it is possible to reconstruct the study patient numbers by category. These values: 295, 144; 486, 482, are shown in the 2 × 2 table of Table 1. These data were used to calculate the S&S (calcS&S) values of **38%** [95%CI: 34–41%] and **75%** [72–79%], respectively, with an accuracy of **53%** [51.3–56.5%].
3. These values are remarkably similar to those published in a 2017 systematic review of the accuracy of the MMAS-8[2] (pooled S&S of: **43%** [33–53%] and **73%** [68–78%], respectively).

4. Based on the sensitivity, specificity, and accuracy, it is possible to derive a set of numerical values used to calculate the pubS&S. The 2 × 2 table of the *unique* mathematical solution includes: **858, 209; 65, 236**. These numbers were independently verified against the pubS&S values of 93% and 53%, along with accuracy of 80%.

The pubS&S values (Point 1) differed markedly from the calcS&S values (Point 2). All the calculations were verified as being correct; however, the pubS&S number of non-adherent patients (score < 6) is mathematically implausible. *This indicates that the pubS&S values are not consistent with the patient level data.*

1. The chi-square value of 6.6 ($p < .05$) in Table 4[1] is an obvious error as it does not reflect the 37.4 (p < 0.001) from the 3 × 2 data in Table 1. The study chi-square value of the 2 × 2 patient numbers in Table 1 is 26.2 ($p < .001$), while the chi-square value of the 2 × 2 patient numbers from the pubS&S (point 4) is much higher at 367.4 ($p < .001$).

So, not only is the chi-square value in Table 4 incorrect, but also the difference between the latter two chi-square values indicates that the pubS&S clearly overstates, by an order of magnitude, the diagnostic properties of the MMAS-8 compared with the calcS&S values.

This study has a high impact in the Medication Compliance literature (cited > 3000 times in Pubmed). It is important for readers to be

TABLE 1 Patient numbers used to calculate the calcS&S values

(3 × 2) percentage data from the study				(2 × 2) reconstructed study population		
Test: Adherence	BP controlled			Test: Adherence	BP controlled	
MMAS-8 score	No[a]	Yes	% total[b]	MMAS-8 score	No	Yes
Low (< 6)	67.2%	32.8%	32.1%	Low (< 6)	295	144
Medium (6– < 8)	55.2%	44.8%	52.0%	Adherent (6–8)	486	442
High (8)	43.3%	56.7%	15.9%			
chi-square	37.4	p < .001	n = 1367	chi-square	26.2	p < .001

Source: Patient numbers were derived by multiplying proportions in the Review Paper by the number of patients and pooling by groups as shown.
[a]From Table 4 page 13.
[b]Text on page 4.

confident in the integrity of this Review Paper and that the published results are independently verified using the real data.

In conclusion, the S&S and accuracy values reported in this paper[1] are mathematically implausible. The pubS&S values are inconsistent with the patient data and they overstate the diagnostic properties of the MMAS-8. Unless these inconsistencies are resolved, it would appear that, based on the study results in Point 2 and the meta-analysis,[2] the MMAS-8 scores may be no more accurate in detecting patients with uncontrolled BP, than tossing a coin to decide.

ACKNOWLEDGMENT

CONFLICT OF INTEREST

The author has no competing interests.

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