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Feasibility, tolerance and effectiveness of enteral feeding in critically ill patients in prone position: more can be less with inappropriate analysis.

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Editor -

We read with interest the study by Savio and colleagues assessing enteral feeding in the prone position and discussed it at our regional journal club[1]. We thank the authors for their timely contribution at the dawn of the COVID-19 pandemic, during which prone positioning has become a routine intervention. Whilst the paper has doubtless proved useful in informing decisions about nutrition[2], we wish to draw attention to a common statistical error; treating interventions as groups, leading to incorrect analysis.

Firstly, Savio *et al* state that the independent sample *t*-, Mann-Whitney *U*-, and chi-square tests were used. All of these assume independence of observations or subjects (i.e. different participants in each group)[3,4]. However, table 1 describes a single cohort (n=47), who in this study were exposed to two interventions: supine and prone positioning. However, analyses were performed on the assumption that there were two independent unpaired groups – effectively (and incorrectly) doubling the sample size. Paired tests of the single cohort for time-indexed summary statistics would have been more appropriate. A more detailed analysis with linear mixed models would have been a further improvement by assessing sequences of supine and prone feeding over time, for example with position (i.e. prone / supine) as a fixed effect, and the patients as a random effect, as the simplest model. The repeated measures over time could be further modelled with period as a fixed effect or the subjects being assigned with random coefficients for slope and intercept.

Secondly, we would like to draw attention to a potentially important error: Savio *et al* state that "interruption in feeding was not statistically significant between prone hours (12.3%) and supine hours (24.1%) (p=0.344)." However, table 2 and 3 show that, amongst all patients, there were 260.75 hours of interruption out of 2831.6 hours in the prone position (9.2%), and 878.75 / 15,506 in the supine position (5.67%). Not only are these results different to those in the text, but the effect is opposite.

Coincidentally, we note from table 3 that 12.3% and 24.1% correspond to the percentage of nasogastric aspirates with a volume of >250 ml in the prone and supine position, respectively.

Finally, the data presentation in this manuscript is unusual and somewhat at odds with the statistical tests used. Both the Student *t*- and the Mann-Whitney *U*- tests involve comparison of central tendency and spread, whilst the chi-squared test compares frequencies[3,4]. However, most results are presented as percentages, either of prescribed doses of nutrition, or of total cumulative time in the prone or supine position. The only result presented as mean ± standard deviation was gastric residual volume (5.3 ± 3.9ml prone and 15.1 ± 18.5ml supine), however the large standard deviations suggest skewed data and this therefore should have been presented as median and interquartile range, and analysed with the Wilcoxon matched pairs test. Whilst percentages provide a useful summary, their use as the sole method of data presentation makes checking the statistical analysis impossible, which would have been useful with respect to the discrepancies identified above.

Based on the delivery of nutrition and interruption in feeding[1], we agree that this study demonstrates the *clinical* feasibility of enteral feeding in the prone position; our recent experience caring for patients with COVID-19 is consistent with this. However, the statistical inconsistencies in this paper undermine its credibility. Given that this work has already influenced practice[2], we invite the authors to take the opportunity to revise and update their analyses as appropriate.

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References:

1. Savio RD, Parasuraman R, Lovesly D, Shankar B, Ranganathan L, Ramakrishnan N, Venkataraman R. Feasibility, tolerance and effectiveness of enteral feeding in critically ill patients in prone position. *J Intensive Care Soc* 2020; DOI: 10.1177/1751143719900100
2. Hardy G, Bharal M, Clemente R, Hammond R, Wandrag L*. BDA Critical Care Specialist Group COVID-19 Best Practice Guidance: Enteral Feeding in Prone Position*, Version 1.0. Birmingham and London: British Dietetic Association and Intensive Care Society; 2020.
3. McCluskey A, Lalkhen AG. Statistics III: Probability and statistical tests. *CEACCP* 2007; 7: 167 – 170
4. Alexander PDG, Columb MO. Presentation and handling of data, descriptive and inferential statistics. In: Hardman J, Hopkins PM, Struys MMRF, (eds). *Oxford Textbook of Anaesthesia (Volume 1)*. Oxford: Oxford University Press; 2017. p. 491-502.