Author’s response to reviews

Title: Do health care professionals' perceptions help to measure the degree of overcrowding in the emergency department? A pilot study in an Italian University Hospital

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Version: 1 Date: 22 May 2019

Author’s response to reviews:

Ferrara 22/05/2019

Subject: Submission of revised paper EMMD-D-19-00015 (Manuscript Number)

Dear Editor,

Please find enclosed our manuscript, “Do health care professionals' perceptions help to measure the degree of overcrowding in Emergency Department? A pilot study in an Italian University Hospital” by Andrea Strada et al., which we would like to submit for publication as research article in BMC Emergency Medicine.

We are returning the above paper, revised on the basis of the reviewers’ remarks. We would like to thank the reviewer for careful and thorough reading of this manuscript and for the thoughtful comments and constructive suggestions, which help to improve the quality of this manuscript.

Looking forward to hearing from you, we remain,

Yours sincerely,

Giorgia Valpiani
A point-to-point response to reviewers’ comments is provided below, and the manuscript has been revised accordingly. The line numbers in the response refer to those in the revised version of the manuscript.

Reviewer 1

Please, carefully checked the English language, it is very difficult to follow the author's logical flow of this manuscript due to poor English.

We have our manuscript checked by an English language editing service affiliates American Journal Experts (http://bit.ly/AJE_BS) and we revised it according to the editor's suggestions (please see "EDITORIAL CERTIFICATE_american journal experts" file).

Please organise in a more schematic way your result section. In particular, state clearly which is the statistical analyses you are presenting, why you performed this kind of test and what kind of results you obtained. At the moment is difficult to follow your logic.

Thank you for your suggestions. We have integrated the section "statistical analysis" expanded the section "results" as follows:
Page 6 lines from 146 to 150 Chi-squared or, when at least one expected frequency in a fourfold table is less than five, the Fisher's Exact test were performed to compare categorical variables (VAS and NEDOCS score graded into six class “not busy”, “busy”, “extremely busy, not overcrowded”, “overcrowded”, “severely overcrowded”, “dangerously overcrowded”) from among groups (physicians, nurses, nursing assistant).

Page 8 lines from 188 to 199 When ED is "not busy" or "busy" healthcare professionals staff tends to overestimate the level of overcrowding; in case of ED "not busy" this difference is statistically significant in particular for physicians vs nurses and nursing assistant (p<0.001). An examination of the last three classes of overcrowding suggests that the NEDOCS overestimates the subjective values of the healthcare professionals, which, for the “overcrowded” class, have virtually identical values (14% physicians, 15% nursing assistant and 15% nurses). Regarding “seriously overcrowded” and “dangerously overcrowded” classes, physicians have a lower (not statistically significant) perception of overcrowding than nurses (7% physicians vs. 15% nurses for “seriously overcrowded” and 4% physicians vs. 15% nurses for “dangerously overcrowded”). Nurses’ and nursing assistants’ perceptions do not show statistically significant differences in situations of dangerous overcrowding conditions.

Concerning figure 1, you state:

"Figure 1 compares the distribution of the two 6-point scales, NEDOCS and VAS, stratifying the objective scale according to categories of healthcare professionals. An examination of the last three classes of overcrowding suggests that the NEDOCS overestimates the subjective values of the healthcare professionals, which, for the "overcrowded" class, have virtually identical values. Regarding "seriously overcrowded" and "dangerously overcrowded" classes, physicians have a lesser perception of overcrowding than nurses (7% vs. 15% p=n.s. and 4% vs. 15% p=n.s.) when EDs are seriously or dangerously overcrowded. Nurses’ and nursing assistants' perceptions do not show statistically relevant differences in situations of dangerous overcrowding."

- The graph has no SD bars

- You state "they have high / less perception of... if compared to" OR "do not show statistically relevant differences"; did you do a one way ANOVA test between and among the groups to support your statements? If you did, which are the p values? Why I can't see the asterisks on the graph? It is very important to perform ANOVA test in cases you want to find differences among and between groups, that is what you want to do when you give the conclusion that the NEDOCS gives more accurate information about the degree of overcrowding if compared to VAS.
Thank you for your suggestion. We added the error bars in the graph (Figure 1), indicated the statistically significant differences (with a p-value) in the text and in the graph, we included the test used to calculate the p-values in the statistical analysis section and finally we have tried to accurately describe the results obtained in the results section. In order to test the presence of statistically significant differences between the study groups, chi square tests for proportion were calculated. Please see reply to the comment above (page 6 lines from 146 to 150 and page 8 lines from 188 to 199).

Reviewer 2

Firstly, the choice to use the NEDOCS score should be better motivated, because in studies such as "Hoot, N., Zhou, C., Jones, I., Aronsky, D.: Measuring and forecasting emergency department crowding in real time. Annals of Emergency Medicine 49 (6), 747-755 (2007)" has been proved that such a measure is not capable to provide an adequate forewarning of the ED overcrowding, even more so if you observe this index one time in a hour and in an Italian ED. I understand the choice of using the measure adopted by the regional system, but if you consider that the NEDOCS is not an appropriate measure to evaluate in real time the overcrowding level, you don't know if the perception of the ED staff is correct or altered. Perhaps further indices could be observed, providing a more complete analysis.

Thank you for your comments, we agree with you but we tried to evaluate the feasibility of the NEDOCS tool measuring the agreement between healthcare professionals and this Regional instrument.

I think that also the method used for the comparison should be better motivated. Cohen's Kappa adequacy is very debated because of its limitations. For example, you can report several works that used the same or other methods, highlighting pros and cons of such approaches.

Thank you for your consideration. We assessed the level of interrater agreement in the case of ordinal variables using Cohen weighted kappa (Cohen J. Weighted kappa: nominal scale agreement with provision for scaled disagreement or partial credit. Psychol Bull. 1968;70:213–220), which is a modification of the above original kappa statistic (Marasini D, Quatto P, Ripamonti E. Assessing the inter-rater agreement for ordinal data through weighted indexes. Stat Methods Med Res. 2016; 25:2611–2633). The original kappa statistic weights all disagreements equally. However, in ordinal data, disagreement often needs to be differentially weighted, depending on whether it refers to adjacent categories or to distant categories. Weighted kappa

Furthermore, it is not clear the observation period you considered, since along the paper you talk about one month, then 2 weeks, and you indicated from February 19 to March 7 (that is 17 days).

Page 6 Line 130 Thank you very much for your suggestion. The correction has been made. We modified the sentence as follow: “The questionnaire was administered twice per shift for three daily shifts (8:00-14:00, 14:00-20:00, 20:00-8:00) during the period from February 19 to March 7, 2018.

A consistent part of the last section "Discussion" could be synthesized, reporting only the necessary information, and should be moved into the "Introduction". I think that at the end of the paper, the focus should be on the results and further works. Since this is a pilot study, I think that it is necessary to be more detailed about the research directions that you will take.

Thank you for your suggestions but the descriptions of our organization model about the patient flow is important to explain the improvement operation plan and to monitorize.

- To the best of my knowledge, the NEDOCS is not used nationwide in Italy.

Thank you, we remind you that NEDOCS is a tool chosen by our Region to monitor the flow of patients within the emergency departments and compare the data of the different Health Local Unit and University Hospital among themselves and compared to the regional average. We remind you that there is a regional dashboard open to General Directorate and staff.
Page 10, 3rd row: the interface between the various -> the interface between various.

Page 10 Line 238 The correction has been made. We removed “the” before “various”.

Page 10, 5rd row: holding relation with spoke hospitals -> holding relation with the spoke hospitals.

Page 10 Line 241 The correction has been made. We added “the” before “spoke hospitals”.

Why did you take into account the perception of the overcrowding by all the staff and not that of more inherent professional figures such as the triage nurses and the case/bed managers?

Thank you for your question. We did not take into account the perception of the overcrowding by other inherent professional figures such as the triage nurses and the case/bed managers because Steven J. Weiss et al. (2004) validated the NEDOCS by comparing the objective scores with the subjective perspectives of the ED staff (physicians and nurses).