PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	The performance of externally validated enhanced computer aided versions of the National Early Warning Score in predicting mortality following an emergency admission to hospital in England: a cross-sectional study
AUTHORS	Faisal, Muhammad; Richardson, Donald; Scally, Andy; Howes, Robin; Beatson, Kevin; Mohammed, Mohammed

VERSION 1 – REVIEW

REVIEWER	Alfredo Enguix-Armada Hospital universitario Virgen de la Victoria. Málaga. Spain
REVIEW RETURNED	29-May-2019

GENERAL COMMENTS	I think the main limitation of this study is just the implementaton of cNEWs in each local hospital, especially if the program has an expensive license

REVIEWER	Dr Rebecca Randell University of Leeds, UK
REVIEW RETURNED	17-Jun-2019

GENERAL COMMENTS	This is an important piece of work which deserves publication. I recommend minor revisions in order to provide further information to those who are less familiar with this topic: 1. In the introduction, please give further information to explain the technology of eNEWS. For example, are the data automatically captured or are they entered into an electronic device by healthcare staff? 2. In the methods, you state that you selected hospitals that use eNEWS. I am assuming that this is because eNEWS are more accurate and are already in electronic form. However, it would be worth explicitly stating this. 3. Where was the diastolic blood pressure collected from? E.g. was it already in electronic form?

REVIEWER	Christian Subbe BCUHB, NHS Wales, UK
REVIEW RETURNED	30-Jul-2019

GENERAL COMMENTS	Many thanks for the opportunity to review this manuscript from Yorkshire: the authors suggest that additional of age, gender and diastolic pressure might improve properties of the National Early Warning Score (NEWS). The submitted paper has little surprises: as in many other studies before the addition of parameters improves properties and most models perform best in the environment in which they were devised.

	Adding age as a surrogate for many ailments does obviously impact on prognosis. The challenges of introducing variation into a model that serves as a common language between professional groups, many of which rotate through a number of healthcare locations is not satisfactorily addressed. Without a way to translate the unfamiliar of the new systems to the familiar of the old NEWS implementation might be more than challenging and bare related safety risks that are not well balanced against the small grains of model M1 and M2. The part that I found of most interest as a novel addition to the literature was the performance of the scores in various disease groups that is not well reflected in the paper. I would therefore suggest to refocus the paper on this data to explain why the new model might have advantages in relation to specific diseases and how differences between the sites might be explained. I noted that a Model M3 is referenced in one of the tables but could not find it in the paper.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Alfredo Enguix-Armada
Institution and Country: Hospital universitario Virgen de la Victoria. Málaga. Spain
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
I think the main limitation of this study is just the implementaton of cNEWs in each local hospital, especially if the program has an expensive license
Response: The algorithm has been developed in one trust and has been externally validated in this study. The algorithm is not licensed and free to implement by any hospital.

Reviewer: 2
Reviewer Name: Dr Rebecca Randell
Institution and Country: University of Leeds, UK
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
This is an important piece of work which deserves publication. I recommend minor revisions in order to provide further information to those who are less familiar with this topic:

1. In the introduction, please give further information to explain the technology of eNEWS. For example, are the data automatically captured or are they entered into an electronic device by healthcare staff?
Response: The vital signs are measured by clinical staff and manually entered into the electronic health care record. The risk score is calculated automatically by the computer system.

2. In the methods, you state that you selected hospitals that use eNEWS. I am assuming that this is because eNEWS are more accurate and are already in electronic form. However, it would be worth explicitly stating this.
Response: We have now made it clearer. We selected these hospitals because they had access to electronically recorded vital signs and electronically calculated NEWS which are collected as part of

the patient's process of care and were agreeable to the study. Furthermore, studies have shown that electronically collected NEWS [1] are highly reliable and accurate when compared with paper based methods [2–4].

1 Smith GB, Prytherch DR, Schmidt P, et al. Hospital-wide physiological surveillance–A new approach to the early identification and management of the sick patient. Resuscitation 2006;71:19–28. doi:10.1016/j.resuscitation.2006.03.008
2 Edwards M, McKay H, Van Leuvan C, et al. Modified Early Warning Scores: inaccurate summation or inaccurate assignment of score? Crit Care 2010;14:P257. doi:10.1186/cc8489
3 Prytherch DR, Smith GB, Schmidt P, et al. Calculating early warning scores--a classroom comparison of pen and paper and hand-held computer methods. Resuscitation 2006;70:173–8. doi:10.1016/j.resuscitation.2005.12.002
4 Mohammed M, Hayton R, Clements G, et al. Improving accuracy and efficiency of early warning scores in acute care. Br J Nurs;18:18–24. doi:10.12968/bjon.2009.18.1.32072

3. Where was the diastolic blood pressure collected from? E.g. was it already in electronic form?
Response: The diastolic blood pressure was recorded at the same time as systolic blood pressure. Historically, diastolic blood pressure has always been a routinely collected physiological variable on vital sign charts and is still collected where electronic observations are in place. NEWS does not include diastolic blood pressure but we incorporate it in our statistical models because this data item is routinely collected.

Reviewer: 3
Reviewer Name: Christian Subbe
Institution and Country: BCUHB, NHS Wales, UK
Please state any competing interests or state 'None declared': None in relation to this study.

Please leave your comments for the authors below
Many thanks for the opportunity to review this manuscript from Yorkshire: the authors suggest that additional of age, gender and diastolic pressure might improve properties of the National Early Warning Score (NEWS).
The submitted paper has little surprises: as in many other studies before the addition of parameters improves properties and most models perform best in the environment in which they were devised. Adding age as a surrogate for many ailments does obviously impact on prognosis. The challenges of introducing variation into a model that serves as a common language between professional groups, many of which rotate through a number of healthcare locations is not satisfactorily addressed. Without a way to translate the unfamiliar of the new systems to the familiar of the old NEWS implementation might be more than challenging and bare related safety risks that are not well balanced against the small grains of model M1 and M2.
The part that I found of most interest as a novel addition to the literature was the performance of the scores in various disease groups that is not well reflected in the paper. I would therefore suggest to refocus the paper on this data to explain why the new model might have advantages in relation to specific diseases and how differences between the sites might be explained.
I noted that a Model M3 is referenced in one of the tables but could not find it in the paper.

Response: We have now interpreted our models in relation to specific disease groups. We have now corrected the typo (Model M3) in the appendix.

VERSION 2 – REVIEW

REVIEWER	Christian Subbe BCUHB
REVIEW RETURNED	22-Aug-2019

GENERAL COMMENTS	I have over the last 19 years probably reviewed a large amount of papers on different scoring systems. I do not find that the paper offers at this point in time enough novel material to justify publication in a very crowded market place: the improvement over the existing systems are minimal and the implementation challenges are not considered.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 3

Reviewer Name: Christian Subbe

Institution and Country: BCUHB

Please state any competing interests or state ‘None declared’: None in relation to this manuscript.

Please leave your comments for the authors below:

I have over the last 19 years probably reviewed a large amount of papers on different scoring systems. I do not find that the paper offers at this point in time enough novel material to justify publication in a very crowded market place: the improvement over the existing systems are minimal and the implementation challenges are not considered.