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Handling time elements for in-hospital cardiac arrest

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This commentary refers to 'Cardiac arrest in COVID-19: characteristics and outcomes of in- and out-of-hospital cardiac arrest. A report from the Swedish Registry for Cardiopulmonary Resuscitation', by P. Sultanian *et al.*, doi:10.1093/eurheartj/ehaa1067 and the discussion piece 'In-hospital resuscitation of COVID-19 patients is impeded by serious delays, but the problem is obscured by poor time data', by J.A. Stewart, doi:10.1093/eurheartj/ehab160.

This is a response to Stewart,[1] commenting on the handling of time data intervals in our publication, *Cardiac arrest in COVID-19: characteristics and outcomes of in- and out-of-hospital cardiac arrest. A report from the Swedish Registry for Cardiopulmonary Resuscitation*.[2]

We would like to address and comment on the points being raised by Stewart.

During the COVID-19 pandemic, personal protective equipment (PPE) has become a necessity in the daily work of healthcare personnel (HCP).[3] As a consequence, subsequent delays in time response to a cardiac arrest are possible. However, one could also suggest that the pandemic has brought about an unprecedented readiness in the entire healthcare system, especially in the in-hospital setting, where HCP have monitored and cared for patients in an unforeseen manner. Thus, while one could argue that PPE may have caused some delay, one could also argue that patients have been more closely monitored than before. Both these are speculations but reasonably plausible.

The Swedish Registry for Cardiopulmonary Resuscitation has monitored management and outcomes for cardiac arrests in Sweden since 1990. The registry complies with the Utstein style of reporting for variables and outcomes.[4] Time intervals are registered upon witnessed collapse, followed by the attachment of automated external defibrillators (AED), with recording of the built-in clock for these devices. This could possibly lead to a difference in reporting time elements (from witnessed collapse until attached AED). However, the elapsed time from witnessed arrest until attached AED should not be longer than 1 min. The Swedish Resuscitation Council updated guidelines for management and personal protection for COVID-19 in the emergence of cardiac arrest. The updated recommendations for HCP were to use PPE, including face visor, face mask, protective gloves, and apron. Donning of aforementioned PPE should not account for delaying intervention more than necessary, and definitely not for several minutes.

Moreover, our main analyses are all adjusted for age, sex, and initial rhythm. Adjustment for time delays did not result in any material difference in the results. Claiming that this is due to an inherent flaw in the quality of data is speculative. Also, as in any investigation—be it a randomized trial or observational study—we do not always know which mediators that convey the effect of an initial exposure or risk factor and that does not invalidate the findings; if the lethality of COVID-19 is due to treatment delays, or differences in the underlying aetiology, etc., is of course an important piece of the puzzle, but it does not reduce the importance of the finding that COVID-19 is a hazardous infection that warrants close monitoring and readiness.

Analyzing only monitored arrests, as suggested by Stewart, would lend us to bias caused by cases with pulseless electrical activity, in addition to the fact that half of the study population would be excluded.

Nevertheless, we agree with Stewart that we should always strive for better and more accurate ways of handling time elements for in-hospital cardiac arrest.

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Data availability

Data is available upon reasonable request and approval from the Swedish Ethical Review Authority.

Conflict of interest: none declared.

References

1. Stewart JA. In-hospital resuscitation of Covid-19 patients is impeded by serious delays, but the problem is obscured by poor time data. *Eur Heart J* 2021;**42**: 1528–1529.
2. Sultanian P, Lundgren P, Strömsöe A, Aune S, Bergström G, Hagberg E, Hollenberg J, Lindqvist J, Djärv T, Castelheim A, Thorén A, Hessulf F, Svensson L, Claesson A, Friberg H, Nordberg P, Omerovic E, Rosengren A, Herlitz J, Rawshani A. Cardiac arrest in COVID-19: characteristics and outcomes of in- and out-of-hospital cardiac arrest. A report from the Swedish Registry for Cardiopulmonary Resuscitation. *Eur Heart J* 2021. 10.1093/eurheartj/ehaa1067
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4. Langhelle A, Nolan J, Herlitz J, Castren M, Wenzel V, Soreide E, Engdahl J, Steen PA; 2003 Utstein Consensus Symposium. Recommended guidelines for reviewing, reporting, and conducting research on post-resuscitation care: The Utstein style. 10.1016/j.resuscitation.2005.06.005.

Erratum

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Erratum to: "ESC Core Curriculum for the Cardiologist"

Upon the original publication of this correction notice, the following requested author corrections to the original article "'ESC Core Curriculum for the Cardiologist' Felix C Tanner, Nicolas Brooks, Kevin F Fox, Lino Gonçalves, Peter Kearney, Lampros Michalis, Agnès Pasquet, Susanna Price, Eric Bonnefoy, Mark Westwood, Chris Plummer, Paulus Kirchhof, ESC Scientific Document Group *European Heart Journal*, Volume 41, Issue 38, 7 October 2020, Pages 3605–3692, https://doi.org/10.1093/eurheartj/ehaa641", were inadvertently not listed and not made. The Publisher would like to apologize for these omissions and has since corrected the errors listed in this erratum.
The correction:

> "Under the "Acknowledgements" section, the contributor's name should read "Kevin Domingues" instead of "Kevin Dominques."

should read:

> "Under the "Acknowledgements" section, contributor Kevin Domingues's full name should read: "Kevin Domingues", instead of "Kevin Dominques". In addition, contributor Dan Foldager's full listing should read: "Dan Foldager (Demark)", instead of "Dan Foldager (Norway)."

The following correction was omitted:

> "Under the "CanMEDS roles" section, the following footnote was omitted: "This framework was adapted from: Frank, JR, Snell L and Sherbino J eds. The CanMEDS 2015 physician competency framework. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015. Adapted with permission."

Indications were made that there were ambiguities within the reporting of the levels of independence in Table 2. and the level of independence for each EPA in Table 3. This was incorrect as there were no ambiguities within the reporting of levels of independence in the tables. To which end, the following correction was revised to read: "There were formatting errors in tables 2 and 3 in which the gridlines were inadvertently omitted and the table headers were not aligned".