

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 IMPORTANCE OF REPORTING SURVIVAL AS INCIDENCE A CROSS-SECTIONAL COMPARATIVE STUDY ON OUT-OF-HOSPITAL CARDIAC ARREST REGISTRY DATA FROM GERMANY AND NORWAY
AUTHORS	Tjelmeland, Ingvild Beathe; Alm-Kruse, Kristin; Grasner, Jan-Thorsten; Isern, Cecilie Benedicte; Jakisch, Barbara; Kramer-Johansen, Jo; Renzing, Niels; Wnent, Jan; Seewald, Stephan

VERSION 1 – REVIEW

REVIEWER	Kosuke Inoue UCLA School of Public Health, Epidemiology
REVIEW RETURNED	04-Nov-2021

GENERAL COMMENTS	<p>Thank you very much for giving me an opportunity to review this paper. Using two large databases in German and Norwegian, they compared incidence and survival for patients resuscitated after out-of-hospital cardiac arrest. Although the topic sounds to be important, the objective and key points in the current manuscript might need to be more clearly stated.</p> <p>They showed the differences and similarities in the cardiac arrest registries in these databases, but what does this information provide us to change future research or clinical practice?</p> <p>Also, their message of “when analyzing data from different systems and countries, results must be related to the population covered to increase comparability” sounds to be quite intuitive (and not novel). The solution for such differences (what we can/should do to maximize the utility of these databases) might need to be more clearly suggested.</p> <p>Lastly, reporting survival as incidence seems to be already common when the data is available. In that case, what could be the novelty?</p>
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REVIEWER	Klaudiusz Nadolny Medical University of Bialystok, Emergency Medicine
REVIEW RETURNED	11-Dec-2021

GENERAL COMMENTS	<p>congratulates the authors of the publication. the manuscript addresses an important medical aspect of OHCA cases. The data comes from medical registers in Germany and Norway. Patients resuscitated between 1st January 2015 and 31st December 2019 were included, resulting in 29,222 cases from GRR and 16,406 cases from NorCAR. This study focused on the EMS systems, the registries, and the patients included in both registries. This study has improved our/my knowledge of both registries and highlighted the importance of reporting survival as incidence when comparing registries.</p>
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REVIEWER	Verity Todd St John New Zealand, Clinical audit and research
REVIEW RETURNED	20-Dec-2021

GENERAL COMMENTS	<p>This manuscript is a tidy and well presented example of the importance of using incidence when comparing OHCA data. The authors have clearly described the research, justifying their approach and discussing the outcomes and limitations of the study. My comments are only very minor in nature, as I think the manuscript is an excellent reflection of the research.</p> <p>My only comment regards the presentation of the graphs in Figure 3 and Figure 4. It would be clearer if the "all events" and "Utstein group" were included in the titles of the graph, rather than the X axis. The Y axes need a title. Lastly, I am not sure that the line chart is entirely appropriate for presentation of the data, and whether a bar chart would be more appropriate, as the categories are independent.</p>
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REVIEWER	Guido Knapp Technische Universität Dortmund
REVIEW RETURNED	22-Dec-2021

GENERAL COMMENTS	<p>Comments to the statistical analysis:</p> <p>I think the p-values in Table 1 can be misleading. Based on the large sample sizes, even small differences can be statistically significant. The results in the table do not support the claim that the two registry populations are comparable. Moreover, I cannot judge, how the GRR population is biased to the population of interest (for instance based on the Norwegian registry population).</p> <p>The above p-value argument also holds for Table 2. For the variable "Shock by public defibrillator if attached", I do not understand the percentages. What are the denominators here? For "Bytander CPR", the total number for GRR does not seem to be correct.</p> <p>As a statistician, I do not understand what can we learn from Utstein comparator group. Are the GRR and NorCAR comparable? Or do we get the incidence differences in Table 4 just because the GRR, for instance, is older than the NorCAR group.</p> <p>In the section on "Patient and Public Involvement", the authors have already said that it is a challenge to compare different regions in the countries and differences between the countries. I agree that reporting incidences is better than reporting proportions. But can we assume that the 100.000 inhabitants in the two countries are comparable? Maybe one should avoid reporting p-values.</p>
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REVIEWER	Alexis Descatha UNIV Angers Inserm, U1085 Irset, Ester Unit
REVIEW RETURNED	27-Dec-2021

GENERAL COMMENTS	<p>I read with a particular interest the Manuscript. I have different comments and questions that illustrated my interest for the work:</p> <ol style="list-style-type: none"> 1. Why comparing Norway and Germany? The rationale for choosing these two countries should be more explicit since there are many other registers in Europe and elsewhere 2. The aim is to compare the management of Cardiac Arrest (CA) in
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	<p>this 2 countries or their registry?</p> <p>3. In order to describe the datasets, is it possible to describe the time and location in the country of both register?</p> <p>4. Covid context would have major consequences on both registries and should be discussed.</p> <p>5. I would expect more perspectives on the use of such registry at an international level to improve such knowledge on CA</p>
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VERSION 1 – AUTHOR RESPONSE

Reply reviewer 1:

Thank you for taking the time to review our article and for your feedback. To clearly state the objective of the study and key points we suggest changes to the bullet points and the last paragraph in the introduction.

This study aimed to understand the German Resuscitation Registry (GRR) and the Norwegian Cardiac Arrest Registry (NorCAR), to compare the EMS systems in Germany and Norway, and to report on the treatment given to patients suffering out-of-hospital cardiac arrest. We also aimed to compare a mandatory registry and a voluntary registry and the incidence of included patients and incidence of survival in our registries.

To maximize the utility of cardiac arrest registries and to change future research or clinical practice, we have added a paragraph in our discussion section addressing how we suggest our knowledge may be used in future reports.

Implication for the future

Based on our findings, we recommend all nations make cardiac arrest a reportable condition. Making reporting mandatory provides an opportunity to follow a patient through the healthcare system and to evaluate how an intervention affects care, health, and cost. 31 When participation in a registry is voluntary, it is difficult to conclude that results are representative for a larger population. If cardiac arrest is not a reportable condition, there is a greater risk that EMS systems and hospitals deliberately do not participate because of fear that their level of care is sub-optimal.

Treating and reporting many patients that do not survive will give a low survival rate, while treating and reporting a low number of non-survivors will give a high survival rate. Reporting inclusion and results as incidence per 100,000 inhabitants is essential if we wish to know the burden of disease in a population, and it is a way of making results more comparable as variation in how prehospital providers perceive futility and variable reporting practices, will have less impact on the overall reported survival.

In regards to your comment that using incidence is intuitive and not novel we would very much like to believe that, but find that most studies still report return of spontaneous circulation and survival as percentages of the EMS treated patients. We have added information in the introduction about major publications in the last years where we see that incidence has not been published.

Two big studies reporting on cardiac arrest in Europe both reported return of spontaneous circulation (ROSC) and survival as percentages and not as incidence. 6 8 The same use of percentages can be seen in the yearly reports from the Cardiac Arrest Registry to Enhance Survival (CARES) in USA 12 and the first report from the International Liaison Committee on Resuscitation. 7

Reply reviewer 2:

Thank you for taking the time to review our article and for your feedback

Reply reviewer 3:

Thank you so much for your feedback. We have changed the figures as you suggested from line chart to bar chart and added information on the Y-axis. The figure legend has been changed to first present the title of the figure.

Reply reviewer 4:

Thank you for your feedback. In regards to your p-value comment; we believe the p-value adds important information about the differences in GRR and NorCAR. Large sample sizes make even small differences statistically significant, and we have to evaluate if differences are clinically relevant. In this article, we believe it is important to be aware that the patients included in GRR are different from the patients in NorCAR as the factors where we report a p-value, have been associated with survival in previous publications.

We do not claim that the populations are comparable, we claim that the patients in the two registries are different and that this might be the reason for the difference in survival.

“Shock by public defibrillator if attached” uses the number of patients where a defibrillator was connected as the denominator. This is unclear in the table, and we have changed the table.

There was unfortunately a typing error in the number of patients that received CPR before EMS arrival, this has been corrected from 1056 to 11056.

The Utstein comparator group is a reference population of particular interest. This group has higher chances of survival than the general cardiac arrest population, and treatment recommendation for this group is very similar across systems. The group is often used when data from different registries are compared. In our study we find that the differences in “all included patients” are also reflected in this subgroup.

Reply reviewer 5:

Thank you for taking the time to review our article.

The background for choosing Germany and Norway is that Germany has a voluntary registry covering parts of the population, while Norway has a mandatory registry covering the entire population. This has been added as information in the introduction section.

Germany and Norway have a similar organisation of the EMS. This information has been included in a paragraph in the Result section.

The aim of the study was to understand the German Resuscitation Registry (GRR) and the Norwegian Cardiac Arrest Registry (NorCAR), to compare the EMS systems in Germany and Norway, and to report on the treatment given to patients suffering out-of-hospital cardiac arrest in our two countries. The aim has been described more clearly in the article.

This study aimed to understand the German Resuscitation Registry (GRR) and the Norwegian Cardiac Arrest Registry (NorCAR), to compare the EMS systems in Germany and Norway, and to report on the treatment given to patients suffering out-of-hospital cardiac arrest. We also aimed to compare a mandatory registry and a voluntary registry and the incidence of included patients and incidence of survival in our registries.

Unfortunately, we are not quite sure what you are asking for with the terms “time and location”. The data we extracted from the registries were all patients filling our inclusion criteria from January 2015

to December 2019. In Norway, we cover the entire country, and in Germany, there are patients from all regions. This is described under the heading “Participants”.

The data in this study only includes patients suffering cardiac arrest before the covid-pandemic. The reason for not including patients from 2020 was that we suspect the pandemic has influenced the incidence and treatment of cardiac arrest patients.

To maximize the utility of cardiac arrest registries and to change future research or clinical practice, we have added a paragraph in our discussion section.

Implication for the future

Based on our findings, we recommend all nations make cardiac arrest a reportable condition. Making reporting mandatory provides an opportunity to follow a patient through the healthcare system and to evaluate how an intervention affects care, health, and cost. 31 When participation in a registry is voluntary, it is difficult to conclude that results are representative for a larger population. If cardiac arrest is not a reportable condition, there is a greater risk that EMS systems and hospitals deliberately do not participate because of fear that their level of care is sub-optimal.

Treating and reporting many patients that do not survive will give a low survival rate, while treating and reporting a low number of non-survivors will give a high survival rate. Reporting inclusion and results as incidence per 100,000 inhabitants is essential if we wish to know the burden of disease in a population, and it is a way of making results more comparable as variation in how prehospital providers perceive futility and variable reporting practices, will have less impact on the overall reported survival.

VERSION 2 – REVIEW

REVIEWER	Guido Knapp Technische Universität Dortmund
REVIEW RETURNED	01-Feb-2022
GENERAL COMMENTS	The authors have satisfactorily addressed all the comments of my first review. No further comments! Thank you!
REVIEWER	Alexis Descatha UNIV Angers Inserm , U1085 Irset, Ester Unit
REVIEW RETURNED	19-Jan-2022
GENERAL COMMENTS	Even it was not easy to review since you only gave answers not comments and questions, I feel it is OK