

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Social and clinical vulnerability in stroke and STEMI management during the COVID-19 pandemic: A registry-based study
<b>AUTHORS</b>	Lesaine, Emilie; Francis, Florence; Domecq, Sandrine; Miganeh-Hadi, Sahal; Sevin, Floriane; Sibon, Igor; Rouanet, François; Pradeau, Catherine; Coste, Pierre; Cetran, Laura; Vandentorren, Stephanie; Saillour, Florence; AVICOVID Group, AVICOVID Group

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Owolabi, M. O. University of Ibadan College of Medicine, Medicine
<b>REVIEW RETURNED</b>	09-Jul-2023

<b>GENERAL COMMENTS</b>	<p>The manuscript is well written though the theme is no longer topical.</p> <p>With the COVID pandemic practically over, it is crucial to discuss the relevance and significance of the findings with respect to implications for clinical practice and health system performance.</p>
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<b>REVIEWER</b>	Wojczewski, Silvia Medical University of Vienna Center for Public Health, Department of Primary Care Medicine
<b>REVIEW RETURNED</b>	13-Sep-2023

<b>GENERAL COMMENTS</b>	<p>Dear authors, this is a very interesting and important study helping us to further understand how the Covid-19 pandemic has impacted on health-care for STEMI and stroke patients. Please find my comments below here as well as attached in the pdf Document.</p> <p>Introduction Please explain in more detail what concepts/definition you mean by social and clinical vulnerability using references Please explain in this section how access to healthcare services/paths for these patients work in France. How are these health services organized in France? In one study women are mentioned as specifically vulnerable group. I believe your study would benefit from analysing potential differences between men and women.</p> <p>Page 5, line 57: per year or per day?</p>
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	<p>3 and 4. As statistical methods are used which I am not an expert in I cannot answer the question fully. In my understanding the methods are aped and well performed.</p> <p>5. Research ethics: It is not clear whether there has been a positive vote of an ethics board. Was there any ethical clearance /ethics board vote for this study? Why does ethical approval not apply?</p> <p>In general please always explain each abbreviation (e.g. EMS, CNV)</p> <p>Results: Please explain most advantaged and most disadvantaged in more detail, in regards to what exactly?</p> <p>Could differences of sex/gender be included in table 1 and 2? I am asking because it is known that there have been many inequalities between genders during the Covid-19 pandemic (men more affected by severe illness, women more affected by post-covid and more social and economoc disadvantages arose for women. So I would find it interesting if in the case of illness treatment any differences could be found.</p> <p>11. Discussion: Discussion needs a better structure. The subtitle headings do not fully reflect the content and the content is a bit chaotic. More subheadings could be useful to guide the reader Global effects is an unclear subheading Differences between STEMI and stroke patients could be a subheading on its own where all different findings and references are grouped together for example. How does your research contribute to filling research gaps? What is new what is surprising? what could be explained in more detail is how the authors made up for the weaknesses? e.g. healthcare avoidance, is there any other studies on that topic that can provide how many STEMI or stroke patients avoided care during Covid/first wave? Why did the authors chose the region least affected by Covid-19?</p> <p>Conclusion "no deep change in management for stroke and STEI patients." What is interesting however is to then not only stay with the general but to give insights into which subgroups were less cared for or which differences between the groups there are and how healthcare systems could improve care for those. on the one hand the authors write about well-structured healthcare networks yet on the other hand they mention the pre-existing inequalities in care for STEMI and stroke patients in the introduction and abstract.</p> <p>It would be important to address how these existing inequalities could be improved in the discussion or conclusion.</p> <p>12. Strengths and limitations</p> <p>What should be explained in more detail is how the authors made up for the weaknesses? e.g. healthcare avoidance, is there any other studies on that topic that can provide how many STEMI or</p>
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	<p>stroke patients avoid care in general or avoided care during Covid/first wave for example?  Why did the authors chose the region least affected by Covid-19?  Can the results then be representative?</p>
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### VERSION 1 – AUTHOR RESPONSE

Our responses to comments of the Reviewer #1:

Comments to the Author:

The manuscript is well written though the theme is no longer topical.

1. With the COVID pandemic practically over, it is crucial to discuss the relevance and significance of the findings with respect to implications for clinical practice and health system performance.

We thank the reviewer for this comment, which gives us the opportunity to improve the discussion. The crisis related to the COVID-19 pandemic is indeed practically over but our results can be used by those responsible for healthcare decisions and healthcare professionals to anticipate any future health crisis. For this purpose, our results were discussed with regional health authorities, emergency services managers and field experts to find opportunities to improve the quality and sustainability of the healthcare system. On one hand, we found that the COVID-19 crisis did not have a differential impact on social health inequalities in STEMI and stroke patients, suggesting a good the resilience of the French healthcare network. Some organisational strategies could be replicated in the event of a new crisis and extended to other conditions: dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted public communication messages, increased regulation capacities for example.

On the other hand, we emphasised pre-existing social health inequalities related to the management of STEMI acute care. These inequalities stem mainly from the organisation of the healthcare system. They are associated with challenges in language and health literacy, implicit bias, and the absence of culturally competent care, all contributing to less accurate medical interviews and subsequently suboptimal medical decisions. Further studies are needed to explore these hypotheses and evaluate corrective measures.

We added a specific paragraph in the discussion:

"Implications for clinical practice and health system performance

While the COVID-19 pandemic crisis is nearly resolved, our findings remain valuable for health institutions and professionals to prepare for future health crises. The structured emergency pathway for strokes and STEMI patients and hospital reorganisations ensured sustained care quality.(12) In our study, the COVID-19 crisis did not have any differential impact on social health inequalities, suggesting a good resilience of the French healthcare network. Organisational strategies employed, such as a dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted communication, and increased regulation capacities, could be replicated in new crises and extended to other conditions. Pre-existing STEMI management inequalities partly result from the healthcare system organisation. In a study about disparities in cardiovascular disease, these inequalities are linked to language challenges, health literacy, implicit bias, and the absence of culturally competent care.(8) This may lead to less accurate medical interviews and suboptimal medical decisions. Further research is essential to investigate these hypotheses and evaluate potential corrective measures." P12.

Our responses to comments of the Reviewer #2

Comments to the Author:

Dear authors, this is a very interesting and important study helping us to further understand how the Covid-19 pandemic has impacted on health-care for STEMI and stroke patients. Please find my comments below here as well as attached in the pdf Document.

1. Introduction - Please explain in more detail what concepts/definition you mean by social and clinical vulnerability using references

In 2020, March, the French High Council for Public Health (Haut Conseil de la Santé Publique) has specified the specific barrier measures to be recommended for populations at risk of severe forms of Covid-19 (Chauvin F. Actualisation de l'avis relatif aux personnes à risque de forme grave de Covid-19 et aux mesures barrières spécifiques à ces publics, 2020). Demographic (advanced age) and medical (especially cardiovascular co-morbidities) characteristics were main criteria to define populations at risk of severe forms of Covid-19. For these populations, we defined as "clinically vulnerable patients", the French High Council for Public Health highlighted the need to respect barrier measures and physical distancing, to encourage remote consultations, and to reduce travel to places at high risk of COVID-19 transmission, such as waiting rooms or healthcare establishments. They also recommended postponing any unnecessary hospitalization and giving preference to home treatment. During hospitalization, the application of barrier measures was particularly essential. Based on these recommendations, we hypothesized that additional protective measures may have been implemented for these clinically more vulnerable populations, resulting in increased management delays.

We added some explanations in the introduction section:

"We hypothesised that socially vulnerable patients, defined as those with low socioeconomic status, may experience longer acute management times during the COVID-19 pandemic.

In France, to protect more vulnerable patients and adapt care, health authorities identified several risk factors of severe COVID-19 based on demographic (advanced age) and medical (especially cardiovascular co-morbidities) characteristics.(20) For these populations defined as "clinically vulnerable patients", French authorities have stressed the importance of adhering to barrier measures, maintaining physical distancing, particularly during hospitalisation, and to limit travel to high-risk areas for SARS-CoV-2 transmission. Information about these risk factors was covered widely in the media which may have led exposed individuals with these underlying conditions to delay seeking treatment.(21) Based on these recommendations, we hypothesised that additional protective measures may have been implemented for these exposed clinically more vulnerable populations, resulting in increased management delays." P5.

2. Introduction - Please explain in this section how access to healthcare services/paths for these patients work in France. How are these health services organized in France?

We thank the reviewer for this comment, which gives us the opportunity to explain the French organization of STEMI and stroke management. We added some explanations in the introduction section:

"In France, patients with acute chest pain or neurological deficit are advised to rapidly call the nationwide EMS using a unique medical dispatch number. In cases of suspected stroke or STEMI, the EMS dispatches rapid transport, including a doctor for STEMI and life-threatening situations, to transfer the patient to a specialised technical platform. If not suspected, the EMS physician may refer the patient to a general practitioner for initial evaluation, or advise them to go to the emergency unit (EU). " P4.

3. Introduction - In one study women are mentioned as specifically vulnerable group. I believe your study would benefit from analysing potential differences between men and women.

We initially intended to include the feminine gender as a distinct vulnerable group. However, for this study, we opted to concentrate on populations at higher risk of severe forms of Covid-19 and patients with lower socioeconomic status. A separate study addressing gender inequalities is currently underway with a focus concerning the COVID period.

We've added precisions in the limits section of the discussion:

" Finally, we did not explore gender as a distinct vulnerable group (9) and short- or long-term outcomes such as morbidity, mortality, disability, or rehospitalisation after initial hospitalisation for STEMI or stroke, for which a wide range of socioeconomic disparities exist, in the context of the COVID-19 pandemic.(3,41) Separate studies on gender inequalities and inequalities following acute care are currently underway, with a focus on the COVID period. This will be a key focus of our ongoing research." P14.

4. Page 5, line 57: per year or per day?

The stroke cohort is not totally exhaustive with regard to included hospitals, but we've tried to study a wide variety of stroke pathways in both referral and local hospitals. Thus, we included all hospitals managing more than 30 strokes per year in Aquitaine, representing more than 95% of patients admitted to hospital with stroke.

5. 3 and 4. As statistical methods are used which I am not an expert in I cannot answer the question fully. In my understanding the methods are aped and well performed.

The methods were discussed in depth by a multi-disciplinary group comprising methodologists, statisticians, data scientists, epidemiologists, experts in health inequalities and doctors (emergency physicians, cardiologists, neurologists). Thus, we are confident that our methods are appropriate.

6. 5. Research ethics: It is not clear whether there has been a positive vote of an ethics board. Was there any ethical clearance /ethics board vote for this study? Why does ethical approval not apply?

This study was approved by the Bordeaux University Hospital Ethics Board. We've added this information in the methods section:

"The CNV Registry was approved by the French authority on data protection and met the regulatory requirements for the handling of patient information (file 2216283). The study was approved by the Bordeaux University Hospital Ethics Board (CER-BDX 2023-131)." P6.

7. Results: Please explain most advantaged and most disadvantaged in more detail, in regards to what exactly?

We thank the reviewer for this comment. To assess patient socioeconomic status, we used an ecological social deprivation score at commune of residence level. Quintiles of the Fdep15 scores were computed from data for the population of metropolitan France. The first quintile (Q1) represented the least and the fifth quintile (Q5) the most disadvantaged communes. We calculated the deprivation score for each patient of our sample in reference to the quintiles of the French population.

We've added precisions in the methods and results sections:

"Quintiles of the Fdep15 scores were computed for metropolitan France, whereby the first quintile (Q1) represented the least and the fifth quintile (Q5) the most disadvantaged communes. We calculated the deprivation score for each patient of our sample with reference to the quintiles of the French population." P7.

"The distributions of the deprivation index quintiles in our sample, ordered from the most advantaged to the most disadvantaged patients of our sample, were 16.2%, 24.8%, 18.1%, 19.3%, and 21.6% for stroke patients and 12.8%, 23.5%, 22.8%, 22.8%, and 18.1% for STEMI patients (Supplementary Material 2)." P8

8. Could differences of sex/gender be included in table 1 and 2? I am asking because it is known that there have been many inequalities between genders during the Covid-19 pandemic (men more affected by severe illness, women more affected by post-covid and more social and economic disadvantages arose for women. So I would find it interesting if in the case of illness treatment any differences could be found.

As mentioned in response of your previous comment, we initially intended to include the feminine gender as a distinct vulnerable group. However, we decided to concentrate on populations at higher risk of severe forms of Covid-19 and patients with lower socioeconomic status. A separate study addressing gender inequalities is currently underway with a focus concerning the COVID period. We've added precisions in the limits section of the discussion:

"Finally, we did not explore gender as a distinct vulnerable group (9) and short- or long-term outcomes such as morbidity, mortality, disability, or rehospitalisation after initial hospitalisation for STEMI or stroke, for which a wide range of socioeconomic disparities exist, in the context of the COVID-19 pandemic.(3,41) Separate studies on gender inequalities and inequalities following acute care are currently underway, with a focus on the COVID period. This will be a key focus of our ongoing research." P14.

9. 11. Discussion: Discussion needs a better structure. The subtitle headings do not fully reflect the content and the content is a bit chaotic. More subheadings could be useful to guide the reader. Global effects is an unclear subheading. Differences between STEMI and stroke patients could be a subheading on its own where all different findings and references are grouped together for example. We thank the reviewer for this comment, which gives us the opportunity to improve the organisation of the discussion. We restructured the discussion and modified its subheadings as followed:

"Effects of the COVID-19 first wave Social and clinical vulnerability in stroke and STEMI management during the COVID-19 pandemic" P10.

"Global effects

Social and clinical vulnerability in stroke and STEMI management regardless of the COVID-19 pandemic

Several studies, including the present work, have shown that acute-care management times are longer for elderly patients and socially vulnerable STEMI patients.(33–35) Concerning stroke, we found no alteration in the acute-care management time for elderly and socially vulnerable stroke patients. The results pertaining to stroke patients may be explained by our examination of the EU admission–imaging time focused on the beginning of in-hospital care. Unlike the STEMI pathway, this time involves such a small portion of stroke patients' pathways that it could have been difficult to detect an effect.

Age

Regarding specifically age for STEMI patients, greater initial clinical severity, atypical symptoms, and a longer delay in admission may explain these findings.(34) Regarding age Half of the STEMI patients in our sample were aged > 65 years. The proportion of elderly stroke patients > 65 years was 81%, which made it difficult to demonstrate an effect. To our knowledge, only one study, conducted in England, has revealed an association between older age and a longer admission–computerised tomography time for stroke patients.(32)

Socioeconomic status

However, Findings with respect to socioeconomic status do not converge for STEMI. (...)" P11.

"Neuro-cardiovascular history" P12.

10. How does your research contribute to filling research gaps? What is new what is surprising? We thank the reviewer for this comment, which gives us the opportunity to improve the discussion. To our knowledge, as stated in the introduction, only one study has evaluated whether COVID-19 modified the associations among the educational level, deprivation, hospital admission indicators, and quality of hospital care, especially for patients with neuro-cardiovascular diseases. Our study added information regarding this specific topic in Europe, and more specifically about acute care management times.

Our results finally invalidate our initial hypothesis: worsening inequalities during the COVID crisis. This study then inform health services research and has practical implications. The crisis related to the COVID-19 pandemic is indeed practically over but our results can be used by those responsible for healthcare decisions and healthcare professionals to anticipate any future health crisis. For this

purpose, our results were discussed with regional health authorities, emergency services managers and field experts to find opportunities to improve the quality and sustainability of the healthcare system. On one hand, we found that the COVID-19 crisis did not have a differential impact on social health inequalities in STEMI and stroke patients, suggesting a good the resilience of the French healthcare network. Some organisational strategies could be replicated in the event of a new crisis and extended to other conditions: dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted public communication messages, increased regulation capacities for example.

On the other hand, we emphasised pre-existing social health inequalities related to the management of STEMI acute care. These inequalities stem mainly from the organisation of the healthcare system. They are associated with challenges in language and health literacy, implicit bias, and the absence of culturally competent care, all contributing to less accurate medical interviews and subsequently suboptimal medical decisions. Further studies are needed to explore these hypotheses and evaluate corrective measures.

We added a specific paragraph in the discussion:

"Implications for clinical practice and health system performance

While the COVID-19 pandemic crisis is nearly resolved, our findings remain valuable for health institutions and professionals to prepare for future health crises. The structured emergency pathway for strokes and STEMI patients and hospital reorganisations ensured sustained care quality.(12) In our study, the COVID-19 crisis did not have any differential impact on social health inequalities, suggesting a good resilience of the French healthcare network. Organisational strategies employed, such as a dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted communication, and increased regulation capacities, could be replicated in new crises and extended to other conditions. Pre-existing STEMI management inequalities partly result from the healthcare system organisation. In a study about disparities in cardiovascular disease, these inequalities are linked to language challenges, health literacy, implicit bias, and the absence of culturally competent care.(8) This may lead to less accurate medical interviews and suboptimal medical decisions. Further research is essential to investigate these hypotheses and evaluate potential corrective measures." P12.

11. what could be explained in more detail is how the authors made up for the weaknesses? e.g. healthcare avoidance, is there any other studies on that topic that can provide how many STEMI or stroke patients avoided care during Covid/first wave?

We thank the reviewer for this comment. In the "weaknesses" paragraph, we tried to explain the consequences that each of the identified limitations could have.

Regarding our population database, we added a sentence to suggest that findings in the Aquitaine region may serve as a representation of results for the entire country of France.

"The sample is representative of stroke and STEMI patients managed in hospitals. However, oOur study has some limitations, particularly with regard to the population. The study area was limited to the Aquitaine region, one of the regions least affected by the first wave of the COVID-19 pandemic.(39) This situation could have led to the exertion of less pressure on health services (especially the EMS, STEMI, and stroke network). Arguments support the sample's representativeness for stroke and STEMI patients in hospitals during this period, making our results likely applicable to all of France. First, a stroke study showed that the use of care was similar regardless of pandemic intensity.(40) Second, a previous study with the same database highlighted results consistent with other French studies on the evolution of stroke and STEMI patient admissions.(12) Third, characteristics and acute management times for stroke and STEMI patients in the 'CNV registry' align with those in other French regions. It would be interesting to repeat the study in another region, or in another country more affected by the pandemic, to test the external validity of the results."P13

In France, a national health surveillance institution called "Santé Publique France" analysed the healthcare avoidance during this period (« Dynamique des admissions aux urgences pour infarctus

du myocarde et accident vasculaire cérébral durant la première vague de COVID-19 en France »). Another study analysed the characteristics associated with not seeking care (younger age, foreign nationality, living alone, and lack of general practitioner care), before and during the COVID-19 pandemic, suggesting that the population were not significantly different between these 2 periods. We added information on this subject and 2 references:

“Moreover, patients who did not enter the healthcare system because they had died or did not benefit from hospital care, as well as STEMI patients with symptoms for >24 h, were not included. The exclusion of these patients may have generated selection bias, and prevented us from quantifying the phenomenon of healthcare system avoidance that could be supposed to be more frequent among socially and/or clinically vulnerable patients during the COVID-19 crisis, as stated in a Danish study; it also entails the risk that increases in the delay to use of care were underestimated for some patient subgroups.(41) A French study revealed a 24% decrease in emergency consultations for STEMI and an 18% decrease for stroke.(42) However, a national survey analysed the characteristics associated with not seeking care, in 2017 and 2020, revealing factors such as younger age, foreign nationality, living alone, and lack of general practitioner care.(43) The proportion of patients not seeking care increased during COVID-19 pandemic, but the population was not significantly different from the one before, suggesting a limited selection bias.”P13

Regarding statistical analyses, we used the DAG method to include appropriate confounding variables:

“Our explanatory analyses yield robust results, with the inclusion of appropriate confounding variables identified by the DAG method. The large panel of data collected enabled the integration of a wide variety of confounders, including clinical characteristics and socio-geographical factors. “P14 Regarding the lack of individual-level socioeconomic data, we used a validated tool that was used in many studies conducted in France:

“Given the lack of individual-level socioeconomic data in the CNV Registry, which prevented the assignment of social determinants for each patient, we used a residence area-based measure, which is a major limitation of our study. However, we determined deprivation indices using a validated tool that has been used in many studies conducted in France.(24) Moreover, the socio-ecological measure of deprivation tends to underestimate social inequalities observed using individual data; thus, caution is advised when attributing group-level estimates to individuals.(6)”P14

12. Conclusion - "no deep change in management for stroke and STEI patients." What is interesting however is to then not only stay with the general but to give insights into which subgroups were less cared for or which differences between the groups there are and how healthcare systems could improve care for those.

We totally agree with this comment. It would be very useful to provide guidance on how healthcare systems could improve care for vulnerable patients. Our study can offer insights into organisational strategies applicable in the context of the COVID-19 pandemic, which could be replicated in the event of a new crisis and expanded to address other conditions, along with other potential implementations. However, regardless of the COVID-19 pandemic, further studies are needed to confirm and explore our results, and evaluate corrective measures.

We added precisions in the discussion and the conclusion:

"Implications for clinical practice and health system performance

While the COVID-19 pandemic crisis is nearly resolved, our findings remain valuable for health institutions and professionals to prepare for future health crises. The structured emergency pathway for strokes and STEMI patients and hospital reorganisations ensured sustained care quality.(12) In our study, the COVID-19 crisis did not have any differential impact on social health inequalities, suggesting a good resilience of the French healthcare network. Organisational strategies employed, such as a dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted communication, and increased regulation capacities, could be replicated in new crises and extended to other conditions. Pre-existing STEMI management inequalities partly result from the healthcare system organisation. In a study about



disparities in cardiovascular disease, these inequalities are linked to language challenges, health literacy, implicit bias, and the absence of culturally competent care.(8) This may lead to less accurate medical interviews and suboptimal medical decisions. Further research is essential to investigate these hypotheses and evaluate potential corrective measures." P12.

"Pre-existing inequalities in care management times observed for elderly and most disadvantaged STEMI patients, were neither aggravated nor reduced by changes in the use of care or implementation of hospital reorganisation spurred by the pandemic."P14

"Additional studies are required to explore findings related to social health inequalities in STEMI management."P14

13. on the one hand the authors write about well-structured healthcare networks yet on the other hand they mention the pre-existing inequalities in care for STEMI and stroke patients in the introduction and abstract.

We thank the reviewer for this comment. In the introduction, we refer to pre-existing inequalities in care evidenced in other studies and populations, which justify our study. Our study also evidenced pre-existing inequalities and we observed that these inequalities have not worsened during the COVID-19 pandemic. The French healthcare network is well-structured to address the COVID-19 crisis, main subject of our study, but actions are needed to enhance the access of care of vulnerable patients.

We nuanced "well—structured pathway" in the abstract and added precisions in the discussion: "Measures implemented during the crisis did not alter the well-structured emergency pathway for these patients." P2.

"Implications for clinical practice and health system performance

While the COVID-19 pandemic crisis is nearly resolved, our findings remain valuable for health institutions and professionals to prepare for future health crises. The structured emergency pathway for strokes and STEMI patients and hospital reorganisations ensured sustained care quality.(12) In our study, the COVID-19 crisis did not have any differential impact on social health inequalities, suggesting a good resilience of the French healthcare network. Organisational strategies employed, such as a dedicated life-threatening emergency pathway, transversal reorganisations aiming at concentrating resources on emergency care (12), targeted communication, and increased regulation capacities, could be replicated in new crises and extended to other conditions. Pre-existing STEMI management inequalities partly result from the healthcare system organisation. In a study about disparities in cardiovascular disease, these inequalities are linked to language challenges, health literacy, implicit bias, and the absence of culturally competent care.(8) This may lead to less accurate medical interviews and suboptimal medical decisions. Further research is essential to investigate these hypotheses and evaluate potential corrective measures." P12.

14. It would be important to address how these existing inequalities could be improved in the discussion or conclusion.

Our results were discussed with regional health authorities, emergency services managers and field experts to find opportunities for improvement. We added information in the discussion and the conclusion regarding the implications of this study for clinical practice and health system performance, particularly to anticipate any future health crisis. Regardless of the COVID-19 pandemic, further studies are needed to explore findings related to social health inequalities in STEMI management and propose appropriate corrective measures.

"Implications for clinical practice and health system performance

While the COVID-19 pandemic crisis is nearly resolved, our findings remain valuable for health institutions and professionals to prepare for future health crises. The structured emergency pathway for strokes and STEMI patients and hospital reorganisations ensured sustained care quality.(12) In our study, the COVID-19 crisis did not have any differential impact on social health inequalities, suggesting a good resilience of the French healthcare network. Organisational strategies employed, such as a dedicated life-threatening emergency pathway, transversal reorganisations aiming at

concentrating resources on emergency care (12), targeted communication, and increased regulation capacities, could be replicated in new crises and extended to other conditions. Pre-existing STEMI management inequalities partly result from the healthcare system organisation. In a study about disparities in cardiovascular disease, these inequalities are linked to language challenges, health literacy, implicit bias, and the absence of culturally competent care.(8) This may lead to less accurate medical interviews and suboptimal medical decisions. Further research is essential to investigate these hypotheses and evaluate potential corrective measures." P12.

"Additional studies are required to explore findings related to social health inequalities in STEMI management."P14

15. Why did the authors chose the region least affected by Covid-19? Can the results then be representative?

We thank the reviewer for this comment, which gives us the opportunity to improve the discussion of the weaknesses. The Aquitaine region is the only one in France to have a neuro-cardiovascular registry with both stroke and STEMI cohorts, collecting numerous variables over more than 10 years in a large panel of care structures. These parallel analyses of the impact of the first wave of the COVID-19 pandemic on the quality of care for socially and/or clinically vulnerable STEMI and stroke patients were only possible in this region.

This region was one of the least affected by the first wave of the COVID-19 pandemic with less pressure on health services. However, a number of arguments suggest that our results may be representative:

At first, the use of these two high-quality databases containing data on large number of stroke and STEMI patients and the results from a stroke study (Kansagra et al. Collateral Effect of Covid-19 on Stroke Evaluation in the United States. *New England Journal of Medicine* 2020), which highlighted that use of care did not differ according to the pandemic intensity, suggest that the sample is representative of stroke and STEMI patients managed in hospitals during this period.

Second, in a precedent study with the same database (Lesaine E et al. Effects of healthcare system transformations spurred by the COVID-19 pandemic on management of stroke and STEMI: a registry-based cohort study in France. *BMJ Open* 2022), we found consistent results with other studies conducted at the regional or national level in France, concerning the evolutions of stroke and STEMI patient inclusions.

Third, in an unpublished results report, we showed that the characteristics of stroke and STEMI patients included in our cohorts in Aquitaine are the same to those of the stroke and STEMI patients in France. We also conducted a study in collaboration with a STEMI registry in the "Ile-de-France" region, demonstrating that the acute management times are comparable between these two geographically distinct regions (results not yet published)

We have added this information in the discussion:

"The sample is representative of stroke and STEMI patients managed in hospitals. However, oOur study has some limitations, particularly with regard to the population. The study area was limited to the Aquitaine region, one of the regions least affected by the first wave of the COVID-19 pandemic.(39) This situation could have led to the exertion of less pressure on health services (especially the EMS, STEMI, and stroke network). Arguments support the sample's representativeness for stroke and STEMI patients in hospitals during this period, making our results likely applicable to all of France. First, a stroke study showed that the use of care was similar regardless of pandemic intensity.(40) Second, a previous study with the same database yielded results consistent with other French studies on the evolution of stroke and STEMI patient admissions.(12) Third, characteristics and acute management times for stroke and STEMI patients in the 'CNV registry' align with those in other French regions." P13

**VERSION 2 – REVIEW**

<b>REVIEWER</b>	Wojczewski, Silvia Medical University of Vienna Center for Public Health, Department of Primary Care Medicine
<b>REVIEW RETURNED</b>	29-Nov-2023
<b>GENERAL COMMENTS</b>	Thank you for the revisions, in my opinion all questions were answered.