

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Labour market attachment after mild traumatic brain injury: Nationwide cohort study with 5-year register follow-up in Denmark
AUTHORS	Graff, Heidi; Siersma, Volkert; Møller, Anne; Kragstrup, Jakob; Andersen, Lars; Egerod, Ingrid; Malá, Hana

VERSION 1 - REVIEW

REVIEWER	John K Yue, MD Department of Neurological Surgery University of California San Francisco San Francisco, CA, United States
REVIEW RETURNED	15-Sep-2018

GENERAL COMMENTS	<p>This is a well-written and informative article regarding rates of return to work after concussion. In total 19732 participants with concussion were followed for up to 5 years postinjury and matched with 18640 controls without concussion by age, sex and municipality. Outcome measures were return to work, health-related benefits, attachment to the labour market, and mortality. The authors found that 43% of mTBI patients were not attending "ordinary" work 5 years post trauma, stable from 6 months onwards with ORs of 1.3-1.5 compared to controls. mTBI patients were also found to have higher odds of limited or permanent attachment to the labour market and importantly OR of 2.6 for mortality. The authors should be congratulated on their sample size, subject matching, applicability of results and readability of the paper. There are sections that can benefit from clarification and improvement, for consideration below:</p> <p>Abstract:</p> <ul style="list-style-type: none">- Would recommend defining "ordinary work".- Would recommend clarifying "major neurological injuries" as what was stated in the Methods section (spine or spinal cord injuries) <p>Introduction:</p> <ul style="list-style-type: none">- First paragraph: While this can be debated, "mTBI" and "concussion" are not synonymous pathophysiological entities. Concussion may be grouped under mTBI, defined by the ACRM as external force trauma to the head with initial GCS 13-15, LOC < 30 min, PTA < 24 hours, with other criteria of alteration of consciousness etc. However, mTBI lesions are heterogeneous ranging from extraaxial injuries to contusions and diffuse axonal injury (DAI), e.g. a thin subdural with minimal mass effect in a
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subject without LOC or amnesia would not be grouped under "concussion". The U.S. Veterans Affairs administration defines any presence of intracranial radiographic lesion as at least moderate TBI. Concussion represents a collection of injuries with predominately coup/contrecoup and/or shearing forces with a grading system, and is on the spectrum of DAI. These points should be explained in greater detail.

Methods:

- It is stated that controls do not have a diagnosis of "concussion" by ICD-10. Is it possible they have another neurological or TBI diagnosis? This would be a major confounder and should be explained clearly. It is possible that Page 8, Line 23-24 is trying to explain this, but not hospital treated for "TBI (including concussion)" is confusing to this reader.

- Any methods to control for patients hospitalized for neurological disorders (e.g. tumor, stroke, MS, etc.)?

- Gainful employment is a proxy for functional outcome, which consists of multiple domains (e.g. ADLs, IADLs, physical/cognitive work capacity, social integration, PCS, QOL). The current paper lacks data on the types of intracranial injuries suffered, whether they went to the operating room or ICU, etc. which would confer different risks for outcome. Contusion or DAI have different management strategies compared to epidural or subdural hemorrhages or SAH, and there is abundant literature detailing differential risks conferred for different outcome measures at different times postinjury. It is certainly true that suffering any severity of "mild" trauma to the head can lead to risks for poorer outcomes, and if this is the rationale for the paper, it should be delineated clearly.

- I understand the systematic approach of using ICD-10 codes for inclusion/exclusion, however ICD-10 does not capture GCS, LOC, amnesia, and other clinical criteria commonly used in neurological and neurosurgical evaluation. If this data is not available, perhaps the authors may consider modifying the title with focus on "concussion" rather than "mTBI" and/or discuss in the limitations.

- Similarly, by the inclusion/exclusion criteria it is possible for controls to have severe medical and/or surgical injuries predisposing them to different outcomes as well.

- I appreciate the removal of patients with SCI or spine injuries from the dataset for the purposes of this analysis.

- I appreciate controlling for education, income level, comorbidities, and psychiatric burden.

- How was polytrauma/multisystem trauma analyzed or controlled for in this paper? There is emerging literature that the polytrauma patient has a different trajectory of recovery compared to the isolated mTBI patient.

Results:

- In general from this paper, concussed patients have 1.5 odds of not achieving gainful employment within the first 5 years compared to nonconcussed controls.

	<p>- It would be of interest and relevance to have a figure on the trajectory of outcomes in mTBI and in controls at 6 months, 12 months, ... , 5 years. For example, there seems to be an increase from 37% "not attending ordinary work" in the first 2 years to 43% at 5 years. There are subsets of concussed patients who 1) continue to improve over time and return to work, 2) who plateau and do not continue to improve, and 3) those who decline. Nevertheless, nearly one-third of nonconcussed controls and half of concussed patients in this analysis being unable to "attend ordinary work" at 5 years postinjury seems high. Were all types of gainful employment captured by the DREAM database? Conversely, was there a difference between missing data and data coded as "No" for the variable "attending ordinary work".</p> <p>- It seems from Table 2 that the odds of death are highest within the first 6 months and subsequently decline over time. This trend differs from that of gainful employment. There may be a separate set of predictors (e.g. baseline comorbidities, injury severity, availability of rehabilitation, economic sufficiency) for earlier death.</p> <p>Discussion: - In general, well-discussed.</p> <p>- Would encourage incorporation of the points stated above.</p>
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REVIEWER	Terri K. Pogoda VA Boston Healthcare System, USA
REVIEW RETURNED	13-Nov-2018

GENERAL COMMENTS	<p>Thank you very much for taking the time to write on such an important topic.</p> <p>Major Comment: 1. For Figure 1, I did not understand what was being communicated. Were these supposed to be frequencies, categories, or something else? What was the purpose of the dotted vertical lines? Separate from this, the font was also very small.</p> <p>Minor comments: 1. Page 7, line 35: Instead of "is obtained by using the possibility to link," replace so it reads "...is obtained by linking several Danish..." 2. Page 10, lines 19 & 37: add "to" in this phrase: "... granted TO citizens..." 3. Page 21, line 43: replace "extend" with "extent" 4. Page 21, line 49: consider adding "identify and" to the phrase "Initiatives that prevent" so that it reads, "Initiatives that identify and prevent the progression..."</p>
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REVIEWER	Janneke Berecki Monash University, Australia
REVIEW RETURNED	29-Nov-2018

GENERAL COMMENTS	In their study titled: "Labour market attachment after mild traumatic brain injury: Nationwide cohort study with 5-year register follow-up" the authors present a thorough and timely analysis of the impact of
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	<p>mild traumatic brain injury on labour force participation, in both short- and long-term. The strengths of this study are the use of large linked administrative databases and registers, both for selecting cases and for determining outcomes; and the use of a control group. The study is overall logical and well carried out, and well written.</p> <p>I have only one main concerns, and several minor concerns.</p> <p>Major concern</p> <p>1. The cause of traumatic brain injury is not considered in the analysis, I suspect because these data were not available. However, the cause could range from motor vehicle crash to family violence. These circumstances are very likely to result in other trauma along with the TBI. As mentioned in the limitations sections, mild traumatic brain injury does not always result in presentation to hospital. Therefore, the cohort could in fact consist of a sample of patients with TBI and a range of other injuries (which may have necessitated presentation to hospital). Although the researchers have adjusted for a commendable range of pre-injury conditions including the Charlson index and psychiatric conditions, they did not take into account injuries that occurred at the same time as the index injury. Therefore we cannot be certain that the effect on labour market participation is due to the TBI or other injuries the person may have sustained. Also, the psychological effects of certain types of trauma may have resulted in PTSD and other psychological sequelae of trauma; this is also not taken into account. In other words, the labour force detachment observed in this cohort may not be attributable to TBI. This could be addressed by identifying other morbidity that occurred on the index date, and including this in the analysis; furthermore only cases with TBI as the most severe conditions should be included.</p> <p>Minor concerns</p> <p>2. Certain causes of TBI are likely to result in repeat trauma, for example family violence. It would be good to take this into account by: 1. adjusting for any pre-index TBI incidence (or excluding these cases); and 2. adjusting for post-index TBI re-occurrence.</p> <p>3. The abstract conclusion is a bit too brief – a more elaborate and meaningful conclusion should be given in the abstract.</p> <p>4. Page 11 line 32-33: Does this refer to pre-injury income?</p> <p>5. Results: please start by describing the overall characteristics of the cohort.</p> <p>6. Why not adjust for 'Not attending ordinary work' at the index date, in subsequent analyses? It looks like this had not been done but it is not quite clear in the methods/results.</p> <p>7. As mentioned in the discussion, the increased death rate among those with TBI (particularly in the early post-TBI months/years) would be an interesting focus for a follow-up paper. Crucial to this analysis would be information on the cause of death, particularly whether externally caused; and if so, whether unintentional or intentional; and if intentional, whether suicide or assault related.</p>
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VERSION 1 – AUTHOR RESPONSE

RESPONSE TO REVIEWER 1. JOHN K YUE, MD

Institution and Country: Department of Neurological Surgery, University of California San Francisco, San Francisco, CA, United States

This is a well-written and informative article regarding rates of return to work after concussion. In total 19732 participants with concussion were followed for up to 5 years postinjury and matched with 18640 controls without concussion by age, sex and municipality. Outcome measures were return to work, health-related benefits, attachment to the labour market, and mortality. The authors found that 43% of mTBI patients were not attending "ordinary" work 5 years post trauma, stable from 6 months onwards with ORs of 1.3-1.5 compared to controls. mTBI patients were also found to have higher odds of limited or permanent attachment to the labour market and importantly OR of 2.6 for mortality. The authors should be congratulated on their sample size, subject matching, applicability of results and readability of the paper. There are sections that can benefit from clarification and improvement, for consideration below:

RESPONSE: Thank you for your comments

Abstract:

- Would recommend defining "ordinary work".

RESPONSE: We have revised accordingly

- Would recommend clarifying "major neurological injuries" as what was stated in the Methods section (spine or spinal cord injuries)

RESPONSE: We have clarified in the text

Introduction:

- First paragraph: While this can be debated, "mTBI" and "concussion" are not synonymous pathophysiological entities. Concussion may be grouped under mTBI, defined by the ACRM as external force trauma to the head with initial GCS 13-15, LOC < 30 min, PTA < 24 hours, with other criteria of alteration of consciousness etc. However, mTBI lesions are heterogeneous ranging from extraaxial injuries to contusions and diffuse axonal injury (DAI), e.g. a thin subdural with minimal mass effect in a subject without LOC or amnesia would not be grouped under "concussion". The U.S. Veterans Affairs administration defines any presence of intracranial radiographic lesion as at least moderate TBI. Concussion represents a collection of injuries with predominately coup/contrecoup and/or shearing forces with a grading system and is on the spectrum of DAI. These points should be explained in greater detail.

RESPONSE: Thank you for your helpful suggestions. Since we only include patients with S06.0 (concussion), excluding patients with major neurological injuries, we have carefully explained the clinical diagnosis of concussion (outlined in the introduction and methods section page 6 and 8).

Methods:

- It is stated that controls do not have a diagnosis of "concussion" by ICD-10. Is it possible they have another neurological or TBI diagnosis? This would be a major confounder and should be explained clearly. It is possible that Page 8, Line 23-24 is trying to explain this, but not hospital treated for "TBI (including concussion)" is confusing to this reader.

RESPONSE: We agree this is unclear. We have excluded controls with spinal cord and column injuries and traumatic brain injuries, including concussions 5 years before trauma. Additionally, we excluded patients with spinal cord and column injuries and traumatic brain injuries as secondary diagnosis to the concussion of interest during the inclusion period. We have clarified this in the text page 8.

- Any methods to control for patients hospitalized for neurological disorders (e.g. tumor, stroke, MS, etc.)?

RESPONSE: We have not adjusted for any additional neurological injuries, beyond the mentioned covariates (which have a large impact on labour market attachment and the incidence of mTBI) since we did not estimate these to be likely confounders.

- Gainful employment is a proxy for functional outcome, which consists of multiple domains (e.g. ADLs, IADLs, physical/cognitive work capacity, social integration, PCS, QOL). The current paper lacks data on the types of intracranial injuries suffered, whether they went to the operating room or ICU, etc. which would confer different risks for outcome. Contusion or DAI have different management strategies compared to epidural or subdural hemorrhages or SAH, and there is abundant literature detailing differential risks conferred for different outcome measures at different times postinjury. It is certainly true that suffering any severity of "mild" trauma to the head can lead to risks for poorer outcomes, and if this is the rationale for the paper, it should be delineated clearly.

RESPONSE: We agree that this is unclear. In the methods section we have outlined an additional explanation on the inclusion of patients with mTBI. We have only included hospital admitted patients with concussion (S06.0) as primary diagnosis, excluding patients with any other major neurological injuries secondary to the concussion of interest. Additionally, we also excluded patients suffering neurological injuries and concussion up to 5 years post-injury. Even while this study lacks specific information on injury severity from the patient's record we can rule out any type of intracranial injuries increasing the risk of adverse outcomes.

- I understand the systematic approach of using ICD-10 codes for inclusion/exclusion, however ICD-10 does not capture GCS, LOC, amnesia, and other clinical criteria commonly used in neurological and neurosurgical evaluation. If this data is not available, perhaps the authors may consider modifying the title with focus on "concussion" rather than "mTBI" and/or discuss in the limitations.

RESPONSE: We have kept mTBI in the title, but have changed to concussion throughout the manuscript. The introduction starts with a distinction between mTBI and concussion.

- Similarly, by the inclusion/exclusion criteria it is possible for controls to have severe medical and/or surgical injuries predisposing them to different outcomes as well.

RESPONSE: This study did not have access to patient records, because of the register-based design. However, we applied the same exclusion criteria for patients and controls, preventing severe neurological injuries (including concussion) 5 years before trauma and as secondary diagnosis to the concussion of interest during the inclusion period. Additionally, we only included patients available for the labour market at the index date, hence considered a proxy for functional outcome. We also adjusted for medical conditions included in the Charlson Comorbidity index and any psychiatric diagnoses given in the five-year period before trauma in the analysis. Hence, while there may be different prevalence of somatic and/or psychiatric conditions between patients and controls, these factors are adjusted for removing their confounding effects.

- I appreciate the removal of patients with SCI or spine injuries from the dataset for the purposes of this analysis.

RESPONSE: Thank you, we agree

- I appreciate controlling for education, income level, comorbidities, and psychiatric burden.

RESPONSE: Thank you, we agree

- How was polytrauma/multisystem trauma analyzed or controlled for in this paper? There is emerging literature that the polytrauma patient has a different trajectory of recovery compared to the isolated mTBI patient.

RESPONSE: We did not adjust for polytrauma/multisystem trauma. However, we only included patients with concussion as primary diagnosis, assuming patients with polytrauma would have concussion as secondary diagnosis, since polytraumas are conditions requiring extensive medical treatment.

Results:

- In general from this paper, concussed patients have 1.5 odds of not achieving gainful employment within the first 5 years compared to nonconcussed controls.

- It would be of interest and relevance to have a figure on the trajectory of outcomes in mTBI and in controls at 6 months, 12 months, ... , 5 years. For example, there seems to be an increase from 37% "not attending ordinary work" in the first 2 years to 43% at 5 years. There are subsets of concussed patients who 1) continue to improve over time and return to work, 2) who plateau and do not continue to improve, and 3) those who decline. Nevertheless, nearly one-third of nonconcussed controls and half of concussed patients in this analysis being unable to "attend ordinary work" at 5 years postinjury seems high. Were all types of gainful employment captured by the DREAM database? Conversely, was there a difference between missing data and data coded as "No" for the variable "attending ordinary work".

RESPONSE: (1) We agree. We have enclosed figure 3 outlining the prevalence and adjusted odds ratios of not attending ordinary work (primary outcome) at 6 months, 12 months and 2 and 5 years. Secondary outcomes are outlined in table 2

(2) The high percentage for not attending ordinary work up to 5 years post-injury could be explained by the wide definition of "availability to the labour market" which was a part of our inclusion criteria. The definition not only include patients gainfully employed but also being available for work, hence receiving unemployment benefits, social security benefits, integrations benefits, flex job and unemployment benefits under the flex job scheme according to the Danish welfare system. This is described in figure 1. As described in the text, flex job is for individuals with lower work capacity. Patients granted flex job before the index date (unrelated to the concussion) were also included in the study. All labour market data were extracted from the DREAM register.

- It seems from Table 2 that the odds of death are highest within the first 6 months and subsequently decline over time. This trend differs from that of gainful employment. There may be a separate set of predictors (e.g. baseline comorbidities, injury severity, availability of rehabilitation, economic sufficiency) for earlier death.

RESPONSE: We agree. We have added these considerations in the discussion section, page 20.

Discussion:

- In general, well-discussed.

RESPONSE: Thank you

- Would encourage incorporation of the points stated above.

RESPONSE TO REVIEWER 2. Terri K. Pogoda

Institution and Country: VA Boston Healthcare System, USA

Thank you very much for taking the time to write on such an important topic.

RESPONSE: Thank you for letting us revise our manuscript

Major Comment:

1. For Figure 1, I did not understand what was being communicated. Were these supposed to be frequencies, categories, or something else? What was the purpose of the dotted vertical lines? Separate from this, the font was also very small.

RESPONSE: Figure 1 illustrates social transfer payments included in the exclusion criteria, the primary outcome and in the secondary outcomes according to the Danish welfare system. We have described this in the legend.

We have removed the dotted lines and enlarged the font.

Minor comments:

1. Page 7, line 35: Instead of “is obtained by using the possibility to link,” replace so it reads “....is obtained by linking several Danish...”

RESPONSE: We have revised

2. Page 10, lines 19 & 37: add “to” in this phrase: “.... granted TO citizens...”

RESPONSE: Revised accordingly.

3. Page 21, line 43: replace “extend” with “extent”

RESPONSE: We have revised

4. Page 21, line 49: consider adding “identify and” to the phrase “Initiatives that prevent” so that it reads, “Initiatives that identify and prevent the progression...”

RESPONSE: We have revised

RESPONSE TO REVIEWER 3 Janneke Berecki

Institution and Country: Monash University, Australia

In their study titled: “Labour market attachment after mild traumatic brain injury: Nationwide cohort study with 5-year register follow-up” the authors present a thorough and timely analysis of the impact of mild traumatic brain injury on labour force participation, in both short- and long-term. The strengths of this study are the use of large linked administrative databases and registers, both for selecting cases and for determining outcomes; and the use of a control group. The study is overall logical and well carried out, and well written.

RESPONSE: Thank you for giving us the opportunity to improve our manuscript

I have only one main concerns, and several minor concerns.

Major concern

1. The cause of traumatic brain injury is not considered in the analysis, I suspect because these data were not available. However, the cause could range from motor vehicle crash to family violence. These circumstances are very likely to result in other trauma along with the TBI. As mentioned in the limitations sections, mild traumatic brain injury does not always result in presentation to hospital. Therefore, the cohort could in fact consist of a sample of patients with TBI and a range of other injuries (which may have necessitated presentation to hospital). Although the researchers have adjusted for a commendable range of pre-injury conditions including the Charlson index and psychiatric conditions, they did not take into account injuries that occurred at the same time as the index injury. Therefore, we cannot be certain that the effect on labour market participation is due to the TBI or other injuries the person may have sustained. Also, the psychological effects of certain types of trauma may have resulted in PTSD and other psychological sequelae of trauma; this is also not taken into account. In other words, the labour force detachment observed in this cohort may not be attributable to TBI. This could be addressed by identifying other morbidity that occurred on the index date, and including this in the analysis; furthermore, only cases with TBI as the most severe conditions should be included.

RESPONSE: These considerations are very important. However, we did not have access to

patient records because of the register-based design, hence information on injury mechanism and psychological effects are missing. The rationale for doing this project was to examine the effect of concussion on labour market attachment. We therefore had many exclusion criteria to ensure that labour market attachment was attributable to concussion. Firstly, we only included patients with concussion as primary diagnosis, excluding patients with polytrauma as primary diagnosis. Additionally, we excluded patients with severe neurological injuries (including concussion) 5 years before trauma and as secondary diagnosis to the concussion of interest during the inclusion period. Thank you for your suggestions, we have tried to include these limitations in the methods section page 21.

Minor concerns

2. Certain causes of TBI are likely to result in repeat trauma, for example family violence. It would be good to take this into account by: 1. adjusting for any pre-index TBI incidence (or excluding these cases); and 2. adjusting for post-index TBI re-occurrence.

RESPONSE: We agree. (1) We excluded patients with previous neurological injuries (TBI) (including concussion) 5 years before trauma and as secondary diagnosis to the concussion of interest during the inclusion period. We revised in the methods section page 8.

(2) We did not adjust for re-occurrence of TBI during follow-up.

3. The abstract conclusion is a bit too brief – a more elaborate and meaningful conclusion should be given in the abstract.

RESPONSE: We have revised accordingly

4. Page 11 line 32-33: Does this refer to pre-injury income?

RESPONSE: Yes, this is the pre-injury income measured at the index date. This has been clarified in the text.

5. Results: please start by describing the overall characteristics of the cohort.

RESPONSE: Revised accordingly

6. Why not adjust for 'Not attending ordinary work' at the index date, in subsequent analyses? It looks like this had not been done but it is not quite clear in the methods/results.

RESPONSE: We did not adjust for "Not attending ordinary work", since we did not judge this variable to be a likely confounder for the incidence of mTBI.

7. As mentioned in the discussion, the increased death rate among those with TBI (particularly in the early post-TBI months/years) would be an interesting focus for a follow-up paper. Crucial to this analysis would be information on the cause of death, particularly whether externally caused; and if so, whether unintentional or intentional; and if intentional, whether suicide or assault related.

RESPONSE: We agree. This topic is of great importance and we are inspired to include these aspects in future research. Thank you for your contribution.

VERSION 2 – REVIEW

REVIEWER	JOHN K YUE, MD Department of Neurological Surgery, University of California San Francisco, San Francisco, CA, United States
REVIEW RETURNED	21-Jan-2019

GENERAL COMMENTS	I commend the authors for their thorough address of the review comments. There remains significant morbidity from mTBI in the general population, aptly discussed by the authors of this work.
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REVIEWER	Terri K. Pogoda VA Boston Healthcare System USA
REVIEW RETURNED	06-Feb-2019

GENERAL COMMENTS	<p>A. Introduction 1. P. 6: Lines 18-20: I would be a little more precise in the definition of mTBI. It's based on loss of consciousness, memory loss for events immediately preceding or following the injury event, alteration in mental state immediately following the accident (e.g., feeling dazed or confused), or a focal neurologic deficit that may or may not be transient. As currently written, the "and" makes the manuscript's definition more restrictive than the citation that references the mTBI criteria.</p> <p>B. Methods 1. P. 8, Line 30: "....were included in the cohort BASED on their index date..."</p> <p>C. Introduction, Results, Discussion: The manuscript discusses controlling for pre-injury diseases: those captured in the CCI and psychiatric diseases. The Intro briefly discusses psychological distress as well as substance abuse. The Results (Potential</p>
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	<p>confounders) discusses that information on psychiatric diagnoses was obtained separately and controlled for.</p> <p>1. Could the authors talk a little more about the ICD codes examined for psychiatric diseases? Was it the full range of MH conditions or more limited in scope? Can the authors list the ICD codes that were entered into the analysis?</p> <p>2. Psychiatric diagnosis is captured as “No diagnosis” and “>=1 diagnosis” in Table 1. Are there any that stood out that drove the effect, such as depression, substance abuse (drugs, alcohol), or anxiety?</p> <p>D. Table 1: For the CCI category, the response options range from 0 to 3 comorbidities. Is “3” the upper bound, or should this be “3 or more”?</p> <p>E. Discussion – consider:</p> <p>1. P. 20, Line 32: “...patients are AT risk...” (not in)</p> <p>2. P. 21, line 55: “...refrain from CONSULTING a physician”</p>
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REVIEWER	Janneke Berecki Monash University, Australia
REVIEW RETURNED	04-Feb-2019

GENERAL COMMENTS	The authors have addressed my previous comments and revised the manuscript accordingly. I have no further comments.
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VERSION 2 – AUTHOR RESPONSE

RESPONSE TO REVIEWERS

Reviewer(s)' Comments to Author:

Reviewer: 1

Reviewer Name: JOHN K YUE, MD

Institution and Country: Department of Neurological Surgery, University of California San Francisco, San Francisco, CA, United States

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

I commend the authors for their thorough address of the review comments. There remains significant morbidity from mTBI in the general population, aptly discussed by the authors of this work.

RESPONSE: Thank you for your comments

Reviewer: 3

Reviewer Name: Janneke Berecki

Institution and Country: Monash University, Australia

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

The authors have addressed my previous comments and revised the manuscript accordingly. I have no further comments.

RESPONSE: Thank you for your comments

Reviewer: 2

Reviewer Name: Terri K. Pogoda

Institution and Country: VA Boston Healthcare System, USA

Please state any competing interests or state 'None declared': I have no competing interests.

Please leave your comments for the authors below

A. Introduction

1. P. 6: Lines 18-20: I would be a little more precise in the definition of mTBI. It's based on loss of consciousness, memory loss for events immediately preceding or following the injury event, alteration in mental state immediately following the accident (e.g., feeling dazed or confused), or a focal neurologic deficit that may or may not be transient. As currently written, the "and" makes the manuscript's definition more restrictive than the citation that references the mTBI criteria.

RESPONSE: Thank you for your comments. We have revised accordingly.

B. Methods

1. P. 8, Line 30: "...were included in the cohort BASED on their index date..."

RESPONSE: We have revised accordingly

C. Introduction, Results, Discussion: The manuscript discusses controlling for pre-injury diseases: those captured in the CCI and psychiatric diseases. The Intro briefly discusses psychological distress as well as substance abuse. The Results (Potential confounders) discusses that information on psychiatric diagnoses was obtained separately and controlled for.

1. Could the authors talk a little more about the ICD codes examined for psychiatric diseases? Was it the full range of MH conditions or more limited in scope? Can the authors list the ICD codes that were entered into the analysis?

RESPONSE: We have added a description to the methods section page 12.

2. Psychiatric diagnosis is captured as "No diagnosis" and ">=1 diagnosis" in Table 1. Are there any that stood out that drove the effect, such as depression, substance abuse (drugs, alcohol), or anxiety?

RESPONSE: We find this question very interesting, however, it was not a part of the research question concerning labour market attachment. In table 1 we showed that a psychiatric diagnosis is related to mTBI and therefore considered a potential confounder. Instead, we have planned to do a national register-based study targeting specific psychiatric diagnoses in a similar mTBI population.

D. Table 1: For the CCI category, the response options range from 0 to 3 comorbidities. Is "3" the upper bound, or should this be "3 or more"?

RESPONSE: We have revised accordingly

E. Discussion – consider:

1. P. 20, Line 32: “....patients are AT risk...” (not in)

RESPONSE: We have revised accordingly

2. P. 21, line 55: “....refrain from CONSULTING a physician”

RESPONSE: We have revised accordingly