Author’s response to reviews

Title: Factors associated with hospital length of stay and hospital charges of road traffic-related injuries in Iran

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Factors associated with hospital length of stay and hospital charges of road traffic-related injuries in Iran

Dear Editor

Please find enclosed a revised version of our paper entitled” Factors associated with hospital length of stay and hospital charges of road traffic-related injuries in Iran”. Based on the comments of the reviewers, changes have been made (and highlighted) to the manuscript. An outline of modifications is attached.

We hope that, in its revised version, you will find the manuscript acceptable for publication.

Yours sincerely,

Hassan Haghparast-Bidgoli, Soheil Saadat, Lennart Bogg, Mohammad H Yarmohammadian and Marie Hasselberg
Outline of modifications

Reviewer’s report:

Authors highlight some findings that are actually not statistically significant. In addition, they discuss potential reasons for higher charges for motorcyclists and shorter LOS for car occupants (second paragraph of page 11) when in fact multivariate models do not show any of these differences after adjusting by co-variables.

In response to the comment of the reviewer, based on the results in the Tables 4 and 5 of the ordinal regression model (previous version of the paper), motorcyclists had higher hospital charges and car occupants had shorter LOS and their associations was significant. The same results were obtained in the linear regression (Tables 4 and 5 in the revised version of the paper).

As solicited by reviewer 1, authors should give a formal definition of RTI in terms of specific ICD-10 codes. From V01-V99 there are traffic and non-traffic subcategories of the external causes. This request was not addressed in their reviewed version.

In line with the comment of the reviewer, we have corrected the ICD codes in the method section (page 5). The codes V01-V89 in ICD-10 are traffic-related accidents.

Authors say that the log transformation of the cost variable did not result in a normal distribution of the dependent variable. However, the linear regression assumption is not under the dependent variable itself but under the distribution of the model residuals. I agree with reviewer 1 in that multiple regression analysis could be a better approach to the billed charges variable.

According to the suggestion by the reviewer, we used log transformation of hospital charges and LOS and conducted linear regression. The results are presented in the Tables 4 and 5. As it can be seen from the tables, the results are slightly different from the ordinal regression model.

Instead of using a dummy variable for each category of road user (which would result in a collinearity problem), I recommend the introduction of the variable as categorical, using any category as the reference. For example in the hospital charges final model, the implicit reference category is pedestrians & car occupant.

In response to the comment of the reviewer, to treat road users as a categorical variable, it is necessary to assume a linear change of the dependent variable among categories of road users. To avoid this assumption, we chose to recode this variable as a dummy variable.
In the LOS final model, the reference category is pedestrians & motorcyclists). From my perspective this approach would not be correct. This comment would also apply for the occupation variable.

The aim of regression analysis was to assess the significance of association between the outcome variable and a specific explanatory variable, adjusted to the other explanatory variables. We did not aim to predict the value of the outcome variable based on the values of explanatory variables. Therefore, we did not define specific reference categories. The dummy variables should be interpreted as “being motorcycle driver compared to not being a motorcycle driver”, for example. In other words, we did not aim to examine how different the LOS of Motorcycle drivers was compared to pedestrians (or any reference category); Instead, we just examined if there was any difference between LOS of motorcycle drivers compared to “all other road users”.

**Major revisions:**

The use of “hospital costs” through the document is misleading. Sometimes is used as synonym of “billed charges”. Billed charges in the context of this particular study refer to what patients/insurance companies are required to pay and not to resources that hospitals are employing to provide medical care to RTI patients. Authors clarify this in the discussion section (page 13) but I think this should be corrected also in the document.

In line with the comment from the reviewer, we now corrected and replaced “hospital costs” with “hospital charges” throughout the paper.

Authors should provide more information on how they handled the “type of road user” and “type of occupation” variables in both of the full models. As it is presented in tables 4 & 5, it is not clear given that if all categories of those variables are incorporated in the model a collinearity problem would arise (authors say that the “other” categories were not included in the analysis). The problem is that “Other occupations” represent 51.1% of the sample and “other road user” represents 1.6%.

According to the suggestions by the reviewer, we included “other occupations” in the new linear model (considering their high frequency) but “other road users” was not included in the model.

Categories of occupation, education, road user and all other categorical variables were mutually exclusive.

In footnotes of table 2 says that patients with 0 charges are patients that their charges were waived by the hospitals by different reasons. From the response to my comments, I had understood that the analysis was performed in the billed charges (which include costs of all services the patient received in the hospital) not under
actual payments. If billed charge is 0 for those who were exempted from their payments, the dependent variable has a great limitation.

In line with the comment of the reviewer, there were only 74 patients with 0 hospital charges among the RTI patients which we removed from the regression model (the majority of these patients had a minor injury which could not affect the results dramatically).

**Minor essential revisions:**

Authors clarified that only those injured that spent at least 24 hours at the hospital were part of the study sample. The first category of LOS that was incorporated in the revised version is then wrong (<=1). The “<” sign should be deleted. This also applies for table 4. In addition, categories of hospital charges are not mutually exclusive and should be corrected in the text (page 6).

We are thankful that the reviewer noticed the errors in reporting the ordinal scales of LOS and hospital charges.

In page 10 authors discuss the potential reasons of differences found both in education and in occupation groups. In both cases authors stay that this might be explained by severity of injuries, although final multivariate model was adjusted by severity (so this would not be the case).

We agree with the reviewer that severity of injury cannot be the explanation (at least not directly) since we adjusted for that in the model. One explanation could be more complications (multiple injuries) among the patients with severe injury and need for expensive procedures such as surgery (which also cause more LOS in most cases). Moreover, research suggests that people with higher education, in general, have lower risk of injury and hospitalization (well-documented), and in addition some research in other fields than injury (mainly chronic diseases) have shown that these group of people have better recovery of illness due to better self-care, compliance and some other factors. This could be true about injured patients too, but more research needs to be done in this area.

Some figures are not rounded correctly when used in the text. For example: 49.6% would be 50% not 49. 77.5% would be 78% not 77. Other figures do not correspond to what is presented in tables (i.e. text says that 48% belong to the “other” occupational group whereas in table 1 it is 51.1%).

In line with the comment of the reviewer, we have corrected the figures in the text (page 6).

Text says that motorcyclists and blue collar workers are associated with higher hospital charges. Table 4 seems to say the opposite. Text says that being a farmer
and blue-collar worker were associated to longer LOS, whereas table 5 apparently shows opposite results.

In the ordinal regression model, “being motorcyclist” compared to “not being a motorcycle driver (or other road users)”. The coefficient in the table is -0.18 for “not being a motorcycle driver”, then being a motorcyclist had higher hospital charge. The same interpretation is true for blue-collar worker.

The same results (higher hospital charges for being a motorcyclists and blue-collar worker) were obtained in the linear regression (Table 4, new version of the paper).

In page 10 authors say that insured patients paid less due to the subsidized care for them. Do they mean “insured patients were charged/billed less” If hospitalization charges included both, patients and insurance’s shares, then it would not be correct to say that patients paid less because their bill was lower (authors explain that shares by patients are different depending on the insurance company: 15-25%).

The results of the univariate analysis showed that patients with insurance stayed longer and were charged more compared to patients without any type of insurance, but after adjusting for socio-economic variables, the patients with insurance charged less for different reasons. However, this relationship (still negative) is not significant in the linear model (table 4, new version of paper).

**Discretionary Revisions:**

If category of “other road user” is not going to be used in the multivariate analysis, then I would recommend eliminating these subjects from the study and focus only on the road users of interest.

In line with the comment of the reviewer, the category “other road users” was not included in the multivariate model but it was included in the descriptive table (Table 1) to reflect its proportion compared to the other categories.