Reviewer's report

Title: Establishing a Proactive Safety and Health Risk Management System in the Fire Service

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Reviewer: Jennifer Taylor

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This is a complex examination of the application of risk management within a fire department. The evaluation of risk management was divided into two processes: (1) the task-based application of risk management, and (2) a process of evaluation of participants involved in the risk management application. Because this is a large and conceptual body of work, I have several recommendations to strengthen the clarity and therefore the reader’s comprehension of what the investigators found.

First this is not a traditional research design that can be easily evaluated using standard practices. For writing clarity, it would be helpful if the investigators could provide a timeline of what was done exactly when in the study. This includes the scoping process, the risk assessment, and the process evaluation. It is not exactly clear the time stamps for each of these activities and how much they overlapped if at all. This will also help fire departments and researchers understand the time commitments needed to carry out this type of work.

Again, because of the complexity of design, it would make it more comprehensible for the reader if the methods and results for the risk management part were sequential, then followed by the methods and results for the process evaluation part. Adhering to the strictures of scientific writing weakens the ability of this paper to convey its findings. The process evaluation qualitative results are so fluid and clear that they read as if by a separate investigator. Keeping the methods and results sequential for each part of the study will add clarity and voice to their findings.

Furthermore, the authors are cautioned to stay away from traditional language such as “hypotheses”, since these are not tested in the manuscript. Again, this is not what the paper is about, but using such terms will mistakenly guide the reader to look for results reflecting the design. For example, the authors make very strong statements about how risk management processes reduce injury and they extend these implications to their own fire department. However, there is no place in the manuscript for the presentation of even anecdotal information about the reduction of injuries in their study population. Therefore, it is recommended to the authors that they closely adhere to their actual methods and let the reader assess if they believe it could be potentially useful for the reduction of injuries. Ex. The methods section of the ABSTRACT definitely leads the reader to anticipate that the authors are going to show reduction of injuries during the
activities for which they conducted risk assessments.

A strength of this manuscript is that it proffers the barriers and challenges the investigators observed during the launch of their intervention. Their findings are resonant with this reviewer's field-based observations.

Overall, I enjoyed this paper and think it with reorganization it will be immediately useful and impactful.

Now, I will begin to walk through the manuscript page by page beginning with the background. Some comments are to clarify assumptions that the authors have made about the reader's knowledge, and I leave it up to the authors' judgment on how deeply to clarify. These clarifications will greatly strengthen the paper.

Background (page 4) line 55: it is unclear what the authors mean by "formal" as opposed to informal. Please clarify and explain. Line 57: the "duty of care" stance needs to be described.

Background (page 6) lines 107 through 109: describing their previous studies, the authors posit that risk management is the reason for lower injury rates in the United Kingdom compares to other countries. While this is most probably cited in that manuscript, the authors should note if they controlled for variances in structure and oversight of the fire service in these countries as many of them have a formal fire service (as opposed to the United States).

Lines 112 through 114: as was mentioned in the beginning of this review, the authors are using terms that imply they are going to evaluate injury rates. Since this is not the case in the data presented in this paper, it is advised that the authors adhere the intent of this particular study as designed.

Lines 116 through 118: I don't think these abbreviations are commonly known and so the actual words should be used throughout the manuscript. It makes the reader's comprehension much stronger.

Line 118: again as previously mentioned, the authors are citing that they have hypotheses when the design of this study does not support the evaluation of hypotheses.

Methods (page 7) lines 138 two 141: the authors cite the use of the workplace risk assessment and control form. There is no citation for this or mention of its provenance. The author should clarify this and include it as an appendix to the paper, as an online supplement, or provide a web link. This will make discovery of the instrument more immediate for the fire service.

Methods (page 9) a timeline of the study's process should be visualized in the paper. Please see the leading comments of this review.

Methods (page 10) line 203: the authors should explain why they collected both qualitative and quantitative data during the process evaluation and only presented qualitative results.
Line 207: it is usual for the initials of the member of the study team who conducted certain aspects of the research to be parenthetically inserted. This would be best placed after, "a member of the study team…"

Line 211: it is usual that focus groups and interview instruments are included as part of the appendix or as an online supplement to the manuscript. As these were not previously submitted, the authors are encouraged to do so.

Discussion (page 22) lines 484-485: citations should be given for all instruments (Haddon, HAZOP, etc) as the fire service and research audiences may not be familiar with them.

Discussion (page 23) line 500: the authors ignore in their assessments of strengths and weaknesses, part of the comments from the participants regarding policies and practices as being essential for strong risk management implementation. As was said in the beginning of these comments, there are very strong structural differences in fire service organization between the UK and United States. It is not just the challenges of administering the intervention, or the financial conditions under which fire departments were operating, but the very structure of the United States fire service in that there is not one master agency under which it resides.

Discussion (page 24) line 515 through 518: please see the comments at the beginning of this review in which the authors are cautioned to use words such as “hypotheses”, since it is clearly stated in the discussion that the results of the risk management process was that the firefighters "looked upon favorably" the intervention. It is unclear if this statement constitutes the "adoption" the authors were looking for as stated on page 7. This should be clarified in order to make consistent the goals of the study and the findings. Essentially, the authors are using the wrong terms of art for qualitative research (hypothesis testing not being among the usual parlance).

The observations described in the results and the discussion have strong face validity from the perspective of this reviewer who also works with the US fire service. I think the investigators did a very good job bringing forward the stories of their participants. Information shared with the investigators is clearly reflective of a strong trust relationship between them and the fire department.

Table and figure comments

Table 2: in the first section, “Clawson” is not a recognized term. Please define as a footnote to the table. Likewise “SPIFi” is not a recognized term and the acronym should be spelled out.

Table 3: it is curious that post risk management perceptions of injury were not conducted at some point during the three-year interval. If the authors collected such information, it would be very helpful to include. It would be reflective of an internalization of the risk management process demonstrating autonomy and self-efficacy in the control of injury.
Table 4 was exceedingly clear and should be very helpful to the fire service and its researchers.

Currently, the United States fire service suffers from a lack of evidence-based intervention opportunities to address its health and safety concerns. This study is one of only a few organizational examinations available to help the fire service stay on the safety trajectory to which it currently aspires.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests