Author's response to reviews

Title: Evaluating implementation of methicillin-resistant Staphylococcus aureus (MRSA) prevention guidelines in spinal cord injury centers using the PARIHS framework: a mixed-methods study

Authors:

Salva N Balbale (Salva.Balbale@va.gov)
Jennifer N Hill (Jennifer.Hill3@va.gov)
Marylou Guihan (Marylou.Guihan@va.gov)
Timothy P Hogan (Timothy.Hogan@va.gov)
Kenzie A Cameron (k-cameron@northwestern.edu)
Barry Goldstein (Barry.Goldstein@va.gov)
Charlesnika T Evans (Charlesnika.Evans@va.gov)

Version: 2
Date: 22 April 2015

Author's response to reviews: see over
Dear Dr. Sevdalis,

I thank you for sharing the helpful comments regarding the manuscript entitled “Evaluating implementation of methicillin-resistant Staphylococcus aureus (MRSA) prevention guidelines in spinal cord injury centers using the PARiHS framework: a mixed-methods study.” We have now addressed these comments in the attached revised manuscript and responded to each comment, point-by-point, below. We have attempted to thoroughly address each comment in the revised manuscript while adhering to the formatting guidelines for *Implementation Science*. All changes made in the manuscript have been tracked.

**Response to Reviewers' comments:**

**Reviewer #1:**

This is a well written and interesting article. I suggest it proceed to publication if the following major and minor revisions can be addressed:

1. The time frame of data collection (2-3 years after implementation) should be specified precisely in the abstract, rather than characterising this as a survey of "early" experiences of implementation.

**RESPONSE:** We thank the reviewer for raising this issue. We have now clearly specified the time frame of data collection in the Abstract, Background and Methods as 2-3 years after implementation. Given that the roll-out of the SCI/D MRSA prevention guidelines is part of a longer term strategy for VA providers to prevent MRSA in SCI/D Centers, we felt that an evaluation in the initial years post-implementation would be best described as an evaluation of “early” experiences with guideline uptake.

2. Although it is not the focus of the paper, the authors should comment not just on the perceived strength of evidence for each component of the bundle, but describe the ACTUAL
strength of evidence for each component. If certain components are less supported by evidence, it is unsurprising that staff do not take them all equally seriously. This is particularly relevant here as the active component of the VA intervention has been questioned:

- http://cid.oxfordjournals.org/content/54/11/1618.long
- http://cid.oxfordjournals.org/content/54/11/1621.long
- http://cid.oxfordjournals.org/content/55/7/1027.long

RESPONSE: We agree with the reviewer that the actual strength of evidence underlying the guidelines is important to discuss in the context of guideline implementation. We have now included the references above and comment on the actual strength of evidence for each component in the Background on Pages 5-6 with the following text: “The initiative was based on evidence from the Centers for Disease Control around management of multidrug-resistant organisms in health care settings [11]. Although research evidence clearly supports the components of the guidelines related to hand hygiene, contact precautions, and the presence of leadership and culture change [12,13], the strength of evidence underlying the universal screening and isolation strategy is less clear [14].”

3. Please clarify LISTSERVs - not all readers will be familiar with the term, although they might guess at its meaning.

RESPONSE: We have now clarified the term “LISTSERVs” in the Methods on Page 7.

4. The absence of MPC survey data is striking, as the authors collected it but failed to report it. Why was this omitted? Was there a particularly low response rate? It would actually be informative to read it, to understand their (MPCs') perceptions of the success/failure of the implementation, and whether those correlated with the views of frontline staff. If they differed widely, it would suggest that extra training for MPCs is warranted and might improve staff uptake.

RESPONSE: The MPC survey extracted data primarily around current policy and prevention practices outlined in the SCI/D MRSA prevention guidelines (eg. Whether or not MPCs rescreen patients). The survey did not focus on MPC perceptions of guideline implementation. These data were collected as part of a broader effort to characterize existing provider practices to prevent MRSA in SCI/D units after the guidelines were released. Of the 23 MPCs nationally, 15 completed the survey (65.2% response rate). For the purpose of this paper, however, we omitted these data as we felt that they were not directly relevant to our evaluation of guideline implementation and our goal of describing providers’ perceptions around implementation.

5. The meaning of this sentence is quite opaque, although what the authors perhaps mean becomes clearer later in the Methods section: "Responses to a set of survey questions about current practices were determined by the research team to be critical to guideline implementation [23]".
RESPONSE: We have now rephrased this sentence on Page 8 in the Methods section to make its meaning clearer: “The research team selected survey questions about current practices that were critical to guideline implementation [27].”

6. Important correction: The chi square test in table 1 shows a significant difference between the frequency of staff groups' perceptions of fully implemented guidelines. The authors assert that nurses are significantly more likely to report full implementation: this is an incorrect interpretation. To properly assess the driver of the chi square p value, my understanding is that a brief post hoc analysis (e.g. with Bonferroni correction) would be required.

   The same applies to the authors' contention that staff in inpatient settings are 'significantly more likely' to report full implementation.

RESPONSE: We thank the reviewer for raising this issue. Our understanding is that a global chi-square can be used to compare variables with more than two categories. In order to address the reviewer's comment and to better assess the driver of the p-value (p=0.035), we have now conducted chi-square tests comparing the two groups and using the “nurse” group as a reference. Nurses were more likely to report full implementation compared to other staff, but were similar in comparison to physicians. We have now updated Table 1 to reflect this. Additionally, we have updated the corresponding sentence in the Quantitative Survey Results on Page 12 to read: “Nurses were significantly more likely to report full implementation of the guidelines compared to other positions, but were similar in comparison with physicians (Table 1).” In addition, we comment on this finding in the Discussion on Page 24: “We found that nurses were more likely to report full implementation of the guidelines compared to other providers, perhaps due to responsibilities and activities that require nurses to be more aware of the recommended prevention practices.”

Regarding the statement that staff in inpatient settings were significantly more likely to report full implementation, we now realize that we reported an incorrect p-value due to a typographical error. Thus, we have corrected the p-value in Table 1 and removed any mention of the incorrect result (originally on Page 12).

7. The results should clearly specify the percentage of eligible providers who replied, of the total ELIGIBLE provider group. This would more accurately reflect the degree to which respondents represented the desired population.

RESPONSE: We have now specified the percentage of eligible providers who replied of the total eligible provider group in the Results on Page 11.

8. The results should clearly specify the percentage of each provider type who responded.

RESPONSE: We have now included the percentage of each provider type who responded in the Results on Page 11.
9. The 'Qualitative themes' section (physical therapist) mentions a disconnect in guideline awareness between newer staff and more experienced staff. Was this supported by the quantitative evidence? This would guide reinforcement efforts - should new staff have a more comprehensive induction, or is it more important to reinforce the message to existing staff?

**RESPONSE:** We reviewed our data to explore any potential disconnect as mentioned in the qualitative themes and found that this was indeed supported by quantitative evidence. To address this and other reviewer comments around guideline awareness, we now show these and other relevant frequencies and chi-square test results in a new table (Table 4) where we explore guideline awareness in more depth, including comparing awareness between staff who had been working with SCI/D patients for 0-2 years, 3-5, 6-8, and 9 years or more. We noted a mild trend that guideline awareness was higher among providers in the initial years of their SCI/D work experience. We now mention this finding in the Results on Page 13: “Guideline awareness was strongest among providers in the initial years of their experience in working with SCI/D patients.” We also comment in the Discussion on Page 24: “Our findings also showed that guideline awareness was strongest among providers in the initial years of their work experience with SCI/D patients, suggesting a need for enhanced reinforcement of the guidelines targeted to more experienced providers.”

10. Other work suggests the level of nurse education (BSRN etc.) is important for patient safety. Was there any correlation between the level of nurse education and their perception of guideline implementation? Would investment in formal nurse education be appropriate, or supported by this data?

**RESPONSE:** We revisited our data to determine possible correlation between level of nurse education and perceived level of guideline implementation, but this did not generate a significant result and we are thus unable to draw any conclusion from these data regarding formal nursing education. We now mention this briefly in the Results on Page 12: “We found no significant difference in perceived level of implementation across levels of nurse education.”

11. What was the final make-up of the interview sample in the second phase? How many of each provider participated?

**RESPONSE:** The final make-up of the interview sample (n = 30) included 16 nurses (8 registered nurses, 7 Bachelor of Science registered nurses, 1 certified nursing assistant); 9 physicians; 4 physical therapists; and 1 physician assistant. Three of the nurses were also MPCs. We have included this information now on Page 13 under Results: Qualitative Themes.

12. “formal training organised and led by SCI chiefs and MPCs was an important contextual facilitator” - context & facilitation are two separate PARIHS categories, so if the authors wish to keep to the PARIHS structure, they should revise this. References to leadership support / training / education appear in both context and facilitation sections. They should be categorised and described under just one of these headings.
RESPONSE: We thank the reviewer for highlighting this issue; we do wish to maintain the PARiHS structure. We have now revised the sentence mentioned above to exclude any mention of “context” and moved it to the Facilitation section. Additionally, we re-evaluated the data described under Context and Facilitation and revised the text under Context, moving the references to leadership support, training and education to the Facilitation section. The Context section now focuses primarily on guideline awareness and familiarity, while the Facilitation section addresses leadership support, as well as training and education to enable implementation.

13. Do the results (qualitative or quantitative) support an emphasis on a leadership strategy, or a focus on education & training? Other institutions would want guidance on the most effective strategy, if one can be identified.

RESPONSE: We believe that these results support an emphasis on improved provider education and training. We learned from the quantitative findings that many SCI/D providers were not aware of the guidelines, and additionally, many felt that the guidelines were not fully implemented in their SCI/D Center. From the qualitative findings we learned that guideline dissemination and awareness has not been consistent across the range of SCI/D providers, and furthermore, that training and education efforts have been varied across sites. Conversely, qualitative data showed that most providers in this sample perceived leadership support to be strong. We have now included the following text to address this comment on Page 24 in the Discussion section: “In light of these data and the SCI/D community's need to obtain chronic care from a variety of providers, strategies that focus on education and training for all SCI/D providers are needed.”

14. Some discussion of dissonant results would be helpful. E.g. there was no significant difference in beliefs that MRSA colonization / transmission could be prevented.

RESPONSE: To some extent, these dissonant results may be explained by barriers to implementation experienced by providers (regardless of perception of implementation) and a disconnect between provider perception and actual practice. The barriers to following infection prevention guidelines, referenced in this study and others, result in a lack of adherence to the guidelines despite provider knowledge, perceptions and motivation to follow them; we believe this disconnect may explain the dissonant results found across perceived levels of implementation. We have now included the following paragraph to address these and other dissonant results in the Discussion on Pages 22-23: “Provider perceptions and attitudes affect implementation of precautions to prevent transmission of drug-resistant pathogens such as MRSA, but a key lesson from this and other studies is that perceptions and attitudes alone may not be sufficient to fully implement best practices or guidelines for prevention [22,40]. As evidenced in our work, barriers to implementation included lack of awareness of the guidelines, and challenges in following contact precautions, cohorting and isolating MRSA-positive patients. Similarly, Seibert and colleagues found that adhering to hand hygiene and contact precautions was challenging for providers even though they felt that they had knowledge and ability to do so [40]. These barriers result in a lack of adherence to the guidelines in spite of provider knowledge, perceptions and motivation to follow them, and point to a disconnect between provider perceptions and prevention practices. This disconnect may explain some of the dissonant results we noted across perceived levels of implementation.”
15. Some discussion of what an MPC should be doing would be helpful (see earlier comment about their absence of their comments in the survey data). Close work with the MPC wasn't significantly different between groups, whereas having someone OTHER than the MPC responsible for guideline implementation was significantly different.

**RESPONSE:** As delineated in the VHA Directives for the MRSA Prevention Initiative, the role of a MPC is to oversee implementation of and compliance with the guidelines, engage and support front-line health care workers and patients in the Prevention initiative, and to serve as the main liaison working with leadership around local prevention operations. It is important to note, however, that beyond the MPC, patients at SCI/D Centers routinely receive care from an interdisciplinary team of providers. In interpreting our data, we found that if the MPC was helpful, the site was able to achieve full implementation; however, if there was a strong group of SCI/D providers, they were able to successfully support MRSA prevention activities. We have now added a brief description of MPCs to the Discussion on Page 23 and commented on the result the reviewer mentioned above: “In addition, we found that the presence of local MPCs, whose role centers on overseeing compliance with the guidelines, was often helpful for implementation; however, a strong group of SCI/D providers could effectively support MRSA prevention activities. This is particularly important in the SCI/D setting given patient needs for interdisciplinary, integrated and team-based care.”

16. Important addition: authors should try to correlate their data with patient outcomes. Is there any evidence that centres where staff feel guidelines are fully implemented have better MRSA outcomes?

**RESPONSE:** We agree with the reviewer that correlating our data with patient outcomes would be an important addition to this manuscript; unfortunately, we do not have individual-level outcome data and are, thus, unable to address this.

17. Physician assistants and physical therapists generally reported in interviews that they didn't learn about the guidelines. Does this correlate with the survey data? These staff spend a lot of time in hands-on contact with patients – should they be a focus for training / guideline dissemination specifically?

**RESPONSE:** We reviewed the relevant survey data based on the reviewer’s comment/question and produced Table 4 to explore guideline awareness across provider position and other characteristics. To some extent, survey data do align with the qualitative data. We conducted chi-square tests to compare awareness across the provider groups, using “nurses” as the reference group. We have now included this in the Results (on Page 13) with the following text: “A smaller proportion of physical therapists and assistants reported being aware of the guidelines compared to nurses. We noted a mild trend showing that physical therapists and assistants were less likely to be aware of the guidelines compared to nurses, but this was not statistically significant.” In addition, we now comment in the Discussion (on Pages 23-24) on the need for guideline dissemination, training and education that reaches these providers given, as the reviewer noted, their extensive hands-on contact with SCI/D patients: “Further, future efforts
should ensure that guideline dissemination reaches the full range of providers that care for patients with SCI/D and should focus on disseminating guidelines to providers with hands-on contact with patients in inpatient and other SCI/D care settings... Next, education around the guidelines should be provided frequently to all SCI/D providers, and should focus on SCI/D-specific recommendations for MRSA prevention. In light of these data and the SCI/D community’s need to obtain chronic care from a variety of providers, strategies that focus on education and training for all SCI/D providers are needed."

Minor Essential Revisions:

18. Two full stops at end of sentence "Interview questions related to perceptions of early efforts to implement the SCI/D MRSA prevention guidelines and the range of facilitating or impeding factors influencing their implementation."

RESPONSE: We thank the reviewer for highlighting this error on Page 10. We have now corrected it.

19. "we used the qualitative interview data to examine the PROVIDE perspective” (should be provider)

RESPONSE: We have now corrected this error on Page 13 to read “provider.”

Reviewer #2:

This paper addresses an important issue in healthcare: the barriers and facilitators relating to the early implementation of clinical guidelines. From a methodological perspective, it serves as a test case for using the PARiHS framework as an evaluation tool in this setting. The design of the study is a mixed methods analysis, using a quantitative survey across all 23 centres supported by focused qualitative interviews.

RESPONSE: We thank the reviewer for her feedback and welcome the opportunity to respond to each specific comment below.

Major compulsory revisions

A strength of this paper was the mixed methods approach. However, the qualitative themes were developed predominately at the ‘elements’ level of the PARiHS framework (context, evidence and facilitation). Detailed exploration at the ‘sub-element’ level was lacking therefore the qualitative interview findings are not substantially different from the survey results. The qualitative interviews should have provided opportunities for exploring the sub-elements in detail, to enable a more comprehensive evaluation of guideline implementation. For example, in
the second paragraph of the Discussion section, contextual and facilitation-related factors drawn from the interviews are described as, ‘variations in familiarity or awareness of guidelines, provider training and local leadership support of implementation.’ The PARiHS framework offers the scope to evaluate why these variations existed: did the culture of the organisation or teams encourage guideline awareness; what was the approach to training (enabling/empowering or didactic); and how did the leadership style (traditional or transformational) in the unit impact on the adoption of guidelines? Exploring and evaluating these sub-elements in detail would improve the originality and relevance of the paper for the audience.

RESPONSE: We agree with the reviewer that further exploration of our results in the context of the PARiHS sub-elements would enhance the manuscript’s originality and utility. We have now expanded our Results: Qualitative Themes (Pages 13-21) to discuss several sub-elements that, based on interview data and analyses, were most relevant to implementation of the SCI/D MRSA prevention guidelines.

1. Is the question posed by the authors new and well defined?
   The question posed by the authors is new, in so far as the type of guidelines and setting is concerned. The elements of the PARiHS framework quoted in this paper (context, evidence and facilitation) have been developed in a more recent paper using an updated definition, ‘a planned facilitated process involving an interplay between individuals, evidence, and context to promote evidence-informed practice.’ (1) The authors might consider the implications of this definition for their question and results.

RESPONSE: We had previously included this reference (Rycroft-Malone et al 2013) in the manuscript Introduction on Page 7; we have now used this same reference, and definition mentioned above by the reviewer, to comment on its implications of our results on Pages 24-25 in the Discussion: “Our results illustrate the ways in which implementation in the SCI/D setting is shaped by a combination of contextual, evidence and facilitation factors; this aligns with recent literature demonstrating that implementation is a facilitated process that rests upon interactions between individuals, evidence, and context [25].”

The title does not reflect the authors’ reference to ‘early implementation’ throughout the paper. The term ‘early’ would benefit from a clear definition and rationale. Given that the survey was carried out in August 2010, two years after the guidelines were available for implementation, it is questionable whether the implementation was ‘early’, if providers were asked to comment on their perceptions at the time of the survey.

RESPONSE: We agree with the reviewer that the term “early implementation” warrants a clear definition and rationale. The national roll-out of the SCI/D MRSA prevention guidelines was part of a longer term strategy for VA providers to prevent MRSA in SCI/D Centers; in this context, we felt that it would be most appropriate to label an evaluation within the initial years post-implementation as an evaluation of “early implementation” of the guidelines. In order to address Reviewer #1’s comment around this same issue, we have now specified the time frame of data collection in the Abstract, Background and Methods as 2-3 years after implementation, but would like to emphasize through the manuscript that this is still an evaluation of “early implementation” in VA SCI/D Centers.
2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?

The use of a mixed methods study is appropriate but the methods section would benefit from a clearer explanation of how the PARiHS framework was used to evaluate the implementation. A mapping table relating the survey questions/semi-structured interview questions to the elements and sub-elements of the PARiHS framework would be a useful appendix. Similarly an explanation of how the emerging themes from the qualitative study were mapped to the PARiHS framework would be helpful.

RESPONSE: We agree with the reviewer that this would be helpful information. As appendices/additional files, we have now included two tables that address these comments: Appendix A includes a table that maps the survey and interview questions with the PARiHS elements and sub-elements, and Appendix B includes a table maps our qualitative themes to the PARiHS elements and sub-elements.

Reaching an understanding of the methods is complicated by the need to refer to a related study of MRSA-related provider training and patient education for ‘further details on the study design and data collection efforts.’ A minor inconsistency between the papers was noted with 24 Centres described in the Hill et al paper and 23 Centres in this paper.

RESPONSE: Thank you for highlighting this discrepancy. There were indeed 24 Centers and not 23. We have updated this throughout the manuscript now.

The rationale for removing MRSA Prevention Coordinators (MPCs) from the original sample of providers surveyed is not given. This contrasts with the decision to include MPCs in the semi-structured interviews ‘to ensure adequate representation from leadership.’ This methodological inconsistency needs better explanation. One concern with the semi-structured interviews is that the purposive sample of 3-4 interviewees per Centre recruited through SCI/D Chiefs (which is acknowledged as a potential study bias) comprises at least 50% leadership positions, which may compromise reporting on the front-line staff perspective.

RESPONSE: We agree that the rationale for not including the MPC survey data is needed. The MPC survey explored current prevention practices outlined in the SCI/D MRSA prevention guidelines, as opposed to MPC perceptions of guideline implementation. As in our response to a similar comment from Reviewer 1, we chose to remove these survey data as we felt that they were beyond the scope of our evaluation of guideline implementation and provider perceptions related to implementation.

3. Are the data sound and well controlled?

There are three issues to note: firstly neither the headline figure (in the abstract results section) that 36% of SCI/D staff members surveyed ‘had not seen, did not remember seeing
or had never heard of the MRSA SCI/D guidelines’ nor was the opposing statement that approximately 64% of SCI/D staff were aware of the guidelines (in the context section of Qualitative themes) was evident in the results tables;

**RESPONSE:** We have now added a new table (Table 4) at the end of the manuscript that clearly displays this result (as well as others discussed by Reviewer #1) related to guideline awareness.

secondly the numerical data in Table 2 is difficult to interpret as the second group (e.g. ‘not agree’, ‘not seen’) for each question is omitted, which requires the reader to calculate the count (first group count/percentage) in order to reach n=228;

**RESPONSE:** We chose to present Table 2 this way in order to streamline the results and focus on the comparisons between provider perceptions of fully versus not fully implemented guidelines. We felt that including the second group would not add value as far as the purpose of this table to draw these comparisons, and would simply increase the size of the table significantly. However, we will be happy to add the second group for each result if the reviewer still feels that this is essential.

and thirdly conducting a Chi square test on a sample of survey questions in Table 1 identified an apparent anomaly in the question ‘type of SCI/D unit setting worked in primarily’ of a different p-value to the stated 0.035. For this reason, review by a statistician is recommended.

**RESPONSE:** We thank the reviewer for highlighting this. This p-value was a typographical error. We have since reviewed and re-checked the chi-square test result for this specific question and now corrected the p-value (p = 0.506) in Table 1.

**4. Are the discussion and conclusions well balanced and adequately supported by the data?**

The discussion and conclusions are well balanced and supported by the data but as discussed above, a more in-depth analysis of qualitative data against the PARiHS framework sub-elements would make the findings more useful for the audience.

**RESPONSE:** We have tried to address the reviewer’s comments described above by expanding our qualitative results as they relate to the PARiHS sub-elements on Pages 13-21. We welcome further suggestions from the reviewer to strengthen this analysis.

**Discretionary Revisions**

**5. The use of consistent terminology throughout the paper of either ‘staff’ or ‘provider.’**

**RESPONSE:** We have now edited the paper to use the term ‘provider’ consistently.
6. The discrepancy between the physician response rate and the sampling frame could be examined in the context of the literature.(2;3)

RESPONSE: We have now added the two suggested references to help explain this discrepancy in the Discussion on Page 25: “Lower physician response rates have also been noted in prior survey studies examining perceptions of clinical guidelines [22,42].”

Reference List


As I am the corresponding author for this manuscript resubmission, please do not hesitate to contact me should you have any questions or need additional information regarding the manuscript or our revisions.

Thank you sincerely for your time and consideration.

Best regards,

Charlesnika T. Evans, PhD, MPH

Director, Spinal Cord Injury Quality Enhancement Research Initiative (SCI QUERI) Research Health Scientist, Center of Innovation for Complex Chronic Healthcare (CINCHCH) Associate Epidemiologist, National Center for Occupational Health and Infection Control (COHIC) Edward Hines Jr. VA Hospital (151H, Building 1, D302), Hines, Il 60141 Phone: (708) 202-4868, Fax: (708) 202-2499, Email: Charlesnika.Evans@va.gov

Associate Professor, Department of Preventive Medicine and Center for Healthcare Studies Institute for Public Health and Medicine (IPHAM), Feinberg School of Medicine Rubloff Building, 10th Floor Northwestern University, Chicago, Il 60611 Email: Charlesnika-Evans@northwestern.edu