PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	THE IMPACT OF HOSPITAL ACCREDITATION ON CLINICAL DOCUMENTATION COMPLIANCE: A LIFECYCLE EXPLANATION USING INTERRUPTED TIME SERIES ANALYSIS
AUTHORS	Devkaran, Subashnie; O'Farrell, Patrick

VERSION 1 - REVIEW

REVIEWER	Dr Charles Shaw Freelance consultant, UK Visiting professor UNSW, Sydney Australia
REVIEW RETURNED	17-Apr-2014

GENERAL COMMENTS	This paper presents an innovative approach to monitoring compliance with accreditation standards, but focuses on the statistical techniques to the exclusion of discussion of the potential implications of the findings for accreditation programs and their customers. Several expansions could help to explain the potential of this time-series approach and its contribution to external assessment and institutional management. Aims Is the evaluation aimed at hospital accreditation, sustainability of compliance, or the life cycle model? Setting The 23 criteria, applicable to all patients, refer to surgery. Are only surgical patients admitted to this hospital? Method Criterion selection: what proportion of all the JCI standards (version 2 or 3?) was reflected in the 23 criteria selected? Was Y6 not also transformed? How were the monthly sample records (250/month) identified and retrieved? How soon after discharge were data abstracted? Are all patient records electronic, or was manual audit required? Results Identify which criteria showed most/least sustainable change over the four years Confounding factors What monitoring eg self-reporting, key indicators, or site visits by JCI occurred in the three years after the first survey? Were all staff aware of the study and the criteria being used for

	assessment? Were results fed back to the hospital and staff concurrently? What bias results from evaluating hospital accreditation based only on criteria which are documented in clinical records? Interpretation The study assesses compliance with a small subset of the accreditation standards, as evidenced by documentation in the patient records. There was a small reduction in compliance (as measured by the 23 criteria) immediately after the external survey, but the lack of subsequent fading really surprises me and should be a great reassurance to researchers, managers, clinicians and accreditors. It does not appear to support the conclusion that "Accreditation does not guarantee that hospitals will maintain improvement in healthcare quality measures over the accreditation cycle". The seven criteria which showed a significant fall after the accreditation survey all refer to documentation of activities; this does not mean the practices required by the standards are not sustained. Could this technique help to identify the most valuable tracer indicators of standards compliance? This study examined one first cycle of accreditation. Several reports describe the high impact of a first accreditation survey, but also the diminishing returns from subsequent cycles. If the time series technique could be developed to cover a wider range of standards, and data capture were automated from EPR, continuous monitoring could be used to evaluate the impact of accreditation over many years. This could lead to further discussion eg • If the hospital makes such consistent progress in compliance with standards prior to the formal survey, what does the mock survey offer in terms of added benefits and costs? Progress in this study seems to plateau three months before the mock survey; is this a stimulant or a distraction? • What is the ideal duration (in years) of the accreditation cycle? • Could automated monthly compliance audits supplement or substitute for expensive on-site surveys? This paper deserves publication in that it introduces an evaluation technique which, to my knowledge, has never bee applied to monitoring compliance with accreditation standards. However, some crucial details are missing from the methods section. Some potentially interesting discussion is lost in a sea of statistics, but that leaves an opportunity for other authors (more widely versed in the subject of accreditation) to build on this foundation.

REVIEWER	Pomey, Marie-Pascale University of Montréal, Canada
REVIEW RETURNED	27-Apr-2014

GENERAL COMMENTS	I have already already revised this article for another journal (BMJ Health Service Research). The authors made substantial modifications compared with the previous version what returns the better constructed and more interesting article. As they said it's the first article of its kind as I know, using interrupted time series analysis. The discussion could have integrated other studies that have been

	done on accreditation for example in Canada and France. Even if they are mostly qualitative the results are going on the same direction. I'm not a specialist on interrupted time series analysis. Add in the discussion more previous research done in other countries. Pomey, MP, Lemieux-Charles L., Champagne, F., Angus, D, Shabah, A., Contandriopoulos, A.P. Does Accreditation Stimulate Change? A Study of the Context and the Impact of the Accreditation Process on Canadian Healthcare Organizations. Implementation Sciences April 2010;5(31). Nicklin W et al. (2006) CCHSA accreditation : a change catalyst toward healthier work environnement. Healthcare Papers. Vol 7. Special issue. Disponible sur le lien http://www.longwoods.com/product.php?productid=18674&cat=467 Profiling health-care accreditation organizations: An international survey. Shaw C.D., Braithwaite J., Moldovan M., Nicklin W., Grgic I., Fortune T., Whittaker S. International Journal for Quality in Health Care. 25 (3) (pp 222-231), 2013. Date of Publication: July 2013. Healthcare accreditation systems: Further perspectives on performance measures. Jaafaripooyan E., Agrizzi D., Akbari-Haghighi F. International Journal for Quality in Health Care. 23 (6) (pp 645-656), 2011. Article Number: mzr063. Date of Publication: December 2011. Do all health care institutions get a fair chance during the accreditation procedure?. <Les etablissements de sante sont-ils egaux devant la procedure d'accreditation?.> Daucourt V., Domecq S., Michel P. Revue d'Epidemiologie et de Sante Publique. 54 (5) (pp 463-468), 2006. Date of Publication: October 2006.

REVIEWER	Susan W Kim Flinders University, Australia
REVIEW RETURNED	23-May-2014

GENERAL COMMENTS	used only including one change point, which is the 'accreditation period'. Therefore it is not entirely correct to say that the accreditation life cycle model was tested. Only part of the model, before and after the accreditation was tested in this manuscript. Whether there are four phases exist in the accreditation life cycle was not examined in this manuscript. 2. Page 5/ Introduction/ 'We shall test the validity of the life cycle model…': The paper tested whether there were any changes in slope/level before/after accreditation, but it did not test the validity of the life cycle model. 3. Page 13/ Methods/ Testing the life cycle model: I cannot see how the life cycle model was tested apart from the effect of the accreditation which was examined by the interrupted time series analysis, in which it examines the change in slope before and after

	the accreditation. 4. Page 17/ Results: I do not agree with the first sentence of the second paragraph “The results provide convincing proof of the life cycle model.” I know the observed data shows it, but the results (from the estimation line) only show the increase before the accreditation and steady state after the accreditation. Minor suggestions: 5. Page 2/ Abstract/ Results: ‘The best fit interrupted time series model’: Only one model was provided in the manuscript for Yc, were there other models that have been fitted for Yc? 6. Page 3/ Abstract/ Results: Please specify what ‘three significant variables’ are. 7. Page 3/ Abstract/ Results: This phrase is vague and needs to be made clear: ‘the size of the coefficient indicates that the effects of these variables are substantial’ 8. Page 5/ Introduction/ Paragraphs beginning with “Joint Comission…” to “This phase follows the post-accreditation slump…”: I think these paragraphs would fit better under the ‘Methods’ section. 9. Page 8/ Methods/ Data collection: what are the ‘quality performance outcomes’? Are they the ones listed in Table 1 (i.e. 23 quality measures)? Please be consistent using terms throughout the document. 10. Page 8/ Methods/ Data collection/ “To test the life cycle model, the quality measures were selected...’: If these are 23 quality measures mentioned above, I suggest the ‘Data Collection’ section to be re-organised so that it flows better. Also the sections mentioned in 6 above could fit under this section. 11. Page 10/ Methods/ Study design: Most of the first and second paragraph in this section would fit better in introduction than in the Study design. The third paragraph fits under “Data analysis”. I suggest authors to look up other papers published in BMJ Open which uses interrupted time series analysis. 12. Page 12/ Methods/ Data analysis: Which statistical package was used for analyses? 13. Page 12/ Methods/ Data analysis: Were the steps taken for the data analysis suggested by previous literature? 14. Page 13/ Methods/ Testing the life cycle model: I suggest this to be under the Data analysis section without subtitle as it is confusing. 15. Page 14/ Results: It is not easy to see the pattern out of a table: “The pattern of results is clear”. 16. Page 14/ Results: I understand authors put in lots of effort building 23 models, testing each for auto-correlation etc., so why not explain what each positive or negative change means in each model rather than telling readers how many out of 23 made positive or negative change? 17. Page 15-16/ Table 2: What does red letter Model 1/2/3/4/5/6 mean? 18. Page 17/ Results: I suggest the following one sentence paragraph to be located under ‘Methods’ and ‘Introduction’, so it is clear that this is that outcome variable for the objective of the study. At the moment, it sounds like we are interested in 23 outcome variables and this Yc is mentioned no where before this occasion. “The ultimate confirmatory test of the proposed Life Cycle model is to aggregate the data for all 23 quality compliance measures to produce a composite score (YC) and to fit an interrupted time series regression equation to the unweighted mean monthly value of the series(Table 3).” 19. Page 17/ Results: The following sentence is related to the observation data rather than the estimated results.

	"The post- accreditation slump is followed by a long period of stagnation characterised by an undulating plateau of compliance but, importantly, at a level of 20 percentage points higher than the pre-accreditation survey levels." 20. Page 19/ Discussion: Ramsey et al 2003 provide a checklist that could be used for interrupted time series analysis, I suggest authors to go through the checklist and discuss where the strength and limitation lies in terms of using interrupted time series analysis on this type of data. Authors also need to discuss why they chose the monthly time interval. 21. Page 19/ Discussion: I am not sure if this statement is entirely true: "The results clearly demonstrate that implementation of accreditation standards does not guarantee that accredited organisations will sustain the improvement in healthcare quality measures gained during survey preparation". Although it does seem there has been a steep increase in Yc over the year before the accreditation, it seems the drop after the accreditation is not as big as the increase over the year before accreditation and it is not decreasing any further. You can see the decreasing coefficient of -2.16 after the accreditation cancels out the increasing coefficient of 2.19 before the accreditation, therefore generating the plateau after the accreditation. My question here would be if the 4% decrease in Yc immediately after the accreditation is large enough to worry about when there was ~20% increase in Yc before accreditation, which remains the same over the next 3 years. Recommended reference: Ramsay CR, Matowe L, Grilli R, Grimshaw JM, Thomas RE. Interrupted time series designs in health technology assessment: Lessons from two systematic reviews of behavior change strategies. Int.J.Technol.Assess.Health Care 2003;19:613-23

VERSION 1 – AUTHOR RESPONSE

Reviewer: Dr Charles Shaw
This paper presents an innovative approach to monitoring compliance with accreditation standards, but focuses on the statistical techniques to the exclusion of discussion of the potential implications of the findings for accreditation programs and their customers. Several expansions could help to explain the potential of this time-series approach and its contribution to external assessment and institutional management.
-We are grateful to Dr. Charles Shaw for his valuable comments and have sought to address all the points made.

Aims
Is the evaluation aimed at hospital accreditation, sustainability of compliance, or the life cycle model?
-The study objective is to demonstrate the existence of an accreditation life cycle model by analysing accreditation's impact on the hospital's compliance to the JCI standards.

Setting
The 23 criteria, applicable to all patients, refer to surgery. Are only surgical patients admitted to this hospital?
-The hospital is a multispecialty hospital with a predominant case mix of surgical patients. Therefore, all patients were subjected to a procedure. Thus, the quality measures relating to surgical procedures apply to all patients.

Method

Criterion selection: what proportion of all the JCI standards (version 2 or 3?) was reflected in the 23 criteria selected?
-Based on the 3rd Edition of the JCI standards effective in 2008 (during the study period), the study measures represented 10 out of the 14 JCI Chapters. This reflects 71.4% of the Chapters in the Standards manual. These Chapters had a direct impact on clinical quality and the criteria in the study are primarily reviewed during survey tracers. The Chapters excluded were facility management, access to care, patient and family education and staff qualifications and education. (Included text on page 9)

Was Y6 not also transformed?
-Yes, it was also transformed and this has been corrected in the text (pages 9 and 15).

How were the monthly sample records (250/month) identified and retrieved?
-The patient discharges for the preceding month were entered into a random sample generator. The selected records were then audited.

How soon after discharge were data abstracted?
-The data was abstracted one month post -discharge (page 9). This ensured that the medical record was completed and free of any documentation deficiencies.

Are all patient records electronic, or was manual audit required?
-The medical record was a hybrid system consisting of electronic and manual documentation systems. The audit was conducted manually by physicians (page 9).

Results
Identify which criteria showed most/least sustainable change over the four years
-The criterion that showed the greatest drop in performance post accreditation was Y9 (The percentage of Completed Anaesthesia, Moderate and Deep Sedation Consent Form). The criterion that was least sustainable was Y10 (Percentage of completed Modified Aldrete Scores (Pre, Post, Discharge)

Confounding factors
What monitoring e.g. self-reporting, key indicators, or site visits by JCI occurred in the three years after the first survey?
-There were no site visits, self-reporting of quality measures or additional organization-wide site visits during the three years after the first survey. The JCI surveys were triennial during the period of the study (page 14). Therefore, the data was not influenced by secular changes and only impacted by the intervention during the study period.

Were all staff aware of the study and the criteria being used for assessment? Were results fed back to the hospital and staff concurrently?
-None of the staff were aware of the study or criteria used for assessment (Page 9). The results of the key performance measures were communicated to the hospital and staff on a monthly basis for quality improvement purposes but not for the purpose of the study hypotheses.

What bias results from evaluating hospital accreditation based only on criteria which are documented in clinical records?
-The results may be biased in terms of its dependence on the medical record for a few reasons. For instance, if the documentation was deficient then this was reflected in the measure. The documentation, although expected to reflect clinical practice, may not in fact reflect practice and is contingent on the care providers' ability to document accurately (page 22).

The study assesses compliance with a small subset of the accreditation standards, as evidenced by documentation in the patient records. There was a small reduction in compliance (as measured by the 23 criteria) immediately after the external survey, but the lack of subsequent fading really surprises me and should be a great reassurance to researchers, managers, clinicians and accreditors. It does not appear to support the conclusion that “Accreditation does not guarantee that hospitals will maintain improvement in healthcare quality measures over the accreditation cycle”.
-The conclusions have been modified in the abstract (pages 3 and 20)

The seven criteria which showed a significant fall after the accreditation survey all refer to documentation of activities; this does not mean the practices required by the standards are not sustained.
-This is in part correct; however the care processes involve documentation as a key practice. A good example of this is the informed consent which requires documentation from the healthcare provider and the patient. Thus, the documentation provides evidence that such a practice has occurred. In the absence of the documentation, there is no evidence of compliance and by default this is measured as non-compliant.

Could this technique help to identify the most valuable tracer indicators of standards compliance?
-In general, tracer activities are based primarily on the medical record as they document the patient’s journey of care. Therefore, we are in agreement that the criteria selected for the study are valuable tracer indicators of standards compliance and also reflect a large percentage of the clinical care standards from the JCI Standards Manual 3rd edition (page 9).

This study examined one first cycle of accreditation. Several reports describe the high impact of a first accreditation survey, but also the diminishing returns from subsequent cycles. If the time series technique could be developed to cover a wider range of standards, and data capture were automated from EPR, continuous monitoring could be used to evaluate the impact of accreditation over many years. This could lead to further discussion e.g.
• If the hospital makes such consistent progress in compliance with standards prior to the formal survey, what does the mock survey offer in terms of added benefits and costs? Progress in this study seems to plateau three months before the mock survey; is this a stimulant or a distraction?
-The mock survey was a stimulant which creates organizational awareness about the standards and the gaps that exist in terms of compliance. It assists in focusing efforts towards the closure of these gaps. Therefore, there is an increase in compliance after the mock survey. The plateau before the mock survey could be explained by the organisation reaching stagnation in their learning about the standards. The mock survey brings in new learning and this stimulates an improvement.
• What is the ideal duration (in years) of the accreditation cycle?
-This is an excellent question and can only be answered after the study of many cycles. However, the literature supports the use of intra-cycle assessments, unannounced audits and the strategy of continual survey readiness in maintaining quality compliance.
• Could automated monthly compliance audits supplement or substitute for expensive on-site surveys?
-This is an insightful suggestion and we are very thankful to the reviewer for this comment. From this study, manual compliance audits of the patient record were not as effective in improving compliance as the on-site survey. However, monthly compliance audits that simulate the survey process and are based on tracer methodology could be of value. We are currently in process of developing such a study in the UAE using an electronic auditing programme.

This paper deserves publication in that it introduces an evaluation technique which, to my knowledge, has never been applied to monitoring compliance with accreditation standards. However, some crucial details are missing from the methods section. Some potentially interesting discussion is lost in a sea of statistics, but that leaves an opportunity for other authors (more widely versed in the subject

of accreditation) to build on this foundation.
-The discussion section was amended to include policy implications.

Reviewer: M-P Pomey
I have already revised this article for another journal (BMJ Health Service Research). The authors made substantial modifications compared with the previous version what returns the better constructed and more interesting article.
As they said it's the first article of its kind as I know, using interrupted time series analysis.
-We would like thank M-P Pomey for the supportive comments and valuable references provided. We have endeavored to incorporate all the above into the manuscript.

The discussion could have integrated other studies that have been done on accreditation for example in Canada and France. Even if they are mostly qualitative the results are going on the same direction. I'm not a specialist on interrupted time series analysis.
Add in the discussion more previous research done in other countries.
-We are grateful for the reviewer's comments and references. The above references have been added to the discussion section where applicable.

Reviewer: Susan W Kim

-We appreciate the important suggestions made by Susan Kim which have added value to the paper. We have made the required changes to the manuscript accordingly.

I found this manuscript interesting and authors presented well how they have applied interrupted time series analysis on their data. I just have few minor suggestions that could improve this manuscript further. Major concern I have is that unlike authors mentioned in their objectives, this manuscript does not exactly test for the accreditation life cycle model, but only test whether a change quality of service happens before and after the accreditation.
-In contrast to interrupted time series (ITS) analyses, before and after study designs take a measure of compliance before an intervention and compare the same measure after intervention. This is usually a snap shot of performance unlike interrupted time series analysis which is a comparison of multiple instances over time. In addition ITS allows the researcher to review the change in the level and also a change in the slope. These changes in level and slope equate to the phases in the life cycle model. Thus, we maintain that the study does in fact test the existence the life cycle model as each variable in the regression equation corresponds to a phase in the life cycle. The authors are reviewing 23 quality measures over 48 months, resulting in 276, 000 observations using a month to month analysis rather than a before-after snapshot of a mean.

Major concerns:
1. Page 3/ Article focus: Although accreditation life cycle model was described in the manuscript, the model you used only including one change point, which is the 'accreditation period'. Therefore it is not entirely correct to say that the accreditation life cycle model was tested. Only part of the model, before and after the accreditation was tested in this manuscript. Whether there are four phases exist in the accreditation life cycle was not examined in this manuscript.
-See response to point 3.

2. Page 5/ Introduction/ 'We shall test the validity of the life cycle model…': The paper tested whether there were any changes in slope/level before/after accreditation, but it did not test the validity of the life cycle model.
-The change in the slope and the change in the level were equated to the various phases in the life cycle model, as described in the paper. Thus, when these changes were significant, it validated the

existence of the four phases.

3. Page 13/ Methods/ Testing the life cycle model: I cannot see how the life cycle model was tested apart from the effect of the accreditation which was examined by the interrupted time series analysis, in which it examines the change in slope before and after the accreditation.
-We respect the reviewers comment and clarify that the life cycle model equates to the multiple regression equation as follows:
$Yt = \beta0 + \beta1 \times timet + \beta2 \times interventiont + \beta3 \times time\ after\ interventiont + et$ (1)
Therefore;
β0 = The Initiation Phase and estimates the baseline level of the outcome.
β1= The Pre-Survey Phase. The measures exhibit a significant positive change in slope in the pre-accreditation period (the baseline trend). Peak compliance occurs during the three months prior to the accreditation survey
β2 = The Post-Accreditation Slump. The measures recorded a significant negative change in level post accreditation survey
β3 = The Stagnation Phase. The measures exhibit a significant negative change of slope post-accreditation survey

4. Page 17/ Results: I do not agree with the first sentence of the second paragraph "The results provide convincing proof of the life cycle model." I know the observed data shows it, but the results (from the estimation line) only show the increase before the accreditation and steady state after the accreditation.
-As stated previously, the regression equation equates to the life cycle model and supports the predictions of the patterns of the time series (page 15). Furthermore, the observed Y values and the Y estimates are highly correlated as shown by an R2 value of 0.87.

Minor suggestions:
5. Page 2/ Abstract/ Results: 'The best fit interrupted time series model': Only one model was provided in the manuscript for Yc, were there other models that have been fitted for Yc?
-This was the only model fitted because there was no autocorrelation or seasonality and, therefore, additional corrected models were not required.

6. Page 3/ Abstract/ Results: Please specify what 'three significant variables' are.
-The significant variables correspond to the interrupted time series regression equation and are β1, β2, β3.
$Yt = \beta0 + \beta1 \times timet + \beta2 \times interventiont + \beta3 \times time\ after\ interventiont + et$ (1)
This is documented in detail on page 13. It has been added to the Abstract (page 3)

7. Page 3/ Abstract/ Results: This phrase is vague and needs to be made clear: 'the size of the coefficient indicates that the effects of these variables are substantial'
-The following details have been added to the Abstract section, (β1 =2.19,β2=-3.95(95%CI-6.39 to-1.51) and β3= -2.16 (95%CI -2.52 to-1.80).

8. Page 5/ Introduction/ Paragraphs beginning with "Joint Commission…" to "This phase follows the post-accreditation slump…" I think these paragraphs would fit better under the 'Methods' section.
-We are grateful for the reviewers comments but in this particular case we believe that the reader would be lost if they were placed in the methods section. These paragraphs outline the study objectives and thus introduce the study.

9. Page 8/ Methods/ Data collection: what are the 'quality performance outcomes'? Are they the ones listed in Table 1 (i.e. 23 quality measures)? Please be consistent using terms throughout the document.

-This was amended in the text (page 8)

10. Page 8/ Methods/ Data collection/ “To test the life cycle model, the quality measures were selected...’: If these are 23 quality measures mentioned above, I suggest the ‘Data Collection’ section to be re-organised so that it flows better. Also the sections mentioned in 6 above could fit under this section.
-This section has been reorganized as per the recommendations of the reviewer.

11. Page 10/ Methods/ Study design: Most of the first and second paragraph in this section would fit better in introduction than in the Study design. The third paragraph fits under “Data analysis”. I suggest authors to look up other papers published in BMJ Open which uses interrupted time series analysis.
-The Authors have reviewed the few papers published using interrupted time series analysis. Changes have been made to the Methods section based on the review.

12. Page 12/ Methods/ Data analysis: Which statistical package was used for analyses?
-Analysis was conducted using EViews 7 and SAS V. 9.3 and this has been added to the text.13.

13. Page 12/ Methods/ Data analysis: Were the steps taken for the data analysis suggested by previous literature?
-Yes, the steps were suggested by previous literature and the references are included below:

Box G.E.P., Jenkins G.M, Reinsel G.C. (1994) Time series analysis, forecasting and control. Third edition. Englewood Cliffs: Prentice Hall.
Wagner AK, Soumerai SB, Zhang F, Ross-Degnan D. (2002) Segmented regression analysis of interrupted time series studies in medication use research. J Clin Pharm Ther; 27: 299-309.

14. Page 13/ Methods/ Testing the life cycle model: I suggest this to be under the Data analysis section without subtitle as it is confusing.
-The subtitle ‘Testing the life cycle model’ was removed.

15. Page 14/ Results: It is not easy to see the pattern out of a table: “The pattern of results is clear”.
-This statement has been deleted.

16. Page 14/ Results: I understand authors put in lots of effort building 23 models, testing each for auto-correlation etc., so why not explain what each positive or negative change means in each model rather than telling readers how many out of 23 made positive or negative change?
-The authors concur with the reviewer. However, due to the specified word limit, we were not able to explain each change. In addition the composite measure was used.

17. Page 15-16/ Table 2: What does red letter Model 1/2/3/4/5/6 mean?
-We agree that this may be confusing to the reader and thus changed to the normal font colour.

18. Page 17/ Results: I suggest the following one sentence paragraph to be located under ‘Methods’ and ‘Introduction’, so it is clear that this is that outcome variable for the objective of the study. At the moment, it sounds like we are interested in 23 outcome variables and this Yc is mentioned no where before this occasion. “The ultimate confirmatory test of the proposed Life Cycle model is to aggregate the data for all 23 quality compliance measures to produce a composite score (YC) and to fit an interrupted time series regression equation to the unweighted mean monthly value of the series (Table 3).”
-This text has been added to the Methods section (page 15)

19. Page 17/ Results: The following sentence is related to the observation data rather than the estimated results. “The post- accreditation slump is followed by a long period of stagnation characterised by an undulating plateau of compliance but, importantly, at a level of approximately 20 percentage points higher than the pre-accreditation survey levels.”
-The estimated results are close to the observation data because of the high R2 of 0.87. There is a very narrow scatter about the regression line because the correlation is high.

20. Page 19/ Discussion: Ramsey et al 2003 provide a checklist that could be used for interrupted time series analysis, I suggest authors to go through the checklist and discuss where the strength and limitation lies in terms of using interrupted time series analysis on this type of data. Authors also need to discuss why they chose the monthly time interval.
-Firstly, the authors are extremely grateful for the reference provided. The assessment of the study based on the checklist resulted in the study meeting 7 out of the 8 criteria. The criterion number 5 was not applicable as the study used quality measures as opposed to a patient population. Secondly, the monthly interval was selected as this was the most disaggregated level of the data collection. The rationale for the number of points and frequency of measurement is detailed on page 8.

21. Page 19/ Discussion: I am not sure if this statement is entirely true: “The results clearly demonstrate that implementation of accreditation standards does not guarantee that accredited organisations will sustain the improvement in healthcare quality measures gained during survey preparation”. Although it does seem there has been a steep increase in Yc over the year before the accreditation, it seems the drop after the accreditation is not as big as the increase over the year before accreditation and it is not decreasing any further. You can see the decreasing coefficient of -2.16 after the accreditation cancels out the increasing coefficient of 2.19 before the accreditation, therefore generating the plateau after the accreditation. My question here would be if the 4% decrease in Yc immediately after the accreditation is large enough to worry about when there was ~20% increase in Yc before accreditation, which remains the same over the next 3 years.
-The paper has been amended to emphasize that there was a 20% increase in Yc before accreditation, which remains the same over the next 3 years.

Recommended reference:
Ramsay CR, Matowe L, Grilli R, Grimshaw JM, Thomas RE. Interrupted time series designs in health technology assessment: Lessons from two systematic reviews of behavior change strategies. Int.J.Technol.Assess.Health Care 2003;19:613-23
-The above recommendation is appreciated as the reference was reviewed in great detail and proved to be a valuable resource.

VERSION 2 – REVIEW

REVIEWER	Dr Charles Shaw UK
REVIEW RETURNED	26-Jun-2014

GENERAL COMMENTS	The title would be more self-explanatory by adding "....analysis of clinical documentation". It may also help to point out on page 9 that the choice of quality measures was also defined by availability of evidence in patient records, and that a large proportion of standards for operational systems and facilities management were therefore excluded. One reason for the sustained high levels of compliance long after the accreditation survey may be that performance was reinforced by feedback of the (same?) performance measures to staff every month.

	I have enjoyed the responses of the authors, and have learned also from the comments of the reviewers. Publication of this polylogue would offer an opportunity for wider discussion.

REVIEWER	Susan W Kim Flinders University of South Australia, Australia
REVIEW RETURNED	07-Jul-2014

GENERAL COMMENTS	Abstract/Results: 'The best fit ITS': if it was the only model that was fitted to Yc, use of the term 'best fit' is confusing, what about change it to 'the ITS model fitted to Yc' - or someting in line with it? Thank you very much for explaining all my questions in detail. The manuscript is now more understandable and easier to follow. The main focus of this manuscript, that the lifecycle of hospital accreditation exists is now highlighted well in this revised manuscript.

VERSION 2 – AUTHOR RESPONSE

Reviewer Name Dr Charles Shaw
Institution and Country UK
Please state any competing interests or state ‘None declared’: None declared

1. The title would be more self-explanatory by adding "....analysis of clinical documentation".
-The Title was changed to “The impact of hospital accreditation on clinical documentation compliance: a lifecycle explanation using interrupted time series analysis.”

2. It may also help to point out on page 9 that the choice of quality measures was also defined by availability of evidence in patient records, and that a large proportion of standards for operational systems and facilities management were therefore excluded.
-This statement was added as a limitation on page 22 as, “Thirdly, the choice of quality measures was also defined by availability of evidence in patient records thus, a proportion of standards for operational systems and facilities management were excluded.”

One reason for the sustained high levels of compliance long after the accreditation survey may be that performance was reinforced by feedback of the (same?) performance measures to staff every month. I have enjoyed the responses of the authors, and have learned also from the comments of the reviewers. Publication of this polylogue would offer an opportunity for wider discussion.

Reviewer Name Susan W Kim
Institution and Country Flinders University of South Australia, Australia
Please state any competing interests or state ‘None declared’: None declared

I would like to suggest just one minor word change.

1. Abstract/Results: 'The best fit ITS': if it was the only model that was fitted to Yc, use of the term 'best fit' is confusing, what about change it to 'the ITS model fitted to Yc' - or someting in line with it?

- This statement in the Abstract/ Results was modified to mirror the suggestions from the reviewer.

Thank you very much for explaining all my questions in detail. The manuscript is now more understandable and easier to follow. The main focus of this manuscript, that the lifecycle of hospital accreditation exists is now highlighted well in this revised manuscript.