PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	A Point Prevalence Cross Sectional Study of Health Care Associated Urinary Tract Infections in Six Australian Hospitals
AUTHORS	Gardner, Anne; Mitchell, Brett; Beckingham, Wendy; Fasugba, Oyebola

VERSION 1 - REVIEW

REVIEWER	Dr. Carina King Institute for Global Health, University College London, UK
REVIEW RETURNED	14-Apr-2014

GENERAL COMMENTS	The stated objectives of the paper are much broader than the paper delivers, so these need to re-written. The study limitations do not state the limitations of gold standard definitions and point prevalence surveys. Overall this is an interesting paper, but it has some tidying of sentences and discussion points which would be good to include. This is a very interesting study and would definitely positively add to the scientific literature around healthcare associated urinary tract infections. Overall the paper reads well, and it methodologically sound. However, the discussion could be a little more critical and focused. the aims and scope of the paper were quite broad, so keeping the discussion targeted is definitely going to be a challenge! Below are two suggestions of missing discussion points which I think would strengthen the paper. Nowhere are the issues with point prevalence surveys properly discussed, of which there are many. It is a sensible way to monitor trends in a relatively cheap manner, but they do not provide terribly useful information at a local level so individual hospitals can monitor their progress easily with regular feedback. Limitations of recommending this system should really be mentioned. Another missing discussion point is around comparability on an international scale, especially when describing the CDC and HPA definitions. A key consideration when choosing the definitions should e around comparing Australia to other countries as well. Specific Feedback: Abstract: I suspect the things I have highlighted below were due to the restrictive word count, but I would suggest adding them in, as it reads a little awkwardly in the introduction paragraph at the moment. Sentence1: 30% of what. The sentence doesn't quite read right. Sentence2: “the use” not “use”

	Sentence4: the word survey is missing after the first point prevalence Method: during what period would be useful to know Method: spell out DRG Results (also in the results section): (10) what is the denominator Background: In general this provides good information, but could do with being a bit more rigorous, e.g. “about 80%”, what is the actual figure? Para3, sentence1: this sentence is vague, 30% of HAIs or all infections? The "urinary tract is accountable for these infections"? Para3, sentence2: “use of indwelling urinary catheter”, need to add an “an” or make catheters plural. Para3, sentence3: I do not necessarily agree with this follow on from the sentence above, are HAUTIs common because catheters are common? Yes. Are 80% of these infections related to catheters because catheters are common? Not quite. It should be the other way around, that catheters are a risk for developing HAUTIs, therefore there high prevalence makes high rates of HAUTI unsurprising. Para4, sentence1: “the urinary tract contributing” seems an awkward turn of phrase, better to use UTI Para4, sentence2: when was the study done? Would be good to have it in the sentence, rather than the reader needing to look at the reference list. Aims: I don’t think you can say that this study can influence policy or inform interventions for all HAI, as you only present information on HAUTI Aims: I don’t think you really showed the efficacy of documentation, but instead described it, so I suggest you change this. Methods Ethics: I would list the specific boards and the approval references, but this may be journal specific? Or just personal preference! Why were those specific hospital chosen? Are they representative of hospitals nationally? Spell out DRG and ICD-10 Bias: “underwent a 2 hours”, no need for the ‘a’ here. What about those who had been re-admitted with a UTI? Were these considered healthcare associated? They are in the HPA and CDC definitions, so if you did include these patients it would be good to state that here, and if not, explain why. In calculating the point prevalence, you included all patients in the denominator even though those patients who had only been in the hospital for 24 hours (accounting for re-admissions) would not be able to have a HAUTI. Does this not under-estimate your prevalence considerably? Generally hospital stays are only a few days long for the majority of patients, so this is likely to skew the results. It would be good to present the prevalence calculated both ways (i.e. point and then prevalence). No need to put these acronyms again, as they are stated earlier Results Participants, last sentence: what exactly does “assigned codes based on factors influencing health status and other contacts with health services for the public hospitals” mean? Would be good to give some examples here, as it doesn't really mean anything to me right now. Also, you should really mention here about one hospital failing to have any DRG codes.

	Prevalence: how many patients had microbiology data, and would be good to give percentages of pathogen prevalence. Also, from the table, Candida is more prevalent than E.coli, so it is misleading for this and Staph to be highlighted in the abstract and results when Candida is not. How can a patient meet non-microbiology and microbiology definitions? Might be good to add a box including the CDC and HPA definitions so the reader can easily see how this is possible. Catheter: when reporting the percentages for the reasons of catheterization, this is misleading as only 38.7% have a reason recorded, but written like this it seems like the information is complete. Maybe add a clarification, or change the numbers to the percent of all catheterized patients? Last sentence: needs re-wording, i.e. of the 292 “patients” and the word admission shouldn't be here. ICD-10 codes: “This is unlike the US coding data which provides a present on admission (POA) indicator code to inpatients helping to identify hospital acquired infections” This belongs in the discussion, not the results. Why not include sensitivity and specificity of the ICD-10 codes for determining HAUTIs? Discussion Para1, sentence1: but positive predictive power suggests that the CDC really is the “gold standard” and there is no proof to state that is the case, so I would be careful on how you phrase this, possibly just that CDC definitions detect more cases. Para2, sentence1: I think you forgot to write the CAUTI prevalence Para2, sentence1: but the prevalence would be higher if you excluded those patients who could not be eligible for a HAUTI from the denominator. I suggest you calculate it using only eligible patients. And you need to discuss re-admissions in this, there is no mention of re-admission cases or how you accounted for this. Para3, sentence5: “The biggest risk for infection is duration of catheter”, what type of infection and catheterization, or catheter insertion. Para4: there is no discussion here around the fact there is in fact no proper gold standard for diagnosing UTIs and this is half of the issue in surveillance. It would be good to discuss that while CDC maybe considered ‘gold standard’ there is in fact no such thing. Recommendations: Para3, sentence2: prevalence studies, not just prevalence. Para4: part of the issue with ICD10 coding for HAUTIs is that there are a limited number of fields available for patients and an HAUTI would require a minimum of 3 fields, one for the UTI, one for being nosocomial and one for the catheter. This is a considerable problem for clinical coders. Table2: write out what GM+ve and GM-ve mean Table3: define what the % represents Table4: need to state in the title or in notes, that this is compared to the CDC definitions, and add the definition of HPA in the notes. Table5: I am confused by the “catheter at any time during this admission”, as the total numbers are not the whole patient population, but then some of this sub-sample do not have catheters. So is the denominator those who have information documented about catheters? If this is the case, then it needs to be stated in the title. Also, then how do you distinguish between non-reporting of

	catheters and active negative reporting of a catheter?

REVIEWER	Dr Lisa Hall Queensland University of Technology Brisbane, Australia I would like to declare that I am a co-investigator (and therefore future collaborator) on a recently awarded NHMRC grant application with two of the authors of this study (AG and BM), alongside ten other Australian infectious diseases researchers. The new grant application is not related to the research area covered in this publication.
REVIEW RETURNED	06-May-2014

GENERAL COMMENTS	4) It would be good to include more detail about the two main surveillance definitions/approaches being compared, perhaps in a text box, so that readers not familiar with the area can compare and contrast. Alternatively, the flow charts used in the study could be included in the manuscript, as supplementary material. 10) To improve clarity the results for the documentation audit against clinical guidelines should be described separately. Given the large amount of missing data (a finding in itself) either further discussion of Table 5 is required, or the table should be simplified. 11) The initial policy recommendations (page 11, rows 20 to 42) are not derived from this research. Discussion and recommendations should instead be limited to the scope of this project - e.g. how and why point prevalence studies are useful, what definitions should be used for this, and why. How the data could be used locally and nationally. Most of this information is in the manuscript but could be re-worded for clarity. 12) Further justification of any potential impact of combining the different public hospitals (with different size and scope of services) is required. It would be good to discuss how the use of a practice checklist could both improve compliance with clinical guidelines, and documentation. If data is available it would be interesting for the authors to mention how long each surveillance approach took, as this will have an impact of the uptake of the recommendations. This is an interesting study with a robust design and data collection approach in a particularly challenging area. I believe with some modifications to the manuscript that it should be published.

VERSION 1 – AUTHOR RESPONSE

REVIEWER	COMMENT	CHANGE/S MADE	EXPLANATION/S
Reviewer 1	The stated objectives of the paper are much broader than the paper delivers, so these need to re-written.	See changes made below.	See changes made below.

	The study limitations do not state the limitations of gold standard definitions and point prevalence surveys.	See changes made below.	See changes made below.
Abstract	Sentence1: 30% of what. The sentence doesn't quite read right.	*Page 2, lines 3 and 4:* "of HAIs" added	Noted. Additional words included to clarify statement.
	Method: during what period would be useful to know	*Page 2, line 15:* "over the first six months of 2013" added	Noted. Study period included in sentence.
	Results (also in the results section): (10) what is the denominator	*Page 2, line 26:* The denominator "1109" added	Noted. The denominator (1109) has been included. This is the total number of patients surveyed.
Background	"about 80%", what is the actual figure?	*Page 4, line 28:* "about" deleted	Noted. Cited reference states 80% hence the word "about" has been deleted.
	Para3, sentence1: this sentence is vague, 30% of HAIs or all infections? The "urinary tract is accountable for these infections"?	*Page 4, line 26:* "infections" deleted "HAIs" added Sentence changed to "Urinary tract infections account for more than 30% of HAIs"	Noted. Sentence restructured to provide clarity.
	Para3, sentence2: "use of indwelling urinary catheter", need to add an "an" or make catheters plural.	*Page 4, line 29:* "s" added to "catheter"	Noted. The word "catheter" has been changed to plural.
	Para3, sentence3: I do not necessarily agree with this	*Page 4, lines 29-31.* Sentence restructured	Agreed. Sentence restructured to

	follow on from the sentence above, are HAUTIs common because catheters are common? Yes. Are 80% of these infections related to catheters because catheters are common? Not quite. It should be the other way around, that catheters are a risk for developing HAUTIs, therefore there high prevalence makes high rates of HAUTI unsurprising.	to read: "The use of urethral catheters is very common with 15% to 25% of hospitalised patients receiving a short-term indwelling urinary catheter hence high HAUTI rates are not surprising"	provide clarity.
	Para4, sentence1: "the urinary tract contributing" seems an awkward turn of phrase, better to use UTI	*Page 5, line 7:* "the" deleted "…infections" added	Noted. Relevant changes made.
	Para4, sentence2: when was the study done? Would be good to have it in the sentence, rather than the reader needing to look at the reference list.	No changes made.	Noted but the follow on sentence states the year in which the study was conducted: "The last Australian national prevalence survey … was conducted in 1984"
	Aims: I don't think you can say that this study can influence policy or inform interventions for all HAI, as you only present information on HAUTI	*Page 5, line 32 and Page 6, line 1:* "HAI" changed to "HAUTI"	Noted. Relevant changes made.
	Aims: I don't think you really showed the efficacy of documentation, but instead described it, so I suggest you change this.	*Page 5, lines 25 and 26* The phrase: "assess completeness and efficacy of documentation practices" deleted and replaced with "describe level and comprehensiveness of documentation"	Agreed. Relevant changes made to the specific aim as the authors did not assess the efficacy of documentation.
Methods	Ethics: I would list the specific boards and the approval references, but this may be journal specific? Or just personal preference!	No changes made	In appreciation of the ethics approval process, the specific health service ethics committee will not be provided in the manuscript. This is because, ethics approval was granted on the basis that the

			study sites will be de-identified in any publications and as such cannot state precisely the exact locations where we collected data. The authors are able to provide approval references on request from the journal editor solely for their records.
	Why were those specific hospital chosen? Are they representative of hospitals nationally?	No changes made.	Hospitals within these two jurisdictions are very similar in terms of patient population and remoteness to major tertiary referral centres in other states. Two of the three publicly funded hospitals are the main hospitals in each of the two jurisdictions subserving the population of the jurisdiction.
	Spell out DRG and ICD-10	*Page 6, lines 28 and 29:* "Diagnosis-related group" and "International classification of diseases Tenth revision" added.	Noted. Abbreviations spelled out.
	Bias: "underwent a 2 hours", no need for the 'a' here.	*Page 7, line 12:* "a" deleted	Noted. Relevant changes made.
	What about those who had been re-admitted with a UTI? Were these considered healthcare associated? They are in the HPA and CDC definitions, so if you did include these patients it would be good to state that here, and if not, explain why.	No changes made.	Noted. Regardless of their re-admission status, all patients meeting the study inclusion criteria with a CDC or HPA healthcare associated UTI definition were considered.
	In calculating the point prevalence, you included all	No changes made.	Whilst using this denominator may

	patients in the denominator even though those patients who had only been in the hospital for 24 hours (accounting for re-admissions) would not be able to have a HAUTI. Does this not under-estimate your prevalence considerably? Generally hospital stays are only a few days long for the majority of patients, so this is likely to skew the results. It would be good to present the prevalence calculated both ways (i.e. point and then prevalence).		underestimate the prevalence, the authors have determined the point prevalence using the population on the survey date as the denominator. Other options were explored and it was felt this was the best method to determine the denominator and prevalence. For example, if in the calculation of the denominator, patients in hospital <48 were excluded, this could artificially increase the prevalence as patient in hospital <24 could technically have a HAUTI using the HPA definition. We would prefer this paper is not distracted by debates about denominators, best explored in a separate paper specifically dealing with this issue.
Results	Participants, last sentence: what exactly does "assigned codes based on factors influencing health status and other contacts with health services for the public hospitals" mean? Would be good to give some examples here, as it doesn't really mean anything to me right now. Also, you should really mention here about one hospital failing to have any DRG codes.	*Page 8, lines 23 and 24:* "…such as patients attending follow-up visits and organ donors" added	Noted. Example of this Diagnosis-related group classification is now provided in the sentence.
	Prevalence: how many patients had microbiology data, and would be good to give percentages of	*Page 8, lines 27-29: "Escherichia coli"* deleted	Agreed. Microbiology data was only obtained from the 15 patients meeting the

	pathogen prevalence. Also, from the table, Candida is more prevalent than E.coli, so it is misleading for this and Staph to be highlighted in the abstract and results when Candida is not.	Sentence changed to: *Staphylococcus aureus* (20%) and *Candida* species (20%) were the most common pathogens identified among the patients with HAUTIs	CDC or HPA UTI definition and this information is provided in Table 2. The percentages of pathogen prevalence are now included in the sentence.
	How can a patient meet non-microbiology and microbiology definitions? Might be good to add a box including the CDC and HPA definitions so the reader can easily see how this is possible.	*Page 7, line 25* Supplementary file cited as "available as online supplementary material"	Agreed. To provide better clarity to readers, an appendix with the definitions will be included as supplementary material.
	Catheter: when reporting the percentages for the reasons of catheterization, this is misleading as only 38.7% have a reason recorded, but written like this it seems like the information is complete. Maybe add a clarification, or change the numbers to the percent of all catheterized patients?	*Page 9, line 11* Sentence added: "For patients with a catheter who had the reason for insertion stated,…"	Noted. Sentence restructured to provide clarity.
	Last sentence: needs re-wording, i.e. of the 292 "patients" and the word admission shouldn't be here.	*Page 9, line 14:* "patients" added "admission" deleted	Noted. Relevant changes made.
	ICD-10 codes: "This is unlike the US coding data which provides a present on admission (POA) indicator code to inpatients helping to identify hospital acquired infections" This belongs in the discussion, not the results.	*Page 9, lines 20-22:* "Australian coding data does not distinguish between HAI cases and non-HAI cases. This is unlike the US coding data which provides a present on admission (POA) indicator code to inpatients helping to identify hospital acquired infections" deleted from results section	Agreed. Sentences moved to discussion section to provide better flow.
	Why not include sensitivity and specificity of the ICD-10	No changes made.	Noted but this is not relevant to the aim of

	codes for determining HAUTIs?		this paper.
Discussion	Para1, sentence1: but positive predictive power suggests that the CDC really is the "gold standard" and there is no proof to state that is the case, so I would be careful on how you phrase this, possibly just that CDC definitions detect more cases.	*Page 9, line 30:* "…has a higher positive predictive value" deleted. Changed to "…identified more patients with HAUTI"	Agreed. Sentence rephrased.
	Para2, sentence1: I think you forgot to write the CAUTI prevalence	*Page 10, line 4:* "0.9%" added	Noted. CAUTI point prevalence estimate added.
	Para2, sentence1: but the prevalence would be higher if you excluded those patients who could not be eligible for a HAUTI from the denominator. I suggest you calculate it using only eligible patients. And you need to discuss re-admissions in this, there is no mention of re-admission cases or how you accounted for this.	No changes made	Noted. Please see previous related response to denominator issues.
	Para3, sentence5: "The biggest risk for infection is duration of catheter", what type of infection and catheterization, or catheter insertion.	*Page 10, lines 20 and 21:* "urinary tract…" and "indwelling urinary…" added	Noted. Relevant changes made.
	Para4: there is no discussion here around the fact there is in fact no proper gold standard for diagnosing UTIs and this is half of the issue in surveillance. It would be good to discuss that while CDC maybe considered 'gold standard' there is in fact no such thing.	No changes made	Noted. The reviewer makes an important and interesting point, however it is not within the scope of the paper to explore and discuss this in- depth issue in more detail.
Recommendations	Para3, sentence2: prevalence studies, not just prevalence.	*Page 12, line 13:* "studies" added	Noted. Relevant changes made.
	Para4: part of the issue with	No changes made.	Noted.

	ICD10 coding for HAUTIs is that there are a limited number of fields available for patients and an HAUTI would require a minimum of 3 fields, one for the UTI, one for being nosocomial and one for the catheter. This is a considerable problem for clinical coders.		
Tables	Table2: write out what GM+ve and GM-ve mean	*Page 23, Table 2:* "Gram positive" and "Gram negative" spelled out	Noted. Relevant changes made.
	Table3: define what the % represents	*Page 24, Table 3:* Statement added as footnote in Table 3: "The percentages represent the number of people identified as having a HAUTI based on a specific criteria divided by the total number of people surveyed"	Noted. Footnote added to Table 3
	Table4: need to state in the title or in notes, that this is compared to the CDC definitions, and add the definition of HPA in the notes.	*Page 25, Table 4:* "…compared to the CDC definition" added to the title	Noted. Relevant changes made.
	Table5: I am confused by the "catheter at any time during this admission", as the total numbers are not the whole patient population, but then some of this sub-sample do not have catheters. So is the denominator those who have information documented about catheters? If this is the case, then it needs to be stated in the title. Also, then how do you distinguish between non-reporting of catheters and active negative	No changes made.	Noted. This refers to patients who had at least one catheter inserted during the current admission. Some patients did not have a catheter on the survey date but had had a catheter inserted prior to this day but had now been removed. Data was still collected on catheter use for these patients as they were at risk for development of a

	reporting of a catheter?		CAUTI if removed in previous 48 hours prior to symptom onset. Also some patients had catheters changed at different times during their admission but data was only collected on the most recent catheter insertion episode.
Reviewer 2	It would be good to include more detail about the two main surveillance definitions/approaches being compared, perhaps in a text box, so that readers not familiar with the area can compare and contrast. Alternatively, the flow charts used in the study could be included in the manuscript, as supplementary material.	No changes made.	Agreed. To provide better clarity to readers, an appendix with the definitions will be included as supplementary material.
	To improve clarity the results for the documentation audit against clinical guidelines should be described separately. Given the large amount of missing data (a finding in itself) either further discussion of Table 5 is required, or the table should be simplified.	*Page 12, lines 8-10:* "One potential way of improving compliance with clinical guidelines and documentation at both the insertion and maintenance phases of catheter care, is the use of a checklist or 'bundle' approach" added	Noted. We would prefer to keep the information contained in Table 5 together, to allow comparisons. We do not see added value in breaking this table up further and doing this may make it more difficult to interpret data across two tables. We have added some addition information on page 12, lines 8-10 and there is a detailed discussion on this point in paragraph 2, page 10.
	The initial policy recommendations (page 11, rows 20 to 42) are not derived from this research. Discussion and	*Page 11, lines 27-32:* "It is important to consider the length of time it is anticipated that the catheter will	Noted. We have made changes to this section to improve clarity and ensure it is related to our study. There are

	recommendations should instead be limited to the scope of this project - e.g. how and why point prevalence studies are useful, what definitions should be used for this, and why. How the data could be used locally and nationally. Most of this information is in the manuscript but could be re-worded for clarity.	be required as this will help with the selection of catheter type. When developing protocols information that should be included are: the day to day management of such a device, including catheter care and securing of the device and management of drainage. While management of drainage was not included in our study, it is also important to consider this" deleted.	sections that are directly relating to our study and these have remained in our paper. For example, the first few sentences in this section relate to the findings described on page 10, paragraph 2
	Further justification of any potential impact of combining the different public hospitals (with different size and scope of services) is required.	*Page 13, lines 3-6:* "The aggregation of data from all participating hospitals for analysis may be a further limitation. The size and scope of services in these hospitals varies and this in turn presents variations in risk. Regardless, the process we employed in common in point prevalence studies" added	Agreed. Amendment made.
	It would be good to discuss how the use of a practice checklist could both improve compliance with clinical guidelines, and documentation.	*Page 12, lines 8-10:* "One potential way of improving compliance with clinical guidelines and documentation at both the insertion and maintenance phases of catheter care, is the use of a checklist or 'bundle' approach."	Agreed. Amendment made.
	If data is available it would be interesting for the authors to mention how long each surveillance approach took, as this will have an impact of the	No changes made.	Noted. The authors have provided a reference (27) for the published study protocol in the methods section.

	uptake of the recommendations.		

VERSION 2 – REVIEW

REVIEWER	Carina King Institute for Global Health, University College London, UK
REVIEW RETURNED	06-Jun-2014

GENERAL COMMENTS	One nitpicking point, the acronyms are defined multiple times. The only other point to make is that they have not really discussed the negatives of point prevalence surveys, but it is probably out of the scope of the paper. Overall, an improvement on the first draft and a nice paper. It reads better than the first draft and the inclusion of the definitions at the end make a big difference. It would be interesting to breakdown the risks and also look at the number (if any) of infections from re-admissions, but this might be for a further paper. Overall, a nice addition to the literature on this subject.

REVIEWER	Dr Lisa Hall Queensland University of Technology, Australia
REVIEW RETURNED	17-Jun-2014

GENERAL COMMENTS	This is an important paper to provide guidance for national action in Australia for the prevention of CA-UTI in hospitals. The authors have demonstrated that using the HPA definition in a point prevalence survey may be a feasible way to implement national surveillance.

VERSION 2 – AUTHOR RESPONSE

REVIEWER	COMMENT	CHANGE/S MADE	EXPLANATION/S
Reviewer 1	One nitpicking point, the acronyms are defined multiple times.	*Page 5, lines 26 and 27:* Acronyms defined "Health Protection Agency (HPA) and Centers for Disease Control and Prevention (CDC)" *Page 6, lines 18 and 19; Page 7, lines 20-22, lines 26 and 27; Page 8, lines 5 and 6:* Acronyms used and definitions taken out	Noted. Relevant changes made and acronyms only defined at start of main manuscript.
The only other point to make is that they have not really discussed the negatives of point prevalence surveys, but it is probably out of the scope of the paper	*Page 12, line 30:* "…which only capture data at a specific point in time" added		We agree and have added a phrase. Any more detailed discussion of the limitations of point prevalence surveys are, as the reviewer stated, out of the scope of the paper.
It would be interesting to breakdown the risks and also look at the number (if any) of infections from re-admissions, but this might be for a further paper	No changes made.		It is not within the scope of the paper to explore this issue.
Reviewer 2		No additional changes requested	