PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Potentially preventable complications of urinary tract infections, pressure areas, pneumonia, and delirium in hospitalised dementia patients: Retrospective cohort study
AUTHORS	Bail, Kasia; Berry, Helen; Grealish, Laurie; Draper, Brian; Karmel, Rosemary; Gibson, Diane; Peut, Ann

VERSION 1 - REVIEW

REVIEWER	Zuliani, Giovanni University of Ferrara
REVIEW RETURNED	01-Mar-2013

GENERAL COMMENTS	- Article focus: I am not sure that dementia might be essentially associated with an increase in the length of stay; indeed, length of stay strongly depends on the specific organization of the hospital; for example, or group did not confirm a significant increase in length of stay in dementia patients (G. Zuliani et al. Int J Geriatr Psych 2012; 27: 313–320). I would rather underline high risk of mortality and transfer to residential care. - Number of episodes: Although dementia patients were correctly case-matched for age, gender, surgical status, and Charlson index, I think it would be useful to adjust analyses for the number of admissions to hospital and/or for episodes. Indeed, dementia patients might be admitted to hospital more frequently compared with “controls”, and also the number of episodes might be different between dementia and non dementia patients. - Charlson index and dementia: I am not sure that excluding dementia from the calculation of Charlson index is correct. After eliminating dementia from the arithmetic, the two groups of patients might be perfectly matched for all the other comorbidities, but those with dementia actually have a higher rate of comorbidity due to dementia itself. - Page 8, line 17: Surgery was much less common in dementia patients: how do the Authors read this data? Might this data bias the results ? (i.e. might surgical dementia patients be included into the medical dementia group since it was decided not to operate) ? - Page 8, line 48: The RR 0.82 refers to the risk of dementia patients compared with not demented “controls”: I would show the RR of non dementia compared with dementia patients (like it is stated in the sentence) - Page 8, line 55: It is not clear to me the definition of physical or metabolic derangement

	- Page 9, line 13: … but not delirium … I would expect a higher rate of delirium in surgical compared with medical patients. Could the Authors suggest a possible explanation for this finding? - Page 11, line 35 and following: The Authors principally ascribe to nurses the higher rate of complications found in dementia patient. In general I agree with this interpretation of the results. Nevertheless, I think that medical personnel might also be directly involved into many aspects of this phenomenon, including prescription of mobilization and hydration, hand washing, flu vaccination, pain relief, verbal reorientation, prescription of psychoactive medication and restrains. Obviously, it is fundamental the degree of autonomy of the nurses, and this in turn might be different in different Countries and hospitals. - Dementia diagnosis: It well known that in studies from database based on discharge reports the diagnosis of dementia might be under estimated. Could the Authors estimate the real prevalence of dementia in their sample? For example, we calculated that being the prevalence of Alzheimer's dementia about 5% in our population, and the rate of admission about doubled in dementia patients, the real prevalence would be about 10% in our hospital database (G. Zuliani et al. Int J Geriatr Psych 2012; 27: 313–320), while we found a prevalence of 8.6%.

REVIEWER	Karen L. Rice, DNS, APRN, ACNS-BC, ANP Program Director, The Center for Nursing Research Ochsner Health System New Orleans, Louisiana United States of America The reviewer does not have any conflicts of interest to disclose.
REVIEW RETURNED	05-Mar-2013

THE STUDY	Authors addressed all Strobe criteria and no questions raised. The 3 supplemental documents provided improved understanding regarding the larger study from which this substudy was derived.
GENERAL COMMENTS	The authors are commended for this relevant and rigorously designed study that provides additional evidence to support the importance of the nursing work force in improving specific clinical outcomes in the hospitalized elderly, particularly those with dementia. The large sample size in this retrospective secondary data analysis from a larger study surprisingly had very little missing data. This important work provides additional support for the inclusion of nursing sensitive indicators with other quality metrics to optimize clinical outcomes. I have 7 comments that are intended to improve the clarity and readability of the manuscript that include: Article summary (Page 2) 1. Line 48. I found the term 'algorithm' confusing and was looking for a decision tree. Although I could not access Needleman's 2001 article, his articles published after that date do not use the term algorithm but rather 'coding rules for adverse outcomes'. Citations 19 + 20 did not include an algorithm either. Consider using a different term vs 'algorithm' or provide a more detailed explanation that makes it clear to the reader.

	Methods 2. (Page 6) Line 4-6 & Line 19-20 and (Page 7, Table 1 title) See above comment regarding 'Needleman algorithm' for consistency and clarity Results (P10, Table 2) 3. Lines 41-51. Although it is obvious why a surgical wound infection would not be collected in a medical patient, please clarify the reason for the missing data fields for Pulmonary failure, Phys/met derangement. 4. Consider using 'Note' at end of table to clarify term 'Phy/met'. Discussion (P 11) 5. Line 34-37. Consider rephrasing the sentence "…association between poorer nursing work environment and higher rates of complications" to reflect the content in Table 3. Table 3 includes associations between nursing work environments for both lower and higher complication rates. (P 13, Table 3 title) 6. Line 2-3. Consider rephrasing the title to reflect the evidence as described above for clarity and consistency. 7. Table 3 Legend on (P 13) Line 50-57 and (P14) Line 2-7 The current description of terms is confusing and difficult to follow. The reader must hunt for the term to find the definition. Consider using a symbol and list in sequential order (i.e. refined staffing model is 1st listed on p. 13 but defined on P 14) Supplements The 3 supplements were very helpful in understanding the larger innovative mixed methods study, The Hospital Dementia Services Project, including the technical aspects of linking analytical data and methods.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1 Reviewer: Karen L. Rice, DNS, APRN, ACNS-BC, ANP Program Director, The Center for Nursing Research Ochsner Health System New Orleans, Louisiana United States of America The reviewer does not have any conflicts of interest to disclose.	
- Article focus: I am not sure that dementia might be essentially associated with an increase in the length of stay; indeed, length of stay strongly depends on the specific organization of the hospital; for example, or group did not confirm a significant increase in length of stay in dementia patients (G. Zuliani et al. Int J Geriatr Psych 2012; 27: 313–320). I would rather underline high risk of mortality and transfer to residential care.	Thank you for the useful reference, and valid point. We appreciate that some studies have not shown increased LOS with dementia but a recent literature review (Reference 6, Mukadam et al, 2011), along with data from our study, suggest that on the whole the literature finds that LOS is increased in people with dementia (see References 5 , 6, 12 and 13), thus we have retained this focus. Further investigation on mortality and transfer to residential care is a

	focus of ongoing analyses.
- Number of episodes: Although dementia patients were correctly case-matched for age, gender, surgical status, and Charlson index, I think it would be useful to adjust analyses for the number of admissions to hospital and/or for episodes. Indeed, dementia patients might be admitted to hospital more frequently compared with "controls", and also the number of episodes might be different between dementia and non dementia patients.	The point regarding the number (and indeed also the length) of admissions is valid, but this kind of analysis was outside the scope of this study. We have, nevertheless, undertaken further analyses informed by our previous research (reference 13 AIHW Bulletin, in particular Table 4.1, 4.6 and A.4). Standardising for age and sex in all cases, compared with hospitalised people who do not have dementia, those with dementia are: ▪ Slightly more likely to have multi-episode stays (87% *vs* 82%); ▪ Much more likely to be re-admitted within 3 months of discharge (45% *vs* 32%); ▪ Average more stays in 12 months (2.5 *vs* 1.9). To cross check this, we estimated the average number of multi-day episodes per person in 2006-07 and then undertook a 2-sided *Z*-score test of proportions of people with dementia *vs* non-dementia using sample numbers adjusted downwards to allow for multiple episodes per patient. Even using the upper limit of episodes per person for people with dementia (3.5) and lower limit for people without dementia (1.9), all comparisons that had significant differences in risk ratios in our original analyses remained significant in the adjusted analyses (and at the same *p*-value level). We therefore conclude that the effect of dementia on the likelihood of developing avoidable complications is robust. While having dementia may bias estimates of rates of preventable complications (primarily upwards, because of the multiple-episode stays and readmissions hospitalisation profile of people with dementia), the observed differences between people with and people without dementia are unlikely to be solely the result of greater use of hospitals. We therefore do not expect the lack of control for admissions to materially alter our findings. Separately, an additional strength of our approach is that our use of episode-level data makes the findings comparable to other studies (e.g., Reference 9, 18, 19 and 20). We have adjusted the following sections of text consistent with our argument: methods, p5, (what is an episode); discussion, p11 (summary of episode analysis).
- Charlson index and dementia: I am not sure that excluding dementia from the calculation of Charlson index is correct. After eliminating dementia from the arithmetic, the two groups of patients might be perfectly matched for all the other comorbidities, but those with dementia actually have a higher rate of comorbidity due to	We do not agree – it is the very issue under examination in this investigation and so to include dementia in the co-morbidity index would be self-defeating. Further, the Charlson coding for dementia and the coding used in the Hospital Dementia

dementia itself.	Services project are not identical, so this would need to be a specific project in itself. Charlson ICD10 codes used were F00, F01, F02, F05 (See reference 15 – Sundajararan). Hospital Dementia Services Project codes are F00.x – F03.x, F05.1, G30.x, G31.x, see references 12 and 13). Excluding dementia from the Charlson Index was the best approach we identified to incorporate a comorbidity control within this project. Improving screening and documentation of dementia in hospital, as mentioned in the recommendations on p15, would aid future research related to the comorbidity profile of people with dementia.
- Page 8, line 17: Surgery was much less common in dementia patients: how do the Authors read this data? Might this data bias the results ? (i.e. might surgical dementia patients be included into the medical dementia group since it was decided not to operate) ?	Yes this is an interesting finding. We suspect that people with dementia are less promising candidates for surgery perhaps, due to their comorbidities, age or the perception of how well they would recover – which may be a form of ageism/exclusion. This was unclear from the data available to us and warrants further research. It is also possible that people with dementia were more likely to be admitted with less severe medical problems (e.g. UTIs, lower respiratory tract infections) than non-dementia patients thus increasing the proportion of medical dementia patients. Yes it is possible. Our study is unavoidably limited by retrospective data collection using secondary diagnoses as comorbidities and/or complications. The recommendation on p15 has been expanded regarding collection of 'in-hospital' complications, in addition to secondary diagnoses, which would improve future data analysis. This reinforces the point that current identified associations are based on limitations in hospital data collection – ie lack of differentiation of prior comorbidity versus in-hospital complication when using 'secondary diagnoses' (of 06-07 data at any rate).
- Page 8, line 48: The RR 0.82 refers to the risk of dementia patients compared with not demented "controls": I would show the RR of non dementia compared with dementia patients (like it is stated in the sentence)	Thank you for the suggestion, we have reworded the sentence on p8 to more clearly reflect that this complication was less common in dementia patients.
- Page 8, line 55: It is not clear to me the definition of physical or metabolic derangement	Thank you, we have inserted the definition of physical or metabolic derangement (serious fluid and/or electrolyte imbalance) in text to P8, and added to Legend in Table 2:
- Page 9, line 13: … but not delirium … I would expect a higher rate of delirium in surgical compared with medical patients. Could the Authors suggest a possible explanation for this finding?	There is likely to be a number of factors contributing to this finding. Firstly it is possible that some dementia patients were admitted to hospital with medical problems due to their delirium. Secondly, the dementia may have obscured diagnosis (and/or documentation) of delirium in the surgical population (more so than

	the medical population, which may have physicians with greater diagnostic behaviours related to delirium). Thirdly, perhaps the surgical exclusions were appropriate – that is, the larger proportion of people with dementia who did not undergo surgery represents those patients who would have been more likely to experience delirium. We feel that these interpretations are too far removed from the data to be able to include them in the paper, though the reviewer's valid questions definitely warrant further exploration.
- Page 11, line 35 and following: The Authors principally ascribe to nurses the higher rate of complications found in dementia patient. In general I agree with this interpretation of the results. Nevertheless, I think that medical personnel might also be directly involved into many aspects of this phenomenon, including prescription of mobilization and hydration, hand washing, flu vaccination, pain relief, verbal reorientation, prescription of psychoactive medication and restrains. Obviously, it is fundamental the degree of autonomy of the nurses, and this in turn might be different in different Countries and hospitals.	Thank you, these are valid and useful points. Sentence on p11 changed to: "Nursing interventions, with and without direct medical personnel involvement, for preventing and mitigating these common complications…." Regarding the 'degree of autonomy of nurses": this paper has included reference only to those researching nursing work environments which had findings linked to the 4 specific outcomes in question. However, for interest, there is a range of proxies used to investigate components of 'nurse autonomy', which are related to 'nursing work environments'. These have included nurse-doctor relationships, nurse involvement in decision making, nurse job-satisfaction and intention to leave, and nurses' confidence that their manager will support their decisions. More work is revealing surprising similarities in the relationship of these issues with patient outcomes across markedly different countries (see Aiken et al BMJ 2012;344:e1717).
- Dementia diagnosis: It well known that in studies from database based on discharge reports the diagnosis of dementia might be under estimated. Could the Authors estimate the real prevalence of dementia in their sample? For example, we calculated that being the prevalence of Alzheimer's dementia about 5% in our population, and the rate of admission about doubled in dementia patients, the real prevalence would be about 10% in our hospital database (G. Zuliani et al. Int J Geriatr Psych 2012; 27: 313–320), while we found a prevalence of 8.6%.	The prevalence using the episode level data for this sub-project found 10.44% with dementia (stated on p5). The overarching Hospital Dementia Services project found 8.2% of hospital patients (compared to 4% of the population) had dementia. (see Reference 12) (Please note that Reference 12 has been updated for this re-submission - the 2011 'Study description' has been replaced by the November 2012 project report 'People with dementia in hospitals in New South Wales 2006–07). The higher rate (10% compared to 8%) found in the sub project compared to the Hospital Dementia Services Project is the result of using episode, rather than stay-level, data.
Reviewer 2	
Authors addressed all Strobe criteria and no questions raised.	Thank you.

The 3 supplemental documents provided improved understanding regarding the larger study from which this substudy was derived. The authors are commended for this relevant and rigorously designed study that provides additional evidence to support the importance of the nursing work force in improving specific clinical outcomes in the hospitalized elderly, particularly those with dementia. The large sample size in this retrospective secondary data analysis from a larger study surprisingly had very little missing data. This important work provides additional support for the inclusion of nursing sensitive indicators with other quality metrics to optimize clinical outcomes.	
I have 7 comments that are intended to improve the clarity and readability of the manuscript that include: Article summary (Page 2) 1. Line 48. I found the term 'algorithm' confusing and was looking for a decision tree. Although I could not access Needleman's 2001 article, his articles published after that date do not use the term algorithm but rather 'coding rules for adverse outcomes'. Citations 19 + 20 did not include an algorithm either. Consider using a different term vs 'algorithm' or provide a more detailed explanation that makes it clear to the reader.	Thank you. 'Coding rules for adverse outcomes' used in replacement of 'Needleman algorithm' throughout.
Methods 2. (Page 6) Line 4-6 & Line 19-20 and (Page 7, Table 1 title) See above comment regarding 'Needleman algorithm' for consistency and clarity	As above
Results (P10, Table 2) 3. Lines 41-51. Although it is obvious why a surgical wound infection would not be collected in a medical patient, please clarify the reason for the missing data fields for Pulmonary failure, Phys/met derangement.	Thank you, added clarification in Table 2 using a legend.
4. Consider using 'Note' at end of table to clarify term 'Phy/met'.	Thank you, added clarification on p8 of text and in Table 2 via legend: 'serious fluid and/or electrolyte imbalance'.
Discussion (P 11) 5. Line 34-37. Consider rephrasing the sentence "…association between poorer nursing work environment and higher rates of complications" to reflect the content in Table 3. Table 3 includes associations between nursing work environments for both lower and higher complication rates.	Thank you for highlighting confusion here. The sentence highlighted is "…association between poorer nursing work environment and higher rates of complications" is correct. Table 3 presents the findings as per each project's description, for precision. This does mean that some of the outcomes are higher or lower, depending on the independent variable being measured. All of the outcomes shown demonstrate that higher rates of complications are associated with poorer nursing work environments. E.g., Schubert et al.'s 'higher levels of pressure ulcers' are associated with 'care rationing' which is an example of 'poorer nursing work environment'. 'Increased time unit pressure' and

	'lower skill mix' are also examples of poorer nursing work environments, and the associated outcomes are higher rates of complications.
(P 13, Table 3 title) 6. Line 2-3. Consider rephrasing the title to reflect the evidence as described above for clarity and consistency.	Not changed, as per explanation above. (Noting that the title "Evidence of association between the four key complications and nursing work environments" is neither positive nor negative in description)
7. Table 3 Legend on (P 13) Line 50-57 and (P14) Line 2-7 The current description of terms is confusing and difficult to follow. The reader must hunt for the term to find the definition. Consider using a symbol and list in sequential order (i.e. refined staffing model is 1st listed on p. 13 but defined on P 14)	Thank you, amended as per your suggestion in Table 3.
Supplements The 3 supplements were very helpful in understanding the larger innovative mixed methods study, The Hospital Dementia Services Project, including the technical aspects of linking analytical data and methods.	Thank you. Please note that we have updated Reference 12 from the 2011 'Study Description' which was available at the time of submission, to the Nov 2012 release of the same project "People with dementia in hospitals in New South Wales 2006–07"