PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Prevalence, nature and predictors of prescribing errors in mental health hospitals: a prospective multicentre study
AUTHORS	Keers, Richard; Williams, Steve; Vattakatuchery, Joe; Brown, Petra; Miller, Joan; Prescott, Lorraine; Ashcroft, Darren

VERSION 1 - REVIEW

REVIEWER	Dr Ian Maidment Aston University
REVIEW RETURNED	24-Jul-2014

GENERAL COMMENTS	This is an important study, however I have a number of concerns and comments as listed below: 1. Page 5 – lines 8 to 13 – the authors need to specify more explicitly how this study is significantly different from Stubbs et al 2006 - re-reading Stubbs - I don't think that they define PE (which this paper did). 2. Page 5 – line 17 – the authors need to further explain the relevance of reducing the possibility of including errors, which have been previously checked and corrected by healthcare staff. 3. Page 6 – lines 34 – it would be useful to have more information on the numbers of wards visited daily and weekly. 4. Page 7 – lines 7 to 16. The paper should clarify exactly how the scope of scenarios was extended from those listed by Stubbs et al, 2006. 5. Page 7 – Data Collection – if possible the authors should include data on the number of pharmacists collecting PE at each site and their AfC grade. 6. Page 8 – line 17 – it would be useful if the study co-ordinators at each site were named. 7. Results – following on from point 5 – it would be useful to report in the results any variability in reporting rates between the pharmacists including whether grade affects the reporting rate. 8. Page 23 – lines 17 to 22 – there is a body of evidence, which suggests that medication errors within mental health services are more common with physical meds – was this investigated? 9. Page 26 – lines 8 to 13 – see earlier comments about Stubbs et al (2006). 10. Pages 27 and 28 – on med rec within mental health services.

	A prospective evaluation of pharmacy technician led medication reconciliation for admissions to a UK Mental Health NHS Trust. (Brownlie K et al. International Journal of Clinical Pharmacy, 2014, 36, 303-9) - is one of the larger studies on Med Rec within Mental Health Services and collected data on 382 admissions; it also investigates the impact of Med Rec (page 28, lines 25 to 27). It has been recently published and may be relevant. 11. Page 29, lines 43 and 44 – both these references are relatively old (2007 and 2009) and since the Sainsbury report - http://www.centreformentalhealth.org.uk/pdfs/scmh_delivering_govt_mental_health_policy.pdf - there has been investment in clinical pharmacy in Mental Health Services. 12. Page 29, lines 53 to 56 – this suggestion to use Reason's theory of error causation to understand the causes of medication error in mental health services was part of a PhD thesis - Medication-related adverse events in older people with dementia; causes and possible solutions. Ian Maidment. This thesis is available from Aston University and should be referenced. 13. Page 30 - further limitations include – this study was conducted within 3 trusts within a single geographical area, which could limit generalizability (particularly compared to Stubbs et al, 2006). More importantly the study only included in-patients and mental health is increasingly moving to a community-based service.

REVIEWER	Sara Garfield Imperial College Healthcare NHS Trust UK
REVIEW RETURNED	30-Jul-2014

GENERAL COMMENTS	A couple of minor suggestions: 1) It may be of benefit to readers to define some of the terms used such as: prospective screening, on leave prescriptions. 2) In the abstract, 2nd sentence, please complete the sentence specialty trainees and consultant physicians were twice as likely to make clinically relevant PEs () respectively than...' 3) In the discussion the authors mention that unknown prescribers are associated with the highest PE rate. I could not find mention of that in the results section.

REVIEWER	Kay Seden University of Liverpool
REVIEW RETURNED	05-Aug-2014

GENERAL COMMENTS	• Summary: (Strengths and Limitations)' The prospective error identification method used and variability in the clinical practice of data collectors may have resulted in an underestimation of the prescribing error rate' It is unclear how variability in clinical practice could specifically result in an underestimation of error rate. Could this be further elaborated on in the article? • Method: (Settings) Are there any further characteristics of the sites

	which could be described? For example are there comparable/different number of inpatients, number of evaluated prescriptions from each site, or particular specialties within mental health? Could they all be considered 'typical' of mental health institutes in the UK? Or were the sites chosen to cover a range of institutions? It's mentioned that the logistic regression analysis was adjusted for clustering at sites. • Method: (Data Collection) The methods section describes that pharmacists undertaking data collection were asked to assign severity to errors. Were pharmacists provided with severity categories and definitions prior to the study (as in table 3 or other)? To what extent were the error severities assigned by pharmacists changed by the multidisciplinary panel, after development of the categories in table 3? • Method: (Data Collection) Pharmacists were asked to state whether errors reached the patient, however these data are not included in the results section. • Method: (Ethics) Presumably data was anonymised? It could be made clear that patient consent was not required for this reason. • Method: Was feedback given to the sites in order to evaluate potential interventions? • Results: (Table 4) In the table, the terminology 'potentially severe' is used, whereas the text refers to 'potentially serious' errors. • Discussion: (Strengths and Limitations) It states that the methods 'minimise the risk of double counting or including previously corrected items'. It could be made clearer in the methods section that the spread of days used, aimed to capture prescribed items only once, with no repeat auditing. • The logistic regression analysis includes written prescriptions vs electronic. The discussion acknowledges limitations of low numbers of electronic prescriptions and the fact that only electronic discharge proformas are used. However, it may be misleading to compare hand written and 'electronic' prescriptions in this case, as all electronic prescriptions were issued on discharge. Also, complete electronic prescribing is in use at many UK institutes, and often comprise drop down menus for drugs, formulas doses, directions, and may flag up alerts such as duplications, high doses, drug interactions. Maybe if the comparison between electronic and handwritten prescriptions is included, the differences between complete electronic prescribing and electronic discharge proformas could be made clearer.

VERSION 1 – AUTHOR RESPONSE

Reviewer Name: Dr Ian Maidment
Institution and Country Aston University
Please state any competing interests or state ‘None declared’: None declared

This is an important study, however I have a number of concerns and comments as listed below:

1. Page 5 – lines 8 to 13 – the authors need to specify more explicitly how this study is significantly different from Stubbs et al 2006 - re-reading Stubbs - I don't think that they define PE (which this paper did).
We would like to thank the reviewer for these useful comments. In the paragraph referred to by the reviewer, we explain that our study is the first in this setting to screen newly written/omitted prescription items for errors and to determine the risk of prescribing errors between prescribers/prescribing stages. We reference the study by Stubbs et al. (2006) [reference 22] on both

these occasions as an example of work that does not follow this approach. We feel that the manuscript adequately identifies the important differences between our work and earlier studies in this field. The reviewer's comment regarding the definition of a prescribing error are a little confusing – both the Stubbs paper and our work report using the same definition of a PE (see Stubbs et al. (2006) page 554).

2. Page 5 – line 17 – the authors need to further explain the relevance of reducing the possibility of including errors, which have been previously checked and corrected by healthcare staff.
We have now amended the text to explain what the consequences might be if these previously checked and corrected items are included.

3. Page 6 – lines 34 – it would be useful to have more information on the numbers of wards visited daily and weekly.
In the interests of maintaining the confidentiality of participating institutions (as per our research ethics application), it would be inappropriate for us to reveal the details of particular wards visited daily or weekly by pharmacy teams as some were more specialist environments unique to particular institutions. In addition, the number of visits per week varied over time both within and between institutions, and was heavily dependent on team capacity. We have instead provided more detail concerning the number of wards and individual hospitals/facilities included in the study (see 'settings' section).

4. Page 7 – lines 7 to 16. The paper should clarify exactly how the scope of scenarios was extended from those listed by Stubbs et al, 2006.
On page 7, we explain that we used the operational definition of a prescribing error developed by Dean et al. (2000), which is also used by Stubbs et al. (2006). We then utilise two of the five extended scenarios listed by Stubbs et al. for mental health settings. The other three scenarios are already captured in the Dean et al. (2000) operational prescribing error definition – this can be seen in Table 2 where all the types of prescribing error recordable in the study are listed. The reader can therefore see that our criteria are practically the same as those used by Stubbs et al. (2006).

5. Page 7 – Data Collection – if possible the authors should include data on the number of pharmacists collecting PE at each site and their AfC grade.
We did not record the grade of participating pharmacist data collectors, but we have now included in this section the number of clinical pharmacists involved in the study (see data collection section).

6. Page 8 – line 17 – it would be useful if the study co-ordinators at each site were named. Due to confidentiality reasons described above, we are unable to name the study coordinators as this would in turn reveal the identity of the NHS trusts involved.

7. Results – following on from point 5 – it would be useful to report in the results any variability in reporting rates between the pharmacists including whether grade affects the reporting rate.
As stated above, we did not collect data on pharmacist AfC grade during the study and are thus unable to provide an analysis of reporting variability. As pharmacists were working under different conditions across the study sites which could have been more or less likely to provoke prescribing errors than others, we feel that presenting medication error identification data between pharmacists could be misleading to the reader. If a study were to be designed that could investigate whether differences between data collectors existed, the pharmacists would be better examining prescriptions written in the same environment at the same time to minimize confounding variability. In addition, data in this study have been aggregated at trust level and are not broken down to individual wards or data collectors. We have instead elaborated in our discussion on the contribution of variability in pharmacist clinical practice when identifying errors, by referencing relevant work.

8. Page 23 – lines 17 to 22 – there is a body of evidence, which suggests that medication errors within mental health services are more common with physical meds – was this investigated?
On this occasion our methodology was based on earlier work (EQUIP study) which did not distinguish between psychotropic and non-psychotropic prescribed items. We refer to this as a limitation in our discussion section (see Strengths and limitations section).

9. Page 26 – lines 8 to 13 – see earlier comments about Stubbs et al (2006).
Please see our earlier responses regarding Stubbs et al. (2006). We feel that the Introduction adequately separated our work from Stubbs et al. and other similar studies in mental health hospitals. For clarity, we have included the word “only” in the first sentence of the Discussion section.

10. Pages 27 and 28 – on med rec within mental health services.
A prospective evaluation of pharmacy technician led medication reconciliation for admissions to a UK Mental Health NHS Trust. (Brownlie K et al. International Journal of Clinical Pharmacy, 2014, 36, 303-9) - is one of the larger studies on Med Rec within Mental Health Services and collected data on 382 admissions; it also investigates the impact of Med Rec (page 28, lines 25 to 27). It has been recently published and may be relevant.

We would like to thank the reviewer for suggesting this paper and inform him that we have already included this work in the manuscript, using reference number 38. We have also updated this reference to the full published version (no longer early online). We refer to this paper on more than one occasion on pages 27-28, and have amended the last sentence on page 27 to now read: “These studies highlight the importance of medicines reconciliation, a practice which is established in UK mental health hospitals[40] and which has shown value across hospital settings.[38,40-42]”

11. Page 29, lines 43 and 44 – both these references are relatively old (2007 and 2009) and since the Sainsbury report -
http://www.centreformentalhealth.org.uk/pdfs/scmh_delivering_govt_mental_health_policy.pdf - there has been investment in clinical pharmacy in Mental Health Services.
Many thanks to the reviewer for suggesting this document. We have now deleted the sentence on page 29 which refers to investment in pharmacy teams, and instead we now only state that the input of pharmacy teams should not be underestimated in keeping patients safe from preventable medication related harm.

12. Page 29, lines 53 to 56 – this suggestion to use Reason’s theory of error causation to understand the causes of medication error in mental health services was part of a PhD thesis - Medication-related adverse events in older people with dementia; causes and possible solutions. Ian Maidment. This thesis is available from Aston University and should be referenced.
We feel that there are a number of published examples of the application of Reasons model to study the origins of prescribing errors in general hospitals which we can draw on to justify further exploration in mental health settings. We have amended this paragraph make this observation clear.

13. Page 30 - further limitations include – this study was conducted within 3 trusts within a single geographical area, which could limit generalizability (particularly compared to Stubbs et al, 2006). More importantly the study only included in-patients and mental health is increasingly moving to a community-based service.
Many thanks for this comment. We have now updated our strengths and limitations section to reflect this and other potential limitations we noted in the original submitted version. Whilst the importance of studying medication errors in community settings should not be ignored, that was not the question that our study was designed to answer and we therefore do not feel that this is a limitation of the work. Instead, we have made reference to the need to study primary care prescribing in our main discussion (see last paragraph before strengths and limitations).

Reviewer Name: Sara Garfield
Institution and Country Imperial College Healthcare NHS Trust UK
Please state any competing interests or state ‘None declared’: None declared

A couple of minor suggestions:
We would like to thank the reviewer for these comments.

1) It may be of benefit to readers to define some of the terms used such as: prospective screening, on leave prescriptions.
We have now clarified such terms – see methods ‘settings’ section.

2) In the abstract, 2nd sentence, please complete the sentence specialty trainees and consultant physicians were twice as likely to make clinically relevant PEs () respectively than...'
Amendment now made to read: “… compared to FY one staff.”

3) In the discussion the authors mention that unknown prescribers are associated with the highest PE rate. I could not find mention of that in the results section.
We have now included this information in the results, see results section paragraph 3.

Reviewer Name: Kay Seden
Institution and Country University of Liverpool
Please state any competing interests or state ‘None declared’: None declared

• Summary: (Strengths and Limitations)' The prospective error identification method used and variability in the clinical practice of data collectors may have resulted in an underestimation of the prescribing error rate' It is unclear how variability in clinical practice could specifically result in an underestimation of error rate. Could this be further elaborated on in the article?
Many thanks for this comment. We have now amended this sentence to improve clarity. In our strengths and limitations section in the discussion, we elaborate on the contribution of data collection methods and vigilance/workload of data collectors in more detail, and now also include an additional reference for a study which has investigated the latter point (See reference 47).

• Method: (Settings) Are there any further characteristics of the sites which could be described? For example are there comparable/different number of inpatients, number of evaluated prescriptions from each site, or particular specialties within mental health? Could they all be considered 'typical' of mental health institutes in the UK? Or were the sites chosen to cover a range of institutions? It's mentioned that the logistic regression analysis was adjusted for clustering at sites.
Due to confidentiality reasons we are unable to provide breakdown of data for inpatient beds or at individual specialty ward level as this may identify participating organisations as previously described. We have however included more information on the number of wards, hospitals and pharmacists involved in the study for descriptive purposes (see methods sections: settings and data collection).

• Method: (Data Collection) The methods section describes that pharmacists undertaking data collection were asked to assign severity to errors. Were pharmacists provided with severity categories and definitions prior to the study (as in table 3 or other)? To what extent were the error severities assigned by pharmacists changed by the multidisciplinary panel, after development of the categories in table 3?
As part of the training package provided to data collectors (see data collection section) pharmacists were given standardised guidebooks containing severity ratings and examples for each category. We

have amended our methods section to include this information (see data collection). Unfortunately, missing data precludes any attempt to compare the pharmacist grading with that of the expert panel.

• Method: (Data Collection) Pharmacists were asked to state whether errors reached the patient, however these data are not included in the results section.
Apologies, this sentence should have read (and has been amended): “(including whether or not the error caused actual patient harm).” We have also included in our results section a statement that no errors were reported to cause actual patient harm (see nature of PEs identified, paragraph 2).

• Method: (Ethics) Presumably data was anonymised? It could be made clear that patient consent was not required for this reason.
Individual patient consent was not required for this study because data collectors were trust employed staff working as part of their routine roles in a service evaluation. We have amended the ethics section to reflect this point.

• Method: Was feedback given to the sites in order to evaluate potential interventions?
A summary report of the findings (after the analysis was completed) was presented to each participating institution in order to stimulate improvement activities.

• Results: (Table 4) In the table, the terminology 'potentially severe' is used, whereas the text refers to 'potentially serious' errors.
Many thanks, correction to table now made – should read “serious”

• Discussion: (Strengths and Limitations) It states that the methods 'minimise the risk of double counting or including previously corrected items'. It could be made clearer in the methods section that the spread of days used, aimed to capture prescribed items only once, with no repeat auditing. Many thanks for this comment.
Amendments have now been made to this section which explain why double counting/counting previously corrected items was minimised.

• The logistic regression analysis includes written prescriptions vs electronic. The discussion acknowledges limitations of low numbers of electronic prescriptions and the fact that only electronic discharge proformas are used. However, it may be misleading to compare hand written and 'electronic' prescriptions in this case, as all electronic prescriptions were issued on discharge. Also, complete electronic prescribing is in use at many UK institutes, and often comprise drop down menus for drugs, formulas doses, directions, and may flag up alerts such as duplications, high doses, drug interactions. Maybe if the comparison between electronic and handwritten prescriptions is included, the differences between complete electronic prescribing and electronic discharge proformas could be made clearer.
We agree with the review comment, and have amended our results table 5, results section (predictors of PEs and clinically relevant PEs) and discussion section (paragraph one) to refer to electronic prescriptions as only at discharge stages.

VERSION 2 – REVIEW

REVIEWER	Ian Maidment Aston University, UK
REVIEW RETURNED	15-Aug-2014

- The reviewer completed the checklist but made no further comments.

REVIEWER	Sara Garfield Imperial College Healthcare NHS Trust, UK
REVIEW RETURNED	21-Aug-2014