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# EUROPEAN JOURNAL OF HOSPITAL PHARMACY

## TITLE PAGE

### Title

Hospital Discharge Information Communication and Prescribing Errors: A  
Narrative Literature Overview

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## **ABSTRACT**

### **Objectives**

To provide a narrative overview of the literature on discharge information communication and medicines discharge prescribing error rate in United Kingdom (UK) and other similar healthcare systems.

### **Methods**

A narrative review of the peer reviewed literature (2000-2014) on communication of discharge information from hospitals to general practitioners (GPs). Databases included were MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Applied Social Sciences Index and Abstracts (ASSIA), and International Pharmacy Abstracts database.

### **Results**

The search yielded 673 results with 15 papers satisfying all inclusion criteria. Direct comparison of studies was not feasible due to differences in study populations and outcome measures. No studies reported post Hospital Electronic Prescribing and Medicine Administration (HEPMA) implementation. Studies (n=6) investigating handwritten discharge communication systems demonstrated medicine information inaccuracy ranging from 0.81 errors per patient to 17.5% medicines with errors and 67% letters missing medicines change information; with 77% assessed as legible. Studies (n=4) comparing interim electronic solutions with traditional showed variable results: improved, unchanged or decreased medicine information accuracy. Studies researching solely interim electronic solutions (n=5) with one including prescribing error rate assessment at 8.4% of prescribed items and identification of a new electronic system related error type.

### **Conclusion**

Implementation of interim electronic discharge solutions resulted in complete legibility but did not eradicate information and prescribing errors. A paucity of information is available about HEPMA implementation impact on discharge

information communication and prescribing error rates. There is urgent need for formal evaluation in this area.

## Key Message

What is already known on this subject:

- Communication of information at hospital discharge is associated with risks, prescribing errors and potential or actual patient harm
- HEPMA implementation is claimed to reduce prescribing errors and improve communication

What this study adds:

- There is a lack of published information relating to the impact of HEPMA implementation on discharge information communication
- Interim electronic discharge solution implementation provides inconsistent prescribing error rates and information accuracy results

## MAIN TEXT

### Introduction

Hospital Electronic Prescribing and Medicine Administration (HEPMA) systems have been implemented into hospitals with a key aim of improving patient safety.[1] HEPMA is an electronic system which enables electronic prescribing of medicines for hospital inpatients, documentation of all medicines administered during the inpatient stay and the compilation of an immediate discharge letter which includes information about prescribed medicines required to be continued by the patient on hospital discharge. The anticipated patient safety benefits include reducing multiple error types including administration, prescribing and transcribing errors.[1] Additional expected benefits include enhancement of the medicine reconciliation processes and medicine information communication at transfers including admission and discharge. Both NHS England and NHS Scotland have developed policies committing to HEPMA as a future e-health model in all secondary healthcare settings.[2, 3] McLeod et al identified that HEPMA implementation was sporadic in NHS England but reported adoption of interim electronic solutions (including a discharge module) as a stepping stone to full HEPMA implementation.[4] HEPMA implementation does not appear to be proposed within the remainder of the European Union (EU).

The immediate discharge letter (hospital discharge summary) is the accepted document used to communicate information about patient care and ongoing care requirements, including medicine information after a treatment episode. Within the EU, patients may receive healthcare in countries which are not their primary abode therefore effective discharge communication is especially essential. The use of electronic discharge summaries is advocated as a potential solution to solve this problem. EU directive 2011/24/EU states that "in order to ensure continuity of care, patients who have received treatment are entitled to a written or electronic record of such treatment and access to at least a copy of this record".[5] The EU funded MARQUIS project called for a standardised European discharge summary.[6] Another EU funded project HANDOVER identified multiple discharge process problems within countries including lack of collaboration and identified frequent insufficient quality and

amount of information provision on hospital discharge summaries to patients, family members and primary care.[7] Knai et al and Glonti et al reviewed discharge summary content throughout the EU and discovered wide disparity in discharge summary content.[8, 9] Knai et al produced a recommended data set for harmonised EU discharge summaries which includes “medication information (using international non-proprietary names)”. [8]

Doring et al reviewed the progress towards a cross-border electronic discharge summary in the EU.[10] They concluded that “EU actions have led to development of electronic discharge summaries but that the establishment of EU-wide electronic discharge summaries is still at a very early stage” and further identified that “research is needed to map the legal and regulatory situation regarding hospital-to-community discharge within EU member states with an in-depth assessment of existing guidelines on discharge summary content should be conducted”. [10] To date limited progress has thus been achieved in creating EU wide standardised electronic discharge summaries. Individual countries including the United Kingdom (UK) have prepared standards and minimum datasets for discharge communication, for example the Scottish Intercollegiate Guidelines Network (SIGN) guidance for The Immediate Discharge Letter.[11]

National Health Service (NHS) England published a patient safety alert in 2014, aimed at all NHS organisations, other providers of NHS care and social care sectors highlighting problems with essential information communication at patients’ hospital discharge, highlighting that, “information is not always acted on in a timely manner”. [12] Several difficulties arise due to communication of discharge information after an inpatient hospital stay including inaccurate, incomplete or delayed information transfer. Medicines information errors including prescribing and transcribing errors may result in either potential or actual patient harm. In 2013, the Department of Health produced a £260 million investment plan to aim for the NHS in England to be paperless by 2018.[2] The Scottish e-health strategy (2011 to 2017) produced by the Scottish Government and revised in 2012 recommends all Scottish health boards implement HEPMA.[3] One of the key aims of these recommendations is to improve communication and reduce prescribing errors.

There is no published systematic review of the prevalence and causes of prescribing errors at the point of patient discharge from hospital. Kripalani et al completed a systematic review, published in 2007, which assessed communication gaps on any type of discharge information communication including handwritten and typed letters and/or summaries.[13] They provided analysis of 83 articles, mainly of studies in American settings. While identifying missing information including that relating to medicines as problematic, they did not focus on prescribing errors. A later systematic review published in 2011 by Motamedi et al of computer-enabled discharge summaries identified only 12 papers worldwide, highlighting recognised benefits of improved quality and timeliness of information receipt.[14] This review did not consider prescribing errors.

The current literature review aims to provide a narrative overview of the published evidence from the UK and similar healthcare organisations on discharge information communication and discharge prescribing error rate.

## **Methods**

### **Narrative literature review**

Narrative literature reviews are defined as “comprehensive narrative syntheses of previously published information”. [15] They provide useful summaries, in-depth analysis of a specific topic and may describe evolution of the subject over time.

A narrative review was undertaken of the published literature on the communication of discharge information from hospital to general practitioners (GPs) on medicines related discharge information communication and discharge prescribing error rate in United Kingdom and other similar healthcare systems including Australia, Canada, Ireland and New Zealand.[16] The review focused specifically on HEPMA implementation or other interim electronic solution implementation.

### **Sources of Information**

The search was conducted using the Knowledge Network of NHS Scotland electronic database which incorporates MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Applied Social Sciences

Index and Abstracts (ASSIA) and International Pharmaceutical Abstracts databases.

### Search Terms and inclusion criteria

The search terms used were: hospital discharge information communication; electronic hospital discharge letters; hospital electronic prescribing information communication; electronic discharge medicine information; integrated care information communication to GPs; seamless care information communication to GPs; and e-prescribing discharge information. Papers were included if they were published in the English language, from 2000 to 2014, and reporting data from the UK, or countries with similar healthcare systems such as Australia, Canada, Ireland and New Zealand. Studies were excluded if full text not available, duplicate references or if inappropriate topic or geographical location. Data were extracted onto an Excel spreadsheet to enable comparison and synthesis. This timeframe was selected because HEPMA implementation began in the late 1990s.

## Results

The search yielded 673 references. Fifteen papers suitable for inclusion were identified and reviewed.[17-31] Key reasons for discounting papers were non-English language, full text unavailable, the healthcare setting was not in the UK or a country with a similar healthcare system, duplication, or if published outwith the defined time period.

### Study settings

The majority of studies (eight) were set in the UK with the remainder situated in Australia (five), New Zealand (one) and Ireland (one).

### Study designs

A variety of study designs and methods were employed, with some studies including more than one method. The identified study designs consisted of nine retrospective audits; [18, 19, 21, 23, 24, 25, 26, 28, 30] six surveys; [17, 20, 22, 23, 29, 31] one blinded randomised controlled trial; [29] one interrupted time sequence; [27] and one employing semi- structured interviews.[18]



### Outcome Measures

The outcome measures varied amongst the studies with the majority assessing information accuracy, receipt time of information, medicine information accuracy and staff satisfaction. A few also measured potential patient harm, error severity or preventable re-admissions. Table 1 provides a detailed description of the studies.

### Statistical Analysis

The approach to statistical analysis varied markedly amongst the studies as evidenced in Table 1. One study used extrapolated data for results, minimising any meaningful conclusion which can be derived.[18] Two studies used statistical analysis as part of the result discussion without providing the analysis method details, making it impossible to confirm statistical appropriateness.[21, 23]

**Table 1 Descriptions of studies**

<b>Authors Publication Year</b>	<b>Country</b>	<b>Setting</b>	<b>Aim</b>	<b>Design (Study type)</b>	<b>Outcome Measures</b>	<b>Sample size</b>	<b>Statistical Analysis</b>
Sexton J, Ho YJ, Green CF, et al. 2000	UK	UK survey	To assess hospital pharmacy service provision for hospital discharge	Postal survey of UK Chief Pharmacists	Grade of staff preparing Immediate discharge letters (IDLs); communication method; format of communication	153/222 (73.4%)	Significance not assessed Percentage response
Wilson S, Ruscoe W, Chapman M, et al. 2001	Australia	Medical, surgical, elderly, gynaecology and paediatric from one hospital	To assess information accuracy and GP receipt time of hospital IDLs, and GP opinion of the process	Retrospective audit; semi- structured GP interviews	Receipt time; information content; accuracy of medicine information; GP opinions	569 (5% sample) of patients 20 GPs	Significance not assessed Percentage response Extrapolated data
Foster DS, Paterson C and Fairfield G. 2002	UK	Patients discharged from hospital to 4 GP practices (35000 patients)	To assess information content of IDLs and receipt time of IDLs by GP surgeries	Retrospective audit SIGN 5 (Sign 5 superseded by SIGN 128)	Receipt time; information content	244 IDLs (28 days)	Significance not assessed Percentage response
Pillai A, Thomas SS and Garg M. 2004	UK	GPs in one Scottish Health Board area	To assess GP opinion about quality and accuracy of electronic IDLs	Postal survey GPs	Information content; number of communications; GP opinions	28/40 (70%) receiving electronic version; 67/96 (70%) will receive electronic version in future	Significance not assessed Percentage response
McMillan TE, Allan W and Black PN 2006	New Zealand	Medical, surgical patients from one hospital	To assess medicine error frequency and type on IDLs	Retrospective audit	Accuracy of medicine information; potential patient harm	100 medical 100 surgical	Not described 95% CI and p used to discuss results
Alderton M and Callen J. 2007	Australia	General medical, elderly wards, 75 bed hospital	To assess GP opinion regarding information quality and receipt time of electronic IDLs	GP survey	Receipt time; Information content; GP opinion	54/85 (64%)	Significance not assessed Percentage response
Scullard P, Iqbal N, White L et al. 2007	UK	Hospital type not stated	To assess information content of traditional handwritten IDLs and typed Final Letters (FLs) with an electronic summary alone using SIGN guideline criteria	Retrospective audit; GP survey	Information content and accuracy; GP opinions	30 patients	Not described SD and p used to discuss results
Callen JL, Alderton M, McIntosh J. 2008	Australia	Unknown	To compare handwritten and electronic IDLs for information content and accuracy	Retrospective audit	Information content; Accuracy of medicine information	Control 94 (38%) Intervention 151(62%)	2x2 table for odds ratio + 95% CI; Chi square analysis p<0.05 significant
Grimes T, Delaney T, Duggan C, et al. 2008	Ireland	Cardiology patients in four medical wards in a teaching hospital	To assess the accuracy of medicine information on discharge documents and to correlate discrepancies with patient harm	Retrospective audit	Accuracy medicine information; potential patient harm	139 patients	Not described 95% CI

Authors Publication Year	Country	Setting	Aim	Design (Study type)	Outcome Measures	Sample size	Statistical Analysis
Witherington EMA, Pirzada OM, and Avery AJ. 2008	UK	Elderly patients, one district general hospital	To assess discharge information availability and content for patients readmitted to hospital within 28 days, and if lack of information or content contributed to readmission	Retrospective audit	Information content and availability; accuracy of medicine information; preventable readmissions	141 patients	Chi square analysis
Abdel-Qader DH, Harper L, Cantrill JA, et al. 2010	UK	Medical and elderly care patients, one teaching hospital (904 beds)	To assess the number of prescribing errors on e-prescribing discharge prescriptions detected by pharmacists during usual validation practice and to determine error severity.	Retrospective observational interrupted time sequence	Number and type of pharmacist identified prescribing errors; error severity assessment	1038 patients 7290 prescribed items	Chi square analysis Unpaired t-test 95%CI Kappa interrater reliability
Callen J, McIntosh J, and Li J. 2010	Australia	Elderly ward, 78 bed hospital	To compare transcription errors on handwritten and electronic IDLs and assess medicine information in relation to grade of staff preparing document	Retrospective audit	Accuracy of medicine information; potential patient harm	966 Handwritten 842 Electronic	Mann-Whitney U test Chi square analysis Odds ratio + 95% CI Correlation analysis P<0.05 significant
Chen Y, Brennan N, and Magrabi F. 2010	Australia	Elderly ward, 300 bed teaching hospital	To assess effectiveness of IDL communication by different delivery methods	Blinded randomised controlled trial (RCT); GP survey	Receipt by GP practice within 7 days following hospital discharge; GP opinions	Control 63 RCT 168: email 40, fax 48, post 40, patient 40; GP n=52	Student's t-test Chi square analysis P<0.05 significant Descriptive statistics
Hammad EA, Wright DJ, Nunney I, et al. 2014	UK	Patients discharged from hospital to one English primary care area (91 GP practices)	To assess information content of IDLs against a recommended minimum dataset and assess compliance with medicine information	Retrospective review of IDLs	Full data set compliance; medicine information compliance; medicine change compliance; legibility	3444 IDLs from 12 hospitals audited by 84 GP practices	Descriptive statistics General linear model analysis 95%CI
Yemm R, Bhattacharya D, Wright D, et al. 2014	UK	600 bed district general hospital 43 GP practices (325,000 patients)	To assess opinion of hospital junior doctors and GPs in relation to discharge letter content	Survey	Ideal receipt time of IDLs; content accuracy assessed by GPs; importance of content and features of IDLs	36 junior doctors, 42 GPs	Descriptive statistics Fisher's exact test Mann-Whitney U test

IDL = Immediate Discharge Letter CI = Confidence Interval RCT = Randomised Controlled Trial p=probability

The studies are presented as three groups to facilitate comparison, provide a description of the evolution of discharge communication systems over time and review any identified study impact:

1. Studies investigating traditional paper handwritten communication systems
2. Studies comparing electronic interim solutions to traditional paper handwritten systems
3. Studies investigating solely electronic interim solutions

#### 1) Results of traditional handwritten systems

Six studies investigated traditional communication methods.[17, 18, 19, 21, 25, 26] The studies were published from 2000 to 2008. The majority were retrospective audits consisting of between 139 and 569 patients.[18, 19, 21, 25, 26]

Details of the key findings are provided in Table 2, clearly demonstrating the high prevalence of errors, with medicine information assessed as 64-66% inaccurate. Examples of identified errors included medicines discontinued during the inpatient stay prescribed on discharge, for example aspirin for a patient newly commenced on warfarin, and medicines omitted from discharge letters. Few studies researched fully all aspects of communication with limited assessment of potential patient harm. There was high variability in the extent of communication deemed to be legible, with up to 77% deemed as "mostly legible", with some authors noting the measurement of legibility to be highly subjective.[18] Hospital readmissions due to medicines related problems were detected in 38% of patients but with uncertainty regarding the association between inaccurate communication and the potential to cause readmission.[26] It should be acknowledged that this study was limited to patients over 75 years old who tend to have more hospital readmissions for multiple reasons.

Table 2 Results of Studies of Traditional IDLs

Author Year	Country Population	Information content + accuracy	Medicine Information Accuracy	GP satisfaction	Potential Patient Harm	Legibility	Communication Method
Sexton J, Ho YJ, Green CF, et al. 2000	UK	NA	NA	NA	NA	NA	Only 9.9% sent by electronic means; 19 different combinations
Wilson S, Ruscoe W, Chapman M, et al. 2001	Australia General	Errors in all parts of the discharge document- assessed as 63.6% accurate	17.5% errors; 21% no medicine information recorded	GP prefer fax communication method	NA	77% mostly legible or legible	NA
Foster DS, Paterson C and Fairfield G. 2002	UK Unknown	20% no admission or discharge dates, 13% no diagnosis	NA	NA	NA	39% legible signature	NA
McMillan TE, Allan W and Black PN. 2006	New Zealand Medical/ surgical	NA	More errors per patients in medical wards (1.42 ) than surgical wards (0.81) with more medicine changes in medical wards	NA	88% of errors assessed as minor or potentially troublesome;  1.8% may result readmission	NA	NA
Grimes T, Delaney T, Duggan C, et al. 2008	Ireland Cardiology	NA	Errors in 65.5% patients or in 10.8% per prescribed item	NA	53% moderate harm;  47% none or minor harm.	NA	NA
Witherington EMA, Pirzada OM, and Avery AJ. 2008	UK elderly	62% no FL when patient re-admitted to hospital	66% incomplete for medicine changes	NA	↔	NA	NA

not assessed; FL = Final Letter ↔- communication error alone not responsible for patient harm

NA-

## 2) Results of comparison of traditional and interim electronic solutions

Four studies compared handwritten traditional methods with electronically prepared IDLs.[23, 24, 28, 30] The studies were published from 2007 to 2014. All involved retrospective audits with one study including a GP survey,[23] and consisted of variety of sample sizes ranging from a modest 30 in each arm; [23]to a comparison of 966 and 842 in another; [28] with the largest being a sample of 3444.[30]

Details of key findings and results are provided in Table3, which demonstrates variability in results among the studies especially in relation to errors and medicines information accuracy. Two studies demonstrated an improvement in information accuracy using electronic systems with up to 82% completed accurately with electronic versus 62% with paper; [23, 30] whereas one study showed no significance difference with an error rate of 12.1% with paper versus 13.3% for electronic although both systems required transcription; [28] and another reported more errors with the electronic system (13% versus 6% errors) with a free-format section being particularly problematic for errors.[24]Two studies demonstrated improved compliance with information documentation of up to 82% compliance with a minimum dataset when using an electronic template.[23, 30]

There are inconsistent findings in relation to medicines accuracy. Studies found deterioration in accuracy from 6.4% handwritten prescribing errors to 12.6% with electronic version,[24] no change in accuracy (13.3 % electronic medication errors versus 12.1% handwritten),[28] or improvement in accuracy from 54.8% to 67.2% compliance.[30] Medicines omission was the commonest detected error type with an average error rate of 1.5 errors per patient with paper versus 1.4 with electronic discharge letters with errors.[24] Changing to electronic discharge letters resulted in complete legibility.[30] GP satisfaction improved with electronic letters.[23,24]

Table3 Results of studies comparing handwritten and electronic IDLs

Author Year	Country Population	Information content and accuracy	Medicine Information Accuracy	GP satisfaction	Potential Patient Harm	Legibility	Communication Method
Scullard P, Iqbal N, White L et al. 2007	UK unknown	electronic + Improved compliance of up to 82%	NA	electronic +	NA	electronic +	NA
Callen JL, Alderton M, McIntosh J. 2008	Australia unknown	electronic - 17.1% deficiency electronic versus 10.8% paper	electronic - 87.4% accurate electronic versus 93.6% paper	electronic +	NA	electronic +	NA
Callen J, McIntosh J, and Li J. 2010	Australia Elderly	NA	↔ Errors in 13.3% electronic versus 12.1% paper	NA	NA	NA	NA
Hammad EA, Wright DJ, Nunney I, et al. 2014	UK General	electronic + 71.7% template conformity	electronic + 67.2% accuracy although only 48.9% medicine change information	NA	NA	electronic +	NA

NA- not assessed

+ - significantly improved

- -significantly worse

↔ - no significance between groups

### 3) Results of studies of electronic immediate discharge letters

Five studies evaluated electronic immediate discharge letters.[20, 22, 27, 29, 31] The studies were published from 2004 to 2014. Four used survey approaches to gauge opinions; [20, 22, 29, 31] with one retrospective observational interrupted time sequence; [27] and one blinded randomised control trial.[29] One study surveyed the requirements for IDLs from the perspectives of both GPs and hospital junior doctors.[31] Sample size varied amongst the studies with a range from a modest 28 to 1038. Details of key findings and results are provided in Table 4.

Information accuracy and content was found to be at least as good as the previous handwritten paper immediate discharge letter in one study,[20] whilst another identified that 93% of surveyed GPs noted enhancement with the electronic version.[22] Accurate information and not timely information receipt was stated to be most important category on discharge communication for surveyed GPs (72%) and junior doctors (88%).[31] One paper showed GPs preferred electronic communication of discharge information.[29]

Prescribing errors were found to still occur with electronic systems, at an error rate of 8.4% of prescribed items. Notably, a new error type was identified with electronic systems, termed 'system errors', defined as errors 'unlikely to occur with handwritten charts'. An example of a system error included incorrect selection of a medicine from the computer generated list. Study findings indicated that these system errors were associated with lower patient harm, 68% being considered significant or serious versus 85% of non-system errors.[27]



Table 4 Results of studies of electronic IDL

Author Year	Country Population	Information content + accuracy	Medicine Information Accuracy	GP satisfaction	Potential Patient Harm	Legibility	Communication Method
Pillai A, Thomas SS and Garg M. 2004	UK General	↔	NA	electronic +	NA	NA	electronic +/- *
Alderton M and Callen J. 2007	Australia General medical, elderly	electronic +	NA	electronic +	NA	NA	NA
Abdel-Qader DH, Harper L, Cantrill JA, et al. 2010	UK Medical, elderly care	NA	Electronic- still errors Prescribing errors occurred in 8.4% of all prescribed medicine on discharge	NA	+ systems errors assessed as less severe than traditional errors	NA	NA
Chen Y, Brennan N, and Magrabi F. 2010	Australia Elderly	NA	NA	electronic +	NA	NA	electronic + 83% of GPs preferred fax communication
Yemm R, Bhattacharya D, Wright D, et al. 2014	UK General	NA	Accuracy main concern (72%GPs and 88% junior doctors)	electronic +	NA	NA	NA

NA- not assessed

+ - significantly improved

- -significantly worse

↔ - no significance between groups

# 58% actually receiving GPs disagreed with 78% potentially receiving agreeing

\* status quo favoured by actually receiving GPs whilst potentially receiving favoured electronic version

## Discussion

Previous studies have highlighted the importance of accurate communication of information including medicines information at patients' hospital discharge.[12, 13, 14] However, there are currently no EU standards for discharge information communication content.[9, 10] This overview concentrated on UK and similar healthcare systems but was unable to source any published literature relating to studies post-HEPMA implementation and discharge information communication and prescribing errors. Therefore, this literature review provides a narrative overview of discharge information communication and prescribing errors.

Studies which investigated traditional handwritten discharge communication methods tended to be published several years before those focusing on either electronic discharge communication versus traditional methods or electronic discharge solutions alone. Analysis of the studies concerning traditional handwritten discharge systems provided information to quantify the extent of the discharge information communication and discharge prescribing errors problem. Review of studies either comparing interim electronic solutions and traditional paper or studies assessing only electronic interim solutions provided information about the possible impact of changing to electronic discharge systems.

Advantages that have previously been ascribed to interim electronic discharge solutions include improved legibility, information content accuracy, and a reduction in prescribing errors.[13] This review highlights that interim electronic solutions had been studied in varying countries but without a standard approach being applied to each study. Direct comparison amongst the studies was limited due to application of different methodologies, the variety of study populations and differing outcome measures. Furthermore, discharge information accuracy and completeness and prescribing error rates were not researched in all studies.

The main findings of this overview are that inconsistent results were found amongst the various studies in relation to discharge information content and accuracy. The use of electronic systems resulted in an improvement in information content and accuracy in three studies; [22, 23, 30] was as good as the traditional system in one study; [20] but resulted in a decrease in quality in one study.[24] In the latter, the main issue appeared to be documentation of

information in an incorrect section. There is no information available to ascertain if this would have improved with familiarity.

Likewise, the impact of electronic interim solutions on discharge prescribing error rates remains inconclusive. Prescribing error rates were found to be unchanged, improved or decreased depending on the individual study.

Therefore, dubiety exists in relation to the impact of interim electronic solutions on discharge prescribing error rates. Moreover, some studies claimed that it was challenging to ascertain if medicines recorded on admission but not on discharge had been intentionally stopped during the patients' hospital stay.[17, 26]

However, it should be noted that formal assessment of transcription errors was not completed in any of the studies. Two studies postulated that once transcription is no longer required, prescribing errors will be reduced.[24, 28]

The major assumption of this theory is that the initial inpatient prescription will not contain any unresolved prescribing errors. Interestingly, two studies [18, 23] recommended changing to electronic discharge letters as a panacea to solve identified problems, without realising that different issues and errors may arise with these systems. A new type of prescribing error, termed a 'system error' has been identified as a result of implementation of electronic systems, although this was associated with lower patient harm[27]

Despite the persistence of prescribing errors and information inaccuracy, none of the identified studies could equate actual patient harm including hospital readmission with miscommunication and prescribing errors on hospital discharge information. Therefore, electronic interventions are at a minimum as good as the traditional system; result in complete legibility, improved information content and resulted in enhanced GP satisfaction

Completion of this overview has highlighted a need for future research to assess the impact of implementing electronic solutions on discharge information communication and prescribing errors.

### Study Limitations

The limitations of this narrative overview are firstly publication bias as it only considered UK healthcare systems or countries with similar healthcare systems, was restricted to publications in the English language and excluded abstracts or

conference proceedings. The experimental study designs adopted by the studies tended to be of lower quality in relation to evidence hierarchy and included only one interrupted time series study and one blinded randomised controlled trial.[32] The majority of studies were retrospective audits with a limited number including control groups.[24, 28, 29] Most of the studies had disparate aims and some studies included multifactorial interventions to improve the discharge information communication process. There was considerable heterogeneity in the studied populations, sample sizes and outcome measures related to the assessment of content, accuracy, and prescribing error assessment adopted amongst the different studies. Finally, there are caveats in relation to the generalisability of the results as many of the studies were conducted in either certain hospital specialties or solely in one hospital. In particular, several of the studies focused on elderly patients who have a tendency to greater polypharmacy than the general population.

## **Conclusion**

In conclusion, there is a paucity of literature regarding evaluation of HEPMA implementation. A limited number of studies have reviewed the impact of electronic solutions on communication of discharge information but none have encompassed HEPMA implementation. Most of the published literature focused on interim electronic solutions which still require transcription from a paper inpatient chart to an electronic discharge document with a potential for prescribing errors to occur during the transcription process. There is therefore an urgent need for evaluative research to focus on the impact of HEPMA implementation, specifically relating to discharge communication and any impact on prescribing errors especially in relation to patient outcome measures including patient harm and hospital readmission rates.

**Contributors:** PM conceived the idea. PM, DS and AW designed the literature review.

PM conducted the literature review and drafted manuscript. DS and AW critically reviewed the manuscript for intellectual content.

**Ethical Approval:** not required

## Competing interests

Nil

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