

A systematic review examining the characteristics of users of NHS patient medicines helpline services, and the types of enquiries they make

Matt Williams ¹, Abbie Jordan ², Jenny Scott ¹, Matthew Jones ¹

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/ejhp-2019-002001>).

¹Department of Pharmacy and Pharmacology, University of Bath, Bath, UK
²Department of Psychology, University of Bath, Bath, UK

Correspondence to

Dr Matthew Jones, Department of Pharmacy & Pharmacology, University of Bath, Bath BA2 7AY, UK; m.d.jones@bath.ac.uk

Received 5 June 2019
Revised 3 October 2019
Accepted 14 October 2019
Published Online First
31 October 2019

EAHP Statement 4: Clinical Pharmacy Services.

ABSTRACT

Background and objective Patient medicines helpline services (PMHS) are available from some National Health Service Trusts in the UK to support patients following their discharge from hospital. The aim of this systematic review was to examine the available evidence regarding the characteristics of enquirers and enquiries to PMHS, in order to develop recommendations for service improvement.

Methods Searches were conducted using Medline, Embase, Cumulative Index of Nursing and Allied Health Literature, Scopus, and Web of Science, on 4 June 2019. Forward and backward citation searches were conducted, and grey literature was searched. Studies were included if they reported any characteristics of enquirers who use PMHS, and/or enquiries received. Study quality was assessed using the Axis tool. A narrative synthesis was conducted, and where appropriate, weighted means (WMs) were calculated. Where possible, outcomes were compared with Hospital Episode Statistics (HES) data for England, to establish whether the profile of helpline users may differ to that of hospital patients.

Results Nineteen studies were included (~4362 enquiries). Risk of bias from assessed studies was 71%. Enquirers were predominantly female (WM=53%; HES mean=57%), elderly (WM=69 years; HES mean=53 years) and enquired regarding themselves (WM=72%). Out of inpatient and outpatient enquirers, 50% were inpatients and 50% were outpatients (WM). Six of 15 studies reported adverse effects as the main enquiry reason. Two of four studies reported antimicrobial drugs as the main enquiry drug class. From two studies, the main clinical origin of enquiries were general surgery and cardiology. Across six studies, 27% (WM) of enquiries concerned medicines-related errors.

Conclusions Our findings show that PMHS are often used by elderly patients, which is important since this group may be particularly vulnerable to experiencing medicines-related issues following hospital discharge. Over a quarter of enquiries to PMHS may concern medicines-related errors, suggesting that addressing such errors is an important function of this service. However, our study findings may be limited by a high risk of bias within included studies. Further research could provide a more detailed profile of helpline users (eg, ethnicity, average number of medicines consumed), and we encourage helpline providers to use their enquiry data to conduct local projects to improve hospital services (eg, reducing errors).

PROSPERO registration number CRD42018116276.

BACKGROUND

Approximately 40% of patients who have been discharged from hospital may subsequently experience medicines-related problems.^{1,2} Additionally, patients often lack knowledge about their medications following hospital discharge,^{3,4} and many patients report not receiving important medicines-related information.^{5,6} Patients may also experience medicines-related errors following hospital discharge, such as dispensing errors and incorrect or missing information on discharge documents.^{7,8} Hospital discharge may therefore be a confusing and/or risky period for patients who have recently experienced changes to their medicines.

Consequently, in the UK, patient medicines helpline services (PMHS) have become available from some National Health Service (NHS) Trusts. The first PMHS was established in the UK in 1992,⁹ and a survey study conducted in 2017 found that 52% of NHS Trusts provided a PMHS.¹⁰ The function of a PMHS is to enable discharged patients to seek medicines-related support from pharmacy professionals from the healthcare setting where they recently received care. This accords with WHO policy which states that offering information on medicines via medicines information (MI) centres, and providing public education about medicines, are essential interventions to promote the rational use of medicines.¹¹

Studies that have examined PMHS have typically been service evaluations of individual sites to describe the characteristics of enquirers and their enquiries, and to report the effectiveness of PMHS using enquirer satisfaction surveys (eg, Bramley *et al* and Badiani *et al*^{12,13}). A recent systematic review examined the evidence regarding the effectiveness of PMHS, concluding that they are typically perceived as positive, advice is usually followed, and users report several positive outcomes (eg, problems resolved/avoided, and improved health).¹⁴ However, to date, a review of the literature has not been conducted which brings together the available evidence regarding the characteristics of enquirers to PMHS, or the enquiries they make. The findings of such a review would be more generalisable to PMHS throughout the UK than individual service evaluations. Such information could be useful for establishing whether PMHS are underused by any types of patients, and for understanding patients' needs, which could highlight areas for service improvement.

Aim

The aim of this systematic review was to address the following research questions, in order to develop



© European Association of Hospital Pharmacists 2020. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Williams M, Jordan A, Scott J, *et al*. *Eur J Hosp Pharm* 2020;**27**:323–329.

recommendations for improving PMHS, and potentially, hospital pharmacy services more widely: *What are the characteristics of people who use PMHS? What are the characteristics of enquiries made to PMHS?*

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses were used in the planning, conducting, and reporting of this review. The protocol was registered with the International Prospective Register of Systematic Reviews on 21 November 2018 (registration number CRD42018116276).¹⁵

Eligibility criteria

Studies were included if they reported any characteristics of enquirers who use PMHS, and/or enquiries received. PMHS were defined as: (1) A service for patients and/or carers of patients who received care from the NHS Trust within the UK that provides the PMHS, and not for a specific subset of patients and/or their carers. (2) A service involving distance communication, via any means, between the service user and service provider, instigated by the service user. (3) A service providing MI, and not general clinical information.

We included published and unpublished studies, abstracts, and conference proceedings that were written in English. We excluded studies if the data were presented in a subsequently published format (eg, a study in a conference proceeding if it was subsequently published as a full-text article). No restriction was made regarding year of publication.

Studies were only included where the types of enquirers and/or enquiries were based on either the total number of all enquiries received within a specified period (eg, 6 months) or a randomly selected number of enquiries from all enquiries received within a specified period. Studies were excluded if they solely described a subset of all enquirers or enquiries (eg, only female enquirers, or only enquiries about adverse effects), since the focus was on PMHS, and not on specific patient groups, issues, or conditions.

Search strategy

Searches were conducted using Medline, EMBASE, CINAHL, Scopus and Web of Science. Where possible, searches were conducted using both free-text and subject headings. The search strategy was determined for EMBASE, and subsequently adapted to the syntax and subject headings of the other databases (see online supplementary information 1 for the EMBASE search strategy). Searches were conducted on 1 August 2017 and updated on 4 June 2019. Forward and backward citation searches were conducted for all included studies. Forward citation searches were conducted on 4 June 2019, using Scopus, Web of Science and Google Scholar.

The following grey literature sources were searched: grey literature databases, Google and Google Scholar, conferences proceedings, and consultation with experts (see online supplementary information 2 for further details).

Screening and selection of studies

Database search results were exported to Covidence,¹⁶ duplicates were removed, and studies were screened and selected. Two researchers independently screened all titles and abstracts for relevance, and disagreements were resolved by discussion. Articles meeting the inclusion criteria, or where there was uncertainty, were obtained in complete form. Full text reports were independently examined against the inclusion criteria by two researchers, and disagreements were resolved by discussion.

Data extraction

Data extraction was conducted by one researcher using a data extraction form, with 20% verified by another researcher (see online supplementary information 3 for the data extraction form). No discrepancies were found. Details from all data extraction forms were entered in to an excel spreadsheet, in preparation for analysis.

Raw data were not analysed for this systematic review. However, where there was the potential to attain data in a more relevant format, authors of studies were contacted (eg, to ask if they would be willing to provide the mean age of enquirers from their retrospective review of enquiries).

Quality assessment of included studies

The Axis tool¹⁷ was chosen to assess risk of bias and quality within studies. This tool comprises 20 items for assessing cross-sectional studies, and is composed of three subscales. The subscales measure risk of bias (ie, selection bias, measurement bias, non-response bias and reporting bias; eg, 'Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?'), quality of reporting (eg, 'Were the methods (including statistical methods) sufficiently described to enable them to be repeated?') and quality of study design (eg, 'Was the study design appropriate for the stated aim(s)?'). The assessments of risk of bias and quality were used for information, and not to exclude studies. Each included study, for which there was a full report, was independently appraised by two researchers. Only full reports were appraised, since they contained enough information to adequately assess risk of bias and quality of reporting compared with, for example, conference abstracts. Disagreements were resolved through discussion.

Narrative synthesis

Findings were synthesised in a narrative synthesis around the study objectives, following the guidelines by Popay *et al.*¹⁸ Where possible, weighted averages were calculated across studies to account for varying sample sizes. Additionally, where possible, outcomes were compared with Hospital Episode Statistics (HES) admitted patient care and outpatient data for England, to examine the representativeness of PMHS enquirers. Since the years of data collection varied across studies, the average of HES data for the past 5 years was used (2013–2014 to 2017–2018).¹⁹

RESULTS

Study selection

Nineteen studies were identified for inclusion in this review. **Figure 1** shows a flow diagram of the study selection process.

Study characteristics

Included studies are presented in **table 1**. Eight studies contained data regarding the characteristics of enquirers of PMHS. Eighteen studies contained data regarding the types of enquiries made to PMHS. All studies were retrospective reviews of enquirers and/or enquiries.

Quality assessment and risk of bias within studies

Five studies met our criteria for quality and risk of bias assessment. The overall score and percentage of quality and risk of bias for these studies are presented in **table 2**. Fleiss' κ was conducted, showing that there was substantial agreement between raters,²⁰ $K=0.72$ (95% CI 0.56 to 0.88), $p=0.000$.

Table 1 Studies meeting eligibility criteria for the systematic review examining characteristics of enquirers and enquiries to patient medicines helpline services

First author, year published	Study source	Study design	Country of study	Data collection year/s (weeks/ months) *	Number of enquiries	Outcomes	
						Enquirers	Enquiries
Adam, 2004 ⁴⁵	CA	RRE	England	2003 (1 week)	90	X	X
Badiani, 2017 ¹³	PS-PR	RRE	England	2015 (9 months)	637		X
Bramley, 2014 ¹²	PS-PR	RRE	United Kingdom	2009 (12 months)	312	X	X
Bruce, 1995 ⁴⁶	PS-BR	RRE	Scotland	1994–1995 (12 months)	111		X
Burgess, 2009 ⁴⁷	CA	RRE	England	2008 (1 month)	17	X	
Cooke, 2010 ⁴⁸	CA	RRE	England	2009–2010 (NR)	56		X
Cuthbert, 2013 ²⁶	CA	RRE	Scotland	NR (6 weeks)	18	X	X
Dhillon, 2001 ²²	PS-PR	RRE	England	NR (3 months)	109	X	X
Dugdale, 2018 ⁴⁹	CA	RRE	England	2016–2017 (24 months)	538		X
Hynes, 2013 ²⁵	CA	RRE	England	2011–2012 (12 months)	209		X
Jones, 2014 ²⁷	CA	RRE	England	2012–2014 (NR)	234		X
Law, 2015 ²⁸	CA	RRE	England	2015 (4 months)	109		X
Martin, 2014 ⁵⁰	LE	RRE	Wales	2012–2013 (12 months)	262	X	X
Marvin, 2011 ²³	PS-PR	RRE	England	2008 (6 months)	500		X
Price, 2011 ²¹	CA	RRE	England	2010–2011 (NR)	51		X
Raynor, 1994 ⁹	PS-BR	RRE	England	NR (NR)	NR		X
Sims, 1996 ⁵¹	CA	RRE	England	NR (NR)	>1000†		X
Teli, 2001 ⁵²	CA	RRE	England	1999 (NR)	NR	X	X
Williams, 1994 ²⁴	PS-PR	RRE	England	1993 (NR)	170	X	X

*Of the included studies, the data collection period ranged from 1 week to 12 months (mean=approximately 31 weeks; seven studies did not report the data collection period length).

†This study reported their sample size as 'over 1000'.

CA, conference abstract; LE, letter to the editor; NR, not reported; PS-BR, study published as a brief report; PS-PR, published study in a peer reviewed journal; RRE, retrospective review of enquiries.

Characteristics of enquirers

Table 3 presents eight studies that reported data regarding the characteristics of enquirers. Enquirers are predominantly female, elderly and enquiring for themselves.

Types of enquiries

Contact reason

Table 4 presents the findings from 15 studies that reported reasons for contacting a PMHS. Adverse effect was the category reported as the primary reason for enquiries from 6 of the 15 studies, with a weighted mean (WM) of 37% of all enquiries.

Clinical origin of enquiry

Two studies reported the clinical origin of enquiries to their PMHS. For Price *et al.*,²¹ the top three clinical origin of enquiries

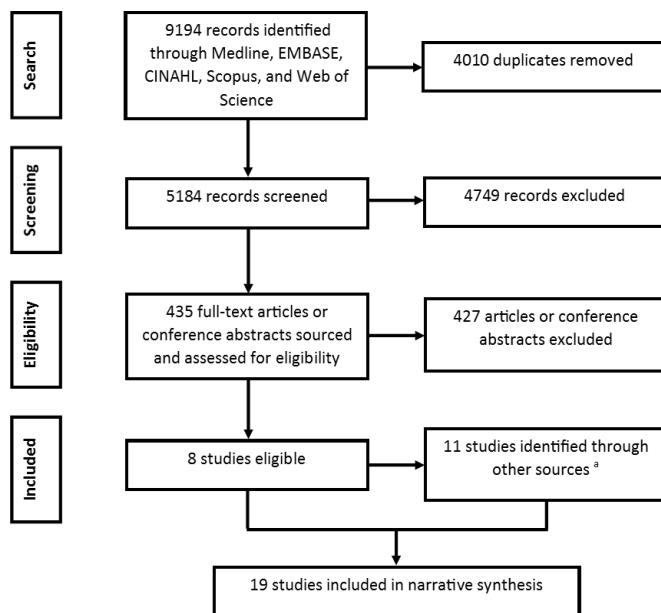


Figure 1 Flow diagram of the study selection process. ^a Forward and backward citation searches, grey literature databases, Google and Google Scholar, targeted websites/sources and consultation with experts.

Table 2 Quality assessment and risk of bias in full reports of studies meeting eligibility criteria for the systematic review

First author, year published	Total *	RoB †	QoR	QoS ^d
Badiani, 2017 ¹³	50% (10/20)	50% (3/6)	57% (4/7)	43% (3/7)
Bramley, 2014 ¹²	63% (12/19)	40% (2/5)	71% (5/7)	57% (4/7)
Dhillon, 2001 ²²	29% (5/17)	100% (3/3)	14% (1/7)	57% (4/7)
Marvin, 2011 ²³	65% (11/17)	67% (2/3)	71% (5/7)	71% (5/7)
Williams, 1994 ²⁴	35% (6/17)	100% (3/3)	43% (3/7)	43% (3/7)
Average (mean) percentage	48%	71%	51%	54%

*Quality assessment was measured using the Axis tool, developed by Downes *et al.*¹⁷ Depending on the study design, not all RoB items were relevant (ie, three RoB items pertain to non-response bias, and three of the studies did not recruit study participants since their aim was to only assess PMHS enquiries. Additionally, the study by Bramley 2014¹² recruited study participants with no non-responders, thus rendering one item obsolete). This accounts for the different maximum total scores and RoB scores across studies.

†The risk of bias items were reversed, so that the reported percentages reflect the amount of potential bias in each study. However, the Axis total score was calculated without reversing the risk of bias items, to ensure that the reported total score percentages reflect the amount of positively coded items in the tool. This accounts for the discrepancy between the total score and the sum of the subscales for each study.

PMHS, patient medicines helpline services; QoR, quality of reporting score (out of a maximum score of 7); QoS^d, quality of study design score (out of a maximum score of 7); RoB, risk of bias score (out of a maximum score of 6).

Table 3 Characteristics of enquirers who use patient medicines helpline services

First author, year published	N	Mean age	% female	% enquired for self	% repeat callers	% discharged inpatients	% outpatients
Adam, 2004 ⁴⁵	90	—	62%	—	—	—	—
Bramley, 2014 ¹²	312	—	50%	70%	—	—	—
Burgess, 2009 ⁴⁷	17	—	—	76%	—	40%*	60%*
Cuthbert, 2013 ²⁶	18	70 (SD=15)	61%	56%	—	—	—
Dhillon, 2011 ²²	109	—	63%	64%	15%	—	—
Martin, 2014 ⁵⁰	262	69 (SD=NK)	50%	79%	—	51%†	49%†
Teli, 2001 ⁵²	NR	—	—	—	—	72%	18%
Williams, 1994 ²⁴	170	—	—	—	4%	—	—
Average (mean)		70	57%	69%	10%	54%	42%
Weighted average (mean)		69	53%	72%	8%	50%‡	50%‡
HES data, where available		53 §	57% ¶	—	—	18%	82%

Part of the data for the studies by Cuthbert, 2013 and Martin, 2014 were obtained from the authors via personal communication.

*In the study by, Burgess, 2009⁴⁷ two service users were members of the public. Therefore, in order to only use the data regarding inpatients and outpatients, we calculated the percentages of discharged inpatients and outpatients using only the total number of callers who were discharged inpatients or outpatients (n=15).

†In the study by, Martin, 2014⁵⁰ 21% of service users were reported as being from ophthalmological surgery or clinics, and 22% were not reported. Therefore, in order to only use the data regarding inpatients and outpatients, we calculated the percentages of discharged inpatients and outpatients using only the total number of callers who were discharged inpatients or outpatients (n=149).

‡The weighted averages for percentages of discharged inpatients and percentages of discharged outpatients are based on two of three studies, since the sample size was not reported in the study by Teli, 2001.⁵²

§Range of mean ages over 5 years of HES data=52–54 years. Only HES admitted patient care data were used, since mean age was not reported in HES outpatient data sets.

¶Range of percentages over 5 years of HES data=57%–58%.

HES, Hospital episode Statistics; NK, not known; NR, not reported.

were surgery (59%), general medicine (13%) and paediatrics (6%). For Bramley *et al*,¹² the top three clinical origin of enquiries were cardiology (20%), general medicine (8%), and ear, nose and throat (6%).

Drug classes

Four studies reported the percentage of enquiries by drug class. The largest drug class was reported to be antimicrobial drugs by two studies (19% and 21% of all enquiries)^{22 23} and cardiovascular drugs in a third study (27% of all enquiries).²⁴ The fourth study, which took place at a mental health Trust, reported atypical antipsychotics as the main drug class (38% of all enquiries).²⁵

Enquiries regarding medicines-related errors

Table 5 presents six studies that reported the percentage of enquiries that were regarding medication errors.^{12 13 23 26–28} Combined, the studies suggest that between 8% and 39% of enquiries concern errors (mean=31%; WM=27%).

DISCUSSION

This systematic review synthesised the current evidence regarding the characteristics of enquirers to PMHS, and the types of enquiries they make. Included studies were all service evaluations where authors evaluated their own service, and we found the average risk of bias in study articles to be 71%, which we perceive to be high.

Characteristics of enquirers

Our findings suggest that users of PMHS are broadly representative of hospital patients regarding gender, but not age. The average age of helpline enquirers was 69 years, compared with an average age of 53 years for hospital patients. This could reflect that older people tend to seek health information from healthcare professionals directly, compared with younger people who may be more inclined to seek information online.^{29 30}

The age difference may also suggest that PMHS are particularly valued as a source of support by people who are at heightened risk with their medicines, since there is an association between age and polypharmacy.³¹ Research suggests that polypharmacy

Table 4 Reason for enquiries reported in studies examining patient medicines helpline services

Enquiry category	Numbers and percentages of studies reporting the specified category as the primary reason for enquiries		
	Total (n=15)	Range of reported percentages of enquiries (mean; WM)	Sample size range (total N)
Adverse effects	6 ^{9 24 25 45 52 53}	21%–46% (33%; 37%)	56–209 (at least 525*)
Administration or dosage	5 ^{21 28 46 49 50}	21%–52% (37%; 34%)	49–538 (1058)
Interactions	1 ²³	22%	500
Appropriateness or safety of medicines	1 ¹³	50%	637
Indications, efficacy or mechanisms of action	1 ⁵¹	34%	At least 1000†
Insufficient information on hospital discharge letter	1 ¹²	24%	413

Enquiry categories are listed according to the number of studies within each category. There may be overlap between some enquiry categories, since study authors did not use exactly the same categories.

*Two of the six studies did not report their sample size.

†This study reported their sample size as 'over 1000'.

WM, weighted mean (weighted by sample size).

Table 5 Studies examining the number of enquiries received by patient medicines helpline services that were regarding medicines-related errors.

Author, year published	N	Total percentage of enquiries regarding errors	Primary error type
Bramley, 2014 ¹²	312	8%	Missing medicines (38%)
Badiani, 2017 ¹³	637	39%	Transfer of care errors (69%)
Cuthbert, 2013 ²⁶	18	33%	NR
Jones, 2014 ²⁷	NR	19%	NR
Law, 2015 ²⁸	109	20%	NR
Marvin, 2011 ²³	500	34%	Wrong/insufficient information supplied with medicine (49%)

There may be overlap between some error type categories, since study authors did not use exactly the same categories.
NR, not reported.

increases the risk of prescribing errors,³² adverse drug reactions,³³ drug-drug interactions,³¹ suboptimal adherence,³⁴ emergency department visits,³⁵ unplanned hospital admissions³⁶ and readmissions.³⁷ Polypharmacy also increases the likelihood that patients will lack knowledge or understanding of their medicines.³⁸ Although no data were found as to the average number of prescribed medicines consumed at the time of contacting a PMHS, approximately 22% of enquiries to PMHS in the UK are regarding interactions, suggesting that a number of enquirers are consuming more than one medicine.

Population projections produced by the Office for National Statistics suggests that there will be a significant increase in the population of older people in the next two decades.³⁹ This may indicate an increased need for MI services in the future, in order to provide support to this growing population.

Our findings, in the context of previous evidence, suggest that there are a number of individuals who may be denied access to some PMHS. We found that 28% of users contacted the service on behalf of a patient, and that 50% of enquiries to PMHS may be from outpatients compared with discharged inpatients. A recently conducted survey of PMHS in England reported that 7% of PMHS do not provide advice to carers, and that 5% of PMHS do not provide the service to outpatients.¹⁰ This suggests that a proportion of individuals in need of medicines-related support are not able to access it from these particular PMHS. This is important, since one study found that approximately 48% of 500 answered enquiries to a PMHS were considered to have the potential to prevent harm from medicines.²³ This highlights the need to advertise this service, and make it available, to *all* patients who may benefit from using it.

Our systematic review found no studies that reported the ethnicity or educational level/socioeconomic status of enquirers, or the average number of medicines consumed. Additionally, of the eight studies that reported data regarding the characteristics of enquirers, none of the data were collected within the past 5 years, suggesting that the relevance and generalisability of the data are now questionable.

Types of enquiries

Our findings suggest that there is wide variation in the percentages of types of enquiries received to different PMHS, since six different categories were reported as being the primary reason for enquiries. This highlights the importance of conducting locally tailored improvement projects whereby PMHS data for

an NHS Trust are used to produce recommendations to improve their own services. However, this variation may also be a consequence of sites coding their enquiries using unstandardised enquiry category options, and/or possible confusion regarding how to code certain enquiries (eg, those that may fit more than one category).

In 6 of 15 studies that reported reasons for contacting a PMHS, the largest category of enquiries to PMHS concerned adverse effects. These findings are congruent with the results from the UK NHS annual Adult Inpatient Survey that found that, between 2013 and 2017, 42%–44% of patients (*n range* = 38 384–52 554) did not recall receiving any information from staff about side effects.⁶ Consequently, by improving medicines-related counselling to patients at hospital discharge, particularly about side effects, patients may be less likely to need support following discharge.⁴⁰ However, there is always likely to be a need for PMHS to support patients and carers following patients' discharge from hospital. Evidence suggests that some patients, particularly the elderly, may forget or misunderstand aspects of discharge counselling pertaining to their medicines.^{3 41 42} Additionally, it could be that even if patients are provided with information about potential side effects at the time of discharge, they may still require support later on, at the time when side effects develop.

One proposed benefit of PMHS is that they act as a safety net to identify errors.¹⁰ Our synthesis suggests that up to 39% of enquiries to PMHS are regarding medicines-related errors, with a WM of 27%. Medication errors can have significant health and economic consequences, such as adverse drug reactions, reduced medication efficacy, increased use of healthcare services and death.⁴³ Learning from medicines-related errors in order to implement methods for their reduction is a current NHS and worldwide healthcare priority.⁴³ Royal Pharmaceutical Society-endorsed national standards for operating a PMHS are available,⁴⁴ one of which is having a mechanism in place to feed back to the Trust medication problems and 'systems errors' identified by patients/carers in order to prevent recurrence. Therefore, a PMHS may provide one avenue for reducing medicines-related errors, if the information from such enquiries is developed into recommendations and implemented in order to improve practice. However, it is currently unknown what percentage of Trusts currently adhere to this standard, and whether there are specific barriers preventing this from happening.

Recommendations

Further research is needed to establish patients' MI needs and preferences, including those of younger patients. Our findings indicate that enquiries to PMHS are often from elderly patients, and cross-sectional studies suggest that younger people are more likely to seek health-related information online compared with older people.³⁰ However, depending on the source, online information about medicines may not be as reliable as seeking the advice of a pharmacy professional with expertise in MI. Therefore, one way to improve the reach of PMHS may be to establish electronic means to access them, which may be more appealing to younger patients. However, it would be advantageous to first establish the medicines-related needs of younger patients, and how best to engage with them to increase their awareness and use of PMHS.

We recommend that PMHS sites conduct service evaluations in order to provide a more detailed and standardised profile of enquirers (eg, including ethnicity, educational level/socioeconomic status and the average number of medicines consumed by

patient enquirers). This would help to establish how enquirers compare to the local patient population, and to enable comparisons across sites. Such data could be useful to explore whether certain types of patients are less likely to use the service. This could result in projects to understand why, and whether more can be done to provide a service that is equitable and available for all hospital patients who require support with their medicines.

We encourage providers of PMHS to evaluate the types of enquiries they receive (including whether they pertain to a medicine error) by using nationally standardised categories and coding instructions/training materials that are endorsed by the UK Medicines Information (UKMi) network. This will enable the types of enquiries received to be more appropriately compared across sites and regions within the UK.

We also encourage sites to use data on types of enquiries to PMHS to produce recommendations for improving local hospital services. For example, six studies reported that enquiries were predominantly about adverse effects, and two studies reported that enquiries were predominantly about antimicrobial drugs. Therefore, potential projects could involve improving patient leaflets and counselling regarding adverse effects and antimicrobial drugs. Another example could be for sites to monitor the number of enquiries regarding medication errors to establish whether using helpline data to improve practice within the hospital results in a reduced number of calls about errors over time. It would also be useful if sites were more easily able to share learning from their local projects, for example, having the capability to share brief reports via the UKMi network.

Strengths and limitations

This is the first systematic review that has examined the types of enquirers and enquiries of PMHS. This has resulted in our development of recommendations to improve current practice in the operation and evaluation of PMHS, and potentially hospital pharmacy services more widely.

However, the findings of this review may be limited by the small number of studies available to establish averages for certain enquirer characteristics. For example, our findings regarding the average age of participants, the average percentage of repeat enquirers, and the weighted average percentage of inpatients versus outpatients, are all based on two studies each. Therefore, these findings should be treated with caution, and also emphasise the need for additional, larger studies to examine the profile of enquirers to PMHS.

Relatedly, the findings of this review may also be limited due to the potential lack of high-quality studies currently available. Only five of the 19 studies in this review met our eligibility criteria for the assessment of quality and risk of bias, since most studies were from conference abstracts and their content was considered too limited to perform a thorough quality assessment on. We considered the quality of these five studies to be moderate (on average, 48%; range=29%–65%) and their risk of bias to be high (on average, 71%; range=40%–100%). Therefore, a limitation of this review is that our quality assessment and risk of bias average scores are only based on 26% of the studies included in this review. However, since the remaining 74% of studies comprised conference abstracts, brief reports and a letter to an editor, their lack of peer review may arguably raise concern over their quality, also.

Another limitation of this review concerns our comparison of PMHS findings to HES data, since the HES data used in this study are not specifically regarding patients that consume medicines. Also, the HES average age percentage (53%) was

calculated from HES admitted patient care data only, since mean age was not reported in HES outpatient data sets. Therefore, the HES age percentage used in this study may not be fully representative of the types of patients who may use a PMHS. Additionally, we compared the findings of this review with HES data over the past 5 years. Therefore, the data collection years for the studies included in this review and for the HES data did not correspond, which will likely affect the comparison. However, the HES data used were relatively stable over the 5 years.

Finally, we did not contact all sites that provide a PMHS in the UK to establish whether any local unpublished work could be included in this review. Instead, we contacted authors of included studies within the past 10 years to establish the availability of unpublished work from their sites. Therefore, it is possible that other studies may have been conducted with findings that are relevant to this review, but which were not included.

CONCLUSIONS

This systematic review synthesised evidence regarding the users of PMHS and the enquiries they make. The service seems particularly appealing for patients who are vulnerable to experiencing medicines-related issues following hospital discharge, since PMHS are often used by the elderly, and elderly patients are more likely to experience polypharmacy. Additionally, over a quarter of enquiries to PMHS may concern medicines-related errors, suggesting that addressing such errors is an important function of this service. However, our study findings may be limited by a high risk of bias within included studies. Further research could provide a more detailed profile of helpline users (eg, ethnicity, average number of medicines consumed). We recommend standardising the way that PMHS data are categorised and reported so that data are more easily comparable and collated across sites for a more generalisable picture of PMHS use. We encourage PMHS providers to use routinely collected data to conduct local quality improvement projects (eg, to reduce medicines-related errors and improve patient MI leaflets/counselling) and to share project findings with other PMHS providers.

Correction notice This paper has been corrected since it was published Online First. The manuscript's headline has been returned to its original title.

Twitter Matthew Jones @MatthewJonesUoB

Acknowledgements The authors thank Danielle Cox and Tess Rugg for their help with the screening and quality assessment stages of this review.

Contributors The study was designed by MW and MJ, with advice from AJ and JS. MW was involved in all stages of the systematic review process, and drafted the manuscript. MJ, AJ and JS were involved in the screening of titles and abstracts. MJ was involved in discussions regarding the inclusion of studies and the quality assessment of studies. All authors read, provided feedback and approved the final manuscript.

Funding The lead author was funded by a Graduate School Scholarship provided by the University of Bath. The funder had no role in the study design, collection, analysis and interpretation of the data, the writing of the report and the decision to submit the article for publication.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

ORCID iDs

Matt Williams <http://orcid.org/0000-0002-9122-1858>
 Abbie Jordan <http://orcid.org/0000-0003-1595-5574>
 Jenny Scott <http://orcid.org/0000-0002-4920-0914>
 Matthew Jones <http://orcid.org/0000-0002-2617-4098>

REFERENCES

- 1 Parekh N, Ali K, Stevenson JM, *et al.* Incidence and cost of medication harm in older adults following hospital discharge: a multicentre prospective study in the UK. *Br J Clin Pharmacol* 2018;84:1789–97.
- 2 Marvin V, Vaughan L, Joshua A, *et al.* Medication-Related problems after discharge from acute care: a telephone follow-up pilot survey. *Eur J Hosp Pharm* 2012;19:112.2–112.
- 3 Eibergen L, Janssen MJA, Blom L, *et al.* Informational needs and recall of in-hospital medication changes of recently discharged patients. *Res Social Adm Pharm* 2018;14:146–52.
- 4 Holloway A. Patient knowledge and information concerning medication on discharge from hospital. *J Adv Nurs* 1996;24:1169–74.
- 5 Knight DA, Thompson D, Mathie E, *et al.* 'Seamless care? Just a list would have helped!' older people and their carer's experiences of support with medication on discharge home from hospital. *Health Expect* 2013;16:277–91.
- 6 Care Quality Commission. 2017 adult inpatient survey. statistical release. London, UK: Care Quality Commission; 2018.
- 7 Perren A, Previsdomini M, Cerutti B, *et al.* Omitted and unjustified medications in the discharge summary. *Qual Saf Health Care* 2009;18:205–8.
- 8 Aldhwaihi K, Schifano F, Pezzolesi C, *et al.* A systematic review of the nature of dispensing errors in hospital pharmacies. *Integr Pharm Res Pract* 2016;5:1–10.
- 9 Raynor T. Dial M for medicine advice. *Health Serv J* 1994;104:33.
- 10 Williams M, Jordan A, Scott J, *et al.* Operating a patient medicines helpline: a survey study exploring current practice in England using the RE-AIM evaluation framework. *BMC Health Serv Res* 2018;18.
- 11 World Health Organisation. Policy perspectives on medicines. Promoting rational use of medicines: core components. (organisation wh ED. Geneva) 2002.
- 12 Bramley D, Erskine D, Safdar A, *et al.* How useful are medicines helplines for patients discharged from hospital? *Pharm J* 2014;292:447–50.
- 13 Badiani A, Wills S, Owen S, *et al.* Impact of a medicines helpline for patients. *Eur J Hosp Pharm* 2017;24:196–9.
- 14 Williams M, Jordan A, Scott J, *et al.* A systematic review examining the effectiveness of medicines information services for patients and the general public. *Int J Pharm Pract* 2019;19.
- 15 Williams MJ, Jordan AL, Scott J, *et al.* Examining the characteristics of enquirers who use hospital-based patient medicines helpline services, and the types of enquiries they make. A systematic review with narrative synthesis, 2018. Available: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018116276
- 16 Covidence. Covidence. About us. Available: <https://www.covidence.org/about-us> [Accessed 23 Jun 2017].
- 17 Downes MJ, Brennan ML, Williams HC, *et al.* Development of a critical appraisal tool to assess the quality of cross-sectional studies (axis). *BMJ Open* 2016;6:e011458.
- 18 Popay J, Roberts H, Sowden A, *et al.* *Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme. version 1.* Lancaster University, 2006.
- 19 NHS Digital. Hospital episode statistics. Available: <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics>
- 20 Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159–74.
- 21 Price V, Worvill C. Introducing and evaluating a medicines information helpline. Poster session presented at: 37th UKMi Practice Development Seminar, Warwick, UK, 2011.
- 22 Dhillon S, Duggan C, Joshua AE. What part pharmacists should play in providing medicines-related information. *Pharm J* 2001;266:364–6.
- 23 Marvin V, Park C, Vaughan L, *et al.* Phone calls to a hospital medicines information helpline: analysis of queries from members of the public and assessment of potential for harm from their medicines. *Int J Pharm Pract* 2011;19:115–22.
- 24 Williams J. Early experiences with a medicine hotline. *Pharm J* 1994;253:199–201.
- 25 Hynes C, Box J. Medicines helpline enquiry analysis. Poster session presented at: 39th UKMi Practice Development Seminar; Sep 13, Birmingham, UK, 2013.
- 26 Cuthbert M, Malek M, Kinnear M, *et al.* Does a patient medicines information helpline improve patient safety outcomes? Poster session presented at: 39th UKMi Practice Development Seminar; Sep 13, Birmingham, UK, 2013.
- 27 Jones M, Pettitt P. The use of outcome data monitoring in the quality assurance of MI services. Poster session presented at: 40th UKMi Practice Development Seminar; Sep 12, Birmingham, UK, 2014.
- 28 Law S. Development and analysis of the patient medicines helpline. Poster session presented at: 41st UKMi Practice Development Seminar; Sep 11, East Midlands, UK, 2015.
- 29 Turner AM, Osterhage KP, Taylor JO, *et al.* A closer look at health information seeking by older adults and involved family and friends: design considerations for health information technologies. Annual Symposium proceedings. AMIA Symposium, 2018:1036–45.
- 30 Wong C, Harrison C, Britt H, *et al.* Patient use of the Internet for health information. *Aust Fam Physician* 2014;43:875–7.
- 31 Guthrie B, Makubate B, Hernandez-Santiago V, *et al.* The rising tide of polypharmacy and drug-drug interactions: population database analysis 1995–2010. *BMC Med* 2015;13:74.
- 32 Avery AJ, Ghaleb M, Barber N, *et al.* Investigating the prevalence and causes of prescribing errors in general practice: the practice study. *Pharmacoepidemiol Drug Saf* 2012;21.
- 33 Saedder EA, Lisby M, Nielsen LP, *et al.* Number of drugs most frequently found to be independent risk factors for serious adverse reactions: a systematic literature review. *Br J Clin Pharmacol* 2015;80:808–17.
- 34 Kardas P, Lewek P, Matyjaszczyk M. Determinants of patient adherence: a review of systematic reviews. *Front Pharmacol* 2013;4:91.
- 35 Allin S, Rudoler D, Laporte A. Does increased medication use among seniors increase risk of hospitalization and emergency department visits? *Health Serv Res* 2017;52:1550–69.
- 36 Payne RA, Abel GA, Avery AJ, *et al.* Is polypharmacy always hazardous? A retrospective cohort analysis using linked electronic health records from primary and secondary care. *Br J Clin Pharmacol* 2014;77:1073–82.
- 37 Fonseca J, Costa F, Mateus JE, *et al.* Number of discharge medications as a risk factor for early readmission of elderly patients: a retrospective study. *Eur Geriatr Med* 2016;7.
- 38 Bosch-Lenders D, Maessen DWHA, Stoffers HEJH, *et al.* Factors associated with appropriate knowledge of the indications for prescribed drugs among community-dwelling older patients with polypharmacy. *Age Ageing* 2016;45:402–8.
- 39 Office for National Statistics. National population projections: 2016-based statistical bulletin. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2016basedstatisticalbulletin>
- 40 Spinewine A, Claeys C, Foulon V, *et al.* Approaches for improving continuity of care in medication management: a systematic review. *Int J Qual Health Care* 2013;25:403–17.
- 41 Elson R, Blenkinsopp A, Cook H, *et al.* Patients' knowledge of their new medicines after discharge from Hospital: what are the effects of nurse doctor or pharmacist counselling and medicines use reviews (MURs)? *Int J Pharm Pract* 2014;22.
- 42 Louis-Simonet M, Kossovsky MP, Sarasin FP, *et al.* Effects of a structured patient-centered discharge interview on patients' knowledge about their medications. *Am J Med* 2004;117:563–8.
- 43 Department of Health & Social Care. *The report of the short life Working group on reducing medication-related harm.* London, UK: Department of Health & Social Care, 2018.
- 44 Wills S. *Medicines helplines for hospital patients: national standards.* UK: Royal Pharmaceutical Society, 2014.
- 45 Adam Z. Ask about medicines week campaign 2003. Poster session presented at: 30th UK Medicines Information Conference; Sep 2–4, Warwick, UK, 2004.
- 46 Bruce F. Pharmacy helpline-addressing patient information needs. *Hospital Pharmacist* 1995;2:135–7.
- 47 Burgess C. Improving access to the medicines information helpline. Poster session presented at: 35th UKMi Practice Development Seminar, Edinburgh, UK, 2009.
- 48 Cooke A, Elrouby S. What questions do patients ask when they ring the trust's medicines information helpline? Poster session presented at: 36th UKMi Practice Development Seminar; Sep 23–24, 2010.
- 49 Dugdale R, Sitiemi M. Patient helpline analysis at a local medicines information centre. Poster session presented at: 44th UKMi Practice Development Seminar; Sep 12, Birmingham, UK, 2018.
- 50 Martin M, Davies S, Jones S. Hospital pharmacy: analysing helpline calls. *Pharm J* 2014;292:474–5.
- 51 Sims S, Golightly P. The medicines helpline - providing information to the public. Poster session presented at: 22nd National UK Drug Information Conference; Sep 18–20, Ulster, UK, 1996.
- 52 Tell V. Role of a technician in medicine help line service. Poster session presented at: 27th UK Medicines Information Conference; Sep 6–8, Harrow, UK, 2001.
- 53 Cooke AE S. What questions do patients ask when they ring the trust's medicines information helpline? Poster session presented at: 36th UKMi Practice Development Seminar, Warwick, 2010.