ORIGINAL ARTICLE

Medication errors in mental healthcare: a systematic review

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Background: It has been estimated that medication error harms 1–2% of patients admitted to general hospitals. There has been no previous systematic review of the incidence, cause or type of medication error in mental healthcare services.

Methods: A systematic literature search for studies that examined the incidence or cause of medication error in one or more stage(s) of the medication-management process in the setting of a community or hospital-based mental healthcare service was undertaken. The results in the context of the design of the study and the denominator used were examined.

Results: All studies examined medication management processes, as opposed to outcomes. The reported rate of error was highest in studies that retrospectively examined drug charts, intermediate in those that relied on reporting by pharmacists to identify error and lowest in those that relied on organisational incident reporting systems. Only a few of the errors identified by the studies caused actual harm, mostly because they were detected and remedial action was taken before the patient received the drug. The focus of the research was on inpatients and prescriptions dispensed by mental health pharmacists.

Conclusion: Research about medication error in mental healthcare is limited. In particular, very little is known about the incidence of error in non-hospital settings or about the harm caused by it. Evidence is available from other sources that a substantial number of adverse drug events are caused by psychotropic drugs. Some of these are preventable and might probably, therefore, be due to medication error. On the basis of this and features of the organisation of mental healthcare that might predispose to medication error, priorities for future research are suggested.

It has been estimated that, in the UK, adverse reactions to drugs cause 1 in 16 hospital admissions and 10 000 deaths each year.[1] Although some of these adverse reactions to drugs are not preventable, many are, and hence would be categorised as being due to medication error.[2]

Broadly speaking, medication errors are classified according to the stage of the process at which the error occurs or by some inference about the cause of the error. An example of the former is the subdivision into errors of prescribing, transcription, dispensing, monitoring and administration. Classifications that infer a cause generally distinguish between errors due to inadequate knowledge, skills or decision making, those due to failure to execute a plan because of slips or lapses, and those due to a conscious violation of the rules of correct behaviour.[3–5]

The incidence and cause of medication error have perhaps been studied most extensively in hospital wards. A recent review of this research concluded that it harmed 1–2% of admitted patients and that prescribing error is the most common type of medication error in these settings.[2] As far as the authors are aware, there has been no previous systematic review of medication error in mental healthcare services. This study presents the results of such a review and summarises the state of knowledge about: the incidence of medication error in mental healthcare; its causes; the relative frequency of different types of medication error; and the harm that it causes.

This study highlights the gaps in the research on medication error in mental healthcare. We also suggest the types of error that might be under-reported in the research literature and that might be more common in mental health care services.

METHOD

Search strategy

We used a broad search strategy to identify all relevant studies. We searched Medline, Embase, Pharm-line, the Cochrane Collaboration and PsycINFO (from 1966 to February 2006). Keywords in the search terms were ''mental health'' *or* ''psychiatry'' *or* ''psychiatric'' *in combination with* ''medication'' *and* ''error''. The electronic search was conducted on two separate occasions on different days. We hand searched the journal *Psychiatric Bulletin* (from 1998 to February 2006). The reference sections of the articles obtained were scrutinised for further references.

Selection criteria

A study was included if it examined the incidence or cause of medication error in one or more stages of the medication management process in the setting of a community or hospital-based mental healthcare service. We only included reports written in English. We excluded studies that involved the prescription of psychotropic drugs in non-mental healthcare settings and those that considered medication errors in a broader range of healthcare services unless the data specific to mental healthcare could be extracted. Figure 1 shows the results of the literature search, which resulted in nine studies that formed the basis of this review.

Data abstraction

The nine studies were assessed independently by IM and PL. Disagreements were resolved by discussion with CP. The assessment of the studies was guided by the work of Franklin *et al*,[2] who undertook a systematic review of prescribing errors in hospital inpatients.

We recorded information on date and setting of the study, the method used to collect data, data source and type of error studied. If available, we recorded the total number of errors, the rate of errors, including any denominator, and severity or potential severity of the error.

Study design can be categorised into four types, depending on whether it is outcome-based or process-based, and whether it is retrospective or prospective.[2] Outcome-based

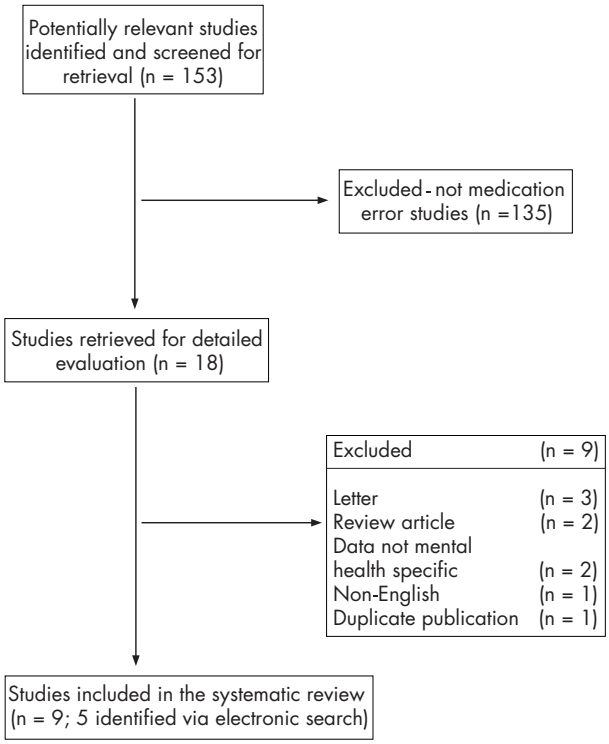

Figure 1 Results of the literature search for studies on medication errors in mental health.

studies identify iatrogenic injury or adverse drug events. This is either retrospective—for example, by a historical review of medical notes or of some other record such as laboratory test results—or prospective by reviewing medical notes daily or by asking staff to report harm caused by medication. One challenge for outcome-based studies, and in particular those that are retrospective, is that it can be difficult to determine from the medical record whether an adverse drug event was preventable and so would be categorised as a medication error. In process-based studies, prescriptions are reviewed, usually by pharmacists, to identify errors. Again, this can be retrospective or prospective. Prospective studies usually involve pharmacists recording error, either as part of routine practice or by a more thorough process of reviewing prescriptions. This categorisation of study design is important because the rate of medication error detected will vary according to the methods used in the study. Thus, outcome-based studies will tend to identify only those medication errors that have caused an adverse reaction to a drug. Process-based studies are likely to detect a higher number of medication errors, including many that have caused no harm.[2] Retrospective studies are likely to detect more errors than prospective studies that rely on clinicians identifying errors during the course of their routine clinical work. Under-reporting is an important factor, particularly in studies that rely on reporting by clinicians.[6 7]

Another factor that makes comparisons between studies difficult is the use of different denominators. Like the study design, these can greatly affect the conclusions drawn about the rate and relative frequency of different types of error. The denominator used in studies of hospital inpatients may be hospital admissions, the number of prescriptions or medication orders issued, or the number of medication orders checked by a pharmacist. This is further complicated by the fact that although some studies consider that a prescription can only contain one error, others will count multiple errors in the same prescription.[2]

RESULTS

Frequency and severity of medication errors

Table 1 lists the nine studies that met the inclusion criteria and summarises their design and results. The main findings from review of these papers are as follows:

1. All of the studies are process-based according to the classification proposed by Franklin *et al*.[2]
2. Where the data are available, there is the anticipated gradient in the reported rate of medication errors, depending on the method of detection. The highest rates seem to be reported by studies that systematically and retrospectively examined prescription charts and case note,[8 9] and intermediate rates by studies that rely on pharmacists to prospectively identify errors during the course of their routine work.[10–13] The two studies of this type that included a denominator reported similar rates of error: −0.022[10] and 0.024[13] per prescribed item. Lowest rates seem to be reported by studies that rely on clinicians using an incident reporting system, although under-reporting limits any conclusion from this data-set.[6 14 15]
3. Most errors reported by these studies are related to clerical aspects of prescribing (illegibility, incomplete prescriptions, transcription errors, etc) or administration (wrong time, wrong dose, missed dose, etc). Far fewer errors detected by the studies identified relate to dispensing or errors of clinical judgement. Only the studies that relied on detection by pharmacists identified substantial numbers of clinical decision-making errors.[10–13]
4. Although a substantial proportion of errors were judged to pose a considerable risk, this was based on an assessment of the potential for harm, rather than the actual consequence. Most errors detected by these studies seem to have caused little actual harm to patients. This is probably because they were detected, and remedial action was taken before the patient received the prescribed drug.
5. Most of the studies have concentrated on prescribing errors. Five studies only investigated prescribing errors.[8 10–13] Two papers studied administration, dispensing and prescribing errors,[6 14] and single studies examined administration errors,[15] and administration, dispensing, prescribing and transcription errors.[9]
6. Six of the nine studies examined medication error for inpatients only.[8–11 14 15] All the studies seem to have focused on medication dispensed by a hospital pharmacy. They therefore tell us little about the medication errors that affect the majority of patients who, in the UK and other countries with well-developed mental health community services, are treated in outpatient and community settings where medication is often dispensed by a community pharmacist.
7. We found no studies that have systematically examined the cause of medication errors in mental healthcare.

DISCUSSION

This review has limitations. It is possible that studies on medication error that would meet our criteria have been published in journals that are not indexed by the databases we searched. This is supported by the fact that two of nine studies reviewed were identified by a hand search of the *Psychiatric Bulletin*, a journal that is not indexed. Also, restricting the search to papers in the English language might have affected the extent to which our conclusions can be generalised to systems of mental healthcare with, for

Table 1 Studies within mental healthcare that investigated the rate and severity or potential severity of medication errors

Date and setting	Study design and data source	Error type studied	Number of errors	Rate of errors	Severity or potential severity of harm caused by errors
1991–1997; England, NHS mental health inpatient units for older people[8]	Retrospective process based; all prescription charts for index admission of 112 patients	Prescribing (psychotropics only)	92 patient prescription records contained an error	0.82 per patient episode	No information given
2000; Japan, 85 long-stay wards in 44 private psychiatric hospitals[14]	Prospective process based; clinician reports on incident reporting system over 2 months	Administration, dispensing and prescribing	221 reports	0.79 per 1000 patient days	56.6% insignificant, 14.9% potentially significant, 28.5% potentially serious
2000–2004; England, tertiary private psychiatric hospital[15]	Prospective process based; all administration errors reported over 42 months on incident reporting system	Administration	112 reports	2.67 per month	77% no or minimal significance, 14% moderate significance, 1% potentially serious, 0% potentially fatal
2001; USA, 103-bedded state psychiatric hospital[9]	Mixed process-based involving random sample of 31 of 95 patients discharged over a 5-month period • Retrospective potential incidents—chart review of entire hospitalisation and prospective reporting of dispensing errors for equivalent number of patient days. • Prospective clinician reports on incident reporting system.	Administration, dispensing, prescribing and transcription	2194 potential incidents *v* 9 clinician reports; ratio 244:1 ($p<0.001$)	1516 potential incidents *v* 6.22 clinician reports per 1000 patient days	19% were low risk, 23% moderate risk and 58% high risk
2002; England, tertiary private psychiatric hospital[10]	Prospective process based; inpatient errors detected by pharmacists in course of routine work over 1 month	Prescribing	311 reports	0.022 per prescribed item	56% insignificant, 36% minimal, 27% definitely significant, 0% potentially fatal
2002; England, 12 NHS mental health trusts[11]	Prospective process based; pharmacists completed intervention forms over 1 month	Prescribing	557 reports	No denominator given with which to calculate a rate of error	11% of errors had a ''potentially serious outcome''
2003; England, tertiary private psychiatric hospital[12]	Prospective process based; errors detected by pharmacists in course of routine work over 1 month	Prescribing	211 reports	No denominator given with which to calculate a rate of error	64.5% insignificant, 24.2% minimal, 11.4% definitely significant, 0% potentially fatal
2004; England, single NHS mental health trust[6]	Prospective process based; clinician reports on a new medication error reporting system over 12 months.	Administration, dispensing and prescribing	66 reports	5.5 per month	40 low severity, 23 moderate, 3 high
2004; England and Wales, 9 centres (8 NHS and 1 independent sector) providing mental health services[13]	Prospective process based; errors detected by pharmacists during course of routine work over 5 days	Prescribing	523 reports	0.024 per prescribed item	47.8% negligible, 45.9% minor, 3.3% serious, 1% potentially fatal

NHS, National Health Service.

example, a different balance of inpatient and community services.

The research on medication error in mental healthcare reviewed here has focused almost exclusively on patients in psychiatric hospitals. This group is at risk from the same type of medication error as other hospitalised patients. The studies on mental health inpatients have the same problems of variability of design and denominator as those conducted in other hospital inpatient settings. They therefore do not allow a precise estimate of the rate of medication error. Also, because of the lack of outcome-based studies, no reliable estimate can be made of the proportion of inpatients who are harmed by medication error.

This review shows that medication error in mental healthcare is a neglected aspect of research. In particular, there have been no systematic studies of patients living in the community. Therefore, the potential for mental health services to prevent harm and deaths from medication error is unknown. Consistent with this, the issue is not high on the mental health policy agenda in the UK, where the overwhelming priority for risk management has been the prevention of suicide and homicide by people with mental illness. Prevention of suicide is a key government policy initiative and concern about homicides by people with mental illness has been one of the main drivers of recent mental health service reform. Despite this emphasis, the potential for specialist mental health services to prevent suicide or homicide is quite modest. Each year, in England and Wales, there are about 1200 suicides and 50 homicides by people who have had recent contact with mental health services.[16 17] Perhaps one fifth of these events could have been prevented by some action of the concerned mental health service.[18] This would equate to about 4.6 potentially avoidable deaths per million population each year.

The broader research literature on adverse events involving psychotropic drugs was not included in the systematic review, because the studies do not identify which adverse drug events are preventable and hence would be classified as medication error. However, they do show that psychotropic drugs cause substantial harm and suggest that mental health services might have greater potential to prevent deaths from adverse drug events than to prevent deaths from suicide and homicide. For example, the largest English study of its type estimated that adverse drug events caused 6.5% of all admissions and might account for about 6000 deaths each year. Antidepressants were implicated in 7% of these admissions.[1] The proportion of admissions due to psychotropics would certainly be higher if admissions because of intentional overdoses are included.

The remainder of this discussion considers what might be the priorities for future research on medication error in mental healthcare services and the potential of research to identify and quantify its causes. It draws on evidence about adverse drug events and inadequate prescribing practice. We suggest that some types of medication error might be more common in mental health services, due to particular characteristics of the organisation and delivery of mental health services, and of the client group.

Communication difficulties in mental health services

One consequence of the move to community care is that modern mental health services are fragmented. In the UK, this has been accentuated by the recent NHS plan which requires the establishment of specialist teams for home treatment, assertive outreach and early intervention.[19] This has created numerous interfaces between primary and secondary care, between hospital and community services and between different components of the community mental health service. Patients with severe and relapsing mental illness often cross these interfaces.

Problems of communication cause more than two thirds of treatment errors in medical practice,[20] and errors are likely when information is transferred across organisational boundaries.[21 22] In one study,[23] potentially harmful medication errors occurred in 24% of psychiatric admissions and in 18% of discharges. In another,[24] 41 of 58 medicines that mental health patients were taking were not consistently recorded in both the primary and secondary care records. In particular, secondary care records tend to omit non-psychotropic drugs.[23 24] Junior doctors may take incomplete or inaccurate histories of medication on admission, partly because of reliance on a single source of information such as the general practitioner's letter.[25–27] Primary care records may omit psychotropics, including medicines supplied by mental health services, such as clozapine, depot injections and cholinesterase inhibitors.[23 24]

Role of the multiprofessional team in medicine management

Two particular situations might warrant more systematic research on medication errors. The first is the frequent use of medication prescribed to be given ''as required'' at the discretion of nursing staff in mental health inpatient units. One study found that the quality of prescribing as required medication was considerably poorer than that of regular medication.[8] The potential risk is illustrated by a census of 3132 inpatients prescribed antipsychotics, which found that as required medication sometimes gave nurses the option of giving doses above the recommended range.[28] The second situation is the role that members of community mental health teams have in monitoring medication in people with severe and enduring mental illness. These team members come from a wide range of disciplines, and many have received no training in the uses and potential side effects of psychotropic drugs. This increases the risk of unintentional harm in two ways: through inappropriate advice and through failure to act. An example of the first type of error is a team member encouraging a patient who has been non-compliant with clozapine for a week to restart at the full dose, rather than retitrate the dosage, with the potential risk of adverse events such as marked postural hypotension. An example of the second type of error is failure to recognise and act on potentially important physical health problems, such as a sore throat and fever in a patient receiving clozapine, or increasing thirst and tiredness in a patient taking an antipsychotic drug.

Decision-making errors in mental healthcare

Psychiatrists often fail to screen adequately for the adverse effects of psychotropic drugs. This includes screening for the metabolic syndrome for patients prescribed atypical antipsychotics[29 30] and for adverse effects and toxicity in patients prescribed lithium.[31 32] This may result in modifiable factors for premature death being untreated. Research on the cause of these failures to monitor for adverse drug reactions might inform the design of training interventions to deal with deficits in knowledge and systems that reduce the frequency of slips and lapses.

The problem of medication error related to inadequate prevention and management of adverse effects might be compounded by the frequency with which psychiatrists prescribe outside the product licence.[33] Although such ''off-label'' prescribing may sometimes be appropriate, it may increase the risk of harm through inadequate monitoring.[34 35] For example, safety alerts concerning drugs not licensed for psychiatric conditions, such as anticonvulsants prescribed as mood stabilisers, may not be directed to psychiatrists. Another example is the off-label prescribing of high-dose antipsychotics. This is associated with a higher incidence of adverse reactions to drugs, and requires close monitoring. There is evidence that this often does not happen.[36]

Two other situations, particularly in mental healthcare, are observed in which poor decision making may be a factor in preventable harm owing to adverse reactions to drugs. The first is the use of medication to manage acutely disturbed behaviour. There is good evidence that monitoring of the patient is often inadequate after giving the medication despite the possible association between rapid tranquilisation and death from a cardiovascular event.[36–38] The second situation is the prescription of toxic psychotropic drugs to people at risk of suicide. About 11% of deaths owing to drug overdoses involve antidepressants; this equates to 50 deaths each year.[39] The prescription of less toxic antidepressants might prevent some of these deaths.[40]

Factors related to patients

Patients with mental health problems may be less articulate and less likely to question a prescription, a change in the medication regimen, potential side effects or whether monitoring is required. This, together with the fact that some patients might have reduced capacity, places additional responsibilities on mental healthcare staff. This applies particularly to mental health wards for older people where many patients have dementia.[8]

Poorly developed prescribing systems and pharmacy services

Many UK mental health services have poorly developed systems to aid communication and support safe medicine management. There is also a lack of standardisation so that clinicians who move between services are confronted with unfamiliar systems for prescribing, obtaining, handling and

administering medication.[41] Many inpatient units and community mental health teams have limited IT infrastructure, unintergrated, paper-based record systems, little decision support for prescribing and poor access to laboratories for monitoring.

Pharmacists are effective at detecting and preventing some serious prescribing errors.[6 11 42] In mental health services, the problems caused by poor prescribing systems are compounded by the inadequate staffing and organisation of pharmacy services. Some mental health services have limited pharmacy infrastructure and so have limited awareness of, or strategic capacity to improve, medication management.[43] Poor staffing levels, inadequate training, lack of appropriate clinical expertise and lone working without adequate clinical supervision are features of the service. In many mental health trusts, pharmacy services are contracted in from acute care providers through service-level agreements.[44] This can compound problems as staff are employed by another organisation whose systems of working may not prioritise mental health.

CONCLUSIONS

Research on medication error in mental healthcare is limited. The research is focused on secondary care; most studies have only included inpatients and mainly relate to prescribing. All the studies are process based, rather than outcome based, and there has been no systematic study of causes of medication error in mental healthcare associated with deficits in knowledge or decision making.

The studies report few errors that result in actual serious harm to the patient. However, this might be owing to the limited focus of the research. Adverse events involving psychotropic drugs are common and some may be due to errors in clinical decision making of a type not detected by the studies reviewed. These are potentially preventable. The way that mental healthcare is organised and delivered, and nature of the patient group, might increase the likelihood of certain types of medication error. On the basis of this, we recommend that medicine management in mental health settings should be a priority for future research, with a particular emphasis on non-hospital settings.

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