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REVIEW ARTICLE

Medication-related issues associated with the documentation and administration of long-acting injectable antipsychotics

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Abstract

Background There are significant research gaps into understanding the extent of medication errors within mental health and variation in the uptake of standardised medication safety practices. Long-acting injectable antipsychotic (LAIA) preparations are a common treatment modality for the administration of antipsychotic medicines. *Aim of the review* To examine the literature on medication-related errors and practice issues associated with the documentation and administration of LAIAs. *Method* Electronic databases were searched for articles exploring medication errors in mental health, charting and administration of LAIAs, standardised medication charts, documentation of LAIAs and strategies or interventions to improve medication safety with LAIAs. *Results* Nineteen articles met the inclusion criteria. Medication errors in mental health were mostly related to the clerical or procedural aspects of prescribing. Standardised charts have been shown to reduce prescribing and administration errors. Divergent practices across mental health services were reported and this lack of standardisation in ordering and administering LAIAs contributes to errors. Discrepancies between guidelines and current practice with the administration of LAIAs were also identified. Evidence demonstrates that clinical pharmacy services reduces medication errors, and increased pharmacist involvement in LAIA care coordination improves communication and documentation with LAIAs. Further investigation focusing on standardisation of charting, administration and documentation of LAIAs is required. *Conclusion* Limited studies were identified that assess the charting, administration and documentation of LAIAs. Future research is required to review current local practices with LAIAs and identify substandard areas so that specific clinical interventions can be implemented and evaluated.

Keywords Administration · Documentation · Long-acting injectable antipsychotics · Medication chart · Medication errors

Impacts on practice

- The National Inpatient Medication Chart (NIMC) was introduced to provide a standardised form for documentation of medication orders and administration to reduce the likelihood of medication errors. Despite this, current NIMC charts are sometimes considered inadequate for appropriate documentation of LAIAs.
- Standardisation and development of guidance is required to improve the documentation and support the appropriate administration of LAIAs.
- Improving the technique and administration of intramuscular antipsychotic injections is a strategy to optimise the drug delivery of LAIAs.
- Challenges with care coordination for patients on LAIAs present pharmacists with an opportunity to assume innovative roles.

Introduction

There is a lack of research on medication safety and the extent of medication-related harm in mental health settings [1, 2]. Significant research gaps exist relating to the extent

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of medication problems, errors and adverse events within inpatient mental health units [3, 4] and there is a wide variation in medication management, often in the context of differing levels of uptake of standardised medication safety practices [1].

Medication is the major intervention used in the treatment of mental health conditions with more than 90% of inpatients within mental health units prescribed psychotropic medicines [2]. Intermittent depot preparations are a common treatment modality used for the administration of antipsychotic medicines, with up to one-third of patients with schizophrenia being prescribed a long-acting injectable antipsychotic (LAIA) [5, 6]. Depot antipsychotics are recommended in the treatment of schizophrenia and first episode psychosis where there has been insufficient response to oral medication and adherence has been poor or uncertain [7]. LAIAs provide an important option to overcome medication non-adherence, reducing relapse and rehospitalisation rates [7].

Aim of the review

This review aims to identify and evaluate the literature on medication-related errors and practice issues associated with the charting of LAIAs. Studies that investigate medication safety practices and strategies to facilitate the effective and appropriate ordering, administration and documentation of LAIAs will be reviewed and appraised.

Method

Search strategy: data sources and study selection

A broad search strategy was used to identify relevant studies. Searches were conducted in January 2019 using Ovid MEDLINE, EMBASE and CINAHL Plus for articles published in English between 2000 and 2019 in a hospital, community or ambulatory care setting. Keywords in the search terms and synonyms, related terms, abbreviations or spelling variants used included *"long-acting injectable antipsychotic", "depot antipsychotic", "intramuscular antipsychotic", "long-acting intramuscular antipsychotic", "intermittent depot injection", "depot neuroleptic", "LAI antipsychotics", "long-acting depot", "depot antipsychotic medication", "mental health", "acute psychiat$", "NIMC", "national inpatient medication chart", "medication chart", "medication ordering", "depot administration", "medication error", and "medication safety"*. Boolean operators were utilised to combine the different search sets; the number of hits and types of citations were monitored, and the search adjusted accordingly. The database search was supplemented with review of relevant reports and publications on the Australian Commission on Safety and Quality in Health Care website [8]. Additional articles were identified by checking the reference lists of the studies included. Abstracts were screened, and studies included based on the following inclusion criteria: exploring the prevalence, causes and types of medication errors in mental health units; investigating the charting and administration of LAIAs; reviewing the documentation of LAIAs; evaluating standardised LAIA medication charts; and evaluating interventions or strategies adopted to improve medication safety practices with LAIAs. The full search strategy, flow diagram and destiny of identified papers that formed the basis of this review are documented in Electronic supplementary material.

Results

Nineteen articles [1–4, 6, 9–14, 16–23] met the inclusion criteria and are included in this review; nine [1–3, 6, 9, 17, 18, 22, 23] literature/systematic reviews, five [10, 12–14, 16] prospective before/after audits, one [4] prospective observational study, two [11, 21] cross-sectional surveys, and two articles with a mixed-methods [19, 20] approach. Six of the studies [1–4, 9, 10] investigated medication safety and medication errors in mental health; five studies [11–14, 16] examined standardisation of medication charts or documentation of LAIAs; four studies [17–20] evaluated clinical pharmacy services in mental health; and four studies [6, 21–23] investigated nursing administration of LAIAs.

Discussion

Medication safety and medication errors in mental health

It has been suggested that 2–3% of Australian hospital admissions are medication-related, with approximately 50% potentially preventable [1, 9]. Medication errors remain the second most common type of incident reported in hospitals [9] and include procedural errors (such as a signature missing from the prescription or lack of documentation of the route of administration) and clinical errors (due to the wrong medicine or dose being ordered) [2]. Clinical prescribing errors have been observed at a rate of 0.2 per patient, similar for paper-based and electronic systems when compared within the same institutions [1]. However, documentation or procedural errors for prescribing have been shown to be more common, occurring at a rate of 4–5 per patient [1]. In general hospitals, prescribing errors are estimated to affect between 2 and 15% of medication orders [4]. Overall, the rate of prescribing errors in mental health units appears to be similar to that found in the general health setting, with on

average, one clinical prescribing error occurring per patient, per admission [2, 10].

Research about medication errors with LAIAs in mental health is lacking [2, 3]. Maidment et al. [3]. conducted a systematic review that examined the incidence, cause and type of medication errors in a community or hospital-based mental healthcare service. Most errors were related to clerical aspects of prescribing such as legibility, completeness of prescriptions and transcribing errors, or administration such as incorrect time, incorrect dose or missed doses [3]. There have been no studies examining causes of medication error in mental healthcare associated with LAIAs [3]. Inpatient mental health units often have limited or poorly developed systems to facilitate effective communication and support safe medication management, such as unintegrated paper-based record systems and little decision support for prescribing [3]. The lack of standardisation in mental health services has also been described, highlighting that clinicians who move between services are often challenged with unfamiliar systems for prescribing and administering medication [3]. Strategies including standardised processes for prescribing, administering and monitoring medicines that have been effective in improving medication safety in general settings can be successfully implemented in mental health settings and reduce medication errors [2].

Multiple system-related causes have been shown to contribute to medication errors [9]. Team factors include communication, supervision and structure while task factors include medication chart design and protocols. Environmental factors include staffing levels, skill-mix, workload and workflow [9]. In mental health services, these problems caused by poor prescribing systems have been shown to be compounded by inadequate staffing or training, lack of clinical expertise and working without adequate supervision [3].

Keers et al. [4] prospectively determined the prevalence, nature and predictors of prescribing errors across three mental health hospitals. This study highlighted the importance of pharmacy teams in the detection and prevention of medication errors in mental health hospitals. Pharmacists screened prescriptions to determine the presence and type of prescribing errors and whether they were clinically relevant and likely to cause harm. Validation of all recorded prescribing errors was undertaken by a multidisciplinary panel which comprised one mental health clinical pharmacist, one consultant pharmacist in medicine and medication safety, and one consultant psychiatrist. The errors were reviewed, and consensus was reached regarding whether genuine prescribing errors had occurred, and, using established criteria, the type and the severity of the error. Of 4427 prescription items screened, 281 were found to have one or more prescribing errors (error rate 6.3% (95% CI 5.6–7.1%)). Most errors were related to omission of drugs and missing or incorrect prescription requirements. Over half (56%) of all errors identified were considered to be clinically relevant, with 20 (6.9%) potentially serious or life-threatening. One example of a significant prescribing error identified was the wrong route of administration, wherein an intramuscular depot was prescribed for subcutaneous administration. Another patient was also prescribed a LAIA without electrocardiogram monitoring despite evidence of a previous prolonged QTc interval whilst taking an antipsychotic medication. Multivariate analysis revealed that specialty trainees [OR 1.23 (1.01–1.51)] and staff grade psychiatrists [OR 1.50 (1.05–2.13)] were more likely to make prescribing errors compared to junior doctors. Likewise, prescription items screened at admission were five times more likely [OR 5.39 (2.72–10.69)] to be associated with clinically relevant errors than those screened during patient stay [4]. Although this was a large study conducted across three sites, generalisability of the results may be limited. The data collection process was standardised, however variation in error detection due to differing workloads, vigilance and/or clinical experience of data collectors cannot be completely excluded.

There have been some studies evaluating factors contributing to medication administration errors in the general hospital setting [9]. A review of medication safety in Australia determined the overall clinical error rate for medication administration in hospitals to be between 5 and 10% of medicine administrations [1]. Interruptions and distractions, poor communication, stress/high workload, organisational climate, quality of work life, information flow and difficulty using/physically accessing computers were the most common factors contributing to medication administration errors [9]. In a literature review investigating the extent of medication-related harm in mental health settings, there were no Australian studies found that assessed prescribing and administration errors in mental health units associated with LAIAs [2]. This scoping study undertaken by the University of South Australia described a consultation process with key stakeholders and clinicians [2] where lack of knowledge about appropriate depot injection technique, medication incidents such as patients unintentionally receiving additional depot injections due to separate systems used for documentation, and inadvertent administration of a LAIA to a different patient due to wrong patient identification, were identified as issues [2].

Standardised medication charts and documentation of LAIAs

The lack of standardisation in ordering and administering intermittent depot injections has been identified as a risk factor for errors [11]. Coombes et al. [12]. described the development of a standardised paper-based medication chart for public hospitals in Queensland and assessed the impact on prescribing errors. Prospective, observational

audits, of all available prescriptions before and after introduction of the medication chart, were undertaken in five sites. Observers were trained using standard scenarios and established definitions. Two observers had to agree on errors with a third researcher involved where disagreement occurred. The level of clinical pharmacy service provided at each site was not assessed, and this could have influenced prescribing habits. This intervention demonstrated a significant reduction in the prescribing error rate from 20% of orders per patient to 16%. Additionally, the proportion of previous adverse drug reactions (ADRs) which were not documented decreased from 20 to 11%. This chart was initially introduced into all hospitals statewide and then formed the basis for the National Inpatient Medication Chart (NIMC), which was subsequently implemented in 2006 [12].

A further study [13] described the piloting of the NIMC across Australia. This was a prospective, before and after chart audit of prescribing errors on general inpatient medication charts. A national working group reviewed existing medication charts and it was agreed to use a modification of the statewide chart used in Queensland [13]. This chart was further enhanced by a process of piloting, evaluating error rates and obtaining feedback from medication safety bodies [13]. Twenty-two hospitals provided matched data before and after implementation and were included in the analysis. Similar numbers of patients and medication orders were observed pre and post intervention. After the introduction of the NIMC, prescribing errors decreased from 41% to 28% ($p < 0.001$). The documentation of drugs causing previous ADRs increased from 82 to 89% of drugs ($p < 0.001$). Standardising medication charts demonstrated improvements in prescribing practice, reductions in prescribing errors and improved documentation. The study was unable to control for the change in medical staff between pre and post audits which could have impacted on the results; inability to blind the clinicians could have also influenced their behaviour and improved their usual practice, irrespective of the intervention. Overall, the NIMC was shown to be effective in reducing procedural errors with prescribing in the general setting and the utilisation of the NIMC in psychiatric services was recommended in 2012 [2, 11]. However, studies evaluating the charting and documentation of LAIAs on the NIMC were not found in the literature.

McIver et al. [14]. examined the effect of form redesign and standardisation to improve prescription and administration of insulin. An expert panel developed standardised charts which were designed to allow all documentation for prescribing and administration of insulin to be included on the one chart. They also included prompts for prescribers to reduce unsafe documentation. Throughout the iterative process, the forms were assessed using prescribing and administration scenarios. The forms were implemented with staff education; impact was measured through a pre-post intervention audit. Data was collected at four Queensland hospitals using a convenience sample of 117 patients pre-implementation and 82 patients post-implementation. Correct recording of insulin infusion rates increased from 56 to 69% post-implementation of the redesigned chart ($p < 0.0002$) and the proportion of subcutaneous insulin charts with unclear dose documentation decreased from 10 to 3% ($p = 0.0014$) [14]. This study demonstrated that improvements in insulin prescribing, documentation of administration and some important aspects of insulin and blood glucose management can be achieved through form design and structured implementation/education packages [14]. Results also demonstrated that standardisation of prescribing tools incorporating safety features to assist prescribers can be achieved [14]. Similarly, in relation to LAIAs, Roughead et al. [2]. highlighted examples where local changes in the administration of depot antipsychotics had been implemented, such as redesigning depot administration charts to record the injection site used and promote rotation of injection sites. While these anecdotal reports indicated success, there has not been any formal studies of medication chart redesign with LAIAs found in the literature [2].

According to the NIMC user guide, a medication order is only valid if the prescriber completes all mandatory fields [15]. A pre-post intervention audit was conducted to evaluate areas on the NIMC with poor compliance [16]. A total of 1877 medication prescriptions were reviewed; no medication charts had all regular medication prescriptions correctly completed. 1653 prescriptions (88%) had no prescriber contact number, 1630 (87%) had no documented indication, 1230 (66%) no prescriber name and 675 (36%) used a drug's trade name. A broad communication-based intervention yielded moderate improvements, with a decrease of 6.1% in prescriptions lacking a prescriber contact number and 7.7% lacking prescriber name. The sections of the NIMC most commonly omitted were procedural rather than clinical, suggesting that errors are related to a lack of understanding of the importance of each section. Similar procedural concerns have been raised regarding LAIAs including documentation of which injection site was used, next due date and countersignature by a second nurse for administration but no studies have been identified in the literature [2, 11].

The NIMC was introduced to provide a standardised form for documentation of medication orders and administration to reduce the likelihood of errors, however it is considered by some as being inadequate for the appropriate documentation of LAIAs [11]. Consultations with stakeholders suggest variation in the LAIA administration charts used in different jurisdictions and within mental health services [2, 11]. The extent to which current chart designs contribute to issues or errors with LAIAs has yet to be evaluated [2]. A survey of

mental health clinicians (nurses, doctors, pharmacists) on barriers to the use of the NIMC in psychiatric acute care settings revealed conflicting views and clinicians could not reach a consensus that the NIMC was able to accommodate intermittent depot injections in its current format [11]. A majority of respondents suggested a separate section on the NIMC be utilised for depot medicines with adequate space for two nursing signatures, site of administration, date last given and date next due. A few respondents reported use of a completely different medication chart and some suggested redesigning sections that reflected local clinical practices including prompts to document requisite information. However, incorporating these suggestions into a specialist NIMC for psychiatric services would lose the previously identified benefits of a standardised chart [11]. Further investigation focusing on standardisation of charting, administration and documentation of LAIAs using the NIMC is required to assist clinicians to effectively and safely perform these functions.

Clinical pharmacy services in mental health

There is strong evidence that within the hospital setting clinical pharmacy services reduce medication errors and adverse drug events [1, 2, 17]. Finley et al. [18]. evaluated the impact of pharmacists in mental health and found the most common interventions to be a combination of drug monitoring, treatment recommendations, and patient education resulting in improved prescribing patterns, clinical outcomes, drug adherence, patient satisfaction and cost savings. However, most of the studies were small, and deficits or variability in design limited comparison between findings. Overall, the quality and consistency of literature focusing on pharmacists in mental health is lacking [18].

Richardson et al. [19]. explored the role of Australian mental health hospital pharmacists in identifying drug-related problems (DRPs). A cross sectional survey and semi-structured interviews of 47 pharmacists resulted in 277 clinical interventions, identification of 332 DRPs and 355 recommendations. Drug interactions were the most commonly identified DRP (14%); changes to therapy were the majority of recommendations (61%) and 92% of recommendations were implemented [19]. This study demonstrated that recommendations by mental health pharmacists were highly valued and of clinical relevance. The use of a mixed methods approach allowed for in-depth analysis into the clinical role of mental health pharmacists however responses were self-reported and could not be verified. In addition, the taxonomy and categorisation of the DRPs was originally developed for the primary care setting and had not been previously applied to mental health inpatients.

Abraham et al. [20]. examined the role of pharmacists in addressing care coordination for patients on LAIAs. A holistic work systems approach was used to assess the effectiveness of implementing a pharmacist-led consult intervention. The Systems Engineering Initiative for Patient Safety (SEIPS) model, which is based on human factor engineering principles, was applied to understand both individual and collaborative work processes involved in LAI coordination. The five key components of the SEIPS model are person(s), organisation, tools and technology, tasks, and environment. Sixteen healthcare team members and six patients were interviewed. Twenty patient charts were reviewed to examine the care coordination process. Four themes emerged as major workflow processes: pharmacist consultation, in-hospital injection administration, discharge, and outpatient treatment. Challenges reported included lack of communication, poor standardisation of roles, and inadequate knowledge of LAIAs and the care coordination process. The difficult patient recruitment process and short timeframe for data collection resulted in the small number of patients interviewed. Overall this paper highlights an opportunity for pharmacists to assume innovative roles to meet the challenges of care coordination for patients on LAIAs. Increased pharmacist involvement in LAIA care coordination may contribute to bridging these gaps by improving communication or documentation and standardising the prescribing and administration of intermittent depot injections [20].

Nursing administration of depot antipsychotic injections

Anecdotal evidence suggests that many nurses giving depot medication have no specific training and are not adequately supported by local mental health services [21]. A survey of general practices (N = 101) investigating administration of depot antipsychotics within primary care reported 55 (80%) administered LAIAs to patients. Survey results were based on answers given by practice staff, and therefore responses could not be validated. There was wide variation between the practices and divergent responses emerged from the survey regarding the need for further training with LAIAs, with most of the GPs stating that additional practice training was not required, whereas many of the practice nurses expressed a need for such training to ensure good practice.

Improving the technique of intramuscular antipsychotic injections, including injection technique, delivery site and patient preference, is one strategy identified to optimise administration of LAIAs [2]. Discrepancies have been identified between available guidelines and current practice [22]. The dorsogluteal muscle has been suggested to be the most commonly used site for administration of depot preparations as it is an area familiar to most practising nurses [6, 23]. Evidence against using the dorsogluteal muscle for administration of LAIAs centres around perceived anatomical disadvantages such as inadvertent damage to major nerve and

vascular structures, which can be avoided when using other sites such as the ventrogluteal region [6, 23]. Wynaden et al. [22] found that nurses were reluctant to use the ventrogluteal site due to difficulty in locating this site anatomically and the risk of needlestick injury when injecting between two wide spread fingers during administration.

Clinicians have also raised concerns about unintentional injection of depot antipsychotics into fat and subcutaneous tissues, rather than into muscle [2]. Injection into the dorsogluteal site has revealed unpredictable results with consistently achieving injection into the muscle [2]. Injections may fail to reach the muscle tissue of the gluteal site in a significant proportion of overweight or obese individuals. The increasing incidence of obesity in mental health has resulted in many studies questioning whether intramuscular injections into the dorsogluteal site reach muscle due to the increase in adipose layers [2, 6, 23]. Consideration also needs to be given to ensure that patients are receiving correct dosages of LAIAs at the intended site, including evaluation of the needle sizes used and alternative administration sites [6]. Licencing restrictions define exactly where LAIAs can be administered and administration outside the stipulated sites could be considered a breach of the licence [6, 23]. Continuing education and monitoring is essential to ensure adherence to guidelines and consistent practice is maintained. An intramuscular administration protocol or tool, which prompts documentation of pertinent information such as the site of injection used, would be beneficial in reducing variation in how LAIAs are administered [2].

Conclusion

There are significant gaps in our understanding of the extent of medication problems, errors and adverse events in mental health. The lack of standardised practice in ordering and administering LAIAs has been identified as a risk factor for errors. No studies were found that assessed the charting, administration and documentation of LAIAs. Development of guidance would be valuable to support the appropriate use of antipsychotic depot injections. Consequently, research is required to review current local practices and identify any substandard areas so that specific interventions and improvements, such as an administration protocol or standardised depot medication chart, can be implemented and evaluated.

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