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Prescription errors in a psychiatric hospital: preliminary results of an observational study

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ABSTRACT

Background: Prescription errors (PE) in psychiatric hospitals can compromise treatment and patient safety. While well studied in general healthcare, evidence from psychiatric settings, particularly in Germany, remains scarce. *Aim*: This preliminary study investigates the prevalence, types, and severity of PE in a German psychiatric hospital over 12 months. *Methodology*: A prospective observational study was conducted at St. Josef AMEOS Psychiatric Hospital, Oberhausen, Germany (2023–2024). All 6,020 paper-based therapeutic plans were screened. From these, 150 cases of PE were identified for interim analysis. Errors were categorized using adapted EQUIP methodology and classified by severity (minor, major, serious, potentially fatal) and by drug group according to the British National Formulary (BNF). *Results*: Of the 150 cases, 93.3% were minor, 5.0% were major, and 1.7% were serious; no potentially fatal errors were observed. Writing errors were most common (38%). Errors most frequently involved musculoskeletal medications (BNF 10; 36.7%), followed by gastrointestinal (BNF 1; 18.7%) and CNS/psychotropics (BNF 4; 14.7%). Most errors occurred in inpatient settings and were primarily attributed to residents and consultants. Significant associations were found between error type and drug class, and between error type and severity ($p<0.05$). *Conclusion*: These interim results suggest that PE in psychiatric hospitals are mostly minor, with somatic medications more often affected than psychotropics. Given the small interim sample (150 of 6,020 plans), findings should be interpreted cautiously and considered hypothesis-generating. Larger, multi-center studies and evaluation of electronic prescribing systems are needed to confirm these patterns and guide interventions.

KEYWORDS

prescription errors, psychiatry, medication safety, Germany, observational study

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1. INTRODUCTION

Prescription errors (PE) are a major concern in healthcare, as they contribute to adverse drug

events (ADE) and reduced treatment quality [1,2]. In psychiatric hospitals, where pharmacotherapy is central for conditions such as depression, schizophrenia, and substance use disorders, errors can aggravate symptoms or may even cause physical harm [3].

The UK EQUIP study reported PE rates up to 8.9%, identifying prescriber inexperience and drug complexity as key risk factors [4]. Systematic reviews further emphasize the importance of prescribing safety in mental health care [3,5], while early German experiences suggested that clinical pharmacy interventions may reduce drug-related problems in psychiatric inpatients [6]. Despite this, psychiatric hospitals in Germany remain understudied compared to general hospitals, and the available data are limited.

To address this gap, the present study reports preliminary findings from an observational investigation of PE in a large German psychiatric hospital. All 6,020 therapeutic plans during a 12-month period were screened, and 150 cases were identified for interim analysis. We hypothesized that PE would be predominantly minor, more frequent in somatic than in psychotropic medications, and associated with drug class rather than patient demographics. These interim results provide early insights into prescribing safety in German psychiatric care and aim to inform the design of larger, multi-center studies.

2. METHODOLOGY

2.1. Data collection and analysis

A 12-month prospective observational study (2023–2024) was conducted at St. Josef AMEOS Psychiatric Hospital, Oberhausen, Germany. The hospital provides psychiatric care exclusively to the city's 210,829 residents within a defined catchment area, which minimizes population heterogeneity.

All 6,020 paper-based therapeutic plans of admitted and hospitalized patients were screened. From these, 150 cases of prescription errors (PE) were identified and included in this interim analysis. Departments covered were: general psychiatry (open and closed wards), substance abuse, depression, outpatient clinic, and emergency services.

The methodology was based on the EQUIP study [4], supplemented with elements from the PRACtICe study [7]. The definition of PE followed Dean *et al*. [8]. A minimum representative sample of 384 patients had been calculated for a 95% confidence interval using STATA version 19; the present analysis therefore represents preliminary findings.

Error identification was carried out independently by two psychiatric specialists (K.M., T.K.), both with certified German language proficiency (≥ C1). Pilot testing showed high interrater reliability (κ=0.85). Data collection took place on weekdays (08:30–17:00), with additional documentation of errors occurring outside scheduled hours.

2.2. Definition of prescription errors

The definition of PE was adopted from Dean *et al*. [8]: "an unintentional significant reduction in the probability of treatment being timely and effective or an increase in the risk of harm compared with generally accepted practice." This definition has been widely applied in prescribing safety research, including EQUIP [4] and PRACtICe [7].

2.3. Research tool

Severity of PE was graded on a four-point scale: Minor (Level 1): unlikely to cause harm, e.g., illegibility or incomplete prescription. Major (Level 2): potentially clinically relevant, e.g., dose deviations up to fourfold or incorrect administration route. Serious (Level 3): likely to cause significant harm, e.g., severe overdoses or high-risk drug–drug interactions. Potentially fatal (Level 4): associated with a realistic risk of fatal outcome, e.g., toxic serum levels or tenfold overdoses.

Error types were categorized into ten predefined groups (dosage, writing, allergy risk, timing, interactions, omissions, unnecessary prescriptions, safety errors, loss of information, other), adapted from Seden *et al.* [9].

Drugs were classified according to the British National Formulary (BNF 83) [10], covering gastrointestinal, cardiovascular, respiratory, central nervous system (psychotropics), infections, endocrine, obstetrics / gynecology / urinary tract, malignant disease / immunosuppression, musculoskeletal, and miscellaneous groups.

2.4. Statistical analysis

Descriptive statistics were used to summarize patient demographics, error location, type, severity, and drug group. Inferential analyses included chi-square tests for categorical comparisons, Spearman rank correlations for continuous variables, and Kruskal–Wallis tests for group differences. Temporal variation across the 12-month period was also examined. Analyses were performed with Microsoft Excel 2021 and IBM SPSS

Statistics 28. Statistical significance was set at $p<0.05$.

2.5. Quality control and ethical approval

All errors were independently assessed by two psychiatric specialists (K.M., T.K.) to minimize observer bias. Oversight was provided by hospital administration, the AMEOS quality management department, and an independent quality control expert (C.D.).

The study was approved by the AMEOS Ethics Committee (approval number: AMEOS-ETH-2023-001) as a quality audit. Data were anonymized, stored on secure hospital servers, and managed in compliance with EU Directive 536/2014 and German Medicines Law (§§40–42a AMG, GCP-V). No individual patient consent was required.

3. RESULTS

A total of 6,020 therapeutic plans were screened, from which 150 cases of prescription errors (PE) were identified and included in this interim analysis, corresponding to an overall error rate of 2.5%. The mean age of patients was 43.5 ± 11.9 years, and 55.3% (83/150) were male.

Most PE (92.0%; 138/150) occurred within inpatient settings, particularly on general psychiatry wards, while 8.0% (12/150) were documented in outpatient care. Residents and consultants were most frequently recorded as responsible, reflecting their central role in prescribing practice. This distribution highlights residents' heavy involvement in drafting prescriptions, suggesting a need for enhanced training during onboarding (Table 1).

Table 1. Prescribing errors by clinical setting and professional role.

Clinical setting	Chief (%)	Vice Chief (%)	Senior Consultant (%)	Consultant (%)	Resident (%)	Nurse (%)
General psychiatry (inpatient)	0.0	5.0	5.0	25.0	57.5	7.5
General psychiatry (outpatient)	0.0	8.5	15.3	25.4	40.7	10.2
Substance abuse unit	0.0	0.0	27.3	27.3	45.5	0.0
Depression unit	0.0	40.0	0.0	40.0	20.0	0.0
Outpatient clinic	0.0	0.0	25.0	50.0	25.0	0.0
Emergency department	3.2	3.2	25.8	16.1	51.6	0.0

With regard to severity, 93.3% of errors (140/150) were classified as minor (level 1). Among the remaining cases, 5.0% (7/150) were major (level 2) and 1.7% (3/150) were serious (level 3). No potentially fatal errors (level 4) were identified.

Analysis of error types showed that writing errors were most frequent, accounting for 38.0% of cases (57/150). Dosage errors accounted for 10.0% (15/150), drug–drug interactions for 8.0% (12/150), allergy-related risks for 6.7% (10/150), and omissions for 9.3% (14/150). Other error types, including incorrect timing or duration, unnecessary prescriptions, safety errors, and loss of information, occurred less frequently. Writing errors, predominantly minor, suggest documentation issues as a key area for intervention, while dosage errors and interactions carry higher clinical risk (Figure 1).

Pharmacotherapeutic classifications showed that errors most often involved musculoskeletal and joint disease medications (BNF 10; 36.7%, 55/150), followed by gastrointestinal drugs (BNF 1; 18.7%, 28/150) and central nervous system drugs, including psychotropics (BNF 4; 14.7%, 22/150). Overall, somatic medications (BNF groups 1–3, 5–7, 9–10) accounted for 85.3% of errors, while psychotropic drugs (BNF 4) represented 14.7%, reflecting polypharmacy in psychiatric inpatients with somatic comorbidities (Figure 2).

Error frequencies remained stable, averaging 12–13 cases per month (Figure 3), with peaks in January and October potentially linked to staff transitions, suggesting targeted training needs. The mean severity remained stable, ranging from 1.00 to 1.23 (Figure 4), indicating consistent low clinical impact but also highlighting the need for preventive strategies.

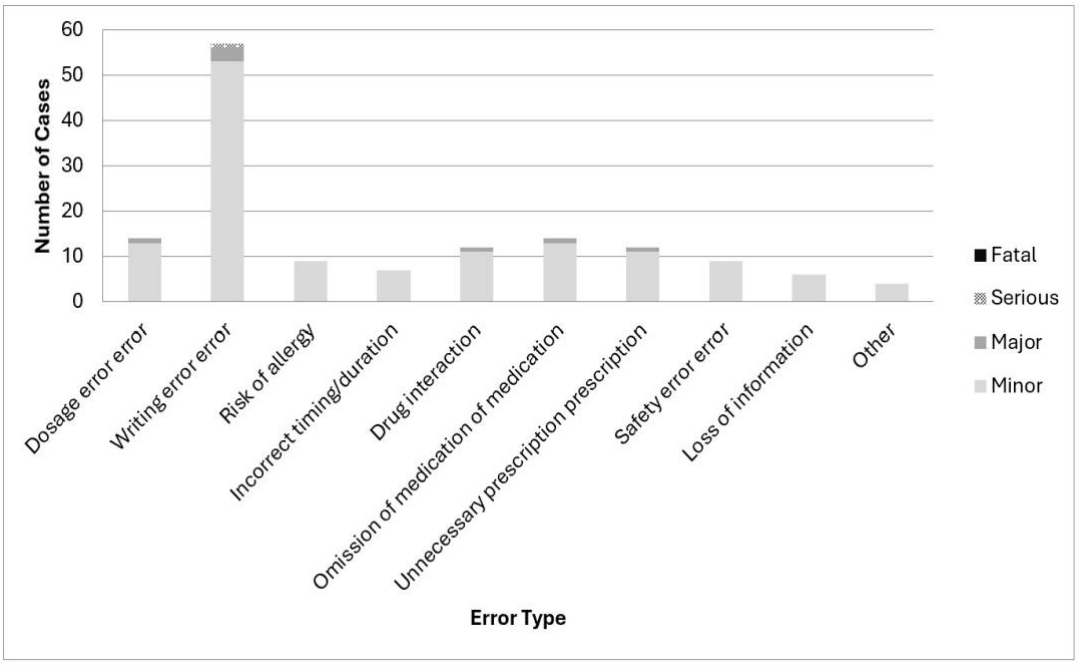

Figure 1. Distribution of prescription errors across ten predefined categories, shown by severity (minor, major, serious, potentially fatal).

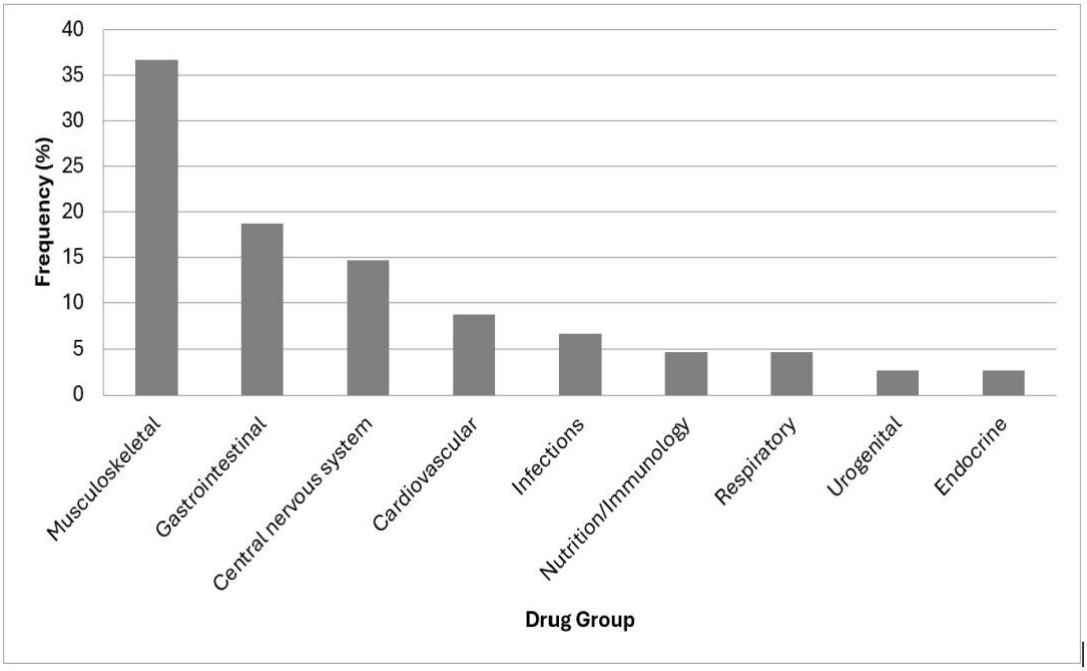

Figure 2. Distribution of prescription errors by drug groups (BNF classification).

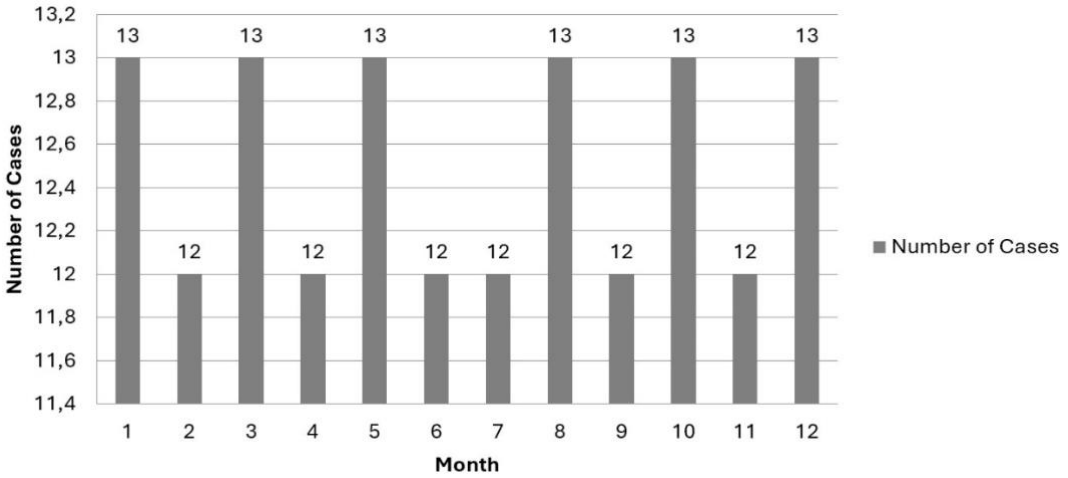

Figure 3. Monthly distribution of prescription errors across the 12-month observation period.

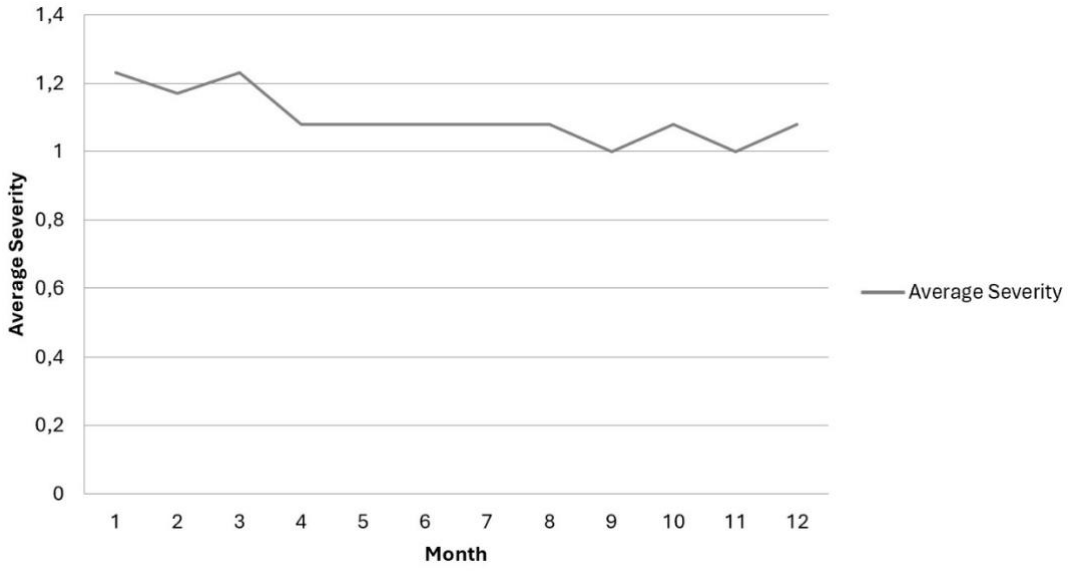

Figure 4. Temporal trends in the average severity of prescription errors.

Statistical analyses revealed significant associations between error type and drug class (χ^2 p<0.001; Kruskal–Wallis p=0.023) and between error type and severity (χ^2 p<0.001; Spearman's ρ p<0.001; Kruskal–Wallis p<0.001). No significant associations were found between the responsible professional group and severity, nor between the month of occurrence and severity (p-values 0.27–0.94). The complete statistical results are presented in Table 2.

4. DISCUSSION

This interim analysis provides one of the first systematic examinations of prescription errors (PE) in a German psychiatric hospital, contributing to the limited literature on this topic [11,12,13,14]. The majority of errors were minor, and no potentially fatal errors were observed, consistent with international studies, including EQUIP and related investigations [4,5,9]. Writing errors were the most fre-

quent type, underlining the limitations of paper-based prescribing, which is still common in many settings [9,15]. These findings align with broader medication safety research, which highlights documentation issues as a common error source [16,17,18].

Table 2. Statistical associations of prescription errors.

Comparison	Chi² (*p*)	Spearman (*p*)	Kruskal–Wallis (*p*)	Mann–Whitney (*p*)	Wilcoxon (*p*)
Error type vs. pharmacotherapeutic group	1.43×10^{-5} †††	0.9037	0.0227 †	n.a.	n.a.
Error type vs. severity	2.13×10^{-21} †††	0.00019 †††	0.00034 †††	n.a.	n.a.
Responsible party vs. severity	0.512	0.460	0.270	n.a.	n.a.
Temporal variation in severity	0.915	0.837	0.972	n.a.	n.a.

Results of statistical analyses examining associations between error type, pharmacotherapeutic group, severity, responsible party, and temporal variation. Significance levels are indicated by crosses († $p < 0.05$, †† $p < 0.01$, ††† $p < 0.001$). n.a. = not applicable, as Mann–Whitney U and Wilcoxon tests are restricted to two-group or paired comparisons, whereas the present analyses involved multiple categories.

Somatic medications were more often implicated than psychotropics, reflecting the high prevalence of comorbid conditions and associated polypharmacy among psychiatric inpatients [3,6]. Previous studies, as well as World Health Organization reports, identify polypharmacy as a global driver of PE [19]. The economic burden of such errors, even when minor, underscores the need for preventive measures [20,21].

Statistical analyses showed significant associations between error type and drug class, as well as between error type and severity. These relationships suggest that certain drug categories may be more prone to specific errors, though the interim sample is too small to allow firm conclusions. The results should therefore be regarded as exploratory and hypothesis-generating, in line with prior work in psychiatric settings [22–25]. Earlier research in inpatient psychiatry has identified common patterns in medication errors and adverse drug events, including prescribing errors [26].

Error frequencies were relatively stable across the year, with modest peaks observed early in the year and again in autumn. A plausible explanation may be linked to staff transition cycles, as new residents typically start in January and October, but this interpretation remains speculative and requires confirmation in larger studies [4].

Overall, these findings offer preliminary insights into prescribing safety in German psychiatric hospitals. They point to the potential value of system-level strategies, such as electronic prescribing [27], and to the need for targeted training during resident transition periods. However, the limitations of the current analysis mean that generalization beyond this single hospital is not possible.

A number of limitations should be considered when interpreting these findings. First, this is an interim analysis based on 150 cases identified from 6,020 therapeutic plans, which falls short of the initially calculated sample size for representative estimates. The results should therefore be regarded as exploratory and not generalizable beyond this single setting. Second, attribution of responsibility for errors may be biased by documentation practices, since residents typically draft prescriptions that are later authorized by consultants. Third, the exclusive use of paper-based therapeutic plans limits comparability with hospitals where electronic prescribing systems are already implemented.

5. CONCLUSION

This preliminary study suggests that prescription errors in psychiatric hospitals are predominantly minor and most frequently involve somatic medications and writing-related issues. No potentially fatal errors were observed. Although their clinical consequences are usually limited, even minor errors are preventable and underline the importance of safer prescribing practices.

Given that the analysis is based on 150 cases out of 6,020 therapeutic plans, the findings should be interpreted as exploratory. Larger multi-center studies are required to confirm the observed patterns, to examine the role of electronic prescribing, and to evaluate training interventions, particularly during staff transition periods. System-level strategies will be essential to reduce the risk of errors and to strengthen medication safety in psychiatric.

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CONFLICT OF INTEREST STATEMENT
The authors declare no conflicts of interest.

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