Benzodiazepine receptor agonists (BZRAs) are commonly used psychoactively drugs globally; they suppress neuronal activity by binding to GABA_A receptors and increasing chloride ion influx to hyperpolarise the neuron’s membrane potentials. Therefore, they are used for treatment of insomnia, anxiety, panic disorder and epilepsy in the short term (usually 2–4 weeks) in psychiatric settings. However, BZRAs may cause many physical and mental adverse effects, including respiratory depression, cognitive impairment, falls and injuries (especially in elderly people), psychiatric symptoms and increased risk of suicide. Another main problem of chronic BZRA use is the rapid development of tolerance, withdrawal or dependence within weeks to months.

Overdose and long-term use are inconsistent with clinical recommendations. Previous studies have shown that hazardous use of BZRAs is quite common, and it results in a premorbid status with high risk of negative consequences, which warrants an early intervention. Additionally, nearly half of long-term benzodiazepine (BZD) users use overdose hypnotics. The use of hypnotics has increased rapidly in recent years, an increase almost entirely attributable to a rise in medium- and long-term use regardless of indication.

Hypnotics are one of the most used classes of drug in psychiatric practice, with 27.9–75.9% of patients with psychiatric disorders (e.g. schizophrenia, affective disorders) using them at some point. However, few large-population studies are available to enable understanding of hazardous use of BZRAs in psychiatric settings around the world or in China.

Conclusions
BZRAs are commonly used and there is a relatively large proportion of over-indication users among Chinese psychiatric out-patients. However, only a small proportion of hazardous users were detected. The study highlights how to use prescription data to support improvements in clinical practice.

Keywords
Benzodiazepine receptor agonists; hazardous use; over-indication use; prescription database analysis; psychiatric population.

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accordance with the World Health Organization’s Anatomical Therapeutic Chemical (ATC) classification codes. Alprazolam, estazolam, lorazepam, oxazepam, midazolam, diazepam, clonazepam, nitrazepam were categorised as BZDs, whereas zolpidem, zopiclone, eszopiclone and zaleplon were categorised as Z-drugs.

Data source
We used the electronic prescription databases provided by a convenience sample of five hospitals with the largest number of clinic visits in their own regions: two in the east, two in central and one in the west of China. Three of these hospitals (Shanghai Mental Health Center, Affiliated Guangxi Hospital of Soochow University and Wuhan Mental Health Center) were the only tertiary mental hospitals in their regions. The other two hospitals (the Second Xiangya Hospital of Central South University and the West China Hospital of Sichuan University) were general hospitals with psychology departments that had the same medical level and regional influence as the mental hospitals. All five hospitals are tertiary hospitals in cities. Owing to the high-quality psychiatric services provided by these hospitals, local civilians tend to seek psychiatric help in these settings, which makes the sampled hospitals well representative of local real situations.

Data on electronic prescription dispensing of BZRAs in 2018 were extracted for these out-patient psychiatric settings. The databases contained information including: (a) de-identified unique patient ID, (b) demographic characteristics (e.g. gender, age), (c) diagnosis and prescription information on drug type, dose, duration and usage, and (d) unique physician ID.

Index and measurements
Defined daily dose
The defined daily dose (DDD) is an internationally accepted standard for measuring drug consumption endorsed by the World Health Organization. We used it to compare BZRA consumption between regions.15

Arrays of individual-level cumulative daily dosage in diazepam milligram equivalents
To compare the potency of different hypnotics, the dosages of different kinds of hypnotic were converted into diazepam milligram equivalents (DMEs).16 Then an individual-level array of cumulative DMEs was calculated day by day over the research period for each patient, which allowed comparison between patients (Fig. 1).

Based on these individual arrays of cumulative daily DME usage, the average daily dosage, total days of use and total yearly usage were calculated for each patient to give the annual hypnotics load. The number of out-patient visits and number of different doctors visited were calculated for further analysis.

Maximum averaged daily DME usage and overdose usage
Based on the arrays of cumulative daily DME usage, we found that some patients requested more hypnotics than justified by their conditions because they want to reduce the number of visits for repeat prescriptions. This might result in an overestimation of daily usage in our study. To avoid this, the 3-month period with most hypnotics use was identified and the average daily dosage in this period was calculated as the maximum daily DME dose. Also based on the arrays, patients were considered as overdose users if their maximum averaged daily DME dose was more than 40.

Maximum days of continuous use and long-term users (>90 days)
Based on the arrays of cumulative daily DME usage, the maximum number of days of continuous use of hypnotics was identified for each patient, and with permissible gap of up to 3 days because the withdrawn symptoms were most obvious in 72 h after the cessation. Withdrawal symptoms develop rapidly after 6 weeks of continuous use and tolerance shows within weeks to months;16 therefore guidelines recommend treatment periods of 2–4 weeks, depending on the indication.1–4 We chose a 90-day cut-off for long-term users17 to ensure at least three hypnotic prescriptions in a year, given the prescription length restrictions in China of no more than 30 days.

Hazardous hypnotics use
Based on the arrays of cumulative daily DME usage, patients with both long-term use of hypnotics (up to 90 days) and overdose use of hypnotics (over 40 mg) were considered to be patients with hazardous use of hypnotics. The other users were considered to be patients without hazardous use.

Over-indication use of hypnotics
Patients were considered to be over-indication users if none of recorded diagnoses in 2018 met any of the indications approved by the Chinese Food and Drug Administration (FDA) for the specific drugs they were prescribed (see supplementary Table 1 available at https://dx.doi.org/10.1192/bjo.2022.589).

Patient follow-up
We randomly selected 200 patients from the hazardous users in one of the hospitals in the east region, using simple randomisation tables generated by SPSS Statistics, and contacted them by phone. Trained psychiatrists conducted face-to-face semi-structured interviews with this selected sample about their use of BZRAs to ascertain

<table>
<thead>
<tr>
<th>Times series</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>...</th>
<th>365th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription 1st: clonazepam, 3 mg/d, 7 days</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Prescription 2nd: zolpidem, 10 mg/d, 2 days</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Prescription 3rd: lorazepam, 1 mg/d, 7 days</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Accumulated daily DME</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1 An example of a cumulative array of the daily dosage of hypnotics for one participant, converted to diazepam milligram equivalents (DMEs): 0.5 mg clonazepam equals 10 DMEs, 20 mg zolpidem equals 10 DMEs, 1 mg lorazepam equals 10 DMEs.
whether they could be diagnosed with sedative hypnotics dependence according to ICD-11 criteria. Patients who received the follow-up interviews gave written consent.

**Statistical analysis**

Statistical analysis was done in R on MacOS (version 3.6.2). The statistical significance level was \( P < 0.05 \). For the sociodemographic characteristics and the pattern of hypnotics use among participants, we used mean (s.d.) and median (interquartile range, IQR) for the continuous variables, and proportions for the categorical variables. For a very small proportion of participants, information on gender, age or diagnosis was invalid or missing, and we excluded these participants in further analyses.

Descriptive statistics were used to present data on the consumption of BZRAs described in DDD values, and the frequency and proportions for the categorical variables. We used mean (s.d.) and median (IQR) for the characteristics and the pattern of hypnotics use among participants, \( \chi^2 \)-test or Wilcoxon rank test were used for the comparison of characteristics between patients with and without hazardous hypnotic use.

To examine the association between the variables of demographics and prescription characteristics and the risk of hazardous hypnotics use, we used multilevel multivariate regression analysis for each patient by hospital is depicted in Fig. 3. The patterns of hypnotics consumption among different hospitals. The Kruskal–Wallis test was used to compare the difference in hypnotics consumption among different hospitals. The \( \chi^2 \)-test or Wilcoxon rank test were used for the comparison of characteristics of patients with and without hazardous hypnotic use.

**Results**

**Overall study population**

Among the sample of 720,054 out-patients from five hospitals in China in 2018, 164,450 (22.8%) had at least one BZRA prescription (Table 1). There were significant between-hospital differences on all variables \( (P < 0.05) \). Most of the patients were female (63.6%) and were aged 18–64 (76.2%). The three most common diagnoses for hypnotics prescription were codes F30–F39 (32.7%), F40–F49 (33.5%) and G47 (28.2%).

**Patterns of BZRA prescription in the five hospitals**

Most patients were medicated with relatively low average daily DME doses for short-term use, and only 4988 (3.0%) were defined as hazardous users (Fig. 2). The overall pattern of hypnotics use for each patient by hospital is depicted in Fig. 3. The patterns of BZRA use were similar in hospitals A, B, C and D, with 4.3%, 2.8% and 1.9% of patients treated with hazardous prescriptions.
respectively. Although only 1.1% of patients in hospital E were hazardous users, there were still some patients prescribed extremely high average daily DME doses for relatively short periods (Fig. 3).

The median maximum average daily DME usage was 4.4 (IQR 1.8–13.3); the median total DME usage was 480 (IQR 160–2130); the median maximum continuous days of use was 33 (IQR 23–54); the median total days of use was 40 (IQR 21–110); the median number of out-patient visits was 3 (IQR 1–6); and the median number of different doctors visited was 2 (IQR 1–4). Patients in hospital C (the west region) showed the highest dosage and longest duration of use, whereas those in hospitals D and E (the central region) showed the lowest. Moreover, patients in hospitals A and B (the east region)
had a larger number of out-patient visits and visits to different doctors compared with patients in other hospitals. Over-indication use occurred in 55.9% of the total patient sample, with the largest proportion (72.5%) in hospitals A and D.

As shown in Table 2, the largest proportion of patients were prescribed BZDs only (67.9%), followed by Z-drugs only (21.8%); a small proportion were treated with both BZDs and Z-drugs (10.3%). We found that BZD consumption was much higher than Z-drug consumption in general. The DDD for all types of hypnotic was relatively low in hospitals D and E (the central region), whereas the DDD for BZDs only was highest in hospital C (the west region) and the DDD for Z-drugs was relatively high in hospitals A and B (the east region). Specifically, clonazepam and alprazolam were predominantly used, whereas zaleplon, nitrazepam and midazolam were much less commonly prescribed (Fig. 4).

### Comparison between hazardous users and non-hazardous users

We further compared characteristics and BZRA prescription patterns of hazardous users with those of non-hazardous users (Table 3). Compared with non-hazardous users, hazardous users were more likely to be male (40.7% vs. 36.2%, \( P < 0.001 \)) and older than 65 years (28.1% vs. 20.9%, \( P < 0.001 \)).

Among hazardous users, 74.4% had over-indication use. Their maximum averaged daily DME usage, total DME dosage, maximum continuous days of use and total days of use were all greater than those observed in non-hazardous users. Further, hazardous users had more out-patient visits and visited a higher number of different doctors than non-hazardous users. Significant differences were found between hazardous and non-hazardous users for all diagnoses except for F01–F09 (Organic, including symptomatic, mental disorders), F60–F69 (Disorders of adult personality and behaviour) and F80–F89 (Disorders of psychological development). The three most common diagnoses were codes F30–F39 (43.7%), F40–F49 (27.6%) and G47 (33.7%) in hazardous users, and F30–F39 (32.4%), F40–F49 (33.7%) and G47 (28.2%) in non-hazardous users.

We also compared the specific medications prescribed to hazardous and non-hazardous users. Hazardous users were prescribed more clonazepam, midazolam and zolpidem than non-hazardous users, whereas non-hazardous users received more prescriptions for eszopiclone, oxazepam, lorazepam, estazolam and alprazolam (Fig. 4).

### Factors associated with hazardous use

In this multilevel multivariate regression model, 56 983 observations were deleted owing to missingness. Although older age and male gender were significantly associated with high risk of hazardous BZRA use, region variables had no significant effect (Table 4). Moreover, over-indication use, more frequent out-patient visits and greater number of different doctors visited also predicted the risk of hazardous BZRA use.
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F39 (64.9%), F29 (19.1%) and F99 (7.7%). The most common diagnoses that did not meet indications for clonazepam were codes F39 (66.6%), F40–F49 (27.7%) and G47 (19.0%). The most common diagnoses that did not meet alprazolam indications were codes F39 (66.6%), F40–F49 (26.1%) and F20–F29 (10.2%).

The most common drugs for over-indication use and their corresponding diagnoses

Among patients with over-indication use, the three most commonly prescribed drugs were clonazepam (32.9%), alprazolam (18.3%) and eszopiclone (13.4%). The most common diagnoses that did not meet indications for clonazepam were codes F30–F39 (66.6%), F40–F49 (27.7%) and G47 (19.0%). The most common diagnoses that did not meet alprazolam indications were codes F39 (66.6%), F40–F49 (26.1%) and F20–F29 (19.1%) and F99–F99 (7.7%). The most common diagnoses for eszopiclone over-indication were codes F30–F39 (51.4%), F40–F49 (26.1%) and F20–F29 (10.2%).

Table 3

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hazardous users (n = 4988)</th>
<th>Non-hazardous users (n = 159 462)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, n (%)</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>Male</td>
<td>2030 (40.7%)</td>
<td>57 683 (36.2%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2949 (59.1%)</td>
<td>101 696 (63.8%)</td>
<td></td>
</tr>
<tr>
<td>Age, years: n (%)</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>&lt;18</td>
<td>19 (0.4%)</td>
<td>3632 (2.3%)</td>
<td></td>
</tr>
<tr>
<td>18–64</td>
<td>3516 (70.5%)</td>
<td>121 877 (76.4%)</td>
<td></td>
</tr>
<tr>
<td>≥65</td>
<td>1404 (28.1%)</td>
<td>33 310 (20.9%)</td>
<td></td>
</tr>
<tr>
<td>Over-indication use, N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3712 (74.4%)</td>
<td>88 223 (55.3%)</td>
<td></td>
</tr>
<tr>
<td>Maximum average daily DME usage, median (IQR)</td>
<td>59.56 (47.21–87.12)</td>
<td>4.27 (1.67–12.76)</td>
<td>0.000</td>
</tr>
<tr>
<td>Total DME dosage, median (IQR)</td>
<td>13 920 (10 211.25–20 000)</td>
<td>453 (157.5–1830)</td>
<td>0.000</td>
</tr>
<tr>
<td>Maximum continuous days of use, median (IQR)</td>
<td>142 (111–197.25)</td>
<td>33 (23–30)</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of different doctors visited, median (IQR)</td>
<td>7 (5–10)</td>
<td>2 (1–4)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Discussion

In this study, we examined the real-world prescription patterns for hazardous BZRA use and its related factors in psychiatric settings using electronic prescription dispensing data from five hospitals in the east, central and west China. The study implied that: (a) the majority of patients were medicated with relatively safe doses and duration, but the small proportion of extreme individuals should be identified; (b) medication prescribing patterns varied among different hospitals and regions; (c) factors associated with a greater likelihood of hazardous use were being male, older age, a higher number of out-patient visits and a higher number of different doctors visited. There is a lack of direct comparability with previous data owing to variations in database sources, study populations, years investigated and methodological approaches. To the best of our knowledge, this was the first large-scale population-based study to investigate BZRA prescriptions among Chinese psychiatric out-patients.

BZRA prescription was found to be highest among women aged 18–64 (76.2%) in psychiatric out-patient settings, which was consistent with findings of a study in urban China between 2013 and 2017. The top three diagnoses for which hypnotics were

Table 4

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient β</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
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<td></td>
</tr>
<tr>
<td>&lt;18</td>
<td>Ref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–64</td>
<td>0.018</td>
<td>0.013 to 0.023</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≥65</td>
<td>0.015</td>
<td>0.010 to 0.021</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Ref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.005</td>
<td>0.003 to 0.007</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Region of China</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>Ref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>0.007</td>
<td>–0.005 to 0.019</td>
<td>0.227</td>
</tr>
<tr>
<td>West</td>
<td>0.008</td>
<td>–0.007 to 0.022</td>
<td>0.278</td>
</tr>
<tr>
<td>Over-indication use (yes)</td>
<td>0.013</td>
<td>0.012 to 0.015</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Number of out-patient visits</td>
<td>0.006</td>
<td>0.006 to 0.006</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Number of different doctors visited</td>
<td>0.007</td>
<td>0.007 to 0.008</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Ref., reference.
prescribed were mood disorder, neurotic, stress-related and soma-
toform disorders, and sleep disorders, which was an expected
result as BZRAs are primarily prescribed for insomnia and
anxiety.3 People with mood disorders usually show sleep distur-
bances or anxiety, so BZRAs are often recommended as adjunctive
drugs for treatment in clinical practice.23 The higher BZRA pre-
scription rate among women is probably related to a higher preva-
lence of anxiety disorders, affective disorders and sleep disorders
among females compared with males.20–24 However, there is a lack
of empirical research concerning the potential benefits or harms
of hypnotics when used with antidepressants,8 which deserves
special attention.

In our observation period in 2018, patients’ median maximum
average daily DME usage was 4.4 and the median maximum con-
tinuous days of use was 33 days, indicating that the majority of
patients were treated with relatively low doses and short-term use,
as defined in this study. A nationwide and longitudinal study in
Japan also found that long-term use of hypnotic medications was
uncommon,26 whereas a study in England showed that long-term
(>12 months) prescribing was common.9 Only 4988 individuals
(3.0%) who showed a hazardous pattern of BZRA use were identi-
ﬁed. However, there was still a small proportion of patients with
extremely overdose or long-term use in hospital E, as some clini-
cians may have prescribed in this way in response to patient’s
requests to reduce the number of hospital visits, which warrants
attention.

With regard to speciﬁc drugs, we found that the percentage of
BZD prescriptions is much higher than Z-drug prescriptions, with
clonazepam and alprazolam being the most commonly prescribed,
indicating that psychiatrists in China seem to prefer BZDs to Z-
drugs for hypnotic prescriptions. The reason for the popularity
of clonazepam in psychiatric settings may be due to its long half-
life.17 It is worth noting that clonazepam is a high-potency BZD
which may easily cause addiction and it was found to be the BZD
most commonly associated with dose increase in a recent
Canadian study.28

BZRA prescribing patterns varied among the different hospitals
and regions in this study. Overdose and long-term use in the central
region were relatively less common than in the other regions.
Moreover, patients in hospitals A and B, which are located in the
east of China, had a higher number of out-patient visits and saw a
greater number of different doctors compared with those in the hos-
pitals in central and west China. This may be explained by the fact
that local governmental regulations for BZRA prescription in the
central region are much stricter. The largest proportion of hazard-
ous users was found in the east region. People living in east China
are considered to have higher economic status and suffer much
higher social pressure compared with those in central and west
China.29 This may increase the prevalence of insomnia (including
that caused by anxiety and depression), thereby increasing the
demand for medicine.30 Overall, a variety of factors might
account for this trend of differing prescribing patterns between hos-
pitals and regions, such as the local healthcare system, socio-
economic status, prescription habits of psychiatrists and other
factors that vary from region to region.29 Future work is needed
to optimise and standardise pharmaceutical administration
among different sites.

In line with a previous study,18 factors associated with hazard-
ous use were male gender and older age. Male patients often
behave more impulsively and aggressively than women patients,20
so male patients were more likely to use BZRAs hazardously.
Olfson et al15 have pointed out the lack of promising alternative
treatments for sleep disorders and noted that older patients were
more likely to lack the motivation to discontinue or reduce the use
of BZDs. Off-label usage was associated with higher risk of

hazardous use and 55.9% of patients in our study had over-indica-
tion prescriptions. We found that clonazepam, alprazolam and
eszopiclone were the three drugs most commonly prescribed
over-indication and the recorded diagnoses were mainly mood dis-
orders and schizophrenia. There are a number of potential reasons
that may explain this trend. First, some psychiatrists lacked standar-
dised operations for clinical prescriptions, so patient’s diagnoses
may be wrongly or not fully recorded in the prescription system.
Second, there may be a lag between drug indications approved by
the Chinese FDA and the newest clinical guidelines: for example,
clonazepam has an anxiolytic effect, but the instruction manual
only indicates its use in treatment for epilepsy. Third, variance in
drug indications between China and other countries may also be a
contributory factor. Our results highlight the great need that guide-
lines should be more in accordance with practical needs. An
improved out-patient prescription system and enhanced profes-
sional training for psychiatrists are also required.

Our data also suggested that hazardous use was associated with
more frequent out-patient visits and visiting a greater number of
different doctors. Doctor shopping, defined as repeated visits to dif-
f erent doctors, has been associated with misuse of prescription
drugs.35 A survey conducted in the USA found that 4.2% of hypno-
tics users had received a prescription from different doctors within a
30 day period.19 However, in one hospital in our study most of the
patients with hazardous BZRA use (98.5%) refused to be followed
up or were not contactable because of invalid telephone numbers.
If the trajectories of hypnotics cannot be traced, it may increase
the risks of drug misuse, dependence and complications. Future
work should be done to improve drug monitoring and management
systems for better follow-up.

Limitations
The study has several limitations. First, the findings are not neces-
sarily representative of the situation in rural areas or small-scale
hospitals (such as local community hospitals or clinics) in China
as the hospitals chosen were tertiary hospitals in urban areas.
However, BZRAs might be less prescribed in rural areas or
primary hospitals owing to limited treatment levels or constrained
resources. One study found that patients from an urban area in
China were signiﬁcantly more frequently prescribed antipsychotic
polypharmacy.33 Therefore, we could consider that the sampled
hospitals with the largest number of out-patient visits within their
own regions could well represent psychiatric out-patient situations
in China to some extent. Second, we conducted the analysis using
prescription records derived from electronic databases, which may
not indicate the amount of BZRAs that patients take in the real
world. Patients may have received BZRAs from friends, family
members or outside the sampled hospitals. Consequently, the
number of hazardous users would be underestimated. Third, as
the deﬁnition of hazardous and over-indication use was relatively
conservative in this study, the true proportion of these prescription
patterns might be higher.

Implications and future research
This study was designed to use prescription databases to identify
hazardous BZRA use, which has important implications for detect-
going potential patients with hypnotics dependence and providing
early intervention. Future research should continue to focus on
identifying hazardous users using prescription data, for example
by creating prediction models using machine learning algorithms,
or identifying features related to hazardous use for early diagnosis
in clinical practice.

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Supplementary material

Supplementary material is available online at https://doi.org/10.1192/bjp.2022.589.

Data availability

The prescription data in this study are not available for sharing.

Author contributions

XX, J.X., G.W. and C.L. are joint first authors and contributed equally to writing the manuscript. X.X. and W.W. did the coding for data cleaning and supervised the study design and data analysis. X.X., J.X., G.W. and C.L. are joint first authors and contributed equally to writing the manuscript.

Declaration of interest

None.

References