European Journal of Clinical Pharmacology (2020) 76:285–290
https://doi.org/10.1007/s00228-019-02783-1

PHARMACOEPIDEMIOLOGY AND PRESCRIPTION

# Why Z-drugs are used even if doctors and nurses feel unable to judge their benefits and risks—a hospital survey

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Received: 11 June 2019 / Accepted: 18 October 2019 / Published online: 16 November 2019


## Abstract

**Background** Many patients receive Z-drugs for hospital-associated sleep problems, in spite of well-known risks. The aim of this study was to learn more about the attractiveness of Z-drugs, seen from the doctors' and nurses' perspective.

**Methods** Using a standardized questionnaire, doctors (63/116) and nurses (73/243) in a German general hospital were surveyed about the risks and benefits of Z-drugs, compared with benzodiazepines.

**Result** "Reduced time to get to sleep" was perceived by doctors (51%) and nurses (53%) to be a strong benefit of Z-drugs; "confusion" and "falls" were perceived by ca. 10% of doctors and ca. 15% of nurses to be a frequent problem. Compared with benzodiazepines, respondents more often answered "unable to judge" for Z-drugs; e.g. for doctors, 18% (benzodiazepines) vs. 45% (Z-drugs) were unable to judge "improved daytime functioning" and 12% (benzodiazepines) vs. 37% (Z-drugs) were unable to judge "falls."

**Conclusion** Z-drugs seem to be attractive because experiential knowledge overemphasizes their benefits and fails to take risks such as drug-related falls and confusion into account. Difficulties to judge a drug's risk-benefit ratio do not prevent doctors and nurses from using them. Interventions for reducing Z-drug usage should incorporate local quality assurance data about relevant patient risks.

**Keywords** Hypnotics and sedatives · Attitudes of health personnel · Drug utilization · Questionnaires · Sleep initiation and maintenance disorders · Perception · Risk assessment

## Introduction

Many hospital doctors experience a conflict every night when on duty: what to do with patients who have trouble sleeping? For severe cases of chronic insomnia, cognitive behavioral therapy and hypnotic drug treatments are recommended. However, transient sleep problems in the hospital—often linked to environmental factors such as unfamiliar sounds, nursing interruptions, uncomfortable beds, and bright lights [1]—are different from a clinical diagnosis of insomnia disorder, which affects sleep onset, duration, and/or quality for at least a month [2]. Guidelines on how to treat transient sleep problems are not helpful in the hospital environment so that doctors and nurses are challenged to manage inpatient sleeping problems.

Chart review studies give us an idea of how hospital doctors usually solve this conflict; they often prescribe benzodiazepines and newer non-benzodiazepines (so-called Z-drugs) for patients who have trouble sleeping [3–5]. While these drugs may help patients to sleep in the hospital environment, they also have adverse effects, such as confusion, falls, fractures, and craving [6] so they are not recommended for the treatment of transient sleep problems in most guidelines [7]. Z-drugs, specifically, have been accompanied with conflicting information ranging from "[Z-drugs are] considered the safest and most effective prescription sleep aids for geriatric patients" [8] to "[Z-drugs are] not necessarily a safer alternative to traditional BZDs" [9].

The goal of this study was to understand why Z-drugs remain an attractive solution for doctors and nurses to

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transient sleep problems. We performed a survey to learn more about how hospital doctors and nurses perceived Z-drugs compared with benzodiazepines. After an initial review of the data of this survey, we became aware that many doctors and nurses in our sample checked "unable to judge" when answering items about the benefits and risks of Z-drugs. Therefore, we were also interested in factors associated with the inability to judge the risks and benefits of Z-drugs.

## Method

### Context: the sleeping pills project

In a mixed-methods project, we strived to add knowledge about the current use of sedatives and hypnotics in hospital and primary care from multiple perspectives and with several different types of data [10]. For example, a hospital chart review showed that 12% of all patients 65 and older received a Z-drug at least once during their stay [11]. A patient survey in the same hospital revealed that more than half of the older patients who received Z-drugs in the hospital wished to continue taking these drugs at home [12].

The data reported here come from a survey from the professional perspective performed between June and September 2014. The study was approved by the Ethics Committee of Göttingen University Medical Center (25/2/14). Parts of the survey results have already been analyzed and published [13, 14], with a focus on benzodiazepines.

### Design, participants, and measures

In a cross-sectional survey, all physicians and nurses of a German general hospital received a paper questionnaire about the risks and benefits of benzodiazepines and Z-drugs. The questionnaire was developed by Siriwardena et al. [15] to explore general practitioners' beliefs about the benefits and risks of hypnotic prescribing. Respondents are asked to rate the extent of different benefits (on a 5-point scale, ranging from "very small" to "very strong") and the frequency of risks (from "never" to "always") for benzodiazepines and Z-drugs. Both scales have an additional answer category, "unable to judge." Hoffmann translated this questionnaire into German to survey German general practitioners [16]. We used Hoffmann's translation in this study, making slight adjustments to the questionnaire for use in a hospital setting.

### Statistical analysis

The relative frequencies of doctors' and nurses' assessments of the six benefits and five risks of Z-drugs and benzodiazepines were analyzed. We combined the two extremes "strong/very strong" for the benefits and "often/always" for the risks of both Z-drugs and benzodiazepines. We compared doctors' and nurses' perspectives about "strong benefits" and "frequent risks" for both Z-drugs and benzodiazepines.

We then explored in more detail the group of respondents who checked the "unable to judge" box when asked about the risks and benefits of Z-drugs. First, we compared the percentage of doctors and nurses who answered "unable to judge" to the items about Z-drugs with the percentage who answered "unable to judge" for benzodiazepines. In a second step, we divided the sample into those who were able to judge the majority of items about Z-drugs (i.e., 0–5 unable to judge answers) versus those who were not (i.e. 6–11 unable to judge answers). In a multivariable logistical regression analysis, we modeled the likelihood for being unable to judge Z-drugs, taking the following five factors into account: sex, profession, length of employment, department, and self-reported frequency of use. We report adjusted odds ratios (ORs) and their 95% confidence intervals (CI). All analyses were performed using SAS 9.4.

## Results

More than half of the doctors (63/116) and about one-third of nurses (73/243) participated in the survey. Most doctors were male (66%), about one-third worked either at departments of internal medicine or surgery, half of them for less than 5 years. Nearly 81% of the responding nurses were female; the majority had more than 10 years working experience (Table 1).

With regard to the benefits of Z-drugs, most respondents appreciated "reduced time to get to sleep" (with 51% of the doctors and 53% of the nurses reporting a strong/very strong benefit; Table 2) and "reduced night-time waking" (41% doctors, 63% nurses). Nearly as many doctors reported these advantages for benzodiazepines, but fewer nurses (Table 2). Both groups clearly favored benzodiazepines for "reducing fear or agitation."

We also found common features of, and differences between, the perceived risks of Z-drugs and benzodiazepines. The order of risks for Z-drugs was nearly the same for benzodiazepines, but far more doctors perceived them as occurring less frequently in Z-drugs than benzodiazepines (Table 2). This difference did not apply to nurses. Both doctors and nurses agreed about the most frequent risk for Z-drugs, 38% of doctors and 45% of nurses rated "craving" as occurring frequently (Table 2). Only few respondents found "confusion" (10% doctors, 15% nurses) and "falls" (10% doctors, 16% nurses) to be frequent problems of Z-drugs.

Interestingly, far more doctors and nurses answered "unable to judge" for the benefits and risks of Z-drugs in comparison with benzodiazepines. For example, 45% (Z-drugs) versus 19% (benzodiazepines) of doctors answered unable to

**Table 1** Characteristics of participating hospital doctors and nurses in percent

| Baseline characteristics | Hospital doctors ($n = 65$)* | Hospital nurses ($n = 73$)* |
|---|---|---|
| Sex | | |
| Male | 66.2 | 19.2 |
| Female | 33.9 | 80.8 |
| Type of station | | |
| Internal medicine | 36.9 | 23.9 |
| Geriatrics | 16.9 | 29.6 |
| Surgical departments | 30.8 | 38.0 |
| Other departments (e.g., radiology) | 15.4 | 8.5 |
| Years of working experience | | |
| < 5 years | 48.4 | 22.2 |
| 5– 10 years | 29.7 | 20.8 |
| > 10 years | 21.9 | 56.9 |
| Frequency of Z-drugs for sleeping problems | | |
| Often/always | 29.7 | 63.9 |
| Never/seldom/sometimes | 70.3 | 36.1 |

*$n$ varies due to missing data

judge for "improved daytime functioning" and 37% (Z-drugs) versus 12% (benzodiazepines) answered unable to judge for "falls." Similarly, more nurses answered unable to judge "falls" for Z-drugs (18%) than for benzodiazepines (8%).

A total of 33 of the 138 respondents (24%) answered "unable to judge" for 6 or more of the 11 items about Z-drugs compared with 14 respondents (10%) for benzodiazepines.

**Table 2** Perceptions of hospital staff about the strong benefits and frequent risks of benzodiazepines (BDZ) and z-drugs (all values in percent)

| | Doctors | | Nurses | |
|---|---|---|---|---|
| | BDZ | Z-drugs | BDZ | Z-drugs |
| Strong benefits | | | | |
| Reduced time to get to sleep | 56.6 | 51.2 | 41.3 | 52.5 |
| Reduced night-time waking | 42.6 | 41.0 | 42.6 | 63.2 |
| Increased total sleep time | 25.0 | 26.3 | 34.4 | 47.4 |
| Feeling of being rested upon waking | 0.0 | 21.1 | 13.8 | 22.2 |
| Improved daytime functioning | 1.9 | 13.9 | 10.5 | 12.5 |
| Reduced fear or agitation | 75.4 | 11.9 | 57.1 | 25.9 |
| Frequent risks | | | | |
| Tolerance (decreased responsiveness) | 78.2 | 21.1 | 30.5 | 10.0 |
| Withdrawal effects on stopping | 62.5 | 29.3 | 27.5 | 18.6 |
| Craving | 72.4 | 38.1 | 53.1 | 44.8 |
| Confusion | 27.6 | 9.5 | 23.9 | 16.4 |
| Falls | 33.3 | 9.8 | 30.3 | 15.3 |

*N* for benzodiazepines (doctors and nurses combined) varies from 107 to 125; *N* for Z-drugs varies from 38 to 100 due to the number of "unable to judge" answers

This difference is significant (Fisher exact test, OR = 2.77, $p = .002$). A multivariable logistic regression showed that sex did not play a role in the ability to judge the benefits and risks of Z-drugs (Table 3). However, four other characteristics (profession, length of employment, department, and self-reported frequency of use) had a significant effect upon the likelihood of being able to judge Z-drugs. The strongest predicting factor was being a doctor (adjusted OR 7.79; 95% CI 1.85 to 32.56), followed by infrequent use of Z-drugs on one's ward (3.99; 1.17 to 13.60).

## Discussion

Many respondents in our survey appreciated the potential of Z-drugs to reduce the time to get to sleep; especially nurses saw a strong effect in reducing night-time waking. For many doctors and nurses, Z-drugs are thought to cause less confusion and fewer falls than benzodiazepines. This is surprising since a Canadian meta-analysis of risks and benefits of short-term treatment with sedative hypnotics in older people with insomnia concluded already 14 years ago that the benefits of both benzodiazepines and Z-drugs are only marginal and outweighed by the risk of falls or cognitive impairment, particularly in a high-risk elderly population [17]. Later studies confirmed these results, most recently a review from Canada in which Lee and colleagues [18] plea for a strategy of deprescribing benzodiazepines and Z-drugs for insomnia. How, then, did the doctors and nurses in the hospital under study come to their positive risk-benefit assessment of Z-drugs?

**Table 3** Predictors for respondents being "unable to judge" the benefits and risks of Z-drugs

| | | Univariate model | | | Multivariable model | | |
|---|---|---|---|---|---|---|---|
| Predictors (*N*) | %* | OR | (95% CI) | *p* | OR | (95% CI) | *p* |
| Gender | | | | | | | |
| Male | 28.1 | 1.00 | | | 1.00 | | |
| Female | 21.0 | 0.68 | (0.31–1.50) | 0.338 | 1.91 | (0.66–5.51) | 0.233 |
| Profession | | | | | | | |
| Nurses | 13.7 | 1.00 | | | 1.00 | | |
| Doctors | 35.4 | *3.45* | *(1.49–7.98)* | 0.004 | *7.76* | *(1.85–32.56)* | 0.005 |
| Length of employment | | | | | | | |
| Less than 10 years | 19.8 | 1.00 | | | 1.00 | | |
| More than 10 years | 30.9 | 1.82 | (0.82–4.01) | 0.139 | *3.53* | *(1.12–11.17)* | 0.032 |
| Department | | | | | | | |
| Non-surgical | 16.9 | 1.00 | | | 1.00 | | |
| Surgical | 36.2 | *2.80* | *(1.24–6.31)* | 0.013 | *3.27* | *(1.17–9.15)* | 0.024 |
| Frequency of Z-drugs for sleeping problems** | | | | | | | |
| Often/always | 6.2 | 1.00 | | | 1.00 | | |
| Never/seldom/sometimes | 39.4 | *9.93* | *(3.25–30.37)* | < 0.001 | *3.99* | *(1.17–13.60)* | 0.027 |

*Percentage of respondents who are unable to judge 6 or more of the 11 items about benefits and risks of Z-drugs

**Survey question: "How often are Z-drugs used to treat sleep problems on your ward?"

*OR*, odds ratio; *95% CI*, 95% confidence interval

Values in italics indicate significance ($p < 0.05$)

First of all, they do not stand alone with their positive assessment of Z-drugs. Many surveyed general practitioners also perceived Z-drugs as more effective and safer compared with benzodiazepines [16]. In addition, pharmacoepidemiological studies report a reduction of benzodiazepine prescribing while Z-drug prescribing is increasing [19]. Z-drugs still seem to benefit from the myth that they are similarly effective and safer alternatives to benzodiazepines, although studies show that Z-drugs also carry the same risks of daytime sedation, cognitive impairment, falls, fractures, and accidents [18].

Second, since Z-drugs are hypnotics, i.e., prescribed primarily to treat sleeping problems, they may not have the same value in the eyes of hospital doctors as benzodiazepines, which are prescribed for several other indications in addition to sleeping problems. Interview studies with hospital doctors have shown that doctors regard other medical issues with higher priority than sleep problems during hospitalization [20].

Third, based on meta-analytic data on sleep efficacy reported mostly by younger patients, Rösner et al. [21] could show a 12-min decrease of sleep onset latency, a 17-min decrease of wake time after sleep onset, and a 28-min increase of total sleep time for eszopiclone, compared with placebo. Although the possible benefits of Z-drugs are relatively minor, it seems that it is exactly these minor effects that matter: for doctors and nurses working in night shifts under high stress and for patients desperately seeking a good night's sleep in a busy hospital and unfamiliar environment [20].

For a deeper understanding why individuals prefer some risky choices over other options, such as Z-drugs to combat hospital-associated sleep problems, a look at recent research on the role of descriptive knowledge (e.g., official drug information) and experiential knowledge (e.g., seeing benefits and risks of a drug first or second hand) in decision making may be helpful. Research investigating how descriptive and experiential knowledge affect choices between risky options found that people give more weight to experiential knowledge [22, 23]. That is, they are more influenced by the perceived outcomes of their own choices rather than by accurate summary statistics about the outcomes across many decisions taken by many people. Importantly, people rely on experiential knowledge even when it is limited and based on rather small samples [22, 23]. When deciding on Z-drugs, doctors and nurses may also have observed only small samples. For example, data analyses show that "falls" occur more often in older hospital patients treated with Z-drugs [24], but falls themselves are rare adverse events and, therefore, difficult for a doctor or nurse to observe. Even if doctors and nurses were taught differently via descriptive knowledge, the experiential knowledge of regularly giving Z-drugs and seeing no direct harm may lead to the belief that Z-drugs do not increase the risk of falls. Vice versa, doctors who were convinced, for whatever reason, that "falls" and/or "craving" are a frequent adverse

effect of benzodiazepines, believed the risks outweigh the benefits of these drugs [14].

A second result of our survey was no less surprising: despite the fact that 12% of older patients are treated with a Z-drug in this hospital [11], a considerable group of respondents checked the unable to judge answer category for the majority of questions about the risks and benefits of Z-drugs. The above-mentioned description-experience approach for explaining risky choices [23] may also help to explain this result. We know from a chart review in this hospital [11] that Z-drugs are much less commonly used in surgical departments. Consequently, this lack of experience with Z-drugs on surgical departments is a logical explanation why fewer surgeons and nurses on surgical wards were able to answer survey questions about the benefits and risks of Z-drugs.

Most interesting is the strong difference between doctors and nurses in the ability to judge Z-drugs, in spite of the fact that the majority of respondents should have had some contact with Z-drugs (experiential knowledge) during the course of their professional careers. All six benefits and, at least, three of the unwanted drug effects ("confusion," "falls," and "craving") can be directly observed due to the fact that these effects come about (or not) within hours of administering the drug. Although doctors are responsible for diagnosing diseases and prescribing medicines, they often prescribe Z-drugs as p.r.n. (pro re nata; as needed) drugs. Since the "as needed" case often occurs during the night shift, doctors may lack direct experience with the patients who use Z-drugs. Nurses, on the other hand, have direct patient contact day and night and are able to directly observe the benefits and adverse effects of these drugs. This difference in experience may explain why nurses are better able to judge the benefits and risks of Z-drugs, especially for items like "reduced time to get to sleep," which are immediate, directly observable results of Z-drug use.

## Strengths and limitations of the study

The most important limitation of the study is the relatively small sample size. The results of a single-hospital study can only be a starting point for future research and are not—of course—generalizable for other settings.

A strength of the study is that we were able to compare within the setting of a single hospital how doctors and nurses perceived and assessed Z-drugs and the frequency with which these drugs are prescribed [11]. However, quantitative analyses of survey data cannot explain the underlying reasons for behavior. Rather, qualitative data (e.g., interviews) may provide an explanation for the discrepancy between unable to judge survey responses and actual Z-drug prescription practices.

An additional strength of the study is the inclusion of both the doctor and nurse perspectives, since the management of hospital-associated sleep problems is a multi-professional task and any change of the current practice will need multi-professional efforts. A high percentage of the hospital's doctors participated in the study, even though doctors' willingness to participate in surveys is generally limited. Given the leading role of hospital doctors in a hospital's prescribing policy, the high response rate contributes to the internal validity of the study results. We can only speculate why two-thirds of nurses declined to participate in the survey. Perhaps they did not consider sleep-inducing drugs an important issue or were afraid that this survey, although anonymous, might uncover a lack of pharmacological knowledge.

## Conclusions and implications for practice

The personal trade-off between the perceived benefits and adverse effects of medicines is essential for deciding on their use [25]. Z-drugs seem to be attractive because experiential knowledge overemphasizes their benefits and fails to take risks such as drug-related falls and confusion into account. Moreover, difficulties to judge a drug's risk-benefit ratio do not prevent doctors and nurses from using them. In light of the dominance of experiential knowledge over descriptive knowledge, hospitals and clinical pharmacologists should not put too much faith in traditional continuous medical education about the risks of Z-drugs to reduce their usage. Rather, descriptive knowledge about Z-drugs should be accompanied at least by a numerical expression of risks and benefits, similar to a number needed to treat statistic. For example, Lee et al. explain that 13 older patients need to be treated with a benzodiazepine or Z-drug for one person to experience improvement in sleep quality, but only 6 patients need to be treated with these drugs for one person to experience an adverse advent [18]. Presenting nurses and doctors with a case series of patients showing these relative frequencies may have similar convincing power as experiential knowledge acquired during practice. In particular, results from local quality assurance data about relevant patient risks resulting from Z-drug use in one's own hospital (e.g., statistics about falls and craving) could be used as a case series for feedback and, thus, be a key to changing professional behavior.

**Acknowledgments** Data collection was organized by Vivien Weiß. This analysis and paper is part of a larger study ("Hypnotics and sedatives at the primary-secondary interface") conducted by Eva Hummers, Wolfgang Himmel, and Roland Nau as principal investigators. We thank all the hospital doctors and nurses who participated in this study as well as the hospital administration for their support. We would also like to thank Frank Czeczelski and Professor Michael Karaus, managing directors of the Evangelisches Krankenhaus Göttingen-Weende, for allowing us to conduct this study in their hospital and for their continued support.

**Authors' contributions** SH and WH developed the study idea, performed statistical analysis, and interpreted data. SH drafted the manuscript. WH, JB, and YH commented extensively and contributed to the expansion of the text including further statistical analyses. SH and WH revised the manuscript. All authors read and approved the final manuscript and are the guarantors.

**Funding information** This study is financially supported by a research grant from the German Ministry of Health (II A5-2513DSM228).

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.



## References

1. Dobing S, Frolova N, McAlister F, Ringrose J (2016) Sleep quality and factors influencing self-reported sleep duration and quality in the general internal medicine inpatient population. PLoS One 11(6): e0156735. https://doi.org/10.1371/journal.pone.0156735
2. Sateia MJ, Buysse DJ, Krystal AD, Neubauer DN, Heald JL (2017) Clinical practice guideline for the pharmacologic treatment of chronic insomnia in adults: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med 13(2):307–349. https://doi.org/10.5664/jcsm.6470
3. Zisberg A, Shadmi E, Sinoff G, Gur-Yaish N, Srulovici E, Shochat T (2012) Hospitalization as a turning point for sleep medication use in older adults: prospective cohort study. Drugs Aging 29(7):565–576. https://doi.org/10.2165/11632350-000000000-00000
4. Somers A, Robays H, Audenaert K, van Maele G, Bogaert M, Petrovic M (2011) The use of hypnosedative drugs in a university hospital: has anything changed in 10 years? Eur J Clin Pharmacol 67(7):723–729. https://doi.org/10.1007/s00228-010-0983-2
5. Heinemann S, Neukrichen F, Nau R et al (in press) Patient-reported factors associated with the desire to continue taking sleep-inducing drugs after hospital discharge: a survey of older adults. Pharmacoepidemiol Drug Saf
6. Guina J, Merrill B (2018) Benzodiazepines I: upping the care on downers: the evidence of risks, benefits and alternatives. J Clin Med 7(2). https://doi.org/10.3390/jcm7020017
7. Riemann D, Baum E, Cohrs S et al (2017) S3-Leitlinie Nicht erholsamer Schlaf/Schlafstörungen. Somnologie 21(1):2–44. https://doi.org/10.1007/s11818-016-0097-x
8. Schroeck JL, Ford J, Conway EL, Kurtzhalts KE, Gee ME, Vollmer KA, Mergenhagen KA (2016) Review of safety and efficacy of sleep medicines in older adults. Clin Ther 38(11):2340–2372. https://doi.org/10.1016/j.clinthera.2016.09.010
9. Levy HB (2014) Non-benzodiazepine hypnotics and older adults: what are we learning about zolpidem? Expert Rev Clin Pharmacol 7(1):5–8. https://doi.org/10.1586/17512433.2014.864949
10. Heinemann S, Weiss V, Straube K et al (2016) Understanding and reducing the prescription of hypnotics and sedatives at the interface of hospital care and general practice: a protocol for a mixed-methods study. BMJ Open 6(8):e011908. https://doi.org/10.1136/bmjopen-2016-011908
11. Arnold I, Straube K, Himmel W, Heinemann S, Weiss V, Heyden L, Hummers-Pradier E, Nau R (2017) High prevalence of prescription of psychotropic drugs for older patients in a general hospital. BMC Pharmacol Toxicol 18(1):76. https://doi.org/10.1186/s40360-017-0183-0
12. Heinemann S, Neukirchen F, Nau R, Hummers E, Himmel W (2019) Patient-reported factors associated with the desire to continue taking sleep-inducing drugs after hospital discharge: a survey of older adults. Pharmacoepidemiol Drug Saf 28(7):1014–1022. https://doi.org/10.1002/pds.4806
13. Weiss V, Heinemann S, Himmel W et al (2016) The use of benzodiazepines and Z-drugs for patients with sleeping problems - a survey among hospital doctors and nurses (benzodiazepine und Z-Substanzen als Schlaf- und Beruhigungsmittel in einem Krankenhaus). Dtsch Med Wochenschr 141(13):e121–e126. https://doi.org/10.1055/s-0042-102618
14. Heinemann S, Himmel W (2017) Searching for factors that may reduce the use of benzodiazepines in hospitals - a survey of hospital doctors and nurses. Int J Clin Pharmacol Ther 55(12):905–910. https://doi.org/10.5414/CP203104
15. Siriwardena AN, Qureshi Z, Gibson S, Collier S, Latham M (2006) GPs' attitudes to benzodiazepine and 'Z-drug' prescribing: a barrier to implementation of evidence and guidance on hypnotics. Br J Gen Pract 56(533):964–967
16. Hoffmann F (2013) Perceptions of German GPs on benefits and risks of benzodiazepines and Z-drugs. Swiss Med Wkly 143: w13745. https://doi.org/10.4414/smw.2013.13745
17. Glass J, Lanctot KL, Herrmann N et al (2005) Sedative hypnotics in older people with insomnia: meta-analysis of risks and benefits. BMJ 331(7526):1169. https://doi.org/10.1136/bmj.38623.768588.47
18. Lee JY, Farrell B, Holbrook AM (2019) Deprescribing benzodiazepine receptor agonists taken for insomnia: a review and key messages from practice guidelines. Pol Arch Intern Med 129(1):43–49. https://doi.org/10.20452/pamw.4391
19. Cadogan CA, Ryan C, Cahir C, Bradley CP, Bennett K (2018) Benzodiazepine and Z-drug prescribing in Ireland: analysis of national prescribing trends from 2005 to 2015. Br J Clin Pharmacol 84(6):1354–1363. https://doi.org/10.1111/bcp.13570
20. Weiß V, Nau R, Glaeske G, Hummers E, Himmel W (2019) The interplay of context factors in hypnotic and sedative prescription in primary and secondary care-a qualitative study. Eur J Clin Pharmacol 75(1):87–97. https://doi.org/10.1007/s00228-018-2555-9
21. Rosner S, Englbrecht C, Wehrle R et al. (2018) Eszopiclone for insomnia, England
22. Hertwig R, Erev I (2009) The description-experience gap in risky choice. Trends Cogn Sci (Regul Ed ) 13(12):517–523. https://doi.org/10.1016/j.tics.2009.09.004
23. Hertwig R, Hogarth RM, Lejarraga T (2018) Experience and description: exploring two paths to knowledge. Curr Dir Psychol Sci 27(2):123–128. https://doi.org/10.1177/0963721417740645
24. Wedmann F, Himmel W, Nau R (2019) Medication and medical diagnosis as risk factors for falls in older hospitalized patients. Eur J Clin Pharmacol 75:1117–1124. https://doi.org/10.1007/s00228-019-02668-3
25. Raisch DW (1996) Determinants of perscribing behavior. In: Smith MC, Wertheimer AI (eds) Social and behavioral aspects of pharmaceutical care. Pharmaceutical Products Press, New York, pp 149–184