

# Interventions to Reduce Benzodiazepine and Sedative-Hypnotic Drug Use in Acute Care Hospitals: A Scoping Review

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## Research

**Keywords:** benzodiazepine, sedative-hypnotic, hospital, intervention

**Posted Date:** October 13th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-88543/v1>

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**Version of Record:** A version of this preprint was published at Research in Social and Administrative Pharmacy on July 1st, 2021. See the published version at <https://doi.org/10.1016/j.sapharm.2021.07.004>.

# Abstract

**Background** Benzodiazepines and sedative-hypnotics (BZD/SHD) are commonly utilized in the acute care setting for insomnia and anxiety and are associated with cognitive impairment, falls, fractures, and increased mortality. Interventions to reduce use of BZD/SHD in hospitals are not well characterized. The objective of the scoping review was to identify and characterize interventions to reduce the use of BZD/SHD by adults for anxiety and sedation in hospitals.

**Methods** We included studies and abstracts published in English that described an intervention to reduce BZD/SHD in adult hospital patients. Six databases (PubMed, EMBASE, CINAHL, PsycINFO, Scopus, and Web of Science) and the grey literature (Opengrey, Grey Matters, Google Advanced) were searched up to July 2018. Titles and abstracts were screened and full-text articles were reviewed for potential inclusion by three independent reviewers. Data on each eligible study was charted in a Microsoft Excel® database. Stakeholder consultation occurred before and after the scoping review was completed.

**Results** There were 9480 records identified from all sources and 35 studies were included in the scoping review. Included studies were divided into two categories that emerged from stakeholder feedback: sedatives prescribed in hospital or home medications. The most common study designs were pre-/post-test (24, 68.6%) and randomized controlled trials (6, 17.1%). The majority of studies tested a single intervention (28, 80%) and these were most commonly education, relaxation training and sleep protocols. Patients were frequently the target of relaxation training and behavior change interventions, while sleep protocols, multifaceted interventions and education were usually directed at healthcare providers, either alone or in combination with patients. Most studies reported positive outcomes in decreasing BZD/SHD use (23, 65.7%), including some that were statistically significant (13, 37.1%).

**Conclusions** This scoping review found a variety of interventions aimed at decreasing the utilization of BZD/SHD in the acute care setting, where previously little was known. Current literature addressed the initiation of BZD/SHD in hospital, rather than chronic medications that had been prescribed in the community. Stakeholder consultation supported these findings and pointed out important factors to consider when designing an intervention for hospital patients.

**Registration:** Open Science Framework, [https://osf.io/u7s4h/?view\\_only=15a9b9134be743b6a4177ba2eec9e91a](https://osf.io/u7s4h/?view_only=15a9b9134be743b6a4177ba2eec9e91a)

## Background

Sleep disturbances and anxiety are common in the acutely ill, hospitalized adult. Sleep problems can occur in up to 50% of hospitalized patients.(1) A study of older inpatients found that 38% reported sleep disturbances during their admission, of which 21% of patients reported new-onset insomnia and 37% reported the insomnia as moderate or severe.(2) Environmental factors (e.g. noise, lighting) and clinical procedures (e.g. blood tests, vital sign checks) contribute to the patients' illness, pain, reduced mobility and medication adverse effects to disturb sleep.(3) Anxiety, prevalent in hospitalized patients, may also be a contributing factor with one cross-sectional study reporting that half of patients with diabetes experienced anxiety while hospitalized.(4)

Benzodiazepine (BZD) and sedative-hypnotic (SHD) medications are commonly used to treat insomnia and anxiety. Some data suggests high, and potentially inappropriate use, ranging from 27–58% in hospitalized patients.(5–8) When prescribed in acute care, these medications pose a number of risks including cognitive impairment, falls, fractures, and increased mortality.(9–14) Furthermore, there is a lack of high quality evidence supporting the benefits of pharmacologic therapy in hospitalized patients with a sleep disturbance.(15) Therefore, it is important to limit the use of BZD/SHD to indications where the benefit exceeds the risk.

Interventions to reduce the use of BZD/SHD have been primarily focused on community and long term care settings.(16, 17) There is limited data on best practices to reduce sedative-hypnotic drug use in the acute care setting. A recent systematic review reported educational and regulatory interventions for reducing BZD/SHD drug use in hospital, community and nursing homes.(18) Of the eight trials described, only five reported an intervention in the hospital setting. Four of these reported educational interventions primarily aimed at physicians.(18) Another review focused on incident use of these agents in previously BZD/SHD naïve non-critically ill inpatients and provided a framework to reduce sedative-hypnotic drug use for patients suffering from disrupted sleep.(19) This focused review described nine studies using a variety of interventions, such as non-pharmacologic sleep hygiene, pharmacist-enabled medication review, and audit and feedback. However, patients who were prescribed chronic BZD/SHD therapy were excluded from the review.(19)

A scoping review was conducted on interventions that may influence BZD/SHD prescribing for treatment of insomnia and anxiety in hospital to address the lack of available information. The scoping review methodology was deemed more appropriate and comprehensive than a systematic review because it includes a wider variety of evidence, identifies gaps in knowledge, and gains a greater understanding of associated facilitators and barriers. The objective of the scoping review was to identify and characterize interventions to reduce or improve the appropriate use of benzodiazepines and sedative-hypnotics by adults for the indications of sedation and anxiety in the acute care setting. The research question was, for adults in acute care hospitals receiving benzodiazepines and sedative-hypnotic drugs for sedation/insomnia or anxiety/stress, what are the frameworks, guidelines, policies, or models that have been evaluated to reduce, stop, or prevent the use of benzodiazepines and sedative-hypnotic drugs?

## Methods

A scoping review was conducted using the six stage methodological framework proposed by Arksey and O'Malley and further advanced by Levac *et al.*(20,21) The scoping review was reported using the PRISMA Extension for Scoping Reviews (PRISMA-ScR).(22) The project was approved by the Nova Scotia Health Authority (NSHA) research ethics board on January 11, 2018 (#1022923) and the protocol was published on May 11, 2018 on Open Science Framework.(23)

### Eligibility criteria

There were no exclusions placed on publication date, type of publication (e.g. abstracts, journal articles, reports), although it had to be a completed study and not a protocol; or study design. Only English language studies would be considered for inclusion. The PICO framework(22) was used to determine inclusion and exclusion criteria:

**Population:** Patients  $\geq$  18 years old in acute care hospitals who were prescribed benzodiazepines, zopiclone, zaleplon, zolpidem, eszopiclone, trazodone, chloral hydrate, melatonin, ramelteon, suvorexant, doxepin (up to 6 mg daily), or L-tryptophan; for sedation/insomnia or anxiety/stress. Excluded were studies where other drug classes were prescribed for sedation or anxiety (e.g. antipsychotics, antihistamines, antidepressants (excluding trazodone) and barbiturates); or where BZD/SHD were used for other indications such as epilepsy, drug/alcohol withdrawal, pre- or peri-procedural use, or palliative care.

**Intervention:** Frameworks, guidelines, policies, models that have been evaluated to reduce, stop or prevent the use of benzodiazepines or sedative-hypnotic drugs were included. Studies with no intervention (e.g. utilization patterns only) were excluded.

**Comparison:** there were no limits placed on the presence or type of comparison.

**Outcomes:** Drug utilization data, proportion of patients using benzodiazepines or sedative-hypnotic drugs, or proportion of appropriate use were included outcomes. Studies with a description of an intervention without an evaluation or outcomes assessment were excluded.

### **Information Sources and Search Strategy**

The database literature searches were conducted from inception until July 2018. A preliminary search was conducted in PubMed, by an experienced medical librarian, and the results were reviewed by the research team to identify relevant articles and to refine the search strategy. Final searches were then conducted in the following six databases: PubMed, EMBASE, CINAHL, PsycINFO, Scopus, and Web of Science (see Additional File 1). The final search strategy was prepared by the medical librarian and peer-reviewed by an information specialist using the Peer Review of Electronic Search Strategies checklist.(24) Search results from bibliographic databases were imported into Covidence web-based software platform(25) to screen titles and abstracts, and for full text review.

The Canadian Agency for Drugs and Technologies in Health's (CADTH) "Grey Matters: a practical tool for evidence-based medicine", OpenGrey, and Google Advanced were used to search the grey literature. With the assistance of a CADTH information specialist, the Grey Matters checklist was reviewed and irrelevant sources were omitted. Seventy relevant sources, international databases and agency websites, were searched independently by two research assistants using various combinations of search terms (see Additional File 2).

Individual relevant studies within systematic reviews were also retrieved for full text screening and the systematic reviews were excluded. Reference lists of all included articles were searched by two research assistants to identify any studies that would meet inclusion criteria. Authors were contacted directly by email if the full text of the article was not published or could not be obtained through the university or health authority's library. If no full text or additional information was received on a study within one month, the study was included or excluded based on the information available.

### **Selection of Sources of Evidence**

Two research assistants were trained by the principal investigator on title and abstract screening processes and application of inclusion and exclusion criteria. Title and abstract screening were conducted independently by two research assistants (C.G. and P.A.). Discrepancies were resolved by the principal investigator (H.N.) using consensus. Full texts of included articles were then retrieved for further review. While there were no language limits in the literature search, at the full text review, only English language studies were included. The principal investigator and the two research assistants independently screened all full text articles. Discrepancies during full text review were resolved through consensus by another research team member (J.B.).

### **Data Charting Process**

A standardized data charting template was drafted in Microsoft Excel® by two research assistants and was further revised and developed throughout meetings with the research team. A training session took place where the principal investigator performed the extraction of two eligible articles with the research assistants. Two research assistants then charted the data of the remaining articles (see Additional File 3). Data charting was verified and revised independently by two members of the research team (H.N. and J.B.). Discrepancies were resolved by consensus.

### **Synthesis**

The included articles were described by intervention type (e.g. education, sleep protocol) and target (patient and/or healthcare provider). Each intervention was attributed to one of two categories that emerged from the first stakeholder consultations: whether interventions addressed sedatives prescribed to patients in hospital, or patients' home therapy that was continued in hospital.

### **Consultation**

Two series of stakeholder meetings were conducted; feedback was obtained at the beginning to guide the scoping review and at the end to discuss the scoping review results. Stakeholders were healthcare providers and patients from the Queen Elizabeth II Health Sciences Centre of NSHA who volunteered to participate and signed an informed consent form. In the first series, stakeholders were invited to answer open-ended questions surrounding their experience with BZD/SHD use in the hospital, how to change BZD/SHD use, other options for insomnia or anxiety, and resources available to decrease BZD/SHD use in the hospital. In the second series, participants were provided with the results of the first stakeholder meetings and were asked to comment on the feasibility of interventions identified by the scoping review. Meetings were recorded and transcribed, or detailed notes were taken.

# Results

A total of 9480 records were identified from all sources and 35 articles were included in the scoping review (Figure 1).

## Study Characteristics

Study characteristics are summarized in Table 1, and individual study details are in Table 2. Most studies were available as full text (30, 85.7%) with the remainder in abstract form. The majority were a pre-/post-test design (24, 68.6%) followed by randomized controlled trials (6, 17.1%). The most frequent comparators were no intervention or usual care (29, 82.9%), or a single intervention (28, 80.0%). Single interventions could have multiple targets and/or formats, e.g. education could be provided verbally and in writing, to various healthcare providers and/or patients, but was categorized as a single intervention.

## Description of interventions for sedatives prescribed in hospital

### 1. Multifaceted interventions

Multifaceted interventions were evaluated in a total of seven studies; six had a pre-/post-test single group design and one was a non-randomized controlled study.(26-32) All studies employed educational initiatives and combined these with policy changes [five studies(27-30,32)], a sleep protocol [two studies(29,32)], or a pharmacy practice change [two studies(27,29)]. In addition, three studies combined education with either relaxation training, withdrawal protocol and discharge support, or system changes.(26,29,31) Results were positive for decreasing BZD/SHD use during hospitalization in six of the studies, (27-32) of which two were statistically significant,(29,31) and mixed findings were observed in one study.(26)

### 2. Education

Educational initiatives were investigated in five pre-/post-test single group design studies, and one cluster randomized controlled trial.(3,33-37) The most common form of education was audit and feedback where BZD/SHD use was audited and the results shared with physicians and nurses during meetings, educational sessions, and in written form in four studies.(33-36) Two of these studies reported positive outcomes,(34,36) including one that was statistically significant.(34) Three studies had mixed findings,(3,35,37) and one reported no change in outcome.(33)

### 3. Sleep protocol

A sleep protocol, defined as a collection of strategies employed to help patients sleep at night, was evaluated in two non-randomized controlled trials and three pre-/post-test studies.(38-42) Components that were studied included reduction of noise and disturbances (quiet time, reduced vital sign checks, noise detectors, light control), promotion of relaxation (relaxing music, massage, warm drink), bedtime routine (toileting), and increasing daytime activity.(38-42) All studies reported positive findings, of which four were statistically significant.(38,40-42)

### 4. Relaxation training

Relaxation training alone or with biofeedback, guided imagery, and/or education were provided to patients in five studies.(43-47) Three were randomized controlled trials, one was a non-randomized controlled trial, and one was a pre-/post-test design.(43-47) Two studies reported no change in outcomes,(43,44) while three resulted in positive findings(45-47) of which two were statistically significant.(45,47)

### 5. Computerized alerts

Automated alerts in computerized provider order entry systems were introduced to improve BZD/SHD use in two pre-/post-test studies.(48,49) In both studies, a statistically significant improvement in the use of recommended sedatives over non-recommended sedatives was found, as well as increased adoption of dosing recommendations.(48,49)

### 6. Miscellaneous Interventions

There were a total of three studies that evaluated miscellaneous interventions that included pharmacy practice,(50) therapeutic body wrap,(51) and a simulated nature environment.(52) The pharmacy practice initiative was a pre-/post-test design and did not result in decreased sedative use.(50) Therapeutic body wrap was a psycho-body technique employed to calm patients experiencing anxiety during an acute psychosis and reported mixed results.(51) Finally, a randomized controlled trial studying a simulated nature environment (lighted ceiling panels that resembled the sky) did not demonstrate any changes in sedative use.(52)

## Description of interventions for home medications

There were seven studies that specifically addressed patient's chronic BZD/SHD therapy on admission to hospital, and these utilized behavior change strategies, withdrawal protocols, and deprescribing.(53-59) Behavior change interventions were described in three studies, two were pre-/post-test designs and one was a randomized controlled trial.(53-55) Two studies yielded a positive outcome,(53,54) but only one was statistically significant.(54) One report had mixed results.(55) A withdrawal protocol for patients taking chronic therapy was investigated in a pre-/post-test study and a randomized controlled trial by the same investigator.(56,57) One study had a positive outcome(57) and in the other study there was no difference.(56) A deprescribing intervention with follow-up after discharge was described in two pre-/post-test study designs.(58,59) One study reported a positive outcome without conducting a statistical analysis, (58) and one study had a positive result that was statistically significant.(59)

## Stakeholder Consultations

In the first series, 21 participants consented and attended three group meetings and two individual meetings to provide feedback in May 2018.(60) Two themes emerged naturally from the stakeholder discussion; that of the issue of sedatives newly prescribed in hospital and sedatives that were home medications and continued in hospital. Transcribed comments were categorized into solutions, barriers, risks, risk modifiers, and benefits.

For the sedatives prescribed in hospital, top barriers to reducing use were (1) easy to prescribe, (2) healthcare providers are busy, (3) staff are not aware of risks, and (4) the hospital environment. Solutions provided were related to policy changes, medication reviews by pharmacists, education, and alterations to the environment. For sedatives as home medications continued in hospital, top barriers to reducing use of BZD/SHD were (1) difficult to make changes to home medications, (2) patient unwilling to make changes, (3) withdrawal takes a long time, and (4) sedatives are not causing any problems. Suggested solutions were deprescribing and withdrawal regimens.

The second series of stakeholder meetings were held in May 2019 to review the preliminary results of the scoping review and obtain feedback on interventions identified. Thirty-four participants attended four group meetings and five individual meetings. A graphic was developed to facilitate discussion and included top barriers and solutions from the first series of stakeholder meetings mapped to the most common interventions found in the scoping review. Stakeholders discussed the advantages and disadvantages of each type of intervention (Tables 3 and 4). Overall, stakeholders were passionate about improving patient care and reducing risk associated with the use of sedatives for sleeping disturbances or anxiety. They felt that feasible interventions should take into account individual patient preferences and risks, staff workload, and the inflexible aspects of the hospital environment. Strategies that increased awareness through education of staff, physicians, patients and families and a focus on best practices were a common theme throughout the discussions.

## Discussion

This scoping review identified 35 studies that reported a wide variety of interventions to reduce the use of BZD/SHD in hospitalized patients. Single interventions were most commonly used (80%) compared to multifaceted interventions. Education was the most frequently employed strategy, followed by sleep protocols and relaxation training, either alone or in combination with other strategies. Most studies (66%) reported a positive outcome for the primary endpoint with just over half of these reporting a statistically significant change in BZD/SHD utilization. The intent of a scoping review is not to assess the quality of the evidence found, however, the majority of studies (69%) were pre-/post-test single group designs which are generally considered of higher risk of bias.

There was little overlap in the type of interventions used when considering the target populations of patients and healthcare providers. Patients were frequently the target of relaxation training and behavior change interventions, and these resulted in mainly positive outcomes.(43–47, 53–55) Sleep protocols, multifaceted interventions and education were usually directed at healthcare providers, either alone or in combination with patients.(3, 26–42) Of these, sleep protocols and multifaceted interventions produced the most positive outcomes.(26–32, 38–42) Education on its own, in the form of written materials, lectures and/or audit and feedback, was not as successful.(3, 33–37) These results are further supported by systematic reviews of educational interventions to change professional behavior which found small or no effects on improving performance or patient outcomes.(61–64) Computerized alerts (e.g. reminders) directed at healthcare providers did lead to positive outcomes in two studies(48, 49) included in the scoping review and as an intervention may be more effective.(65)

This scoping review demonstrated there is a relative lack of primary literature available to guide clinicians on how to reduce BZD/SHD use in hospitals, compared to the community setting. A recent scoping review focused only on deprescribing strategies and found 74 original research articles that aimed to reduce BZD/SHD use in the community.(17) Pharmacologic interventions were the primary method employed (42 studies, 57%), whereas in the hospital setting only four studies (11%) used pharmacologic substitution and deprescribing.(17) This is likely due to the time required to monitor the addition of pharmacotherapy and/or support the gradual dose reduction of BZD/SHD,(66) which was confirmed during stakeholder meetings. As well, stakeholders provided very clear feedback that changing BZD/SHD prescriptions that had been initiated in the community setting was very challenging. A higher rate of positive outcomes (66%) was found in this scoping review for the hospital setting, compared to deprescribing interventions in the community (47%).(17) There may be numerous reasons for this, including broader inclusion criteria for the types of interventions and a lower proportion of randomized controlled trials in our scoping review.

A strength of this scoping review was the extensive stakeholder consultation which highlighted important factors to consider when implementing interventions to decrease the use of BZD/SHD in hospitals and served to integrate knowledge translation throughout the process. Engaging nurses and pharmacists in interventions were common themes during the stakeholder consultations, which has been echoed in recent published guides.(19, 32) Interventions should empower nurses to create a safe environment for patients, rather than generate extra work, and it was found that nurses were active participants in most of the studies. On the other hand, while pharmacists are ideally positioned to identify inappropriate use of BZD/SHD and provide education on alternatives, the scoping review found fewer examples of pharmacists filling this role. Another critical issue to address were the barriers to appropriate prescribing that physicians experienced such as being called late at night when patients cannot sleep or having easy access to sedatives on pre-printed orders. Stakeholders emphasized preventative measures such as changing the hospital environment, providing non-pharmacologic strategies, and developing policies around the appropriate use of BZD/SHD.(19, 32) Interestingly, patient-focused interventions such as relaxation training and behavior change methods were successful in the scoping review but were not well-described in the guides. An additional strength was the conduct of the review, which adhered to the published methods(20, 21) with searches of multiple medical databases and the grey literature with no limits placed on publication date, study design, or publication type.

This review was limited to studies that evaluated changes in utilization of BZD/SHD and did not include an assessment of other outcomes such as sleep quality, patient satisfaction, or cost-effectiveness. However, the objective of the scoping review was to identify and characterize interventions and not to describe the outcomes. Although some potential interventions may have been missed due to the outcome eligibility criteria, interventions not previously

described in the guidelines such as relaxation therapy were found, indicating an expansion of previously limited knowledge around interventions in the hospital setting was achieved. Stakeholder feedback was obtained from healthcare providers who volunteered for the meetings, therefore selection bias may be present and their comments may represent local institutional culture and resources and may not be generalizable to the broader healthcare system. Nevertheless, stakeholders identified many issues that were previously reported in the literature. Stakeholder consultation was also utilized to develop the initial research question and provide context for the results in order to make these findings directly applicable and relevant to the hospital setting.

The scoping review found a variety of interventions aimed at decreasing the utilization of BZD/SHD in the acute care setting, where previously little was known. While most strategies identified were single interventions and/or included an educational component, the most successful strategy may need to consider the targeted population. For patients, behavior change and relaxation therapy interventions warrant further research. Approaches that are solely aimed at healthcare providers, such as computerized alerts, also require additional study. Finally, both patients and healthcare providers may respond to multifaceted interventions and sleep protocols. The majority of research addressed the initiation of BZD/SHD in hospital, therefore more evidence is required to determine the best strategies to reduce chronic medications that had been prescribed in the community. Stakeholder consultation supported these findings and pointed out important factors to consider, such as the hospital environment and staff workload, when designing an intervention for hospital patients.

## List Of Abbreviations

BZD: benzodiazepine

CADTH: Canadian Agency for Drugs and Technologies in Health

NSHA: Nova Scotia Health Authority

SHD: sedative-hypnotic drug

## Declarations

### Ethics approval and consent to participate

The project was approved by the Nova Scotia Health Authority research ethics board on January 11, 2018 (#1022923). Participants in the stakeholder meetings signed written informed consent.

### Consent for publication

Not applicable

### Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

### Competing interests

The authors declare that they have no competing interests.

### Funding

This work was funded by the Dalhousie University Pharmacy Endowment Fund. The funding body had no role in the study design; collection, analysis, and interpretation of data; or in writing the manuscript.

### Authors' contributions

HLN designed the study, obtained the funding, conducted the stakeholder meetings, screened the studies, charted the data, analyzed the data and drafted the manuscript. CG and PA searched the literature, screened the studies, charted the data and revised the manuscript. JB, JEI and SKB revised the study design, analyzed the data, and revised the manuscript. All authors read and approved the final manuscript.

### Acknowledgements

The authors acknowledge the assistance provided by Melissa Gehrig in the study design, and the support provided by Katie McLean, Librarian Educator, Nova Scotia Health Authority, and Nina Frey, Research Information Specialist, Canadian Agency for Drugs and Technologies in Health, for the literature search.

### Authors' information (optional)

Not applicable

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## Tables

Table 1  
Study characteristics, n = 35

Characteristic	No. of studies (%)
Article type	30 (85.7)
Full text	5 (14.3)
Abstract	
Publication date	2 (5.7)
Before 1990	5 (14.3)
1990–1999	10 (28.6)
2000–2009	18 (51.4)
2010–2018	
Study design	24 (68.6)
Pre-/post-test (single group)	6 (17.1)
Randomized controlled trial	4 (11.4)
Non-randomized controlled trial	1 (2.9)
Cluster-randomized controlled trial	
Indication	3 (8.6)
Anxiety	19 (54.3)
Insomnia	4 (11.4)
Anxiety or insomnia	9 (25.7)
Not specified	
Comparator	24 (82.9)
Usual care/No intervention	6 (17.1)
Active comparator	5 (14.3)
No comparator	
Population target	13 (37.1)
Patient	9 (25.7)
Healthcare provider	13 (37.1)
Patient and healthcare provider	
Mean patient age	9 (25.7)
< 65 years old	15 (42.9)
≥ 65 years old	11 (31.4)
Not specified	

<sup>1</sup>Miscellaneous interventions were pharmacy practice, simulated nature environment, and therapeutic body wrap

<sup>2</sup>Multifaceted interventions included combinations of education, policy, relaxation training, sleep protocol, pharmacy practice, pharmacologic withdrawal, discharge support, or system changes

Characteristic	No. of studies (%)
Intervention category	28 (80.0)
Single	6 (17.1)
Education	5 (14.3)
Relaxation training	5 (14.3)
Sleep protocol	3 (8.6)
Behavior change	3 (8.6)
Miscellaneous <sup>1</sup>	2 (5.7)
Computerized alerts	2 (5.7)
Deprescribing	2 (5.7)
Withdrawal protocol	7 (20.0)
Multifaceted <sup>2</sup>	
Outcomes	13 (37.1)
Positive (statistically significant)	10 (28.6)
Positive (no statistics reported)	6 (17.1)
Mixed (mix of positive and no change)	6 (17.1)
No change	
<sup>1</sup> Miscellaneous interventions were pharmacy practice, simulated nature environment, and therapeutic body wrap	
<sup>2</sup> Multifaceted interventions included combinations of education, policy, relaxation training, sleep protocol, pharmacy practice, pharmacologic withdrawal, discharge support, or system changes	

Table 2  
Study details, n = 35

Article	Country	Study Sponsor	Study Design	Outcome of Interest	Patient Population	Total Sample Size	Mean or Median Age <sup>1</sup>	BZD/SHD Initiated in Hospital or Home	Intervention Target
Achterberg 1989(43)	United States	Not reported	Non-randomized controlled, intervention (3 arms) vs. monitoring	Change in mean administration of SHD in first 3 days compared to last 3 days of admission	Orthopedic surgery	64	29.3	Hospital	Patient
Agostini 2007(48)	United States	Academic	Pre-/post-test (single group), intervention vs. usual care	Percentage of patients prescribed SHD during admission	All adult inpatients	24,509	76	Hospital	Provider
Akinci 2016(47)	Turkey	Not reported	Randomized controlled, intervention vs. usual care	Change in mean SHD use score assessed pre-operatively and 2 weeks post-operatively	Cardiac surgery	24	64.2, 62.4	Hospital	Patient
Bartick 2010(38)	United States	Government or health system	Pre-/post-test (single group), intervention vs. usual care	Proportion of patients given night time administration of any SHD before and after intervention	Medicine, Surgery	267	63.0, 59.1	Hospital	Provider
Batty 2001(33)	United Kingdom	Government or health system	Cluster randomized controlled, intervention (2 arms) vs. education not related to BZD	Proportion of appropriate prescribing of BZD before and after intervention	Various acute, rehabilitation, long term care	2805	79, 78	Hospital	Provider
Blanchard 2015(39)	United States	Academic	Pre-/post-test (single group), intervention vs. usual care	Number of prescribed SHD	Not specified	10,757 (Pre-intervention)	Not specified	Hospital	Provider
Carey 1992(26)	Australia	Government or health system	Pre-/post-test (single group), intervention vs. usual care	Change in prescription, administration and use of SHD after intervention	Medical, Surgical	428	Not specified	Hospital	Patient, Provider
Carr 2017(58)	Canada	Government or health system	Pre-/post-test (single group)	Number of patients who discontinued BZD or reduced BZD dose	Rehabilitation	12	79.3	Home	Patient
Caswell 2006(34)	United Kingdom	Not reported	Pre-/post-test (single group), intervention vs. usual care	Number of patients prescribed SHD on discharge before and after intervention	Functional older adult wards	119	Not specified	Hospital	Patient, Provider

SHD: sedative-hypnotic drug, BZD: benzodiazepine

<sup>1</sup>per group, if applicable

<sup>2</sup>Outcomes included in the scoping review were grouped into 4 categories: positive with statistically significant findings, positive with no statistics reported, r that were both positive and no difference, and no difference

Article	Country	Study Sponsor	Study Design	Outcome of Interest	Patient Population	Total Sample Size	Mean or Median Age <sup>1</sup>	BZD/SHD Initiated in Hospital or Home	Intervention Target
Chung 2018(3)	Korea	Not reported	Pre-/post-test (single group), intervention vs. patient education	(i) Proportion of patients taking SHD at admission and discharge, before and after intervention (ii) Proportion of patients prescribed SHD on the first day of the month	Not specified	239,448	Not specified	Hospital	Patient, Provider
Crönlein 2014(53)	Germany	Not reported	Pre-/post-test (single group)	Number of patients on SHD before and after intervention	Not specified	131	53.6	Home	Patient
Dhubhlaing 2016(27)	Ireland	Not reported	Pre-/post-test (single group)	Proportion of patients taking regular or PRN BZD/SHD before and after intervention	Adult mental health	272, 285	Not specified	Hospital	Provider
Elliott 2001(35)	Australia	Government or health system	Pre-/post-test (single group), intervention vs. usual care	The proportion and appropriateness of BZD prescriptions after intervention	Aged care, General medicine	1301	80.7, 79.8	Hospital	Provider
Griffith 1996(28)	England	Not reported	Pre-/post-test (single group), intervention vs. usual care	(i) The number of temazepam tablets issued to wards (ii) The number of temazepam discharge prescriptions (iii) Trends in SHD prescribing before and after intervention	Acute elderly care	200	Not specified	Hospital	Provider
Haumschild 2003(50)	United States	Not reported	Pre-/post-test (single group), intervention vs. usual care	Proportion of falls patients on SHD before and after intervention	Rehabilitation	400	78.5, 79.6	Hospital	Provider
Holland 2012(36)	United States	Not reported	Pre-/post-test (single group), intervention vs. usual care	(i) Patients on two BZD (ii) Percentage of orders for dose decreases (iii) Percentage change in BZD on admission versus upon discharge (iv) Patients on high treatment doses	Psychiatry	239	Not specified	Hospital	Provider
Inouye 1999(40)	United States	Academic	Non-randomized controlled, intervention vs. usual care	Proportion of patients using SHD	General medicine	852	79.6, 79.8	Hospital	Patient, Provider

SHD: sedative-hypnotic drug, BZD: benzodiazepine

<sup>1</sup>per group, if applicable

<sup>2</sup>Outcomes included in the scoping review were grouped into 4 categories: positive with statistically significant findings, positive with no statistics reported, r that were both positive and no difference, and no difference

Article	Country	Study Sponsor	Study Design	Outcome of Interest	Patient Population	Total Sample Size	Mean or Median Age <sup>1</sup>	BZD/SHD Initiated in Hospital or Home	Intervention Target
LaReau 2008(41)	United States	Academic	Non-randomized controlled, intervention vs. usual care	Number of SHD used	Cardiology, Medicine	59	78.6, 80.5	Hospital	Patient, Provider
McDowell 1998(42)	United States	Academic	Pre-/post-test (single group), intervention vs. usual care	Proportion of patients receiving SHD at least once during admission	General medicine	111	79.3	Hospital	Patient, Provider
Opsommer 2016(51)	Switzerland	Academic	Pre-/post-test (single group)	(i) Number of admission vs. discharge SHD prescriptions (ii) Change in SHD dose	Psychiatry	172	30.4	Home	Patient
Pati 2016(52)	United States	Industry	Randomized controlled, intervention vs. usual care	The mean number of self-requested SHD	General medicine, Surgery	181	56.9, 57.8	Hospital	Patient
Peterson 2005(49)	United States	Academic	Pre-/post-test (single group), intervention (2 periods) vs. usual care with renal dosing alerts only (2 periods)	(i) Agreement with the recommended daily dose from decision support (ii) Incidence of dosing at least 10-fold greater than the recommended daily dose (iii) Prescription of non-recommended drugs	Medicine, Surgery, Neurology, Gynecology, Intensive care	3718	74.8, 74.6	Hospital	Provider
Petrovic 1999(56)	Belgium	Not reported	Pre-/post-test (two groups), two intervention arms	Initial and long term BZD discontinuation rates	Geriatric	49	81.7 (male), 81.2 (female)	Home	Patient
Petrovic 2002(57)	Belgium	Not reported	Randomized controlled, intervention vs. placebo	Proportion of patients who discontinued BZD	Geriatric	40	82, 81	Home	Patient
Reyes 2018(29)	Ireland	Not reported	Pre-/post-test (single group), intervention vs. usual care	(i) The proportion of patients started on SHD for night sedation (ii) The proportion of all sedative users where a dose reduction was attempted	Rehabilitation	237	79, 80	Both	Patient, Provider
Sheerin 1973(30)	Australia	Not reported	Pre-/post-test (single group), intervention vs. usual care	Quantity of SHD stocked by wards before and after intervention	General	Not specified	Not specified	Hospital	Provider

SHD: sedative-hypnotic drug, BZD: benzodiazepine

<sup>1</sup>per group, if applicable

<sup>2</sup>Outcomes included in the scoping review were grouped into 4 categories: positive with statistically significant findings, positive with no statistics reported, r that were both positive and no difference, and no difference

Article	Country	Study Sponsor	Study Design	Outcome of Interest	Patient Population	Total Sample Size	Mean or Median Age <sup>1</sup>	BZD/SHD Initiated in Hospital or Home	Intervention Target
Sinvani 2018(31)	United States	Not reported	Non-randomized controlled, intervention vs. usual care on medical or telemetry units without specially trained staff	Percentage of patients with SHD prescription	Medicine	1270	81.0, 81.6	Hospital	Patient, Provider
Soong 2017(32)	Canada	Not reported	Pre-/post-test (single group), intervention vs. usual care	Proportion of SHD drug-naïve patients prescribed a SHD for sleep	Not specified	Not specified	Not specified	Hospital	Provider
Toth 2007(44)	United States	Government or health system	Randomized controlled, intervention vs. quiet time	Number of patients administered anxiolytics	General medicine	23	53.5, 54.8	Hospital	Patient
Vandepoele 2017(59)	Belgium	Not reported	Pre-/post-test (single group)	Number of patients on BZD for greater than or equal to 4 weeks at admission and discharge	Ortho-geriatric, Geriatric	398	84.7	Home	Provider
Wang 2014(45)	China	Government or health system	Randomized controlled, intervention (3 arms) vs. usual care	Dosage of estazolam administered	Cardiovascular	128	62.6, 62.2, 59.4, 62.0	Hospital	Patient
Wilson 2018(54)	Canada	Government or health system	Pre-/post-test (single group), intervention vs. usual care	Proportion of sedatives deprescribed in hospital and sustained 30 days after discharge	Medical teaching unit	252	79	Home	Patient
Youn 2011(46)	Korea	Not reported	Pre-/post-test (single group), intervention vs. usual care	(i) Percentage of patients not administered SHD (ii) Percentage of patients administered multiple SHD	Psychiatry	Not specified	Not specified	Hospital	Patient
Youn 2017(37)	Korea	Not reported	Pre-/post-test (single group), intervention vs. patient education	(i) Proportion of patients prescribed SHD at discharge who had been prescribed them at admission (ii) The proportion of inpatients newly prescribed SHD after admission (iii) Proportion of patients taking SHD on the first day of each month	Oncology	24,695	Not specified	Hospital	Patient, Provider

SHD: sedative-hypnotic drug, BZD: benzodiazepine

<sup>1</sup>per group, if applicable

<sup>2</sup>Outcomes included in the scoping review were grouped into 4 categories: positive with statistically significant findings, positive with no statistics reported, r that were both positive and no difference, and no difference

Article	Country	Study Sponsor	Study Design	Outcome of Interest	Patient Population	Total Sample Size	Mean or Median Age <sup>1</sup>	BZD/SHD Initiated in Hospital or Home	Intervention Target
Zahradnik 2009(55)	Germany	Government or health system	Randomized controlled, intervention vs. booklet about prescription drugs	Odds ratio for reduction in SHD use and dose	Internal medicine, Gynecology, Surgery	126	53.4, 56.5	Home	Patient
SHD: sedative-hypnotic drug, BZD: benzodiazepine									
<sup>1</sup> per group, if applicable									
<sup>2</sup> Outcomes included in the scoping review were grouped into 4 categories: positive with statistically significant findings, positive with no statistics reported, n that were both positive and no difference, and no difference									

Table 3  
Stakeholder feedback on benzodiazepines and sedative-hypnotic drugs initiated in hospital

Stakeholder Concerns <sup>1,2</sup>	Stakeholder Solutions <sup>1,2</sup>	Interventions from Scoping Review (No. of studies) <sup>2</sup>	Stakeholder Discussion <sup>3</sup>
<b>Easy to prescribe</b> - Prescribing prevents calls in middle of night - Sedatives are on preprinted orders - There are no prescribing guidelines <b>Healthcare providers are busy</b> - Prescribers get phone calls about sedatives - Staff don't have time for other options <b>Staff are not aware</b> - Hard to keep track of new medications - Managing sleep medications are not a priority - Staff need to know more about harms - Staff have unrealistic goals for sleep requirements <b>Hospital environment</b> - Patients sleep during the day  - Electronics and caffeine  affect sleep	<b>Policy</b> - Order with a stop date, one time dose, or no refills - Document why prescribed - Assess for underlying issues - Do not continue sedatives after discharge - Remove sedatives from preprinted order or box that says "do not give sedatives" - Focused stepwise intervention for patients with difficulty sleeping <b>Medication reviews by pharmacists</b> - Flag sedative prescriptions - Help with tapering schedules - Review sedatives after a fall or if patient experiencing side effects - Resource for sedative use and dosing <b>Education</b> - Educate staff on sedative use, falls, how to manage difficult patients, manage anxiety, delirium, and promote sleep - Educate patients on risks of long term use, tapering, provide counselling and handouts, other resources <b>Environment</b> - Single rooms, headphones, sleep masks, lights out, reduce caffeine, electronics and noise	<b>Multifaceted interventions (7)</b> - Restriction of PRN (as needed) sedatives, limited duration of therapy, reassess daily, sedative use guidelines developed, order sets changed - Sleep friendly environment - Staff education, workshops, meetings, new staff orientation - Patient educational programs in sleep hygiene, relaxation training - Pharmacist medication review - Withdrawal protocols - Patient engagement specialists to identify early signs of agitation <b>Education (6)</b> - Audit and feedback, guideline development, printed materials, multidisciplinary meetings <b>Sleep protocol (5)</b> - Quiet time, noise detectors, reduce vital sign checks, lullaby, lighting, decaffeinated beverages, maximize daytime activity, room temperature, relaxing music - Back rub, warm drink and relaxation tapes given before sedative prescribed <b>Relaxation training (5)</b> - Combined with biofeedback and guided imagery, or education <b>Computerized alerts (2)</b> - Dosing recommendations and psychotropic drugs to avoid during computerized provider order entry	<b>Advocated for:</b> - Changing hospital environment where possible - Removing sedatives from preprinted orders and changing prescribing policies - Learning from other hospitals - Introducing interventions sequentially to reduce frustration - Targeting high use/high risk areas - Interventions individualized to the patient - Providing sleep hygiene information on admission - Access to calming music, blanket warmers, engaging family - Allied health assistance and/or phone apps for relaxation training - Educating staff, physicians, and patients to increase awareness, change attitudes and expectations <b>Described challenges with:</b> - Access to equipment (e.g. sleep masks) - Inflexible aspects of hospital environment (e.g. interruptions) - Interventions must be time-effective and tools easy to use and access - Avoid substitution with other sedatives - High patient turnover - Collaboration among healthcare providers is needed  - Busy staff who have other patient care priorities
<sup>1</sup> Summarized from first stakeholder meetings			
<sup>2</sup> Provided to initiate discussion at second stakeholder meetings			
<sup>3</sup> Summarized from second stakeholder meetings			

Stakeholder Concerns <sup>1,2</sup>	Stakeholder Solutions <sup>1,2</sup>	Interventions from Scoping Review (No. of studies) <sup>2</sup>	Stakeholder Discussion <sup>3</sup>
- Hospital schedule and environment is disruptive			
<sup>1</sup> Summarized from first stakeholder meetings			
<sup>2</sup> Provided to initiate discussion at second stakeholder meetings			
<sup>3</sup> Summarized from second stakeholder meetings			

Table 4  
Stakeholder feedback on benzodiazepines and sedative-hypnotic drugs initiated at home and continued in hospital

Stakeholder Concerns <sup>1,2</sup>	Stakeholder Solutions <sup>1,2</sup>	Interventions from Scoping Review (No. of studies) <sup>2</sup>	Stakeholder Discussion <sup>3</sup>
<b>Difficult to make changes to home medications</b> - Medications for hospital admission are a priority - Decreasing sedative use may damage patient-physician relationship - Patients may be on high doses - Changes in hospital may not continue after discharge - Pharmacists don't have time for full medication review and teaching <b>Patient unwilling</b> - Patients don't want sedatives changed, addictive personalities, vulnerable, may become anxious, upset - Patients need to agree to taper <b>Withdrawal takes a long time</b> - Tapering may not be appropriate in hospital, admissions are short <b>Sedatives aren't causing problems</b> - Long term use hasn't yet caused harm - Often good rationale why sedative was prescribed - Patient feels sedative still helpful, even after a fall	<b>Deprescribe</b> - Try to deprescribe when appropriate <b>Withdrawal</b> - Counsel patient on tapering - Tapering should be multidisciplinary, may encourage patient - Make sure patient agrees to taper	<b>Behavior change (3)</b> - Two week inpatient program of cognitive behavioral therapy - Motivational interviewing and education with follow-up after discharge - Educational brochure to promote tapering after discharge <b>Withdrawal protocol (3)</b> - Substitution with another benzodiazepine then complete withdrawal - Tapering protocol in combination with multifaceted interventions <b>Deprescribing (2)</b> - Pharmacist intervention in collaboration with physician with follow-up with family physician and community pharmacist after discharge	<b>Advocated for:</b> - Changing medication depending on reason for admission - Educating patient may increase awareness - Providing patient brochures takes little time <b>Described challenges with:</b> - Reluctance to make changes to chronic therapy in acutely ill patient - Communicating changes made in hospital when transitioning to primary care
<sup>1</sup> Summarized from first stakeholder meetings			
<sup>2</sup> Provided to initiate discussion at second stakeholder meetings			
<sup>3</sup> Summarized from second stakeholder meetings			

## Additional Files

**Additional File 1:** Search strategy for medical databases (Word .docx)

Detailed description of search terms used, including PubMed search query performed July 12, 2018

**Additional File 2:** Search strategy for grey literature (Word .docx)

Detailed description of search strategy used, including GreyMatters search

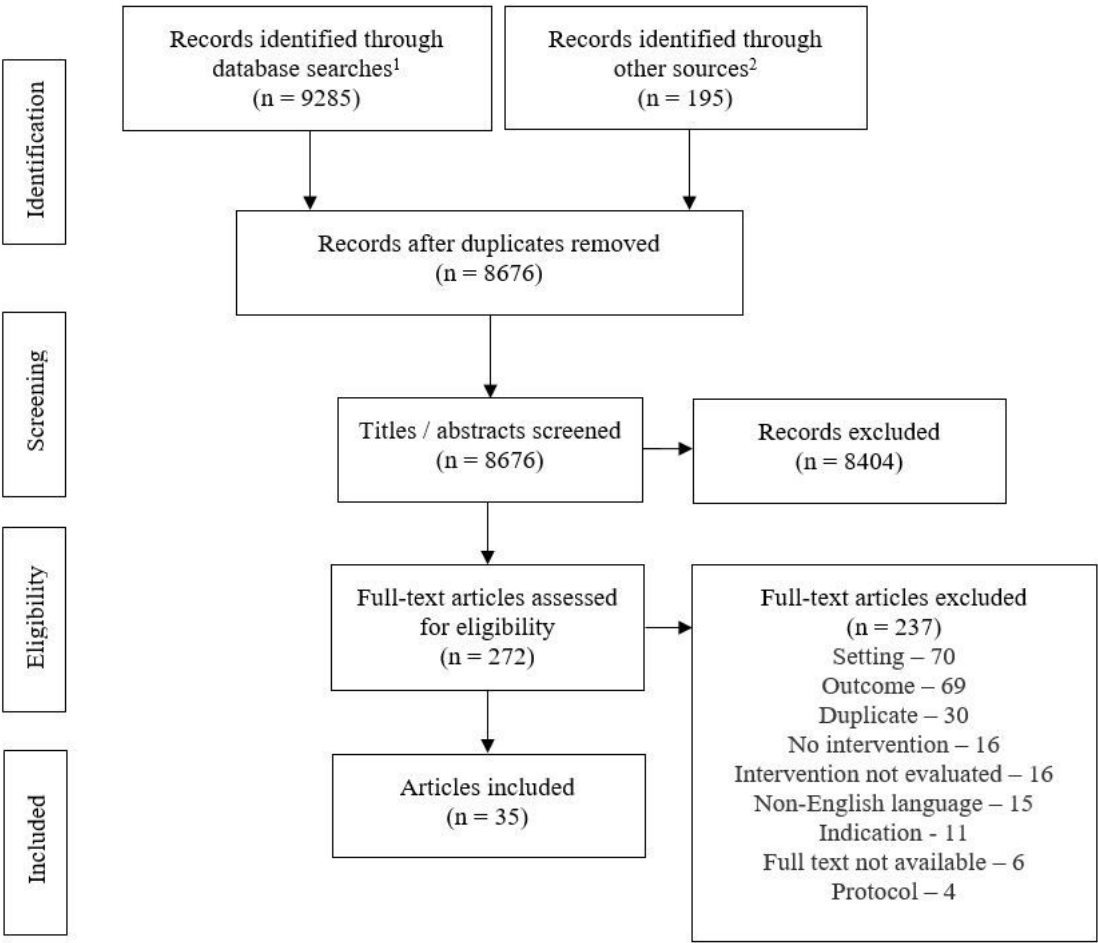
**Additional File 3:** Data items charted (Word .docx)

List of data items charted for included articles

**Additional File 4:** PRISMA-ScR Checklist (Adobe acrobat .pdf)

Preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) checklist

Figures



**Figure 1**  
PRISMA flow diagram 1PubMed, EMBASE, CINAHL, Scopus, Web of Science, PsychInfo 2Grey Matters, Google Advanced, JBI Ovid, Opengrey, reference searches

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdditionalFiles.docx](#)
- [AdditionalFile4PRISMAScRChecklistHNevilleSep242020.pdf](#)
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- [AdditionalFile1PubMedSearchAug212020.docx](#)