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Identifying barriers and facilitators to deprescribing benzodiazepines and sedative hypnotics in the hospital setting using the Theoretical Domains Framework and the Capability, Opportunity, Motivation and Behaviour (COM-B) Model: a qualitative study

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ABSTRACT

Objectives Geriatric guidelines strongly recommend avoiding benzodiazepines and non-benzodiazepine sedative hypnotics in older adults. Hospitalisation may provide an important opportunity to begin the process of deprescribing these medications, particularly as new contraindications arise. We used implementation science models and qualitative interviews to describe barriers and facilitators to deprescribing benzodiazepines and non-benzodiazepine sedative hypnotics in the hospital and develop potential interventions to address identified barriers.

Design We used two implementation science models, the Capability, Opportunity and Behaviour Model (COM-B) and the Theoretical Domains Framework, to code interviews with hospital staff, and an implementation process, the Behaviour Change Wheel (BCW), to codevelop potential interventions with stakeholders from each clinician group.

Setting Interviews took place in a tertiary, 886-bed hospital located in Los Angeles, California.

Participants Interview participants included physicians, pharmacists, pharmacist technicians, and nurses.

Results We interviewed 14 clinicians. We found barriers and facilitators across all COM-B model domains. Barriers included lack of knowledge about how to engage in complex conversations about deprescribing (capability), competing tasks in the inpatient setting (opportunity), high levels of resistance/anxiety among patients to deprescribe (motivation), concerns about lack of postdischarge follow-up (motivation). Facilitators included high levels of knowledge about the risks of these medications (capability), regular rounds and huddles to identify inappropriate medications (opportunity) and beliefs that patients may be more receptive to deprescribing if the medication is related to the reason for hospitalisation (motivation). Potential modes of delivery included a seminar aimed at addressing capability and motivation barriers in nurses, a pharmacist-led deprescribing initiative

using risk stratification to identify and target patients at highest need for deprescribing, and the use of evidence-based deprescribing education materials provided to patients at discharge.

Conclusions While we identified numerous barriers and facilitators to initiating deprescribing conversations in the hospital, nurse- and pharmacist-led interventions may be an appropriate opportunity to initiate deprescribing.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study's strengths include the use of an implementation science-driven approach to systematically identify barriers and facilitators regarding deprescribing in the hospital.
⇒ Another strength is the interdisciplinary approach of both the qualitative research and development of potential interventions.
⇒ Limitations include the study setting of one large, urban hospital, which may limit transferability.

INTRODUCTION

Geriatric guidelines strongly recommend avoiding benzodiazepines and non-benzodiazepine sedative hypnotics (eg, z-drugs including zopiclone, zolpidem and zaleplon) in older adults.[1] Long-term use of benzodiazepines is associated with increased risk of mortality, fractures, delirium, cognitive decline, depression and accidental overdose among older adults.[2–5] A meta-analysis on use of z-drugs in older people for insomnia found that the risks of adverse events (cognitive effects including memory loss, confusion; psychomotor effects including dizziness, loss

of balance and falls) was high compared with the potential benefits.[4] Benzodiazepine use is common among older adults. The prevalence of benzodiazepine use, defined as filling at least one prescription in the past year, in older adults in the USA is estimated to range from 7% to 14%.[6–8] The prevalence of benzodiazepine is similarly high in countries such as Canada, Australia, the UK and others.[6 9]

Hospitalisation can be a particularly vulnerable time for older adults with chronic benzodiazepine and sedative-hypnotic use. Pain and sedative medications with the potential to depress respiratory function may be added during the inpatient stay, raising the potential for accidental overdose, rapid clinical deterioration, delirium, withdrawal and falls.[10–12] Conversely, hospitalisation may provide clinicians with an important opportunity to begin discussions about deprescribing benzodiazepine and sedative-hypnotic medications,[13–17] particularly as new drug–drug, age–drug or condition–drug contraindications arise. Moreover, many 'as needed' medications are often stopped during hospitalisation, providing an opportunity to have a conversation with the patient about the continued use of these medications postdischarge. This approach has been used with smoking cessation, where this initial pause has been leveraged as an opportunity to quit. Several studies have found that hospitalisation may be an opportune time to review a patient's medications, educate patients and their families on the risks of benzodiazepines,[18 19] and to potentially reduce use of benzodiazepines and sedative-hypnotics.[20] A 2019 study in more than 100 Italian internal medicine and geriatric wards found that from admission to discharge, the prevalence of inappropriate benzodiazepine prescriptions decreased by 4%, demonstrating that some benzodiazepine prescriptions are identified and reduced or stopped during hospitalisation.[21] Another study in three Canadian medical centres found that an intervention using an electronic decision support tool for deprescribing led to an 5% increase in the proportion of patients who were deprescribed benzodiazepines and sedative-hypnotics from admission to discharge.[22] Recent small pilot studies have demonstrated that it is possible to begin deprescribing medications in the hospital setting.[23–27] While benzodiazepines and sedative-hypnotics may require slow tapering over many months, the hospitalisation may be a moment to (1) identify potentially inappropriate medications, (2) counsel patients and their families about the risks of benzodiazepine and sedative-hypnotic use and (3) link the patient to outpatient resources to assist with deprescribing. For example, at the health system where this intervention was implemented, there is a specialised outpatient pharmacist-led outpatient clinic focused on the deprescribing of benzodiazepines.[28] While this may not exist at all health systems, patients could be linked to clinical pharmacists or psychiatrists with knowledge about deprescribing of these medications. Other interventions have focused on creating partnerships with postdischarge nursing facilities to ensure that deprescribing can occur safely after the hospitalisation.[29]

Despite opportunities and potential benefits, hospital-based clinicians and staff continue to face numerous barriers to discussing and initiating benzodiazepine and sedative hypnotic deprescribing.[19 30] Systematically identifying these barriers and developing a behaviour theory-based intervention that addresses them could increase deprescribing and subsequently reduce benzodiazepine and sedative-hypnotic use among older adults. Implementation science, 'the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services',[31] routinely relies on theories of behaviour change to develop interventions. Prior research examining interventions using theories of behaviour change finds them to be more effective than non-theory-based interventions.[32–34] A key framework often effectively used in Implementation Science to identify cognitive, social, affective and environmental factors that may influence behaviour is the Theoretical Domains Framework (TDF), a synthesis of 33 theories of behaviour and behaviour change categorised into 14 domains.[35] A related model, the Capability, Opportunity, Motivation and Behaviour (COM-B) Model,[36 37] posits that there are three key interacting conditions for behaviour: capability, opportunity and motivation, and is used in conjunction with the Behaviour Change Wheel. The Behaviour Change Wheel, developed by Michie *et al*, maps the COM-B and TDF domains with nine 'intervention functions', or methods to change a specific or particular behaviour (figure 1). These nine functions include: *Modelling, Education, Coercion, Environmental restructuring, Incentivisation, Enablement, Training, Persuasion* and *Restrictions*. Each of these functions has corresponding behaviour change techniques, that is, specific strategies to change behaviour.[36] The objective of this study was to use qualitative interviews, Implementation Science frameworks/models and the Behaviour Change Wheel to: (1) identify barriers and facilitators to initiate benzodiazepines and sedative hypnotics deprescribing in the hospital-setting, (2) map barriers and facilitators to the COM-B and TDF, (3) identify potential intervention functions using the Behaviour Change Wheel, (4) identify potential behavioural change techniques and (5) identify potential modes of delivery.

METHODS
Study design
We used a five-step approach to identify and design potential interventions to increase deprescribing of benzodiazepines and sedative-hypnotics in the hospital (figure 1). The use of the COM-B model and Behaviour Change Wheel's multistep approach has been used to design a variety of interventions, including addressing medication management in patients with multimorbidity,[38] increasing hearing aid use,[39] address barriers to naloxone use[40] and coaching Latina women with gestational diabetes.[41] We selected the COM-B Model, TDF and Behavioural Change
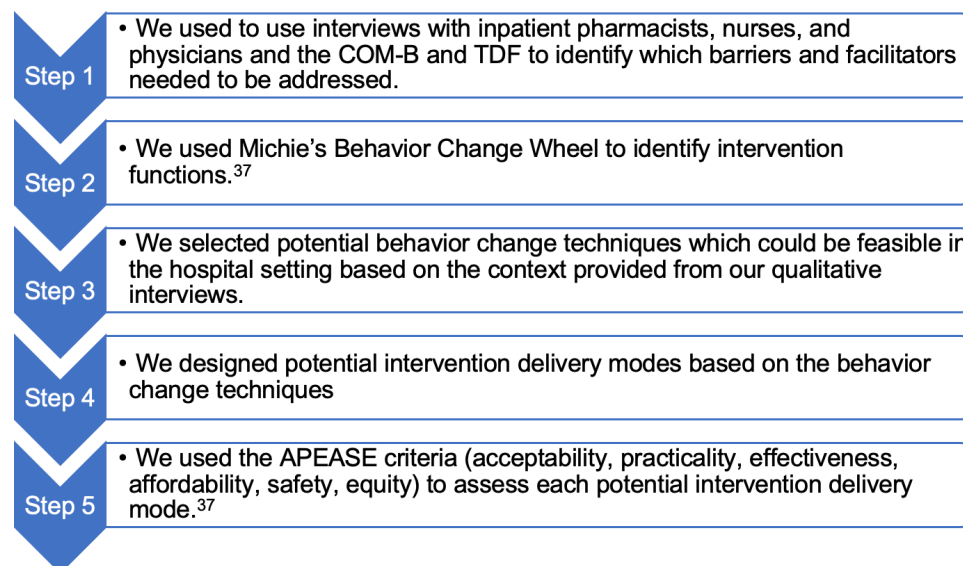
Figure 1 Steps to design and assess intervention delivery modes aimed at addressing barriers to deprescribing benzodiazepines and sedative-hypnotics in the hospital using the Behaviour Change Wheel and qualitative interviews. APEASE, affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety and equity; COM-B, Capability, Opportunity, Motivation and Behaviour; TDF, Theoretical Domains Framework.

Wheel approach given its previous use in identifying potential deprescribing strategies, examining influences on deprescribing practices and developing medication optimisation interventions.[38 42 43]

Setting

This study took place at Cedars-Sinai Medical Centre (CSMC), a non-profit, tertiary-care, 886-bed hospital system in Los Angeles with 50 000 admissions per year. The system has more than 4500 physicians and nurses and the inpatient pharmacy department at CSMC includes 150 pharmacists and 150 pharmacist technicians. The hospital has several groups of private hospitalists, independent community physicians and a group of salaried faculty hospitalists. The study was reviewed and approved by the CSMC Institutional Review Board.

Step 1. Using qualitative interviews and the TDF and COM-B to identify which barriers and facilitators need to be addressed
Study participants

We chose to interview clinicians in the inpatient setting whom could potentially be involved in deprescribing, including pharmacists, nurses and physicians. Eligibility criteria included working in a role directly involved in inpatient care, working with older adults and working in a role related to medication management (including patient education, prescribing, medication administration or medication reconciliation). We recruited study participants via emails, accessing lists of potentially eligible study participants from managers and from the organisation's website. We also used snowball sampling, asking participants to refer other potentially eligible study participants. In some cases, the interviewers were familiar, but did not work directly with, the interviewees. MSK, a female research scientist/assistant professor at CSMC

(PhD, MPH), and JC-B, an undergraduate research assistant at University of California Los Angeles (UCLA), interviewed clinicians from March through August 2021.

Our semistructured interview guide (appendix 1), which we modified and refined as interviews were conducted, focused on the following: knowledge about the treatment of insomnia and anxiety and training related to treating these conditions, familiarity with the Beers criteria and lists of fall-risk medications, knowledge about the use of benzodiazepines/sedative-hypnotics and their alternatives, language and cultural barriers when discussing medications with patients, familiarity and comfort with deprescribing conversations, organisational barriers related to deprescribing and experiences with deprescribing and deprescribing conversations with patients and their families/caregivers. Prior to the interviews, the interview guide was reviewed and revised by nursing (coauthors KB and LYK), pharmacy (coauthors DWL and KAK) and physician (coauthor JMP) stakeholders. We obtained oral informed consent with all interviewees and provided an information sheet with details about the study. Prior to the interview, we confirmed eligibility criteria with the potential participants using a brief email exchange. We piloted the interview guide with the first two study participants, asking for clarification on any questions or topics and subsequently revised the guide. We informed study participants that the study focused on medication safety in the hospital and postdischarge. We interviewed clinicians by phone and audio recorded the interviews. We stopped interviewing when we felt we had *meaning saturation*; that is, we felt we had enough information from the interviews to understand barriers and facilitators within the system.[44] We interviewed each participant once. MSK and JC-B met after each interview

to debrief, update the interview guide if needed and note potential lines of inquiry. We had the interview audio professionally transcribed and subsequently checked the transcripts for accuracy.

Analysis

We imported the transcripts into Dedoose (version 9.0.17, Los Angeles, CA: SocioCultural Research Consultants, LLC 2021). We used descriptive grounded theory methodology to code the initial data set. Following Corbin and Strauss (2014), we used open coding to code the first six interviews using line-by-line coding in Dedoose, where each line of a transcript is given a code.[45] Line-by-line coding is a method to ensure that small details are not missed and that the data are coded thoroughly. We used a style of coding called process coding to code the transcripts, which uses gerunds to code the data.[46] Process coding is useful because instead of attaching a one-word code to a line of text, the researcher uses a phrase with a gerund to describe the action or feeling from the participant. This style of coding aims to reduce researcher bias, as it aims to stay close to what the participants are perceiving and feeling.[45] For example, a section of text where a clinician is describing reasons for hesitating to start deprescribing conversations might be coded *Hospitalist finding it challenging to address benzo use when it is unrelated to the reason for hospitalisation.* In summary, we used both of these methods—line-by-line coding and process coding—to stay close to the data. MSK, a researcher with experience in advanced qualitative methods, coded all of the transcripts. From these initial codes, we created a codebook.[45]

We exported these codes to an Excel spreadsheet and a PhD-trained researcher (MSK) used the TDF and the COM-B Model[37] to deductively map the barriers and facilitators into constructs from these models. In the COM-B Model, psychological capability-related facilitators and barriers to behaviour change might include existing or lack of knowledge about deprescribing, existing or lack of skills related to how to engage in any of the behaviours associated with deprescribing, and the presence or absence of cognitive overload which could interfere with engaging in the deprescribing behaviours.

Motivation-related facilitators and barriers might include perceived competence and self-efficacy; beliefs about one's capabilities to engage in deprescribing behaviours; perceptions of one's professional identity or role; pessimism or optimism about deprescribing and outcome expectancies in engaging in deprescribing behaviours; reinforcement, or incentives, rewards, consequences associated with deprescribing and emotions around the deprescribing process. Opportunity-related facilitators and barriers are related to the physical and social environment and context in which the behaviour is happening. Environmental facilitators and barriers might include the organisational culture and climate around medication management and deprescribing, resources available for deprescribing; policy-related incentives or disincentives to deprescribe. Social influence-related facilitators and barriers might include social norms, modelling by other clinicians and group identity.

To increase rigour, we reviewed the qualitative findings with nursing (coauthors KB and LYK), pharmacist (coauthors DWL and KAK) and physician medication management champions (coauthors JMP and JLS) as a form of member checking, that is, respondent validation, and to identify additional potential barriers. As only one member of our research team (MSK) is trained and experienced in advanced qualitative methods, we used this approach instead of the use of two coders to code and review the qualitative data, as it made the best use of the skills of our research team. We used the CORE-Q to report the study findings. While patients and the public were not informed during this part of the study, we hope to include patients and caregivers during the intervention pilots.

Step 2. Identifying intervention functions

Intervention functions are broad categories of techniques aimed at changing behaviour. These may include strategies such as providing education or using persuasion. Table 1 describes each intervention function and how these functions can mitigate potential barriers. An example of a persuasion-based intervention to change behaviour might include a pamphlet at the doctor's office using strong persuasive messaging about the harms of antibiotic resistance to reduce patients' behaviour of

Table 1 Intervention functions aimed at addressing capability, motivation or opportunity barriers (adapted from Michie *et al*)

Intervention function	Description
Education	Influences psychological capability, specifically knowledge
Training	Imparts skills, increasing both physical and psychological capability and beliefs about capabilities
Persuasion	Uses communication strategies to induce positive or negative feelings, influencing motivation
Incentivisation	Creates expectations of a reward, influencing motivation
Coercion	Creates expectations of a cost or punishment, influencing motivation
Restriction	Uses rules to reduce opportunities to engage in the target behaviour, influencing both opportunity and motivation
Environmental restructuring	Changes the physical and/or social context to affect physical and social opportunity
Modelling	Provides an example of the target behaviour for people, influencing motivation
Enablement	Uses tools to reduce barriers that can increase capability or provide cues to engage in the target behaviour, influencing psychological capability and physical and social opportunity

asking for antibiotics for a viral-based infection. We used the process outlined in *The Behaviour Change Wheel: A Guide to Designing Interventions* by Michie *et al*[47] to map barriers and facilitators to potential intervention functions using an Excel worksheet.

Step 3. Identify behaviour change techniques

Behaviour Change Techniques are 'coordinated sets of activities designed to change specified behaviour patterns',[37 48] otherwise referred to as the 'active ingredients' in interventions. Behaviour Change Techniques can be combined, must be observable and replicable.[49] For example, if a department is seeking to reduce surgical time turnover, they might use Behaviour Change Techniques such as setting a department goal to reduce surgical time turnover, process mapping (action planning) the detailed steps to change workflows, providing feedback to staff on the process, using comparisons with other units or departments to motivate behaviour change and demonstrating the new workflows to other surgeons.[50]

We identified potential Behaviour Change Techniques from Michie *et al*[47] to identify opportunities and strategies to facilitate deprescribing behavioural change which were considered feasible in the hospital setting. To do so, we created an interdisciplinary workgroup of nursing, pharmacy and physician leaders at the hospital. The workgroup included a pharmacy director (DWL), nursing scientists and leaders (KB and LYK) and a physician scientist/faculty member (JMP). We met separately with each clinician type stakeholder(s) (pharmacists, nurses and physicians) to identify potential Behaviour Change Techniques.

Step 4. Design potential modes of delivery

Modes of delivery are ways in how the content of various Behaviour Change Techniques is delivered.[48] To use the example above of reducing surgical turnover, the mode of delivery to implement the Behaviour Change Technique of demonstrating the new process to other surgeons might be delivered using a Visual Informational mode of delivery (ie, a video demonstrating the new process) or a group-based mode of delivery, which might use a weekly meeting to discuss the new process. We held separate meetings with pharmacy, nursing and physician champions to discuss design potential modes of delivery from the behaviour change techniques and described them in short paragraphs, considering contextual factors from the interviews, barriers and facilitators.

Step 5. Assess the acceptability of the potential modes of delivery

We used the APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety and equity)[37] to qualitatively rate the acceptability of these potential modes of delivery with our stakeholders in pharmacy, nursing and medicine. For example, we selected some interventions as 'likely highly acceptable', while others were rates as 'likely acceptable'.

Our future work will use these findings to develop and test these modes of delivery.

Patient and public involvement

None.

RESULTS

Step 1. Using the TDF, COM-B and qualitative interviews to identify which barriers and facilitators need to be addressed

We interviewed 14 clinicians working in the inpatient setting, including six pharmacists, one pharmacist technician, four physicians and three nurses. Interviews ranged from 30 to 90 min. In table 2, we describe the barriers and facilitators we identified mapped to the relevant COM-B categories and TDF.

Facilitators

Capability

Clinicians across the different roles had high levels of knowledge about the potential risks of benzodiazepines and z-drugs in older adults, including concerns about fall risk, drug–drug interactions, respiratory depression when combined with opioids, delirium and increased confusion and sedation. Physicians and pharmacists in particular referenced the Beers List, START/STOPP criteria and Choosing Wisely lists when discussing why these medications 'may not always be appropriate'. Physicians and pharmacists expressed high levels of skill in finding ways to reduce the dose of the medication, holding 'PRN/as needed' medications during hospitalisation or switching scheduled medications to as-needed. At discharge, both physicians and pharmacists would try to highlight the dose reduction or lack of use of the medication to patients and their families to illustrate how it was possible to function at lower doses or without the medications. One pharmacist explained being aware that physicians were potentially uncomfortable with completely deprescribing the medication during or after hospitalisation, so focused on reducing the dose instead.

Motivation

We found a wide range of skills and beliefs about competence and self-efficacy elated to how to deprescribe in the hospital. Pharmacists demonstrated the greatest confidence in deprescribing behaviours (ie, education, counselling, recommending reducing medications, reaching out to outpatient providers). When they viewed a significant safety concern, such as the potential for accidental overdose, a high risk of falls, or concerns about renal problems, pharmacists also expressed feeling confident in reaching out to physicians to reduce the dose of benzodiazepines. In general, physicians and nurses expressed moderate-to-high levels of self-efficacy in counselling patients. However, there was substantial variation, as we note in the barriers section below. Some nurses felt they had received a lot of training and education around medications and felt confident in discussing the risks of

Table 2 Facilitators and barriers to deprescribing sedative-hypnotics in the hospital identified during interviews with pharmacists, nurses and physicians mapped to COM-B categories and the Theoretical Domains Framework

Facilitators		
COM-B category	**Theoretical Domains Framework**	**Illustrative interview quotes**
Psychological capability	Knowledge about deprescribing	Cause sometimes some of these patients are going home with like PRN (as needed) melatonin and PRN Trazodone, PRN Ambien, and then they're on gabapentin and they're also on Cymbalta. And they're also on Remeron like everything, you know, and it's like there's just a lot of medications here, and there's just room for accidental misuse, not even, you know, because they're abusing the meds but they just happen to mix up their pillbox or their bottle. So we try to deprescribe as much as we can we try to limit just to one sleep aid per discharge. (pharmacist)
Psychological capability	Skills	You can identify things to (the physicians), like, 'Hey, this patient came in for a fall, we noted that they're on, Xanax like two milligrams, three times a day, scheduled, you know, we should consider reducing this or starting to wean the patient off.'(pharmacist) For patients where I'm really worried about it, I talk to the patient, you know? We're not changing this, but I think you should talk to your doctor. You should consider modifying it, especially if it's something that PRN or over the counter, and that's more under my scope where I can maybe influence change. (pharmacist)
Motivation	Perceived self-efficacy and confidence, beliefs about capabilities	I'm very comfortable, especially if I know I have a very good clinical reason why the patients shouldn't be on a certain medication. I think here at (institution) our pharmacists are empowered to have that conversation. We've actually done a lot of education on deprescribing a couple of years ago and we have it built into (templates) (pharmacist) So I have a stronger chance of getting these things deprescribed if the patient has had a fall either during that hospital stay or recently… You know, the more recent the fall, the more fresh it feels and therefore I'd say the, the higher chances I have of being able to make that a strong link and offering up some sort of an alternative, or at least a trial off of the medication. (pharmacist)
Motivation	Professional role and identity	So I think that's why pharmacists play like a very important role, 'cause we kind of fill a void that something that sometimes primary care doctors or physicians don't have time to go through each individual bottle and, or they have to focus on the diagnoses. So, you know, we can, that's something we can prioritize, and that is a specialty, you know, medications are obviously our specialties. (pharmacist)
Motivation	Reinforcement	I could very easily just give them the sleep medication. I don't like to, because I know what they're going to be like the next day. It'll be harder for me to do my job. Let's just say you don't even care how the patient's doing, think about yourself, like you cannot perform your duties. It will be more difficult for you to care for this patient. (nurse)
	Positive outcome expectancy	I mean there have been times where, I guess talking to either the patient themselves if they're able to talk to you, or the families, sometimes they genuinely are like they didn't really know the risks, let's say. Or they didn't know that that's not a medication that we recommend for elderly people and they would say, 'Yeah, I agree. Let's try to take them off of it.' (hospitalist) I think you initially get resistance. But I think once you introduce what their risk factors are, especially if the patient has had one of those happen, and that's led to that admission, their families are a little bit more onboard. (pharmacist)
Opportunity	Environmental context and resources	I think at (this hospital), we've done a really good job of thinking about deprescribing because we incorporate as part of our daily discharge rounds on every unit, we talk about deprescribing…. We had an initiative here where we had a report of patients who met criteria for falls and we were trying to prevent them. And then we, it was our responsibility to make sure that we keep not prescribing the medications that can contribute to that. (pharmacist)
	Social influences	We really kind of shy away from it, and even when you try to order it at (this hospital) or at (an affiliated rehabilitation hospital), a pop-up comes up discouraging the use of benzos, and it'll actually ask you, 'Why are you ordering the benzos?' You kind of have to put a reason in there. They really don't want you using benzos. (hospitalist)
Barriers		
Psychological capability	Memory, attention and decision processes	In the inpatient setting, there's something acute going…oftentimes it's not related to the benzo. And so we're often focused on that and it's different than the outpatient setting, where there is some time to sort of discuss some of these chronic issues and chronic medications that patients are on and what they need it for and how we can better manage that. So I do think that is a challenge. (physician)
Motivation	Low perceived self-efficacy or confidence	Interviewer: Do you feel comfortable educating patients and their caregivers about the fall risks of some of these medications? Nurse: No. I never bring them up individually. I am very general about it… Yeah. I'm just not the physician. It doesn't feel right for me to do it. I know that I don't know enough about the medications, like scientifically about the meds to explain it to them, and to answer more questions that they might have. (nurse)
Motivation	Professional role and identity	A lot of times these patients or their families have resistance to getting off of that medication, so I just try to educate them and give my recommendations. But sometimes it's hard when it's a doctor that they've been with forever who's prescribing it or something and they trust that person. So, it's not always practical as a hospitalist to do that. (physician)

Table 2 Continued

Motivation	Negative outcome expectancy and pessimism	…there are others who come in who have underlying psych issues or anxiety issues. They're like 'I take Xanax three times a day and I need it for sleep.' That makes it challenging to give them something else or take them off that. (physician) And I can also say that when anxiety is a big component of benzo use, the prescribers are often very hesitant to make any adjustments. Not that I am qualified to diagnose, but it almost seems like the patients sometimes get pre-emptive anxiety if you talk about changing their benzos for anxiety. (pharmacist) Clinician: The scheduled ones are just no interest, no interest. Interviewer: Do you feel like with the scheduled ones, that they've already heard these clinicians telling them they shouldn't take it before? Clinician: Maybe yeah. Yeah, probably. I mean, I hope so. I hope more clinicians are having that conversation with them. I think they're just so set on their schedule, like you're not, I came in here for a fractured ankle. I'm not leaving here with like new… Just fix my ankle. I'm doing what I've done this whole time. (nurse)
Motivation	Emotion	A lot of (the family members) are shocked. Sometimes they get offended, because they don't want to be accused of not taking great care of their family member, because they thought this was the best care. (pharmacist) A lot of them are scared when you tell them, or when the physician talks to them about alternatives, because they've become so reliant. And they just know, like, 'This is what has been working for me.' They don't want to go try something else. (nurse)
Opportunity	Environmental context and resources	…If someone's chronically on benzos and they come in, I don't really take the inpatient opportunity to say, 'Hey, we really should talk about your benzodiazepine use,' because I'm not going to follow up with the patient again, so I don't know how their anxiety symptoms are going to be. (physician) So what am I gonna be able to do in four days on a 30 year benzodiazepine, you know, dependency, and then not knowing what kind of follow-up they have, right? (physician)
Opportunity	Social influences	I mean, there are obviously, certain physicians who don't like to be called and questioned and want to be bothered, I think that happens. And I think anytime that does happen, it is very frustrating because, you know, we're just trying to look out for the patient's best interest and do the right thing. (pharmacist) We only call when we have something very clearly disrupting patient safety. (pharmacist)

medications with patients and physicians, while others felt less confident in engaging in these behaviours. All clinicians expressed that it was easier to engage in deprescribing behaviours when the reasons for hospitalisation may have been related to the benzodiazepine. For example, if the patient had a recent fall or came in for a benzodiazepine overdose: *So that's a whole different story because that aligns with what, you know, might be going on (physician).*

We found high variation in perceptions of how clinicians' professional role and identity aligned with deprescribing behaviours in the hospital, from perceptions that it should be done completely in the outpatient setting by outpatient providers to perceptions that inpatient providers were in the right place to start deprescribing or conversations around deprescribing. Pharmacists were the most likely to express that it was part of their professional role to be aware of the potential for drug-related adverse events and to warn other clinicians about the mitigating the risk of adverse events such as falls as much as possible, particularly when clinicians were focused on other concerns. This could result in patient education about speaking to their outpatient provider about deprescribing or making recommendations to physicians to reduce the dose during hospitalisation.

Pharmacists also noted that physicians faced competing pressures in both the inpatient and outpatient settings, both time pressures and patient/family pressures to prescribe. These pressures made it difficult for physicians to address polypharmacy or potentially inappropriate

medications. In addition, pharmacists noted that fragmentation of care made it difficult for outpatient physicians to be aware of all of the medications prescribed by multiple specialists. As a result, pharmacists felt that the hospitalisation presented them with an excellent opportunity to see all of the patient's medications in one place and review them with fresh eyes.

We found multiple facilitators related to motivation. Reinforcement refers to perceptions around how the behaviour is incentive or rewarded. Nurses in our sample described having a greater incentive to recommend reducing the dose of benzodiazepines or z-drugs or hold the medications during hospitalisation because it made it easier for the patient to stay awake and it thus made it easier for them to help the patient ambulate, eat and avoid delirium. While clinicians voiced fears about upsetting families, described in detail below, they also expressed times when the deprescribing conversation had gone positively. Highlighting specific risks such as risks of falls, cognitive decline or dependency was occasionally helpful with convincing some family members, particularly when the reason for the admission was related to the medication and the family was concerned about a readmission.

Opportunity
Pharmacists noted that the history of the pharmacy programme at the institution was strong, which helped empower pharmacists to make recommendations to other clinicians and patients. Pharmacists described implementing a variety of programmes focused on reducing

medication-related readmissions and using these metrics to gain additional resources and staffing for the pharmacy services. For example, pharmacists described a departmental aim to thoroughly review medications for older adult patients on seven or more medications or any patients with 10 or more medications. Some pharmacists regularly rounded with faculty physician and resident teams, allowing them to make medication recommendations on the spot, and pharmacists described that medications were reviewed by pharmacists every time the patient transitioned to another level of care (eg, moving from the ICU to the medical–surgical floor). In addition, pharmacists highlighted special programmes such as postdischarge phone calls for patients with Medicare Advantage where the healthcare system has 'financial skin in the game'. In addition, several pharmacists brought up a recent quality improvement/test of change of an inpatient deprescribing project focused on non-steroidal anti-inflammatory drugs and proton-pump inhibitors (PPIs).

Barriers
Capability
We identified an important barrier related to psychological capability. Given the strong external pressures to discharge as soon as possible, clinicians noted that they perceived a lack of opportunities to engage in deprescribing behaviours because they were engaged in identifying and managing an acute issue. This resulted in cognitive overload, as they were more focused on addressing and/or resolving the acute issue and perceived that there was little time during the hospitalisation to start tapering down the benzodiazepine or even discuss chronic medications with patients.

Motivation
We identified a variety of motivational barriers to deprescribing benzodiazepines and z-drugs in the hospital, including low perceived self-efficacy or confidence to begin deprescribing conversations, negative outcome expectancy and pessimism (ie, believing that starting conversations about deprescribing was futile) and fears about strong negative reactions from patients and their families.

Some of the nurses in our sample expressed less confidence or perceived self-efficacy to learn about and discuss the risks of benzodiazepines with patients in the hospital—or that their colleagues might have some of these psychological capability barriers. Some nurses also expressed that medication counselling was outside of their scope of practice and that they had not received enough training to speak comfortably about specific risks of benzodiazepines.

Several clinicians noted that deprescribing was best done by the patient's regular outpatient provider and did not see that their role encompassed deprescribing behaviours, such as educating patients about the risks of long-term benzodiazepine use or reducing the dose in the inpatient setting. Several physicians noted that they

felt that their role was to stabilise the patient enough to discharge them back to their outpatient provider. An important challenge highlighted by hospitalists and others was their recommendation might conflict with that of an outpatient provider who had been regularly prescribing this medication, and with whom the patient had a much longer relationship. Several nurses also expressed that they felt that their role in the hospital was to monitor the patient and create a healing environment, not necessarily to address their outpatient medications.

Clinicians expressed pessimism over whether deprescribing these medications was possible—regardless of setting. Several clinicians noted that when patients were taking scheduled benzodiazepines for anxiety, that deprescribing discussions were challenging and often felt futile. Clinicians across all three roles expressed negative experiences discussing reducing benzodiazepines and z-drugs with patients and caregivers. They felt frustrated with conversations about reducing the medications because they did not feel that patients and/or their caregivers were open to listening.

Closely tied to pessimism about deprescribing and negative outcome expectancy was the strong reactions from patients and their families about bringing up the issue of reducing the medications, which could in turn make it more difficult for clinicians to address the acute issues at hand. Clinicians described how they could quickly lose rapport with the patient and were wary of bringing up something that could make patients and their families upset.

Opportunity
With regards to environmental context and resources, physicians were most likely to bring up concerns about the potential for lack of follow-up, both for deprescribing benzodiazepines and for starting other medications for anxiety with different side effect risk profiles (eg, antidepressants). Physicians were most concerned about follow-up patients with barriers to accessing care, including patients with Medicaid (public insurane for low-income populations) or no insurance, but all clinicians were concerned that if they started tapering medications, the patient may not have adequate follow-up post-hospitalisation.

Pharmacists and nurses reported that they found it more challenging to work with non-hospitalist physicians for several reasons. Private physicians were not always on the same phone/pager system, making it more difficult to communicate with them regularly. Pharmacists and nurses also noted that occasionally, private physicians were not used to having their prescribing challenged, which caused some communication challenges. Additionally, pharmacists noted that private physicians were not always in tune with the institution's organisational culture around medication management and patient safety and thus questioned recommendations.

All clinicians noted interprofessional barriers to reducing inappropriate medication use. Nurses and

Table 3 Behaviour Change Technique options mapped to intervention functions for a potential intervention focused on deprescribing benzodiazepine and z-drugs in the hospital

Barrier	Intervention function	Behaviour Change Technique options
Motivation	Persuasion	▶ Use of a credible source to deliver a persuasive message ▶ Feedback on behaviour ▶ Feedback on outcomes of the behaviour ▶ Focus on past successes ▶ Verbal persuasion about capabilities ▶ Framing/reframing ▶ Identify associated with changed behaviour ▶ Salience of consequences ▶ Identification of self as a role model ▶ Social comparison
Capability, motivation	Modelling	▶ Demonstration of the behaviour
Incentivisation	Modelling	▶ Align with existing institutional goals
Motivation, physical and social opportunity	Enablement	▶ Social support ▶ Goal setting (eg, focusing on outcomes) ▶ Problem solving ▶ Action planning ▶ Adding objects (eg, cues) to the environment

pharmacists both noted that there were occasions when they made recommendations to the attending physician to reduce or stop a medication but the physician did not take the recommendation and instead preferred that the decision to taper or stop the medication be done in the outpatient setting. In order to reduce recommendation fatigue, this led pharmacists and nurses to 'save' their recommendations for physicians about those patients for whom they perceived that harm was most imminent. This led pharmacists and nurses to sometimes avoid making recommendations when the medication was not directly related to the hospitalisation.

Physicians and pharmacists who reached out to outpatient providers to discuss deprescribing the benzodiazepines or z-drugs described that another challenge was that the patient's primary care provider had already attempted to deprescribe the medications and had been unsuccessful or was not the prescriber of the medication and did not want to supervise the taper.

Responses from nursing, pharmacy and physician champions

After reviewing the findings with various nursing (coauthors KB and LYK), pharmacy (coauthor DWL) and physician medication management champions (coauthors JMP and JLS), we identified additional barriers to deprescribing benzodiazepines in the hospital. For example, nursing champions noted that nurses may both be concerned with negative reactions from the patient, and also from these patient complaints making it back to nursing management. Nursing champions also noted that during the COVID-19 pandemic, there was an increase in float and travel nurses who worked in short-staffed units. Float or travel nurses may not have established relationships with physicians and so may be less likely to speak up about medication safety concerns. Nursing champions also reiterated that discussing outpatient medications with patients requires skills in having these complex conversations, and that newer nurses may not yet have honed these skills. Our pharmacy champion noted that many inpatient pharmacists sometimes approached their role as responsible for only managing inpatient medications, necessitating a need to change the mindset about also addressing outpatient medications. Another pharmacy-related concern was that upsetting patients regarding their medications could potentially lead the patient to leave the hospital against medical advice.

Our physician champions noted two additional potential barriers to deprescribing. One issue identified is stigma surrounding their use. As these medications are sometimes taken by patients without a prescription, patients may not disclose their use, or the full extent of their use (which may exceed what is being prescribed). This underdisclosure may prevent physicians from recognising and thus addressing opportunities for deprescribing. Another issue involves potential sensitivity around their use. As these medications are almost always prescribed on an 'as-needed' basis, patients or families are almost always the ones deciding how much of these medications to use. Asking patients about their use of these medications and asking them about reducing use may imply that clinicians are negatively judging them and their care teams, including their family members, and potentially their physician prescribers. Broaching these topics can thus potentially increase resistance and reduce rapport, including when the topics are discussed with family members and primary care physicians.

Step 2. Identifying intervention functions

From step 2, we identified that critical barriers were in the areas of motivation and opportunity, including low perceived self-efficacy and capability, negative outcome expectancy and pessimism, emotion, environmental

Table 4 Designing potential modes of delivery of Behaviour Change Techniques aimed at increasing deprescribing of benzodiazepines and z-drugs in the hospital

Behaviour Change Technique	Potential intervention focus population	Potential modes of delivery
Use of a credible source to deliver a persuasive message, demonstration of the behaviour	Nurses	Pharmacist presents background on benzodiazepines and z-drugs, including information about how these medications can increase length of stay, delirium, falls, fractures to nurses during a monthly seminar series. Respected, experienced nurse with experience and high self-efficacy in deprescribing delivers several short presentations during pizza lunches on their 'go-to' scripts for staring a conversation about deprescribing both with physicians and patients as part of a 'benzodiazepine awareness month.' Nurses are provided with continuing education units during these seminars. This intervention can also be used to increase nurses' self-efficacy in when these medications should be best administered and when non-pharmacologic options may be more appropriate.
Feedback on outcomes, action planning, feedback on the behaviour, problem solving	Pharmacists	Pharmacists create a guideline to risk stratify patients with benzodiazepines/sedative-hypnotic use based on dose, comorbidities, reasons for hospitalisation (eg, fall-related fracture) and other clinical factors (eg, other sedatives). Pharmacists identify patients at highest risk of adverse effects and flag these patients as targets for deprescribing. Pharmacists track deprescribing conversations with physicians and patients and note successful dose reductions. The team goes over these encounters at the end of each month to discuss successes and challenges.
Identification of self as a role model, identity associated with changed behaviour	Nurses	Nursing leaders emphasise that the role of a nurse in the unit is to increase patient safety, which includes educating patients about medications. The idea of deprescribing as part of the job (including conversations about deprescribing) is woven into regular huddles.
Adding objects to the environment	Pharmacists, nurses	Pharmacists and nurses distribute evidence-based educational tools (available from Choosing Wisely or Deprescribing.org) about deprescribing to patients during hospitalisation and at discharge. These materials emphasise the fact that the entire healthcare team (physicians, nurses and pharmacists) is involved in medication safety. These materials are also provided as part of the After Visit Summary and are available through the patient portal. Pharmacists making postdischarge phone calls go over the materials during these calls.
	Nurses	Nurses are encouraged to employ additional strategies to alleviate anxiety in the hospital, including the use of smart speakers (already available at the bedside) with relaxing music and aromatherapy.
Action planning	Pharmacists	Pharmacists connect patients directly to existing benzodiazepine tapering clinic in the outpatient setting if the patient is eligible.
Demonstration of the behaviour, action planning, problem solving	Physicians, pharmacists, nurses	Use of an interprofessional seminar where physician, nursing and pharmacist champions present various case scenarios and debrief together, developing strategies for managing patients hesitant about deprescribing benzodiazepines and z-drugs.

context and resources and social influences. We mapped these barriers to intervention functions in online supplemental appendix table 1. Persuasion, modelling and enablement were the most occurring intervention functions identified through this process.

Step 3. Identify behaviour change techniques
Next, we linked intervention functions with most frequently used Behaviour Change Techniques in Michie *et al*[47] associated with those functions aimed at addressing the specific barriers we found in the qualitative interviews. We identified those that would be most likely to succeed in the hospital environment in table 3.

Step 4. Design potential modes of delivery
Based on the potential Behaviour Change Techniques we identified, we designed potential modes of intervention. We considered how potential modes of intervention could align with existing organisational goals, staffing, defined roles, and trainings and list these in table 4.

Step 5. Assessing the acceptability of the intervention
Evaluating potential intervention modes of delivery using the APEASE, three potential interventions had the highest ratings in all criteria: creating a nursing seminar series;

developing a risk stratification guideline for pharmacists, intervening in the highest-risk patients and tracking outcomes and distributing evidence-based educational materials in the hospital and in the patient portal. The APEASE criteria evaluation for each proposed intervention is included in table 4. We list the potential rating for each criterium in online supplemental appendix table 2.

DISCUSSION
In this implementation science analysis, we found numerous barriers and facilitators to benzodiazepine and sedative-hypnotic deprescribing behaviours in the hospital across all three domains of the COM-B model: capability, motivation and opportunity.[36 37 47] We also identified potential intervention functions and modes of delivery which could directly address barriers and build on facilitators. Specifically, we found that clinicians perceived that it was sometimes difficult to address chronic benzodiazepine and sedative-hypnotic use—particularly if the medication was not related to the hospitalisation—when experiencing time pressures to stabilise and discharge the patient as quickly as possible. Important motivational barriers for all three clinician

groups included fears of upsetting patients and families, and relatedly, negative outcome expectancy about deprescribing benzodiazepines and sedative-hypnotics. Clinicians noted that prior attempts to engage in deprescribing behaviours had often proven to be difficult and unrewarding. Opportunity-related facilitators included a strong organisational culture that valued pharmacists and medication management, while opportunity-related barriers included concerns about lack of follow-up for patients, interprofessional disagreements about medication management (particularly with private physicians) and challenges with outpatient providers who had their own barriers to deprescribing. We also found that while there are numerous barriers to beginning deprescribing of benzodiazepines and z-drugs in the hospital, clinicians have found ways to engage in deprescribing behaviours. These findings illustrate the potential of implementing deprescribing interventions in the hospital setting—as long as barriers are mitigated and addressed. Potential modes of delivery we developed as part of this study included a seminar aimed at addressing capability and motivation barriers in nurses, a pharmacist-led deprescribing initiative using risk stratification to identify and target patients at highest need for deprescribing, and the use of evidence-based deprescribing education materials provided to patients and their families at discharge and via the patient portal.

Our study found that clinicians often come across patients and/or families who do not view benzodiazepines and/or sedative-hypnotics as unnecessary medications, creating challenges for clinicians attempting to deprescribe these medications. Clinicians in our study noted that an additional challenge was that even when the hospitalisation was related to a fall or fracture, patients were often averse to placing the blame on the medication. A few prior studies have examined potential barriers around deprescribing in the hospital. Scott *et al* surveyed hospitalised older adults and their caregivers in two UK hospitals finding that 43.5% reported a desire to try stopping a medication. The authors found that patients who perceived that they did not have any unnecessary medications had no desire for dose reduction.[51] Jokanovic *et al* conducted a mixed-methods study for creating patient-facing and caregiver-facing educational materials focused on deprescribing benzodiazepines, antipsychotics, z-drugs and PPIs in the hospital.[18] They conducted semistructured interviews with patients, finding that patients had significant concerns about withdrawal. Health professionals liked having something to give caregivers, particularly when the patient had cognitive impairment or dementia, and appreciated having all of the information in one place. This mode of delivery is similar to a need we identified. However, health professionals brought up similar barriers as the findings in our study, including perceptions of cognitive overload and being strapped for time. This may point to the need for a multimodal intervention that targets numerous barriers.

The next steps of our study are to develop an interdisciplinary working group to further develop the multimodal intervention. In addition, we will identify patient and family stakeholders to help us design the best way to approach patients. We will then pilot-test the intervention in 1–2 hospital units to identify further barriers to implementation and to refine the modes of delivery. We will subsequently survey and/or interview stakeholders across the unit to determine if the implementation strategies we identified addressed barriers to deprescribing these medications. For example, we will develop questionnaires to determine whether nurses felt higher levels of self-efficacy in discussing benzodiazepine/z-drug safety with patients. As noted in the introduction, the success of this type of intervention will also rest on linkage to resources in the outpatient setting, as these medications may require tapering over weeks or months. Thus, future interventions leveraging the findings from this study are aimed at starting conversations about deprescribing in the hospital setting but they will require follow-up in the primary care setting. This type of 'reachable moment' intervention is similar to buprenorphine induction in the ED or in the hospital, which requires robust outpatient linkage and support.[52][53] Similarly, there will be an important requirement to connect with outpatient clinics to ensure appropriate follow-up.

Strengths of this study include the use of an existing frameworks (the COM-B model and the TDF) to identify and categorise the numerous barriers and facilitators to deprescribing behaviours in the hospital. Additionally, we interviewed providers across multiple roles, as they have different interactions with patients and thus might encounter different challenges. Limitations include the fact that our interviews were concentrated in one health system in Southern California, thus potentially making our findings less generalisable to other settings. For example, patient attitudes and beliefs about benzodiazepines and sedative-hypnotic medications might be varied in other regions of the USA or in other countries, particularly countries where direct-to-consumer medication advertising is not allowed or where prescribing cultures are different. However, other studies cited above point to similar barriers encountered in other countries, which strengthens our confidence in the generalisability of our findings. Furthermore, the health system where the interviews were conducted has a strong culture of supporting and prioritising pharmacists, with a robust transitions of care programme, and a well-staffed inpatient pharmacy team. This culture of strong pharmacy support may not exist in other health systems, impeding the implementation of similar interventions. However, the advantage of developing and testing interventions in this type of pharmacy-supportive environment is that they are more likely to succeed, therefore providing evidence that these interventions are indeed feasible given the right environment. As a result, organisations may be incentivised to support pharmacy programmes to see similar outcomes. Once the interventions are designed and refined,

adapting them to other settings and evaluating them will be critical. Another limitation is the small sample size, although other studies have found that thematic saturation is generally reached around 12 interviews.[54] Another limitation is the lack of patient and family stakeholder involvement. We are aiming to include patients and stakeholders in the next phase of our intervention design.

In conclusion, we found that while clinicians face multiple barriers to deprescribing psychoactive medications such as benzodiazepines and sedative-hypnotics in the hospital, there are potential implementation strategies that could encourage deprescribing behaviour change. These implementation strategies, which use theory-based implementation delivery modes such as action planning, using credible sources to deliver a message, and providing feedback on behaviour directly target capability-based, motivation-based and opportunity-based barriers which are currently impeding deprescribing. We designed potential behavioural change interventions such as creating a nursing seminar series; developing a risk stratification guideline for pharmacists, intervening in the highest-risk patients and tracking outcomes and distributing evidence-based educational materials in the hospital and in the patient portal. Increasing deprescribing of these high-risk medications has the potential to reduce falls, fractures, delirium and other adverse events among older adults, highlighting the importance of undertaking this work.

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