

RESEARCH ARTICLE

CLINICAL REASONING

Prescribing decision making by medical residents on night shifts: A qualitative study

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Funding information

Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health under Award Number P30AG064199 to BWH (Choudhry PI). Dr. Lauffenburger was supported by a career development grant (K01HL141538) from the NIH. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Abstract

Introduction: Prescribing of medications with well-known adverse effects, like anti-psychotics or benzodiazepines, during hospitalisation is extremely common despite guideline recommendations against their use. Barriers to optimal prescribing, including perceived pressure from allied health professionals and fatigue, may be particularly pronounced for less experienced medical residents, especially during night shifts when these medications are often prescribed. Under these circumstances, physicians may be more likely to use 'quick', often referred to as System 1 choices, rather than 'considered' System 2 strategies for decisions. Understanding how medical residents use, these different cognitive approaches could help develop interventions to improve prescribing.

Methods: To understand decision-making and contextual contributors that influence suboptimal prescribing during night coverage by medical residents, we conducted semi-structured qualitative interviews with residents in general medicine inpatient settings. The interviews elicited perspectives on shift routines, stressful situations, factors influencing prescribing decision making and hypothetical measures that could improve prescribing. Interviews were audio-recorded and transcribed. Data were analysed using codes developed by the team to generate themes using immersion/crystallisation approaches.

Results: We conducted interviews with 21 medical residents; 47% were female, 43% were White, and 43% were Asian. We identified five key themes: (i) time pressures affecting prescribing decisions, (ii) fears of judgement by senior physicians and peers and being responsible for patient outcomes, (iii) perceived pressure from nursing staff, amplified by nurses' greater experience, (iv) clinical acuity as a key factor influencing prescribing, and (v) strategies to improve communication between members of the care team, like ensuring adequate hand-off by day teams.

Conclusion: Medical residents highlighted numerous contextual factors that promote quick thinking rather than slower thinking when prescribing on night shifts,

particularly time constraints, perceived pressure and patient clinical acuity. Interventions aimed at reducing prescribing should address how to manage stress and perceived pressure in decision making.

1 | INTRODUCTION

Although there are many contributors to how providers make prescribing decisions, provider-level factors,^{1,2} such as clinical inertia, perceived pressure from nurses, patients and/or their caregivers, and a lack of familiarity with specific patients, are thought to be central.^{1,3} In less experienced physicians, especially medical residents, these factors may be particularly pronounced.^{4,5} Inadequate sleep and rest during night shifts that residents frequently work reduce levels of alertness,⁶ and higher levels of stress, common during residency training, are correlated with lower clinical performance.^{7,8}

These factors may influence prescribing by encouraging the use of mental shortcuts (i.e., System 1, or emotional, automatic thinking) rather than more rational decision making (i.e., System 2, or considered, logical thinking), described in behavioural economics.⁹⁻¹¹ High levels of System 1 thinking have been correlated with lower quality of care in other settings.^{1,4,12,13} Resident physicians could be particularly prone to System 1 thinking for decisions, particularly during night shifts when they are often the primary prescribers.

System 1 thinking may be particularly problematic for potentially inappropriate medications with well-known adverse effects, such as anti-psychotics, benzodiazepines and sedative hypnotics (e.g., zolpidem or eszopiclone), which continue to be widely used despite recommendations from numerous professional societies against their use.^{12,14} Despite clinical guidelines recommending non-pharmacologic or less risky pharmacologic alternatives, they are often prescribed on night shifts to efficiently handle agitation, delirium or sleep concerns.¹⁵⁻¹⁸ Unfortunately, suboptimal prescribing can lead to an increased risk of poor clinical outcomes, such as falls, particularly in older adults.^{13,19,20} We believed that some of suboptimal prescribing could be related to how physicians, particularly medical residents, make decisions during times of stress. We were particularly interested in this question due to overprescribing of these medications we observed during night shifts at our own institution as clinicians, in addition to the known elevated prevalence of prescribing nationwide shown in literature. We believed that understanding factors influencing decision making and prescribing by residents would help elucidate local and global solutions to overprescribing.

However, this type of thinking has not been specifically evaluated in the context of prescribing, especially by medical residents. Understanding the importance of System 1 thinking (or the circumstances in which System 1 thinking occurs) will help us design solutions that encourage more considered thinking by clinicians and shift to System 2 as a strategy. For example, interventions to promote System 2 thinking have been used in analogous areas, such as role-playing or simulation-based education, and are shown to be effective in encouraging System 2 thinking.^{4,21-26}

Therefore, to understand prescribing decision-making and contextual contributors that influence prescribing, particularly of potentially inappropriate medications, during night coverage, we conducted in-depth, semi-structured qualitative interviews with medical residents in general medicine inpatient settings.

2 | METHODS

We followed established standards for qualitative research (i.e., Consolidated Criteria for Reporting Qualitative Research [COREQ]) to ensure conformity.²⁷⁻²⁹ The Mass General Brigham (MGB) Institutional Review Board approved this study; participants provided verbal informed consent.

2.1 | Study participants/recruitment

Participants were recruited from Brigham and Women's Hospital (BWH) and Massachusetts General Hospital (MGH), part of the MGB healthcare system in Boston, MA, USA. While the composition and timing of night shifts differ, medical residents at BWH and MGH are typically on their own or with one other resident, with the number of covered patients ranging between 15 and 30. The length of night shifts also varies, with typical assignments a minimum of 2 days, up to 2 weeks. Using purposeful sampling, we identified medical residents (i.e., interns and second and third year residents) who previously had ≥ 1 night rotation on a general medicine unit from a resident roster. Every eligible resident was contacted over email for participation and received the opportunity to be interviewed; we continued follow-up until we reached saturation. All participants were offered \$75.

Although the primary focus was on resident decision making, we also interviewed four pharmacists and nurses to capture a fuller picture particularly for strategies regarding communication. We identified these individuals by contacting nurse and pharmacy managers of inpatient operations for a list of those who practice regularly on general medicine night shifts.

2.2 | Qualitative interviews

To elicit personal accounts and generate a deeper understanding of contributors to decisional conflict, we used semi-structured one-on-one qualitative interviews. The lead author, with experience in qualitative methods and inpatient pharmacy, first drafted a comprehensive semi-structured interview guide and circulated it for iterative

refinement from other coinvestigators with expertise in internal medicine, qualitative methods, behavioural science and geriatrics.

The interview guide (Table S1) was organised around separate but overlapping topics, including (1) night shift routines, pace of the shifts and situations that lead to increased stress, (2) factors they feel negatively impact their prescribing of potentially inappropriate medications, (3) the decision-making process behind prescribing for agitation, delirium and insomnia, and (4) hypothetical measures that could reduce suboptimal prescribing. These topics were drawn from extensive discussions within the investigative team, which consists of numerous medical educators and clinical trainees, based on our impressions of relevant factors. Some of these topics, such as the roles of workplace stress, regret aversion and social norms (e.g., peer pressure), also originated from behavioural sciences literature.^{3,30,31} Questions also touched on communication and relationships with allied staff during prescribing, given their key relationship with residents during night shifts. A few questions (i.e., How familiar are you with current prescribing guidelines? How often do people physically evaluate a patient before prescribing? How has COVID affected your routine?), were added after the guide was pilot-tested with a non-participant physician volunteer. The guide was then finalised after additional input from the multidisciplinary team. This semi-structured guide was followed for each interview, with some modification depending on answers.

Due to restrictions of the COVID-19 pandemic, interviews were conducted virtually using the Zoom video platform and audio-recorded. All interviews were conducted by a trained moderator/practicing pharmacist (JCL) in English. Several strategies were used to minimise any misperceptions about the interview, including the interviewer wearing non-clinical outfits and emphasising the interviewer's primary research role. The interviewer also had no prior or ongoing face-to-face encounters with any of the residents or nurses nor was involved in the residency or evaluations. The interviewer had previously some minimal interaction with the pharmacists. At the interview conclusion, participants were also asked demographic questions on race/ethnicity, gender and year of training; on the basis of the prior literature, we hypothesised that there could be important nuances in how medical residents make prescribing decisions via these factors.^{2,32,33} We used peer debriefing with the study team after the first five interviews to confirm the topics in the interview guide.

A sequential identification number was assigned to each interview, with physicians (P), pharmacists (RPh) and nurses (RN) denoted separately. We continued conducting interviews until saturation was reached for physicians, defined by no new themes emerging.³⁴

2.3 | Analyses

Interviews were transcribed verbatim, with transcripts checked for accuracy against recordings. Two investigators (manuscript first and second authors), with training in qualitative methods, annotated a selection of transcripts independently and devised preliminary codes;

after discussion, preliminary codes were revised and agreed upon. We used the immersion/crystallisation method for data analysis, as it is less inductive than other approaches given some prior knowledge about prescribing factors.^{35,36} In brief, these two investigators immersed ourselves in collected data and identified salient themes during the crystallisation process. We continued these cycles of concentrated review until all data were examined and identified meaningful patterns. All transcripts were then re-read as we constructed additional themes. Representative quotations were chosen to illustrate themes, with statements by participants shown in italics.

Dedoose software version 8.3.47b (Los Angeles, CA: SocioCultural Research Consultants, LLC) was used for storage, handling and analysing the dataset.

3 | RESULTS

We conducted interviews with 21 medical residents (Table 1): 10 (47%) were female, nine (43%) were White, and nine (43%) were

TABLE 1 Characteristics of participants

Clinical role	N = 25
Clinical role	
Medical resident	21
Nurse	2
Pharmacist	2
Medical resident characteristics	N = 21
Year of training	
Intern (1st year)	7
2nd year	9
3rd year	5
Gender (self-reported)	
Male	11
Female	10
Race/ethnicity (self-reported)	
White	9
Asian	9
Black	1
Hispanic/Latino	1
Multiracial	1
Allied professional characteristics (nurses and pharmacists)	N = 4
Years of experience	
5–10 years	2
11–15 years	2
Gender (self-reported)	
Female	4
Race/ethnicity (self-reported)	
White	3
Black	1

TABLE 2 Participants by clinical role and gender

Participant identifier	Clinical role	Gender
P1	Resident (2nd year)	Male
P2	Resident (1st year/intern)	Male
RPh1	Pharmacist	Female
RPh2	Pharmacist	Female
P3	Resident (3rd year)	Female
P4	Resident (2nd year)	Male
P5	Resident (3rd year)	Female
P6	Resident (1st year/intern)	Female
P7	Resident (3rd year)	Male
P8	Resident (2nd year)	Male
P9	Resident (3rd year)	Male
P10	Resident (1st year/intern)	Female
P11	Resident (1st year/intern)	Female
RN1	Nurse	Female
P12	Resident (2nd year)	Male
P13	Resident (3rd year)	Male
P14	Resident (2nd year)	Female
P15	Resident (1st year/intern)	Female
P16	Resident (1st year/intern)	Female
P17	Resident (2nd year)	Male
P18	Resident (2nd year)	Male
RN2	Nurse	Female
P19	Resident (2nd year)	Female
P20	Resident (1st year/intern)	Male
P21	Resident (2nd year)	Female

Asian; 3 (14%) were of another race/ethnicity. We also interviewed two nurses and two pharmacists as supporting interviews. An individual breakdown by participant identifiers, clinical roles and gender is shown in Table 2. Each interview lasted 30–60 min (mean: 44 min). We reached saturation by Physician 20 and reaffirmed it in the subsequent interview that was already scheduled; thus, a total of 21 physicians were interviewed. Recruitment and interviewing occurred between October and December 2020.

Topics that residents spoke of in most detail included: specific stressful patient experiences, challenges associated with prescribing for agitation/delirium/insomnia, and challenges in communication with nurses and patients. They highlighted numerous competing pressures when making prescribing decisions on these shifts, with several being particularly clear: (a) time pressure/limited time to problem solve, (b) fear of prescribing incorrectly, (c) pressure from nurses and (d) pressure regarding certain patients.

We identified five themes related to contextual contributors to prescribing of potentially inappropriate medications with a focus on night coverage, summarised in Table 3. We present each in detail below including representative quotations from participants.

TABLE 3 Summary of key themes

Theme	Key takeaways
Time pressures in prescribing decisions, especially when caring for many patients simultaneously	<ul style="list-style-type: none"> Poor hand-off/transitions, high-acuity patients, and new admissions are highly distracting and create immense time pressures. Strong reported need to quickly problem solve.
Fears of judgement by senior physicians and peers and being responsible for adverse patient outcomes	<ul style="list-style-type: none"> Strong inclination to reduce friction with day team that is primarily responsible for patient. Prescribing is driven by fear of making patients conditions worse and feeling responsible.
Perceived pressure from nursing staff, amplified by the nurses greater experience	<ul style="list-style-type: none"> Decision making is less likely to be questioned and pressure is less strong with increasing seniority of the medical resident. Medical residents noted some gender biases in the likelihood of feeling pressure in prescribing.
Clinical acuity as a key factor influencing prescribing	<ul style="list-style-type: none"> Patient acuity described as the main concern when considering prescribing. Any prior exposure to potentially-inappropriate medication increases likelihood of prescribing.
Strategies to improve Thank you. Communication between members of the care team	<ul style="list-style-type: none"> Ensuring an adequate pass-off process from the day medical team would improve communication. Individual telephone systems would be less challenging to communicate about treatment plans directly with nurses.

3.1 | Time pressures affecting prescribing decisions, especially when caring for many patients simultaneously

Time pressures appear to be the largest contributor to gaps between what medical residents know is best to prescribe versus what is actually prescribed. Several specific factors that limit their time to adequately care for patients were frequently mentioned by residents, including the high clinical acuity of medical inpatients with agitation, delirium or insomnia and the need to simultaneously care for them while admitting new patients.

P2: Triaging is what is dangerous. It's pretty difficult on call—my own primary responsibility is also to care for the new admissions that I'm getting. It's busy enough with admissions, but if somebody gets sick, requires a

rapid response or something, things fall through the cracks.

P9: If I have a lot of new admissions, it can be pretty stressful because you feel like sometimes you pay less attention to established patients already on the floor. The level of stress is dependent on, for me at least, how many new patients I'm admitting that night because that tends to take a considerable amount of my time.

Consequently, the residents reported a strong urgency to rely on mental shortcuts to quickly problem solve, with less time spent on deliberating the most optimal prescribing decision. Common mental shortcuts seemed to be those that helped residents judge the likelihood of events occurring to different types of patients.

P7: If it is a slow shift, then I'm less likely to push medication, because it's possible to reassess someone more frequently and provide verbal redirection. If there's three other people who are actively decompensating, even though it's not ideal, it sometimes is just easier to put out a fire very quickly to focus on more acute issues.

P14: It is stressful, and it's difficult to explain it in the morning when things have calmed down. You're like, "Well, it was 2:00 in the morning and everything was on fire." I did not have time to really take the time to try and calm the patient down by myself. We needed something that was fast, that would work quickly.

Inadequate hand-offs or transitions also occur in the care of patients from the day team to the night resident. This was thought to further exacerbate suboptimal prescribing, particularly when the residents lack familiarity with the patients they are actually covering. This further contributes to the time pressure felt by residents when treating patients with agitation, delirium or insomnia.

P3: The ones that I felt like were the trickiest were ones you are cross-covering for day teams. They just gave you a quick pass-off. I always felt like there were five or six patients I'm like, "I hope they do not ask me a question about them", especially when I was a first-year.

P6: Some patients may have problems that you are not aware of, or they may just develop entirely new problems, and then it's stressful dealing with that because you do not know as much about their background.

P9: I feel a lot of stress about patients I do not know. A lot of the stress comes from your mind. You're being

pulled in a million different directions by nurses, patients, family members, plus stress that you really do not know the patients that well.

3.2 | Fears of judgement by senior physicians and peers and being responsible for adverse patient outcomes

Residents referenced that their prescribing decisions were often driven by what was considered acceptable by their attending physicians. They expressed a particularly strong desire to reduce friction with the day team primarily responsible for the patient and who provide feedback the next morning. Unlike when residents are in situations where they are more autonomous, fears of potential friction seemed to help to move residents away from System 1 thinking and towards slower thinking and less suboptimal prescribing.

P7: If I give a patient, for example, a benzo overnight, the team in the morning may be very sceptical, like why did you do that. Or they may kinda gripe that now they are stuck with having to either continue that or tell the patient why they are not gonna do that.

P17: Once junior residents start getting more comfortable, that really changes prescribing behaviour quite a bit. It really shapes how you think about those situations when you focus on what feedback I'm gonna get in the morning about what I've done.

This fear seemed to extend to how they view guidelines. For example, residents reported some awareness of national clinical guidelines but instead indicated that they prescribe based on what they have seen prescribed before for similar patients.

P1: It's always helpful to know the guidelines, but sometimes there are scenarios where it's just hard to apply them.

P8: There's streamlining based on what we learn from our residents and our residents learn from their residents. Some things standardise themselves just by the way people are taught. Not in the sense that someone's referencing a guideline, but in that this is how you have been told to do it and how they have been told to do it.

Prescribing decisions also appear to be strongly driven from a fear of adverse outcomes. Residents spoke about the responsibility and residual emotional consequences from making prescription errors, such as guilt, shame and inadequacy.

P11: I know that there is a black box warning on antipsychotics. They scare me a little, but at the same time, I often am asked to use them. A lot of this is old hat to a lot of the senior [residents], so they might not even realise it is hard deciding what to do.

P15: I worry that I'm causing harm. I just feel guilty every time I prescribe it. If they were my grandmother or grandfather, I do not want them to get that.

P17: Am I gonna have decided something was very serious and they are [day team] gonna think, oh, that wasn't a big deal at all? Or what is the scarier situation—you decide something's not serious and you do not need to intervene, but then you find out in the morning that it actually was very serious, and you should have intervened.

3.3 | Perceived pressure from nursing staff, amplified by the nurses' greater experience

Residents described substantial pressure at times to prescribe medications from nurses caring for patients. They were frequently conflicted about the high degree of knowledge that nurses have about specific patients and nurses' relatively greater experience with medications they were asking to be prescribed. In general, residents felt that their decision making about prescribing was less likely to be questioned with their increasing seniority over time.

P4: It's pretty common to get paged asking can this patient get antipsychotics? In some sense the day team also does not want to do these things, 'cause they want to optimise care. Then sometimes I feel like they [nurses] try to take advantage of the fact that we are just there overnight and just trying to put out the fires.

P5: I have a lot of respect for the fact that the nurses have to be there more than I do, but there are sometimes where it's just like, "Oh, let us just try this. Can we try this?" At least once a night you get paged about some sort of pharmacologic, whether it be benzos or antipsychotic meds.

P8: There have definitely been times where I felt like a situation would settle out if we just waited. Just try to redirect the patient a little more. I've really been pressed to order something.

P9: As an intern, you kind of just do whatever the nurses tell you to do. Now, I recognise that these meds could be dangerous. Now that I have more of a position of authority, I feel more comfortable telling nurses,

"No, we are not doing that. Put a sitter, or we are just gonna let them yell out, or try and reorient them." As an intern, you get a lot of pressure, and you usually just cave into usually what the nurses want.

Female medical residents also noted that they felt some gender biases in the likelihood of feeling pressure about prescribing potentially inappropriate medications from nurses and patients that they felt male colleagues did not experience.

P14: Sometimes I think it is necessary to have a taller male white coat older gentleman. As frustrating as that is, and of course I feel like I could do just as well of a job, in that moment, it's not what's going to calm the patient down in their delirious state. I do not take it personally, but that's who they'll listen to at 3:00 at night.

P15: "I feel I experience more gender bias from nursing than patients. I had this whole talk the other day with a close friend who's also an intern who's male. He's like, "Oh yeah, I rarely get questioned." Like, hmm, I get questioned all the time. I then talked to attendings and senior residents. They're like, "Welcome to being a woman in medicine."

3.4 | Clinical acuity as a key factor influencing prescribing

Residents described several factors that increased their likelihood of prescribing potentially inappropriate medications, such as how sick the patient is, level of physical functioning (i.e., not appearing frail), or if the patient was extremely disruptive. Extra high-acuity patients can also have spillover effects on prescribing for other patients, both in terms of the time they require and mental energy expended. Of note, in patients with fewer comorbidities or deemed less frail, age alone was not always a factor residents used to make prescribing decisions.

P3: "When you are admitting five patients or you have other really sick patients about to go to the ICU, you cannot always get to the other room the nurse is concerned about, because you have to internally triage. I think those are times, where it's easier to have a lower threshold to give medications that previously we are told to maybe try not to."

P12: There are patients in their '50s, but they just feel very elderly or frail. There's patients that are very sharp in their upper '60s, but they seem very sharp. I move them up or down from a neuro-psych perspective in their prescribing need.

P21: Sometimes the patient's screaming, and they [nurses] do not feel comfortable with that, even though they are not a threat to themselves. They're not a threat to other people. They're not getting up and falling. They're just not comfortable with the patient who screams.

Thresholds for potentially appropriate prescribing are also substantially lower if patients have had any prior exposure to the medication, even if that exposure was inappropriate.

P1: The times where I've been pushed to prescribing benzos would be like really difficult patients who are repeat patients.

RPh2: That [prior use] also might be another justification for why—even if you notice that it might not be the best care, why people feel like it's okay to continue.

P10: It is very hard when that PRN has been written before.

Precautions and barriers related to the COVID-19 pandemic were also repeatedly described, as they limited the ability to assess situations quickly and directly.

P3: We saw patients less in the setting of COVID because we did not want to expose them if we were asymptomatic carriers, or we did not want to get exposed. Whether they had COVID or not, it became less of a culture to go see patients.

RN1: COVID has affected things greatly. Especially when patients are a safety risk, we really are just looking for meds to change those behaviours. We cannot keep the doors open based on precautions. Providers, it takes longer just to get in the room. We're making decisions that ordinarily we would try to avoid.

3.5 | Strategies to improve communication between members of the care team

Reducing structural barriers to communicating effectively with floor nurses and the day team were suggested as major ways to improve prescribing. Related to nursing, these included reducing the distribution of patients across floors and improving messaging systems to directly reach nurses rather than through unit-based phone lines. Pharmacists were less frequently mentioned as an issue given access to a paging system. The nurses and pharmacists also endorsed these strategies as ways to improve communication.

P15: “If I can just talk to people, it's so much easier than having to get paged, call a number, get to a person. Then to wait on hold to finally get through to somebody. That, from start to finish, can take upwards of 10 minutes just to say, ‘Yes, it's okay to give Tylenol,’ which if I got three admissions, that's really taxing.”

RN2: Because the patients residents care for are spread throughout the hospital, they could be in one building doing admissions and we are paging them to come to another for an elderly patient who might be having delirium. The response time is longer.

Adequate hand-off from the day physician team was also described as something that was critically important for improving communication and therefore reducing suboptimal prescribing at night. Residents felt that a more thorough hand-off would also aid in reducing time pressures.

P9: What would be nice, ideally, is if the day team who knows the patient put in PRN medications to avoid someone who does not know the patient randomly picking one. The vast majority of the time, there are no PRN medications written for the patient. If there is, it's melatonin or something, which nurses aren't happy with as a sleep aid.

P19: It's always massively helpful when the day team tries to leave contingencies and because that means they have already thought about, “Yes, Haldol would be the best medication for this patient.” It's helpful if they even suggest a dose. Then, all I have to do is eyeball their EKG, and I can more comfortably prescribe it.

4 | DISCUSSION

In this qualitative study, medical residents highlighted numerous contextual contributors to decision making and prescribing choices for potentially inappropriate medications, such as anti-psychotics, benzodiazepines and sedative hypnotics, on night shifts. The most notable were time pressures leading to stress, perceived pressure from nurses, fears of making incorrect choices for patients or potential for criticism from the day team, which all influenced their thinking and how they made decisions. In some cases, patient clinical acuity and perceived gender bias exacerbated gaps between what residents knew to do versus what they actually did.

Prior research in other contexts has identified similar themes. A study of 31 new physicians in the United Kingdom identified the same types of feelings as reported by our study participants of uncertainty and responsibility for patients and pressure from others in the

healthcare team that increase stress.³⁷ Another interview study with 20 junior physicians in England similarly elucidated the impact of inherited decisions made by others on decision making.³⁸ A 2021 ethnographic study in Denmark identified similar themes of time management and seeking out the ‘quick fix’.³⁰ Among 15 residents in Australia, issues of frequent interruptions and time pressures were pronounced.³⁹

Our results suggest that medical residents often lean on System 1 (i.e., automatic) more than System 2 (i.e., considered) thinking, which may be contributing to suboptimal prescribing.¹⁰ The types of specific mental shortcuts that residents seem to use are those based on availability heuristics or those who help individuals assess how likely an event is to occur.⁴⁰ When considering specific patient-level factors that seem to promote System 1 thinking in our study, new patient admissions, patients they are cross-covering and patients with high clinical acuity were central. These not only created time pressures but were distractions that reduced their ability to think sufficiently about issues of agitation, delirium and insomnia specifically, whether in that specific patient or as spillover effects from other patients. The time of night and alertness were also noted as something that reduced clear thinking and enhanced time pressures in these scenarios.

Of the interpersonal factors that seem to be key in promoting System 1 thinking, perceived pressure from nurses was described most frequently. Conversely, fear of judgement from the day team or peers and a strong desire to prevent guilt often hindered System 1 thinking about prescribing. However, there was some recognition that prior receipt of one of these medications, particularly the prescription when written by other providers, encouraged continued prescribing.

Other structural factors also seem to promote System 1 thinking, such as distribution of patients across floors and limited access to nurses. Similar issues common to night shifts, such as higher volume of patients, also created time pressures that in turn enhanced System 1 thinking. Conversely, supporting actions, such as clear patient hand-offs and lines of communication with nurses and pharmacists, also seemed to encourage System 2 thinking. Addressing these types of upstream factors that promote System 1 thinking may also be necessary to reduce suboptimal prescribing.

These findings have important implications for clinicians, researchers and designing medical education interventions. First, addressing system barriers such as poor pass-offs and fractured communication between allied staff appears critical. Second, identifying ways to alleviate time pressures, by staggering transition periods may help. Third, prior interventions to reduce the use of potentially inappropriate medications may only have been modestly successful because they have typically focused only on educating physicians, particularly medical residents, when actively in slower thinking states (e.g., seminars or online training).^{41,42} Unfortunately, they may not have adequately prepared physicians for how to think during more stressful situations, which may be even more important for individuals earlier in their careers. Because fixing structural factors that promote System 1 thinking is complex and time-intensive,

interventions that promote considered thinking may have a more immediate impact.

Accordingly, prescribing interventions, particularly for medical residents, may need to be designed so that they promote considered thinking, by explicitly promoting stress management prior to and during night shifts and how to communicate effectively through perceived pressure. Some solutions particularly relevant for medical residents may be using medical simulation or interpersonal communication training.^{43,44} Moreover, interventions may also need to be individually tailored to increase their potency, such as for women, as the role of gender bias in medicine is increasingly being understood.^{45,46}

Several limitations should be acknowledged. We expect no major impacts on data dependability, but we conducted this study in academic medical centres. Interviews were also conducted by someone part of the medical system; although medical residents have had no face-to-face clinical interactions with the interviewer and the interviewer is not a physician with any authority over participants, some response bias may be possible. Interviews were conducted during the COVID-19 pandemic, which could impact transferability. Because the focus was on resident physicians, we did not interview a wide variety of nurses or pharmacists, or attending physicians, which could have reduced the breadth of findings or ability to discern whether these issues are specific to residents. The sample size also did not permit evaluating specific differences by year of residency.

5 | CONCLUSION

Medical residents often rely on mental shortcuts when prescribing potentially inappropriate medications, especially when they feel they need to make a decision immediately—known from behavioural economics evidence as System 1 automatic thinking versus more considered System 2 thinking. Numerous contextual contributors promoted quick versus considered thinking on night shifts, particularly time pressures, perceived nursing pressure, and stress from new or high-acuity patients. Medical education interventions aimed at reducing suboptimal prescribing should draw from the science of how to promote more considered choices to address managing stress and perceived pressure in decision making.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

Dr. Niteesh K. Choudhry is a consultant to and holds equity in RxAnte, unrelated to this work. He receives grant funding, payable to his institution, from Boehringer Ingelheim and Humana, also unrelated to the current work. The other authors report no conflicts.

ETHICS STATEMENT

The Mass General Brigham (MGB) Institutional Review Board approved this study.

AUTHOR CONTRIBUTIONS

Julie Lauffenburger conceived the work, acquired the data, interpreted the data, drafted the work, approved the final version, and agrees to be accountable for the work. Maxwell Coll analysed and interpreted the data, revised the manuscript critically for important intellectual content, approved the final version and agreed to be accountable for the work. Erin Kim acquired the data, revised the manuscript critically for important intellectual content, approved the final version and agreed to be accountable for the work. Ted Robertson conceived the study and interpreted the data, revised the manuscript critically for important intellectual content, approved the final version and agreed to be accountable for the work. Rebecca Oran conceived the study and interpreted the data, revised the manuscript critically for important intellectual content, approved the final version and agreed to be accountable for the work. Nancy Haff interpreted the data, revised the manuscript critically for important intellectual content, approved the final version, and agrees to be accountable for the work. Kaitlin Hanken interpreted the data, revised the manuscript critically for important intellectual content, approved the final version, and agrees to be accountable for the work. Jerry Avorn conceived the study and interpreted the data, revised the manuscript critically for important intellectual content, approved the final version, and agrees to be accountable for the work. Niteesh Choudhry conceived the study, interpreted the data, revised the manuscript critically for important intellectual content, approved the final version and agreed to be accountable for the work.

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How to cite this article: Lauffenburger JC, Coll MD, Kim E, et al. Prescribing decision making by medical residents on night shifts: A qualitative study. *Med Educ*. 2022;56(10):1032-1041. doi:[10.1111/medu.14845](https://doi.org/10.1111/medu.14845)