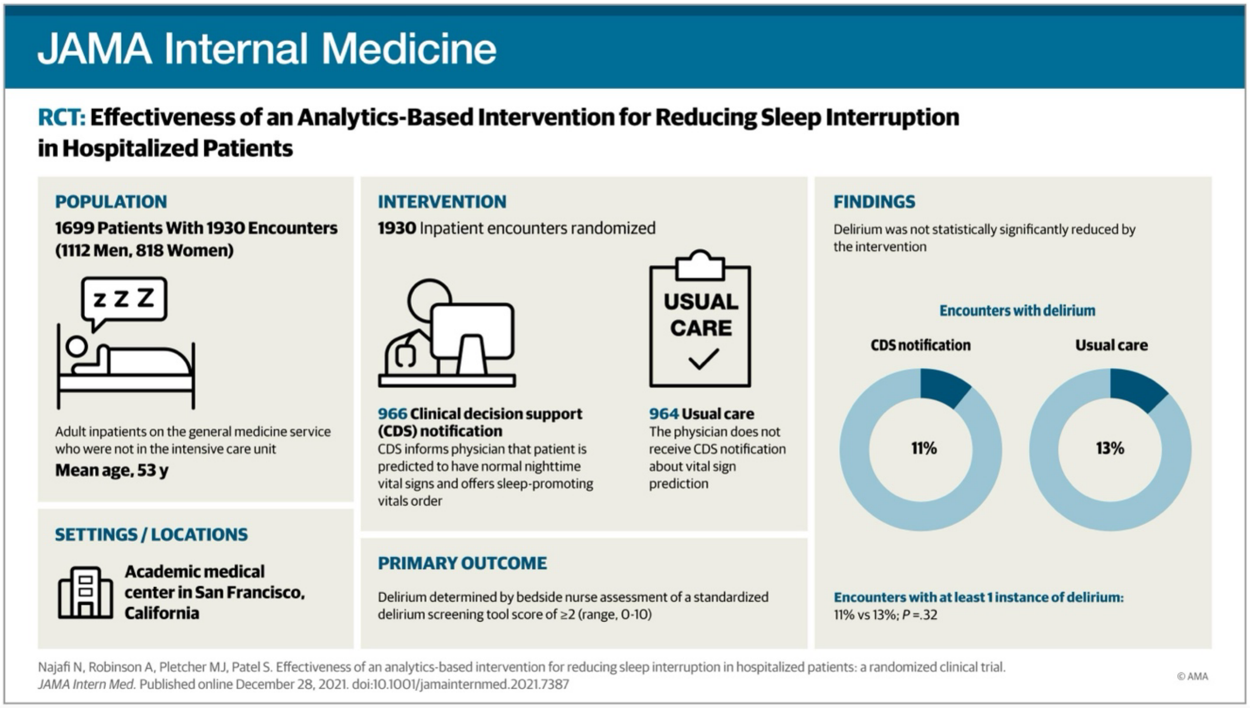
Published literature consistently documents that sleep disruption caused by vital sign measurements during hospitalization is associated with a range of harmful effects, including impaired cognitive function, increased risk of delirium, metabolic dysregulation, cardiovascular dysfunction, and negative impacts on recovery.

Multiple studies have identified overnight vital sign checks as a leading modifiable cause of sleep interruption in both general medical and ICU settings, with patients frequently reporting these checks as a primary source of poor sleep quality and dissatisfaction with care.[1-2]

The Society of Anesthesia and Sleep Medicine explicitly states that insufficient sleep during hospitalization—often due to operational interruptions such as vital sign checks—can acutely impair cognition, increase pain perception, elevate blood pressure, worsen insulin resistance, and increase infection risk, all of which are counterproductive to recovery.[3-4] The Society of Critical Care Medicine also recognizes healthcare-related interruptions, including vital sign monitoring, as significant contributors to sleep disruption and its sequelae in the ICU.[5]

Randomized clinical trials have demonstrated that reducing unnecessary overnight vital sign checks in clinically stable patients can safely decrease sleep interruptions without increasing adverse events, though the direct impact on delirium incidence may be limited.[6-8] Survey and observational data further confirm that patients who experience fewer nighttime disruptions report improved sleep duration and quality, which are linked to better overall outcomes.[7][8]

The following visual abstract summarizes the findings of a randomized clinical trial evaluating an intervention to reduce sleep interruptions from vital sign checks, highlighting the relationship between reduced disruptions and patient safety:



Visual Abstract 1. Visual abstract for "Effectiveness of an Analytics-Based Intervention for Reducing Sleep Interruption in Hospitalized Patients: A Randomized Clinical Trial"
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Interventions Shown to Reduce Sleep Disruption from Routine Vital Sign Checks:

Background: Harmful Effects of Sleep Disruption from Vital Sign Checks
Routine vital sign checks, especially overnight, are a leading cause of sleep disruption in hospitalized patients. This disruption is associated with impaired cognitive function, increased risk of delirium, metabolic and cardiovascular dysfunction, and overall patient dissatisfaction. Sleep fragmentation is highly prevalent in both general medical and ICU settings, and is linked to delayed recovery, increased sedative-hypnotic use, and poorer patient outcomes.[1-4]

Interventions to Reduce Sleep Disruption from Vital Sign Measurements
A range of interventions have been studied to reduce sleep disruption from routine vital sign measurements:

- **Nonpharmacologic sleep hygiene protocols and environmental modifications**: These include instituting quiet times, reducing noise and light, clustering care activities, and adjusting the timing of monitoring and medication administration to minimize nocturnal interruptions.[2-5]
- **Restructuring clinical workflow**: Postponing or eliminating overnight vital sign checks and early morning medication administration has been shown to increase total sleep time and reduce patient-reported sleep disruptions. For example, shifting blood pressure checks and injections from early morning to later hours significantly reduced the frequency of sleep interruptions.[5-7]
- **Clinical decision support (CDS) tools and predictive algorithms**: These tools identify low-risk patients for whom overnight vital sign checks can be safely omitted, allowing for individualized reduction in monitoring frequency without compromising safety.[1]
- **Multicomponent sleep promotion bundles**: These combine staff education, environmental modifications, sleep aids (such as earplugs and eye masks), and evening sleep rounds. Such bundles are guideline-recommended by the American Thoracic Society for ICU patients and have been shown to improve sleep quality.[2][5][7]

Effectiveness of Interventions in Minimizing Harmful Effects
These interventions have demonstrated effectiveness in reducing sleep interruptions, improving sleep quality and duration, and decreasing sedative-hypnotic use without increasing adverse events.[1][4-7]For example, a multicomponent sleep-enhancing protocol led to significantly better patient-reported sleep quality (as measured by the Richards-Campbell Sleep Questionnaire), though effects on delirium and mortality were not statistically significant.[7] Restructuring workflow to reduce overnight vital sign checks and medication administration resulted in fewer patients reporting sleep disruptions and improved sleep satisfaction.[6] Nonpharmacologic sleep hygiene protocols have also been associated with reduced sedative-hypnotic initiation.[4] However, improvements in objective sleep quantity and long-term clinical outcomes such as delirium incidence and mortality are less consistently observed, and adherence to interventions can be variable.[5][7]

The following table summarizes studies evaluating interventions to reduce sedative-hypnotic use among inpatients, many of which include sleep hygiene protocols that modify vital sign measurement schedules and other nocturnal care activities. This table illustrates the types of interventions implemented, their outcomes, and the impact on sedative use and sleep quality.

Table. Studies Evaluating Interventions to Reduce Sedative-Hypnotic Use Among Inpatients

Source	Design	Setting	Intervention	Results
Nonpharmacologic Sleep Hygiene				
Bartick et al,[27] 2010	Prospective pre-post study; preintervention period: 4 mo (n = 161); postintervention period: 4 mo (n = 106)	UK community teaching hospital	Implemented the "Somerville Protocol": 8-h quiet (no vital signs taken except patients on telemetry; avoided routine medication administration; noise reduced; lights off; sound meters to alert staff of high noise levels); physician and nurse champions emailed intervention details to staff	Decrease in as-needed sedative use: before implementation, 37.1% vs after implementation 16% (95% CI, 0.056-0.26) for all patients; before implementation, 38.2% vs after implementation, 14.6% (95% CI, 0.084-0.39) for patients age ≥65 y; modified Verran-Snyder-Halpern sleep scores unchanged
Chung et al,[28] 2018	Prospective pre-post study; preintervention period: 1 y (n = 118 475); postintervention period: 1 y (n = 120 973)	Single-center hospital in Korea	Implemented the "i-Sleep" program: educated physicians and nurses, provided lectures by sleep specialist; patients received inpatient guidebook and video clips; nonpharmacologic sleep hygiene promotion	Decrease in proportion of inpatients taking sedative-hypnotics on admission who were discharged with a prescription for sedative-hypnotics: before implementation, 57.0% vs after implementation, 46.8% (RR, 0.82; 95% CI, 0.79-0.86); no change in new sedative-hypnotic prescriptions while in the hospital: before implementation, 1.97% vs after implementation, 2.00% (RR, 1.01; 95% CI, 0.96-1.07)
McDowell et al,[29] 1998	Prospective pre-post study; preintervention period: 3 mo (n = 94 patients); postintervention period: 9 mo (n = 111 patients)	General medical unit in teaching hospital	Nonpharmacologic sleep protocol (back rubs, warm drinks, and relaxation tapes administered by nursing personnel to patients with difficulty initiating sleep or who requested a sedative-hypnotic); after 1 h, sedative-hypnotic administered if the patient still requested it	Decrease in use of at least 1 sedative-hypnotic: before implementation, 54% vs after implementation, 31% ($P < .002$); overall adherence to any aspect of the protocol, 74%; adherence to all aspects of the protocol, 9%; quality of sleep from questionnaire: sedative-hypnotic use, $r = 0.07$; $P = .45$; non-sedative-hypnotic use, $r = 0.74$; $P = .001$; long-term sedative-hypnotic users 1.6 times more likely to refuse sleep protocol than nonusers (64% vs 41%; $P < .05$) and received sedative-hypnotics 4.5 times more often than nonusers (67% vs 15%; $P = .001$)
Lareau et al,[30] 2008	Unblinded randomized clinical study (n = 59)	Single Michigan academic medical center	Educate staff and nurses on sleep hygiene; minimize noise and interruptions overnight; nursing checklist on nonpharmacologic strategies to promote sleep	No difference between intervention and control groups in sleep hours, number of awakenings and RCSQ scores; mean number of sedative-hypnotics administered for insomnia was 1.55 in intervention group compared with 2.20 in the control group ($P < .05$)
Pharmacist-Enabled Medication Review				
Browne et al,[31] 2014	Pre-post study (n = 50 nonacute inpatients)	Academic medical center in Ireland	Pharmacist review of medications in patients at risk of falls to identify and reduce use of medications associated with falls; pharmacist recommendations implemented at the discretion of treating physician; if no change, reminder at 1 wk	31/50 patients had at least 1 recommendation for a change in fall-risk medication; 20.1% of fall-risk medications were thought suitable for change or elimination; 80% of these came from 4 classes: antiemetics, opioid analgesics, sedative-hypnotics, and anticholinergic agents acting on the bladder; 6/30 sedative-hypnotics were thought appropriate for reduction; 70.8% of pharmacists' recommendations were implemented; pharmacist time averaged 23.5 min per patient
Nishtala et al,[32] 2009 (n = 500)	Retrospective cohort study; duration: 8 mo	Adults in 62 aged-care homes in Australia	Pharmacist completes medication review to identify sedative-hypnotics or anticholinergic medications and make recommendations to physicians to reduce Drug Burden Index	Decrease in median Drug Burden Index score: before implementation, 0.5; after implementation, 0.33 (95% CI, 0-0.67; $P < .001$); mean DBI score decreased 0.07 (95% CI, 0.05-0.08)
Crotty et al,[33] 2004	Cluster-randomized clinical trial (n = 154)	10 Australian long-term care facilities; preintervention: NA baseline data collection	Residents with medication problems and/or challenging behaviors were selected for case conferences by residential care staff; 2 multidisciplinary case conferences involving the primary care physician, geriatrician, pharmacists, and residential care staff were held for each resident; reviewed medication and dementia-related behaviors	Improvement in Medication Appropriateness Index: mean change in intervention group compared with controls, 4.1 (95% CI, 2.1-6.1) vs 0.4 (95% CI, −0.4 to −1.2); $P < .001$; improvement in Medication Appropriateness Index for benzodiazepines: mean change in intervention group, 0.73 (95% CI, 0.16-1.30) vs mean change in control group, −0.38 (95% CI, −1.02 to 0.27); $P = .02$; resident behaviors were unchanged after the intervention
Avorn et al,[34] 1992	Cluster-randomized trial; duration: 30-d postintervention, preintervention (n = 823), postintervention long-term care (n = 678)	Long-term care residents	Comprehensive educational outreach program in 6 nursing homes randomly assigned to the experimental group, and not to the 6 nursing homes in the control group; 6 topical summaries of the literature, "visually engaging" in the style of drug advertisements; 3 mailings to physicians caring for patients; invited nurses and nursing assistants in separate groups to 4 training sessions at each facility in the experimental group; additional session for night shift focusing on sedative-hypnotic agents	Decrease in mean psychoactive drug use score: 1.87 to 1.36 (27% reduction) in experimental groups vs 1.74 to 1.60 in control groups (mean difference in risk reduction, −0.37; 95% CI, −0.08 to −0.67; $P < .05$); 45% of residents in experimental group vs 21% in control discontinued diphenhydramine treatment in exchange for an "acceptable" hypnotic or no agent; mean difference, −24% (95% CI, −54% to 5%)
Audit and Feedback				
Elliott et al,[35] 2001	Prospective pre-post study; preintervention period: 2 d (n = 594); postintervention period: 6 mo; assessments done at 4-8 wk (n = 563) and 6 mo (n = 144 patients)	9 Australian hospitals (6 geriatrics and rehabilitation units and 3 GIM units)	Feedback about practices at staff meeting (registered nurse, and medical and pharmacy staff); 1-h presentation by clinical pharmacist and geriatrician (presentation and discussion on audit results, literature review regarding sedative-hypnotic use in elderly individuals, comparative results from other hospitals); written summary distributed and posted on participating wards	No significant reduction in initiation of benzodiazepine prescriptions in hospital; increasing proportion of appropriate benzodiazepine prescriptions in 2 audits: audit 1, 20% (n = 46 prescriptions) vs audit 2, 44% (n = 83 prescriptions); $P < .001$; 3 hospitals participated in 3 audits: 22% (n = 14 prescriptions) vs 41% (n = 22 prescriptions) vs 50% (n = 26 prescriptions); $P < .01$
Kashyap et al,[36] 2015	Data on older inpatients (>60 y) was collected prospectively; intervention period: >3 y (n = 1510 patients)	4 Medical wards of 1 public Indian teaching hospital	Random medical record audits for inappropriate drugs using Modified Beers Criteria with feedback provided to prescribing physician	325 Patients received at least 1 inappropriate drug (21%); there were 365 inappropriate drugs for 325 patients; 78.5% did not have any indication for an inappropriate drug; the most common inappropriate classes were long-acting benzodiazepines, anticholinergics, nitrofurantoin, and digoxin 85/365 prescriptions were for benzodiazepines; 28/365 were for tricyclic antidepressants; decrease of inappropriate drug use by 30.7%
Computer-Based Intervention				
Agostini et al,[37] 2007	Prospective pre-post study; preintervention period: 12 mo (n = 12 356); postintervention period: 12 mo (n = 12 153)	Inpatients >65 y in a single academic medical center	Educational intervention aimed to reduce diphenhydramine and diazepam use for insomnia; educational intervention using 3 computer-based real-time alerts: (1) ascertained if the sedative-hypnotic is being prescribed for sleep; (2) education about adverse effects of sedative-hypnotics (targeted diphenhydramine and diazepam); and (3) recommendation to prescribe nonpharmacologic sleep protocol (warm milk, herbal tea and relaxation methods or choose an alternative medication: trazodone and lorazepam)	Decrease in number of patients prescribed at least 1 sedative-hypnotic: before intervention, 2208 per 12 356 (18%); vs after intervention, 1832 per 12 153 (15%) (odds ratio, 0.82; 95% CI, 0.76-0.87; $P < .001$); prescription rate for each individual sedative-hypnotic over time: rates for lorazepam decreased by 39% ($P < .001$); rates for trazadone increased ($P < .001$); 79% of patients (1448/1832) received only 1 sedative-hypnotic order, of which 95% were directed to safer options or sleep protocol and 5% received diphenhydramine or diazepam; 20% of patients received >1 sedative-hypnotic of which 93% of patients (347/372) received lorazepam, trazodone, or SLP and 7% received diphenhydramine and diazepam; 85% combined SLP and a sedative-hypnotic
Education				
Carey et al,[38] 1992	Pre-post and cross-sectional comparison study; preintervention period: 3 mo, 5 randomly selected patients per day from hospital admission list (n = 214); postintervention period: 3 mo, 5 randomly selected patients per day from hospital admission list (n = 214)	Tertiary hospital in Sydney, Australia	Education campaign on rational sedative-hypnotic use, including booklet and video for hospital staff and patients; cross-sectional survey to obtain baseline and postintervention sedative-hypnotic drug use in hospital	Decrease in sedative-hypnotic use among patients: before intervention, 39.4%; vs after intervention, 27.3% ($P < .005$); increase in drug knowledge (58.4% after intervention compared with 42.1% before intervention reported knowing sedative-hypnotics were associated with harmful adverse effects; $P < .005$)
Other				
Westbury et al,[39] 2010	Controlled pre-post study; duration: 26 wk	25 Long-term care facilities in Tasmania	Multifaceted intervention including: education, training, nonpharmacologic approaches to behavioral and psychological symptoms of dementia and insomnia, academic detailing, pharmacist-enabled sedative review	Decrease in benzodiazepine prescription prevalence: before intervention, 31.8%; vs after intervention, 26.9% ($P < .005$); no change in controls

Abbreviations: DBI, Drug Burden Index; GIM, general internal medicine; NA, not applicable; RCSQ, Richards-Campbell Sleep Questionnaire; RR, relative risk; SLP, speech language pathologist.

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