



Sueño en pacientes hospitalizados

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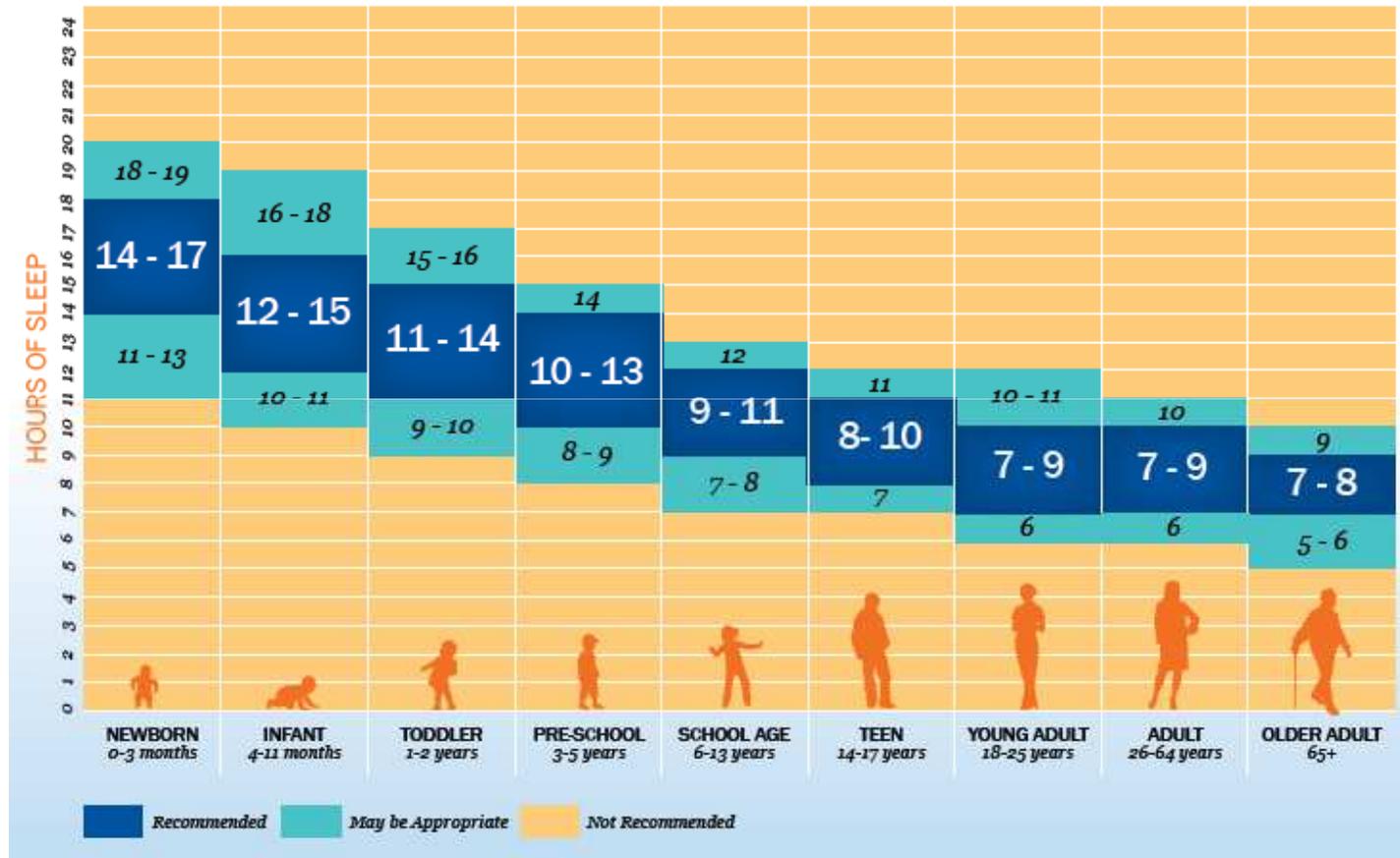
Temario

- Importancia de dormir
- Tipos de problemas de sueño
- Causas y mecanismos
- Fisiología
- Intervención y prevención
 - No farmacológicas
 - Farmacológicas

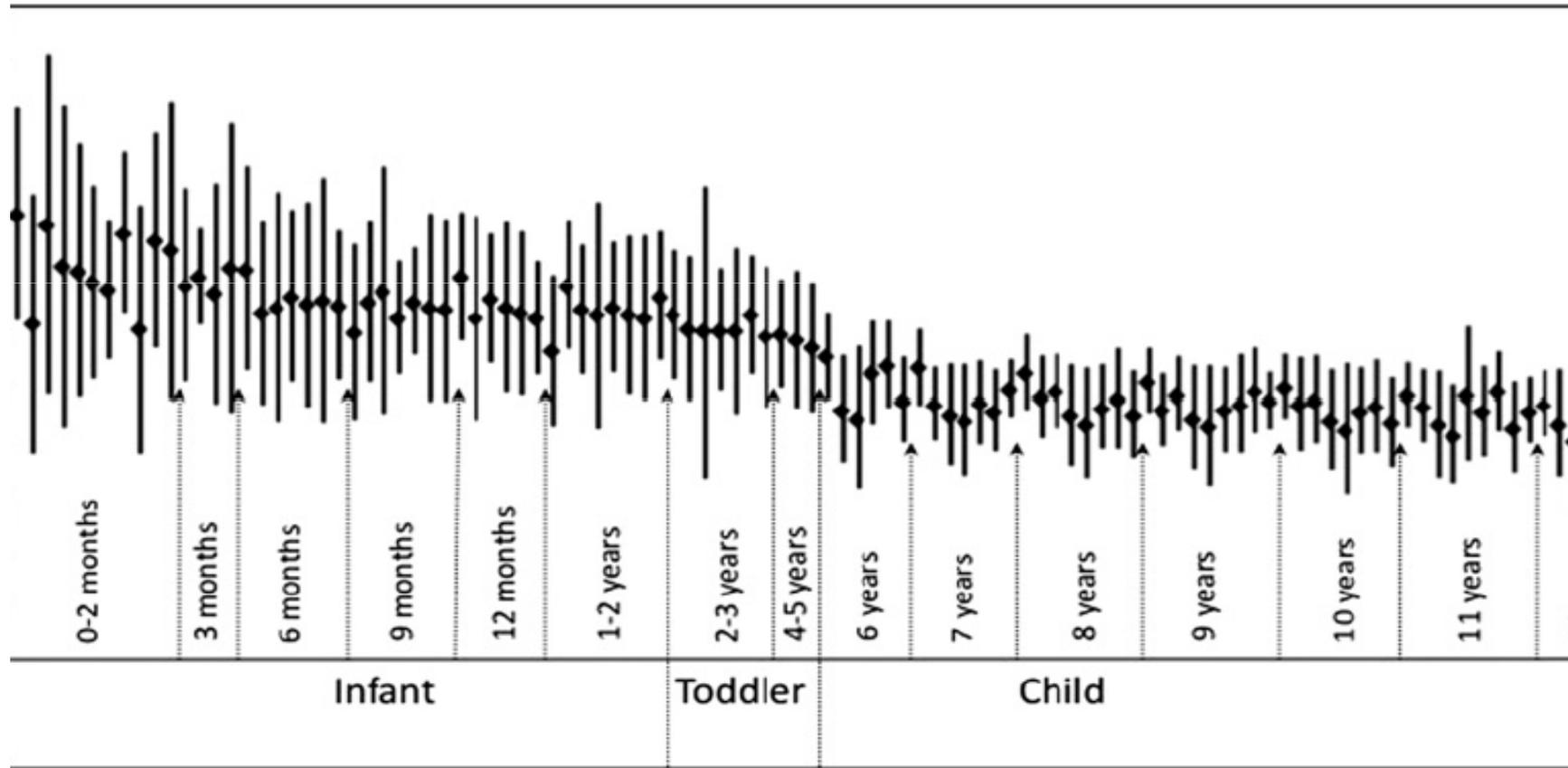
Introducción

- Problemas de sueño frecuentes en pacientes hospitalizados
- Causa multifactorial
- Tema muy estudiado en adultos, escasamente en niños
- Problema con consecuencias importantes

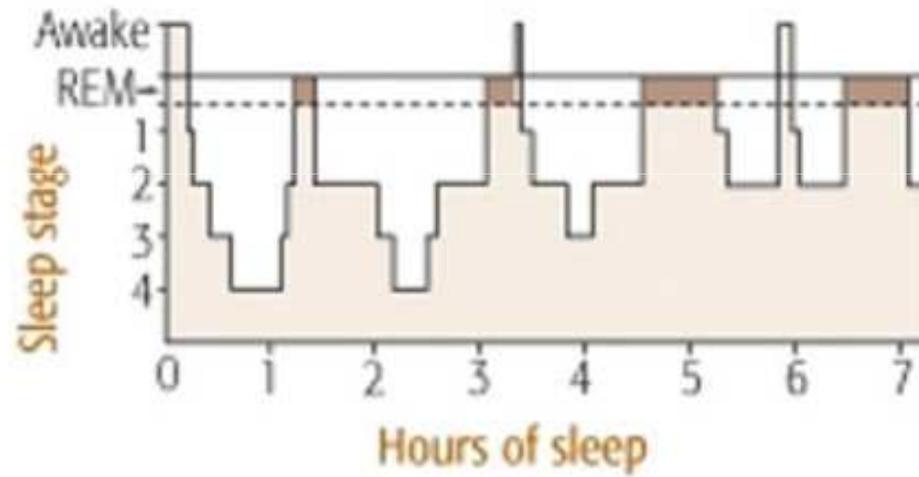
SLEEP DURATION RECOMMENDATIONS



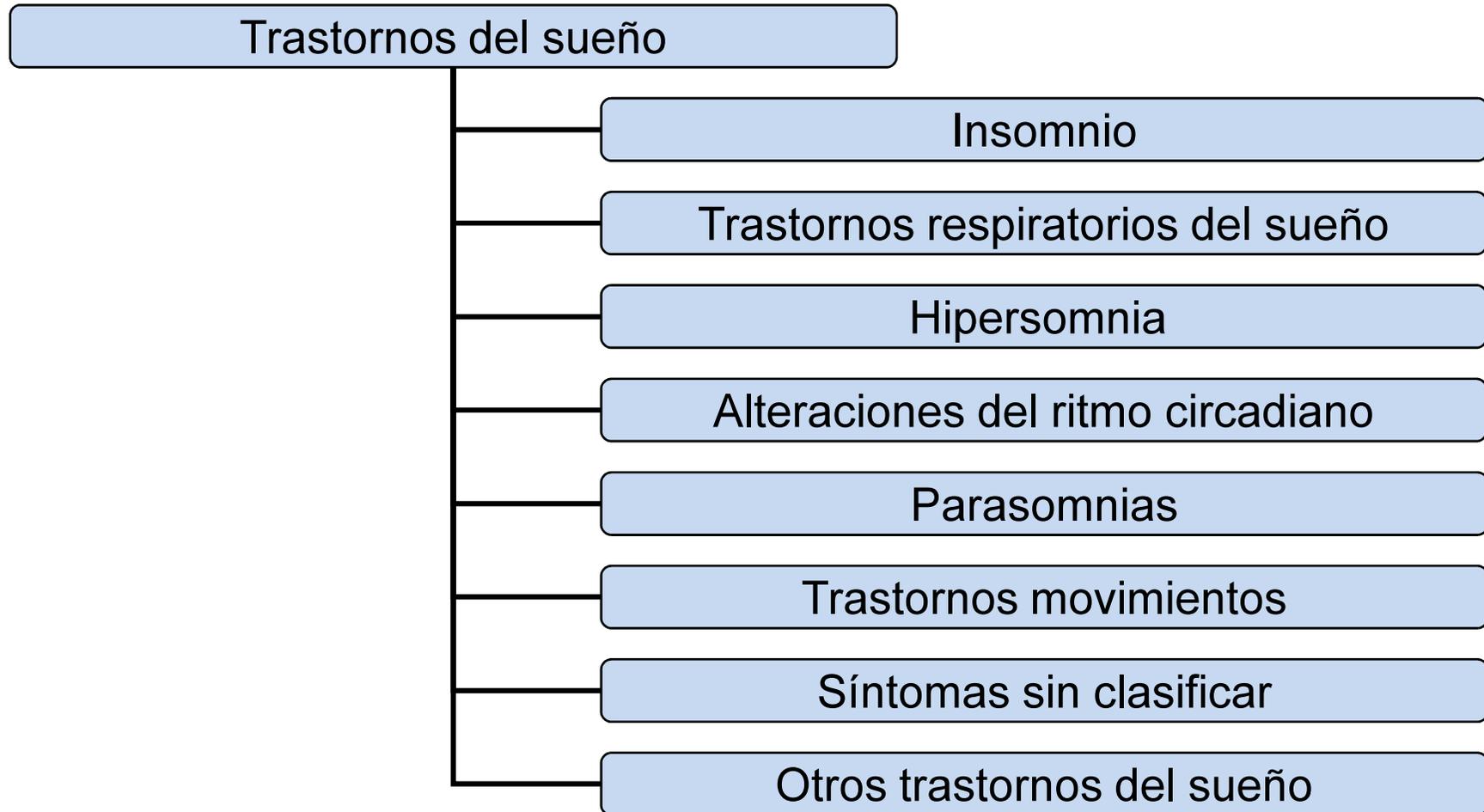
Sueño: cambios con la edad



Sueño normal



International Classification of Sleep Disorders (ICSD-2)



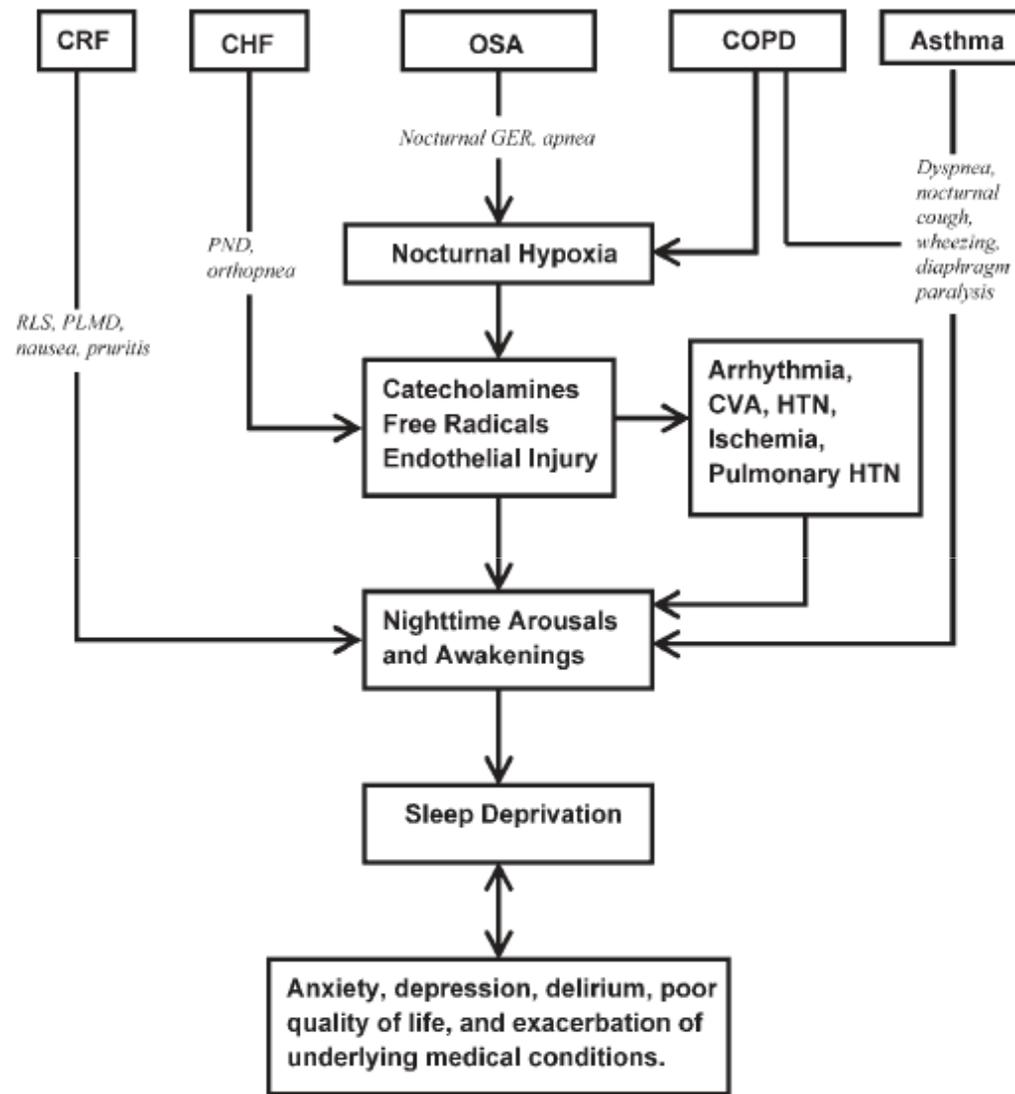
Consecuencias mal dormir

- N= 972, 3.-5. año básico, 21 colegios, Bruselas
- Cuestionarios (65 Items)
- Definición “mal dormir ”
 - Latencia del sueño >30 min y
 - Despertar nocturno >2x/semana
- Asociaciones con
 - Problemas escolares (RR: 1,9)
 - Parasomnias (RR: 1,6)
 - Uso sedantes (RR: 40)



Factores asociados

- Enfermedades y condiciones de base
 - Asma
 - Neuromusculares
 - Psiquiátricas
 - Endocrinológicas
 - Sd. Down
- Uso de medicamentos
- Vinculo y apego con madre/padre
- Factores ambientales



Mecanismos

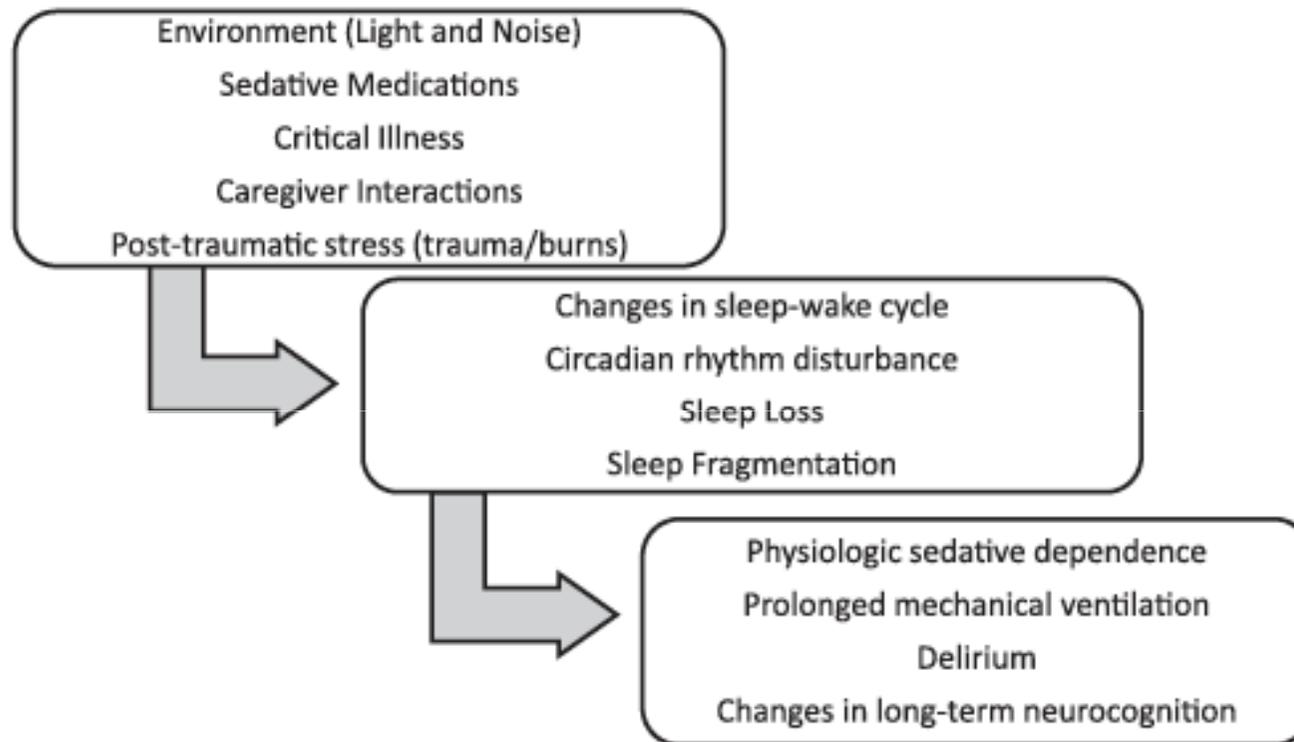


Fig. 1. Proposed causal pathway for changes in sleep behavior as a modulator of outcomes in critically ill children.

Aspectos neurológicos

- Problemas en pacientes con epilepsia
 - Alteración de etapas N3 y REM
- Problemas en pacientes con Sd. Down
 - Aparición de parasomnias
- Problemas en pacientes con apneas y asma
 - Exacerbación de apneas por crisis de asma
 - Uso de O2 enmascara apneas obstructivas

Dolor y sueño

- Dolor afecta el sueño
 - A través de neurotransmisores y mediadores inflamatorios
 - 50-70% de los niños y adolescentes hospitalizados refieren dolor
 - Aumento de los microdespertares
 - Perdida de arquitectura del sueño normal
 - Aumento de etapas N1 y N2 en desmedro de NREM N3 y REM

Trastornos psiquiátricos y sueño

- Aumento en 3.8 veces síntomas depresivos por mal dormir en adolescentes hospitalizados
- Síntomas ansiosos por falta de sueño
- Disminución en adherencia a tratamiento
- Problemas en madres y padres acompañantes

Medicamentos y sueño

Sobreuso de sedantes, benzodiazepinas,
analgésicos y opiáceos



Uso de salbutamol, corticoides y pseudoefedrina

TABLE 5
Drugs that Affect Sleep, Mechanisms, and Clinical Implications

Drug Class	Examples of Drugs	Affect on Sleep Architecture	Potential Mechanism	Clinical Implications
CNS				
AEDs	Phenobarbital, carbamazepine, phenytoin	Very sedating. AEDs tend to ↑ TST, ↓ sleep latency	Inhibit neuronal calcium influx, adenosine, or 5HT activity	Sedation is dose-dependent and tends to occur with acute use
TCAs	Amoxapine, amitriptyline, imipramine, nortriptyline, desipramine, doxepin, clomipramine	Very sedating. Suppresses REM sleep. ↑ TST, ↑ stage-2 sleep	Stimulate antimuscarinic-receptor and alpha ₁ -receptor	Suppressed REM sleep → ↓ motor inhibition → restlessness, psychomotor agitation during sleep → subjectively ↓ sleep quality, ↑ daytime sleepiness
BzRAs	Abrazolam, lorazepam, chlordiazepoxide, diazepam, oxazepam	Very sedating. ↑ TST, ↓ sleep latency, ↓ SWS duration, ↓ REM, ↑ stage-2 sleep	Stimulate GABA type A receptor	Minimize daytime use. Chronic BzRAs → ↓ SWS → long-term sequelae unknown
MAOIs	Phenylethylamine, tranylcypromine	Very sedating. ↑ TST, ↓ REM, REM rebound if stop MAOIs	Mechanism unknown	Daytime sleepiness; dosing time does not affect daytime somnolence
SSRIs	Sedating: paroxetine, fluvoxamine. Activating: fluoxetine, sertraline, citalopram	↑ TST, are less sedating than TCAs and MAOIs. May ↓ REM, ↑ TWT, ↑ TST, ↓ SE	↑ 5HT activity	Some patients get the opposite reaction
SNRI	Venlafaxine, duloxetine	Activating in some patients; sedating in 12% to 31%. ↓ TST	↑ 5HT and NE activity	If activating, switch to AM dosing. If sedating, switch to PM dosing
Mood stabilizer	Lithium	Sedating. ↑ TST, ↑ SWS, ↓ REM, ↓ REM latency		↑ daytime sedation. Dose at night
Stimulants	Ephedrine, pseudoephedrine, modafinil	Activating. ↓ TST, ↓ SWS, ↑ sleep latency	↑ DOPA, NE, and 5HT activity	Avoid after 6 PM
Anti-Parkinson	Bromocriptine, levodopa	Sedating. Nightmares, ↓ SWS	↑ DOPA	Dose at night, if possible
Cardiac				
Lipophilic beta-blockers	Propranolol, pindolol, metoprolol, timolol	Activating. ↑ awakenings, ↑ TWT, ↓ REM, nightmares	CNS beta-blockade	Lipophilic beta-blockers → ↓ daytime sleep when dosed in AM
	Hydrophilic agents (atenolol and sotalol) lack these effects			
CNS agents	Norepinephrine, epinephrine	Activating. ↓ REM, ↓ SWS	Stimulate alpha ₁ -receptor	Minimize use at night
	Dopamine	Activating. ↓ REM, ↓ SWS	Stimulate dopamine ₂ -receptor and alpha ₁ -receptor	Minimize use at night
Ca ⁺⁺ channel blockers	Amlodipine, verapamil, nifedipine	Exacerbate underlying medical condition		↓ Lower esophageal sphincter tone → nocturnal GER → sleep disturbance
Alpha ₂ -receptor agonist	Clonidine	↑ Stage 1, ↓ REM, nightmares	Stimulate alpha ₂ -receptor	Alpha ₂ -agonists → ↑ daytime sleep and sleepiness directly. Dose at night
Alpha ₁ -receptor blockers	Doxazosin, prazosin, terazosin		Inhibit alpha ₁ -receptor	Alpha ₁ -receptor blockers → ↑ daytime sleepiness
Diuretics	HCTZ, furosemide	Sedating.		PM diuresis → frequent awakenings
Other				
Opioids	Codeine, morphine	Sedating. ↓ SWS, ↓ REM	Stimulate mu-receptor	Minimize use at night
NSAIDs	Ibuprofen, indomethacin, celecoxib	↓ TST, ↓ SE	Inhibit prostaglandin synthesis	Minimize use at night
Methylxanthine	Theophylline	Activating. ↑ stage 1, ↓ REM		Causes less restful sleep
Antihistamines	Diphenhydramine, promethazine	Sedating	H ₁ receptor blockade	Minimize use at night
Corticosteroids	Dexamethasone, prednisone	Activating. ↓ REM, ↓ SWS, nightmares	↓ Melatonin secretion	Can disrupt sleep. ↑ anxiety, induce mania or psychosis
H ₂ blockers	Cimetidine, ranitidine, famotidine	Sedating. ↑ TST	H ₂ receptor blockade	Sedating if >60 years old, renal impairment
Quinolone	Ciprofloxacin, sparfloxacin, ofloxacin, grepafloxacin, levofloxacin	Activating	Stimulate GABA type A receptor	Consider sleep agent after maximizing sleep hygiene. Linezolid rarely causes sleep disturbances

Abbreviations: 5HT, serotonin; AED, antiepileptic drug; BzRA, benzodiazepine; CNS, central nervous system; DOPA, dopamine; GABA, gamma-aminobutyric acid; GER, gastroesophageal reflux; H₂, histamine₂-receptor; HCTZ, hydrochlorothiazide; MAO, monoamine oxidase inhibitor; NE, norepinephrine; NSAID, nonsteroidal anti-inflammatory drug; REM, rapid eye movement; SE, sleep efficiency; SNRI, serotonin norepinephrine reuptake inhibitor; SSRI, selective serotonin reuptake inhibitor; SWS, slow-wave sleep (stage 3 and 4, or deep sleep); TCA, tricyclic and tetracyclic antidepressant; TST, total sleep time; TWT, total wake time; →, leads to or causes; ↓, decrease or reduce; ↑, increase

Factores predisponentes

TABLE 1
Predisposing Factors, Clinical Features, and Differential Diagnosis of Common Primary Sleep Disorders

Sleep Disorder	Predisposing Factors	Clinical Features	Differential Diagnosis
Obstructive sleep apnea (OSA)	Nasopharyngeal abnormalities, craniofacial abnormalities, obesity, >40 years old, men > women (2:1), neurologic disorder (eg, recent stroke)	Repetitive episodes of upper airway obstruction that occur during sleep, usually associated with oxygen desaturation. Episodes include loud snoring or gasps lasting 20–30 seconds. Associated with morning headaches and dry mouth.	Sleep-related laryngospasm, nocturnal gastroesophageal reflux, narcolepsy, hypersomnia, PLMD, central alveolar hypoventilation, paroxysmal nocturnal dyspnea, primary snoring, Cheyne-Stokes ventilation, nocturnal asthma
Periodic limb movement disorder (PLMD)	OSA, RLS, or narcolepsy; aging; chronic uremia; TCAs or MAOIs; withdrawal from antiepileptic agents, or other sedating agents	Periodic episodes of repetitive and stereotyped limb movements: extension of the big toe with partial flexion of the ankles, knees, or hips. Muscle contractions last 0.5 to 5 seconds, with 20-second to 40-second intervals between them.	Sleep starts (occur just prior to, not during, sleep, and do not have a regular periodicity like PLMD), nocturnal epileptic seizures, myoclonic epilepsy
Restless leg syndrome (RLS)	Pregnancy (>20 weeks gestation), uremia, anemia, rheumatoid arthritis, peak onset is middle age	Uncomfortable leg sensations that occur prior to sleep onset that leads to an irresistible urge to move the legs. Described as “achy,” “crawling,” “pulling,” “prickling,” or “tingling,” and disrupts sleep onset.	Chronic myelopathy, peripheral neuropathy, akathisia, fasciculation syndromes, anemia
Sleep starts	Can worsen with anxiety, caffeine or other stimulants, daytime physical exertion	Sudden, brief contraction of the legs that occurs at sleep onset. Usually benign, but may worsen during hospitalization, and interfere with sleep.	PLMD, RLS, hyperekplexia syndrome, in which generalized myoclonus is readily elicited by stimuli

NOTE: Based on information in American Academy of Sleep Medicine, International Classification of Sleep Disorders, revised Diagnostic and coding manual. Chicago, IL: American Academy of Sleep Medicine, 2001. Abbreviations: AEDs, antiepileptic agents; MAOIs, monoamine oxidase inhibitors; OSA, obstructive sleep apnea; PLMD, periodic limb movement disorder; RLS, restless leg syndrome; TCAs, tricyclic antidepressants.

Problemas a distintas edades

- Neonatología
- Unidad de cuidados intensivos
- Sala pediátrica comun
- Adolescentes

Pediatria: edad muy vulnerable

Patient and Parent Sleep In a Children's Hospital

	Hospital Mean (SD)	Home Mean (SD)	<i>t</i>	<i>p</i>	ES
Children (8 to 12 years)					
Bedtime	22:38 (98)	21:05 (46)	4.82	<0.001	1.22
Wake time	7:32 (73)	6:49 (36)	2.87	0.02	0.74
Sleep onset latency (minutes)	24.1 (37.6)	18.9 (18.5)	0.80	0.43	0.18
Night waking frequency	2.7 (1.7)	0.82 (1.0)	6.12	<0.001	1.35
Total sleep time (minutes)	501.9 (102.4)	558.0 (52.1)	2.70	0.01	0.70
Adolescents (13 to 21 years)					
Bedtime	22:49 (92)	22:32 (76)	1.12	0.27	0.20
Wake time	7:42 (83)	6:32 (64)	4.19	<0.001	0.94
Sleep onset latency (minutes)	25.7 (33.0)	24.5 (21.4)	0.18	0.86	0.04
Night waking frequency	2.7 (2.2)	1.2 (1.6)	3.48	0.001	0.78
Total sleep time (minutes)	515.3 (95.2)	460.3 (93.9)	2.54	0.02	0.58
Parents					
Bedtime	23:03 (83)	22:46 (66)	1.49	0.14	0.22
Wake time	6:38 (77)	6:17 (73)	1.86	0.07	0.28
Sleep onset latency (minutes)	23.0 (20.6)	17.7 (8.9)	1.41	0.16	0.33
Night waking frequency	4.7 (3.6)	2.0 (1.5)	5.53	<0.001	0.98
Total sleep time (minutes)	427.9 (104.1)	428.2 (88.9)	0.02	0.98	0.003

Patient and Parent Sleep In a Children's Hospital

	Pain Mean (SD)		<i>t</i>	ES
	Yes	No		
Sleep Onset Latency (Minutes)				
Child	44.3 (56.5)	12.5 (11.0)	2.41 ^a	0.91
Adolescent	22.4 (18.1)	30.7 (44.5)	-0.70	0.25
Parent	23.3 (25.1)	23.4 (18.3)	-0.01	0.00
Night Waking Frequency				
Child	3.2 (2.1)	2.5 (1.6)	1.02	0.40
Adolescent	3.5 (1.7)	2.4 (2.4)	1.58	0.53
Parent	4.6 (2.3)	4.8 (4.1)	-0.20	0.06
Wake Time				
Child	7:55 (1:51)	7:31 (1:03)	0.69	0.32
Adolescent	7:33 (1:41)	7:54 (1:19)	-0.60	0.25
Parent	6:52 (1:25)	6:36 (1:18)	0.46	0.20

Patient and Parent Sleep In a Children's Hospital

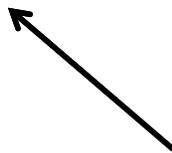
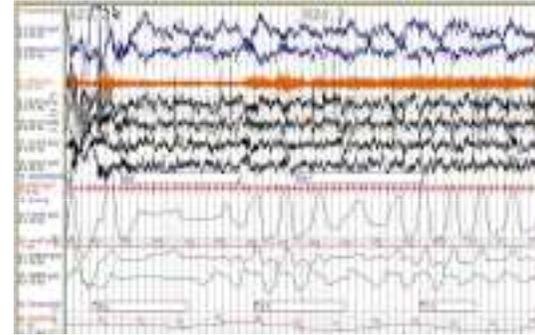
	Vital Sign Checks Mean (SD)		<i>t</i>	ES
	Yes	No		
Sleep Onset Latency (Minutes)				
Child	19.1 (17.6)	27.1 (45.7)	-0.55	0.21
Adolescent	22.8 (18.0)	31.3 (47.5)	-0.71	0.25
Parent	25.1 (20.4)	20.7 (20.3)	0.75	0.22
Night Waking Frequency				
Child	2.7 (1.2)	2.7 (2.1)	0.02	0.01
Adolescent	3.6 (2.3)	1.8 (1.6)	2.54 ^a	0.87
Parent	4.8 (3.8)	4.7 (3.6)	0.11	0.03
Wake Time				
Child	7:53 (1:33)	7:20 (0:56)	1.24	0.46
Adolescent	7:23 (1:16)	8:22 (1:21)	-2.26 ^a	0.75
Parent	6:39 (1:21)	6:37 (1:18)	0.11	0.03

Patient and Parent Sleep In a Children's Hospital

	Noise in Room Mean (SD)		<i>t</i>	ES
	Yes	No		
Sleep Onset Latency (Minutes)				
Child	30.8 (30.8)	22.7 (38.0)	0.45	0.21
Adolescent	30.3 (21.1)	24.2 (37.9)	0.49	0.18
Parent	35.9 (23.9)	15.5 (14.3)	3.73 ^c	1.09
Night Waking Frequency				
Child	3.7 (2.7)	2.5 (1.4)	1.51	0.68
Adolescent	3.5 (1.4)	2.6 (2.4)	1.04	0.41
Parent	6.3 (4.9)	3.5 (1.5)	2.97 ^b	0.82
Wake Time				
Child	7:05 (0:12)	7:31 (1:10)	-0.90	0.41
Adolescent	7:30 (1:32)	8:05 (1:12)	-1.30	0.43
Parent	6:24 (1:14)	6:49 (1:20)	-1.14	0.32

Monitorización

- Cómo afecta la monitorización a RN en neonatología?
 - Enfermera y técnicos
 - Monitor habitual
 - SpO2 continua
 - Poligrafía o Polisomnografía
- Qué técnica es mejor? Cuántas intervenciones se hacen cada noche?



Under-recognition of alarms in a neonatal intensive care unit

Pablo E Brockmann,^{1,2} Cornelia Wiechers,¹ Tobias Pantalitschka,¹ Jessica Diebold,¹ Jan Vagedes,^{1,3} Christian F Poets¹

Table 2 Comparison of prolonged events (>10/20 s) found in polysomnography and those documented by nursing staff

Variable	Polysomnography	Nursing staff's registry	p Value
Desaturation events >10 s	5.5 (0–36.0)	2 (0–21.0)	<0.0001
Desaturation events >20 s	3.5 (0–24.0)	0.5 (0–9.0)	0.003
Bradycardias >10 s	2.0 (0–11.0)	0 (0–3.0)	0.007
Bradycardias >20 s	0 (0–8.0)	0 (0–4.0)	0.120

All results are given as median (minimum–maximum).

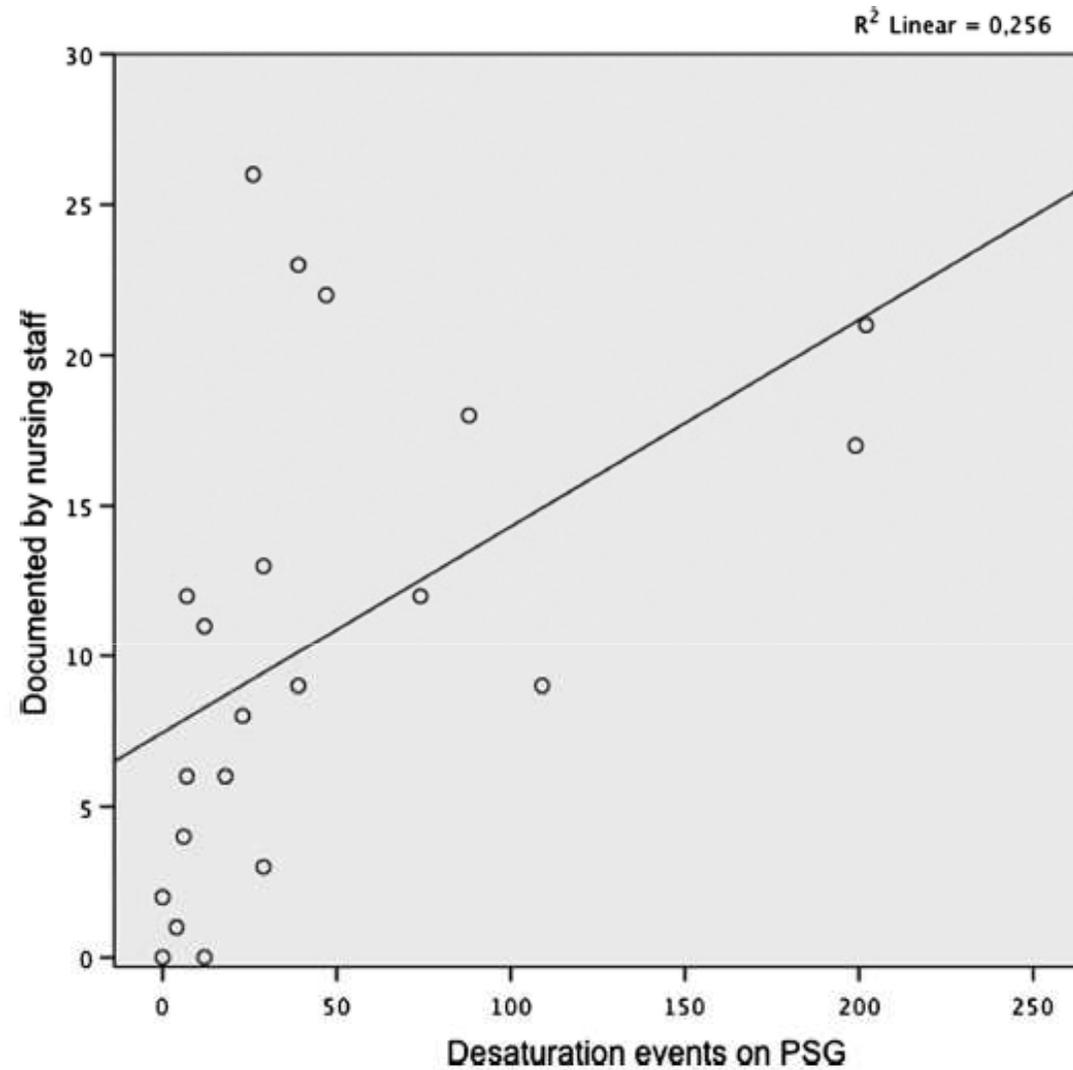


Figure 1 Scatterplot of SpO₂ desaturation events identified by polysomnography (after mathematical conversion) and those documented by nursing staff. PSG, polysomnography.

Intervenciones y alarmas nocturnas

- 968 desaturaciones y 416 bradicardias
- Personal enfermería reconoció:
 - 23% desaturaciones bajo 80% SpO₂
 - 60% de las bradicardias bajo 70 lpm
- Hubo **225 intervenciones**/respuestas a eventos por personal enfermería
 - 39% fue registrado en hoja o protocolo
- Calidad de sueño a futuro???

Intervenciones para mejorar sueño

TABLE 2
Questions to Ask in a Focused Sleep History

Focus	Examples of Questions
Sleep pattern	Do you have problems falling asleep or staying asleep? How often do you wake up during the night? How long does it take you to fall back asleep? When did the problem start? What can we do to help you sleep? What time do you try to go to sleep, and what time do you wake up?
Behavioral factors	Compare your bedtime routine at home, and in the hospital.
Environment	Does the lighting or noise level in the hospital disrupt your sleep? How so? Are you awoken from sleep for laboratory work, monitoring, bathing, or other nursing/medical procedures?
Patient comfort	Is your pain adequately controlled at night? If not, are you on a scheduled analgesic regimen, or do you have to ask for pain medications? Do you have breathing problems, gastroesophageal reflux, or other type of discomfort that keeps you from sleeping well?
Substances	Do you drink alcohol? How much, and how often? When was your last alcoholic beverage? Inquire about cocaine, methamphetamine, marijuana, and medically-supervised use of opioids.
Psychosocial	How was your mood just prior to being hospitalized? How has your mood been since you were admitted? Have you experienced any emotionally or physically traumatic event prior to, or during, this hospitalization that continues to bother you (eg, intubation, resuscitation, surgery, blood draws, MRI scanning)?

Abbreviation: MRI, magnetic resonance imaging.

Intervenciones no farmacologicas

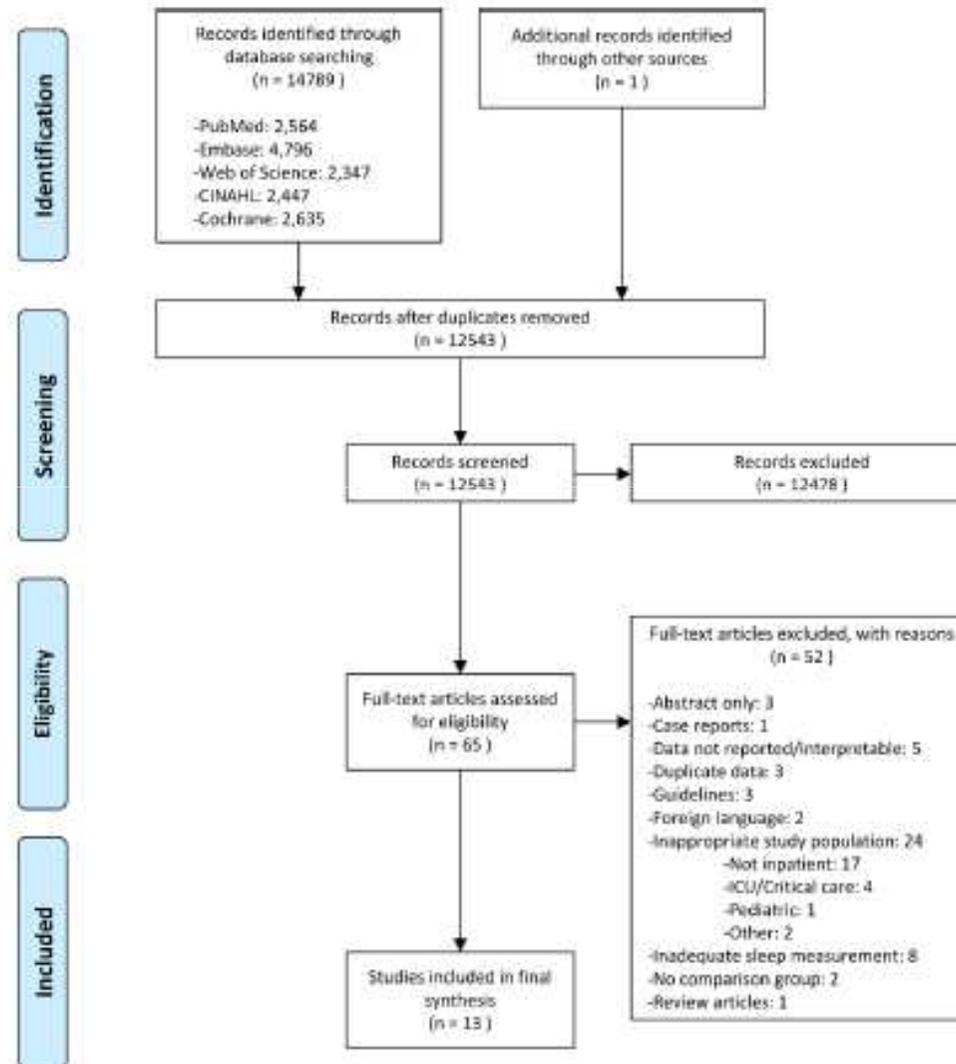


Figure 1. Summary of evidence search and selection.

Intervenciones no farmacológicas

Table 2. Characteristics and Results of Included Studies

	Study design (Sample size)	Intervention	Comparator	Ward type (Mean age)	Sleep outcome [†]	Relative % change post-intervention (effect size) ^{‡, §}	P value	ROB ^{¶¶}
Relaxation techniques								
Lareau 2008	RCT (n=70)	Quiet time, room temp changes, relaxation techniques each night of hospital stay	Usual care	Cardiology & medical (80)	RCSQ	7 (.11)	0.667	M
Soden 2004	RCT (n=42)	Massage or aromatherapy + massage weekly × 4 weeks	Usual care	Palliative care (73)	VSH	NR	NR	M
Toth 2007	RCT (n=30)	Audiotape guided imagery for 20 min twice daily × 2 days	Reading, music, or other solitary activity	General medical (54)	RCSQ	0	0.34 [†]	H
Zimmerman 1996	RCT (n=96)	Music video for 30 min × 2 evenings	Scheduled 30 min rest period	Post-surgical (67)	RCSQ	28 (.70)	< 0.05	M
Williamson 1992	NRC (n=60)	White noise all night × 3 nights	Usual Care	Post-surgical (59)	RCSQ	38	0.002*	M
Smith 2002	NRHC (n=41)	Massage for 15–20 min × 3 spread over 1 week	Nurse interaction for attention control	Oncology (62)	VSH	20 (.63)	NR	H
Connell 2001	Pre-post (n=58)	Aromatherapy each night × 1 week	Baseline	Elderly care units NR	TST (OSS)	10	0.004	H
McDowell 1998	Pre-post (n=111)	Back rub, warm drink, relaxation tapes each night patient complained of insomnia	None	Medical (79)	PTSS	NR	< 0.001 [#]	L
Sleep hygiene/Reduced sleep interruption								
Bartick 2010	NRHC (n=267)	Quiet Time 10 pm–6 am each night of hospital stay	Usual Care	Medical-surgical (61)	VSH	NR	NS	H
Edinger 1989	NRHC (n=321)	Stimulus Control × mean of 35 days	Usual Care	Psychiatric NR	TST (OSS)	5 (.36)	NR	H
Daytime bright light								
Mishima 1994	Pre-post (n=24)	2 h artificial light therapy daily × 4 weeks	Baseline	Psychiatric (75)	TST in demented patients (OSS)	18 (.79)	0.01	H
Wakamatsu 2001	Pre-post (n=7)	5 h artificial light therapy daily × 1 week	Baseline	Chest disease (67)	TST (WA)	7	0.05	L
Yamadera 2002	Pre-post (n=27)	2 h artificial light therapy daily × 4 weeks	Baseline	Not specified (80)	% night spent sleeping (WA)	10 (.31)	< 0.05	M

[†]RCT randomized controlled trial, NRC non-randomized trial with a control group, NRHC non-randomized trial with a historical control

Tipos de intervenciones estudiadas

- Ruido blanco (20-38% mejoría)
- Reducción de ruido ambiental (22% mejoría)
- Tapones oído
- Yoga y relajación
- Luz (18% mejoría)
- Aromaterapia (10% mejoría)
- Masoterapia y Reiki (20% mejoría)

Sueño y UCI pediátrica

- Paciente de 21 ms → intubados
- 24 h PSG → sin variación diurna nocturna → pérdida de ritmo circadiano
- 40 niños en UCI entre 3 - 18 años
- Randomizados a zolpidem vs haloperidol
- PSG:
 - Zolpidem: aumento N3 y REM
 - Haloperidol: disminuía latencia sueño y aumentaba NREM N2

Factores asociados: psicológicos

- 20-30% niños hospitalizados señalaban no poder dormir por:
 - Echar de menos su familia
 - Preocupación por no ir al colegio y perder clases
 - Sentirse solos
- 50% encontraba incómoda la cama del hospital
- 70% molesto por control de signos vitales en la noche





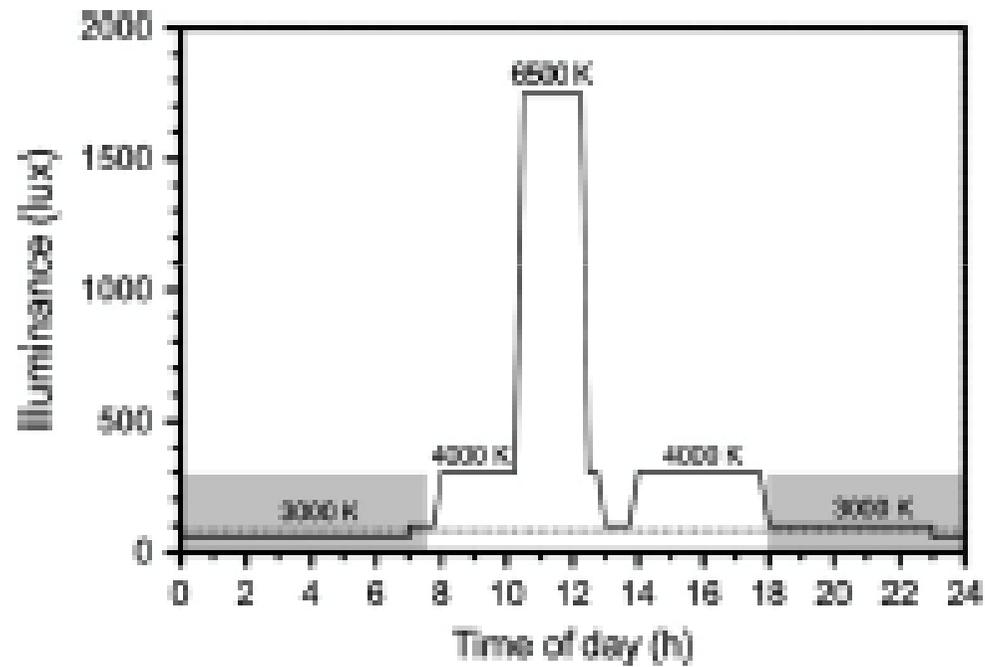
Intervenciones con padres

- Mala higiene de sueño en 70-90% de los padres de niños enfermos hospitalizados
 - Miedo a no saber que pasa en la noche con sus hijos
 - Incomodidad de dependencias
 - Preocupacion por trabajo y su casa
- Luz excesiva
- Ruidos molestos
- Falta de privacidad

Ambiente hospitalario

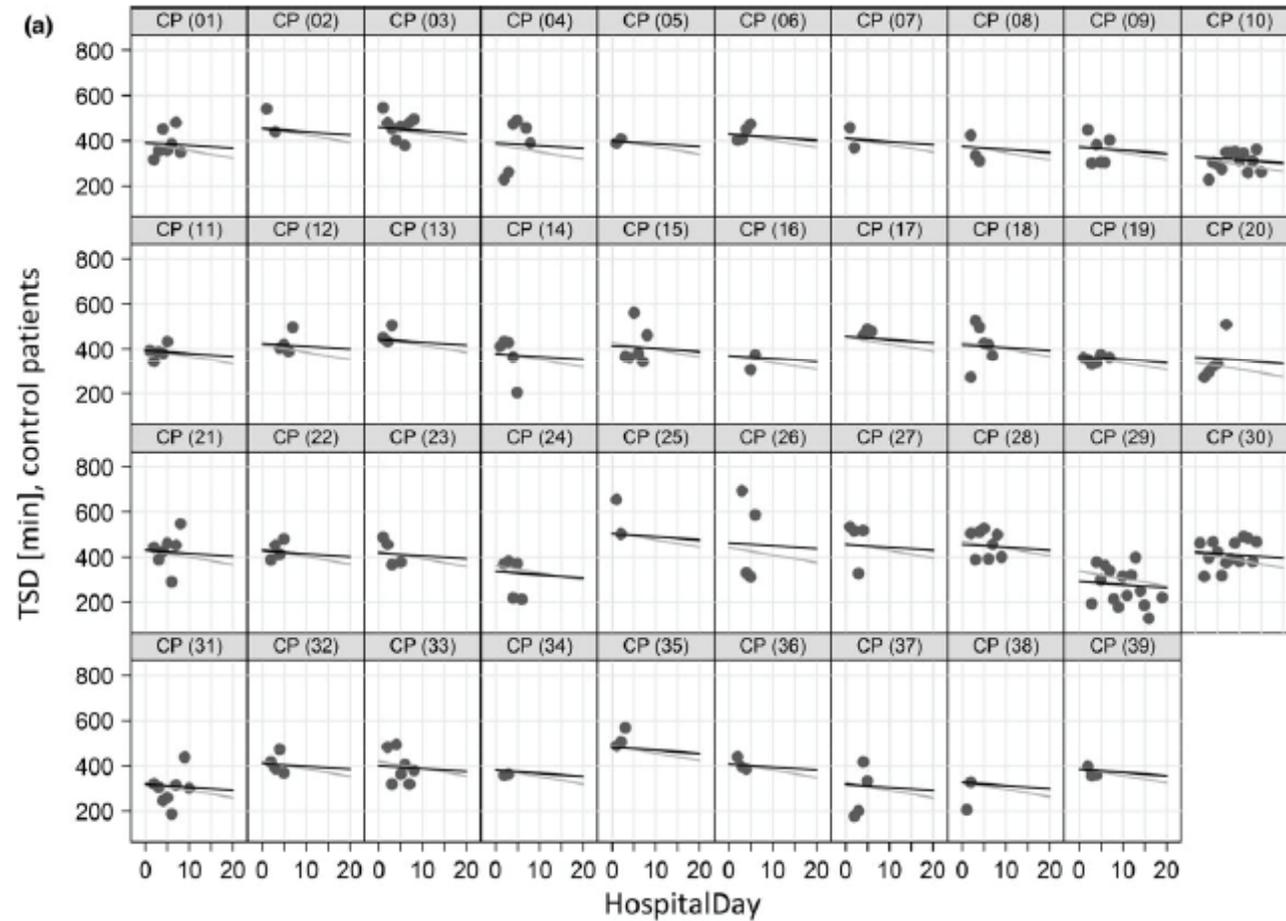
- Ruido
 - Frecuentemente mas de 110 dB en salas pediátricas
 - Peor en unidades de cuidado intensivo
 - Cerrar puertas
 - Evitar risas y visitas excesivas
 - Respetar horarios y ritmo circadiano
 - Tapones de oidos

Ambiente hospitalario: luz



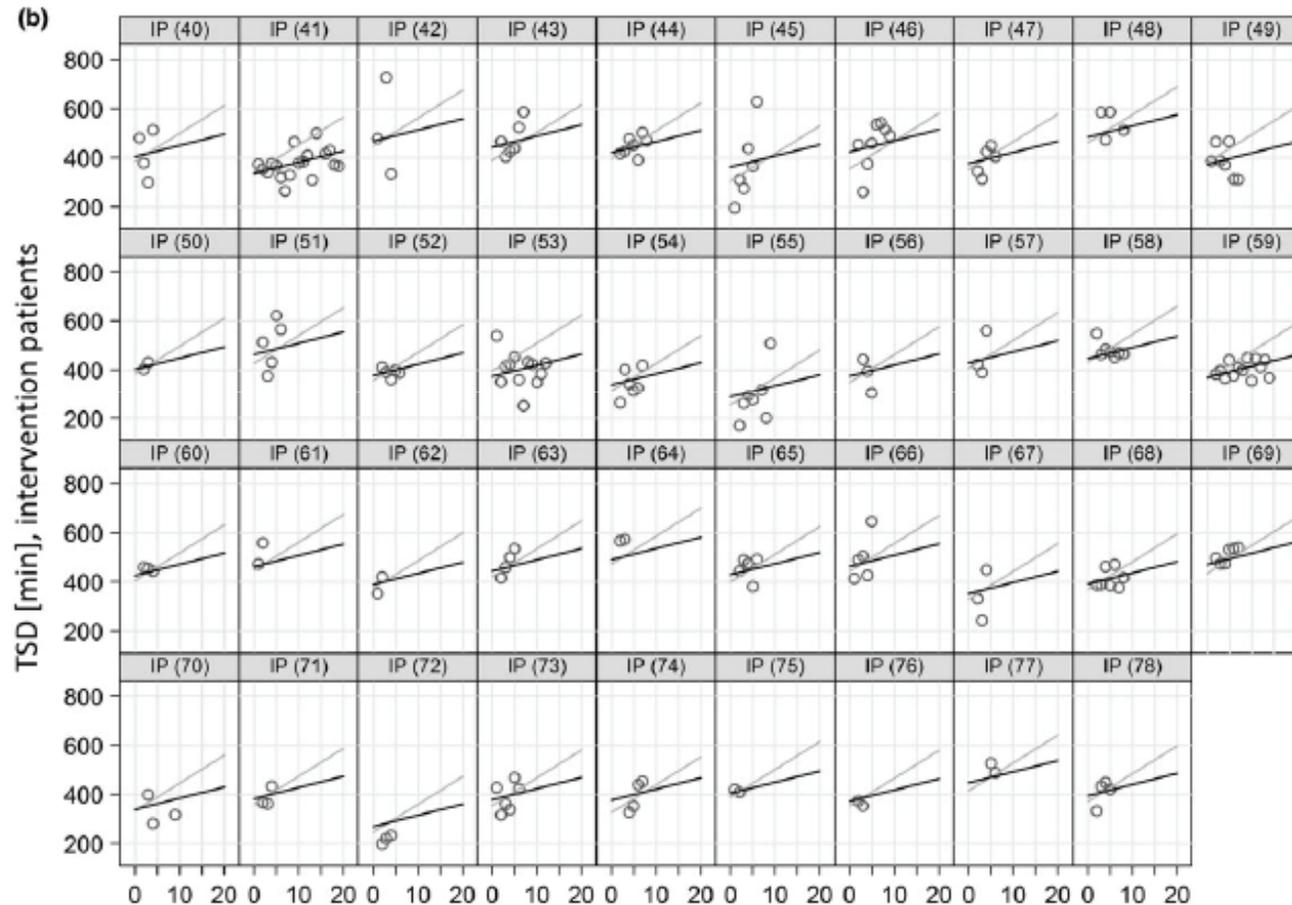
N=196

Impacto terapia con luz



controles

Impacto terapia con luz



Grupo intervenido

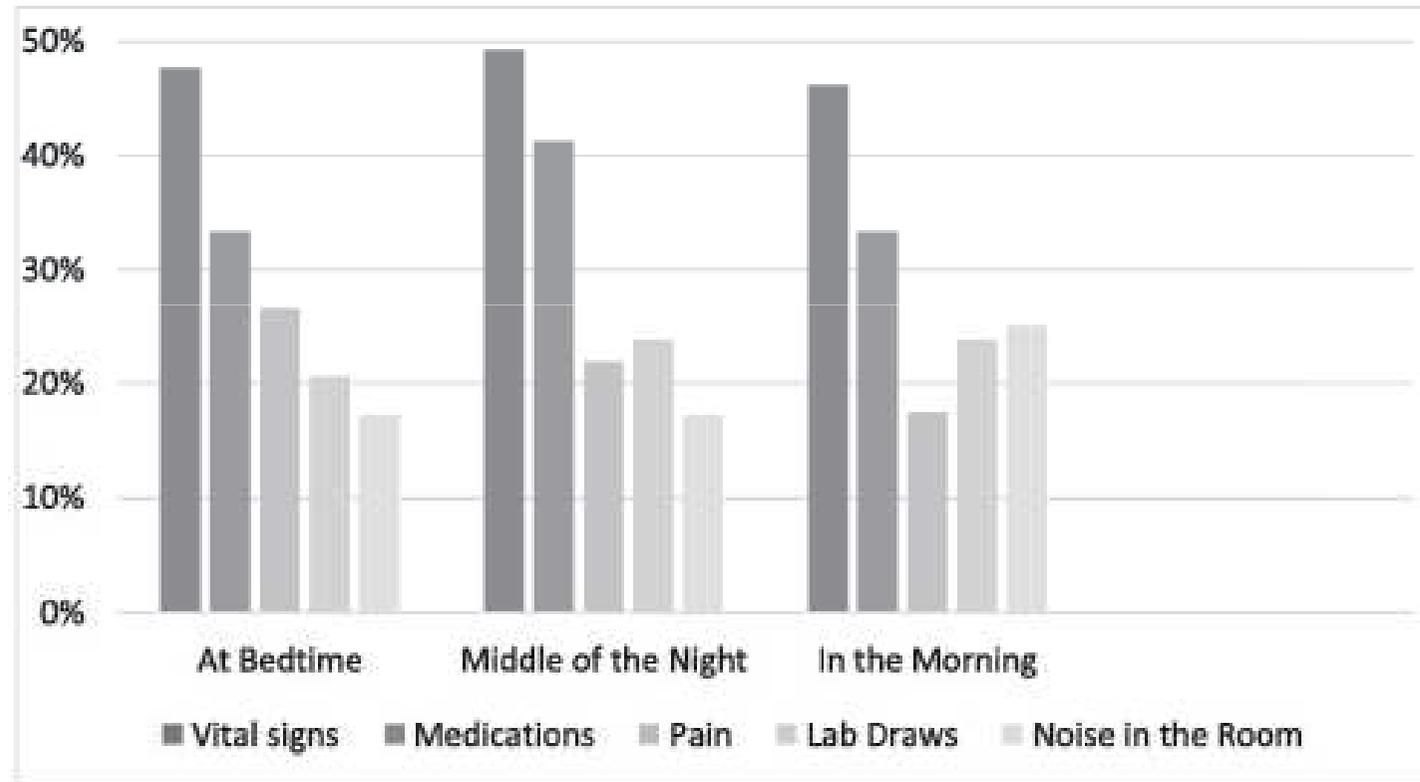
Proyecto Hospital Suecia







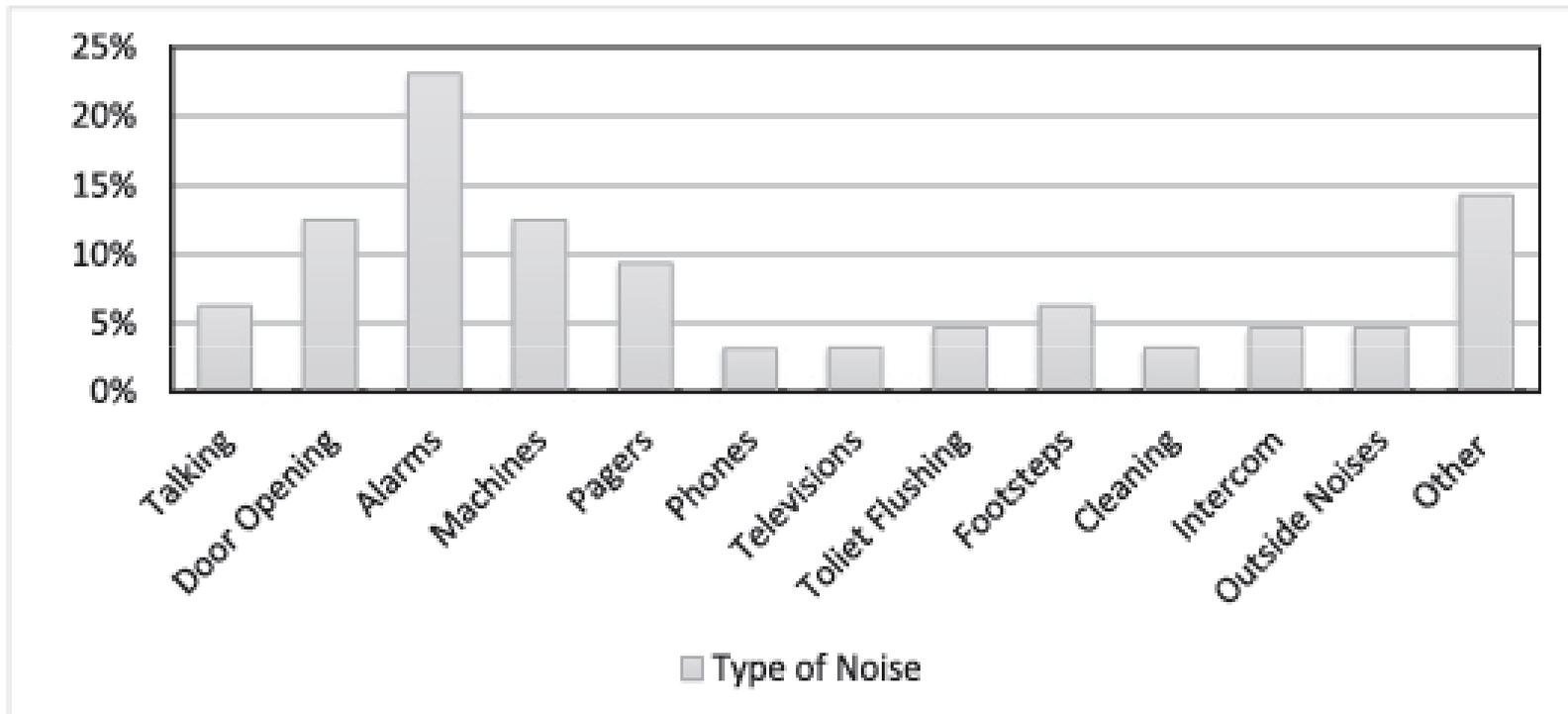
Interrupciones de sueño por personal



A qualitative study of sleep quality in children and their resident parents when in hospital

- 17 co-sleeping padres de 16 niños
- 3–12 años
- Entrevista estructurada referente a calidad de sueño
- Quejas:
 - Ruidos de monitor
 - Ruidos de personal riendo y hablando en la noche
 - No preocupación por parte del personal respecto a sueño de padres ni pacientes.

Ruidos en un servicio de pediatría



Crawford et al. JONA 2019; 49 (5):273-279.

Characteristics of the Nighttime Hospital Bedside Care Environment (Sound, Light, and Temperature) for Children with Cancer

- Ruido nocturno fue 49.5 dB (SD=3.1; 34.6–84.8 dB).
- Mayor ruido y luz al comenzar los turnos nocturnos
- Ruido influia en calidad de sueño($F=50.42$, $p<.01$)
- Exposición a luz nocturna ($F=12.43$, $p<.01$)

Sleep of critically ill children in the pediatric intensive care unit: A systematic review

Table 1
Included studies.

Authors (year)	Design	N	Age	Patient sample	Sleep assessment	Main findings
Al-Samsam and Cullen, 2005 ¹⁶	Cross-sectional	11	3–21 mo	Intubated children on sedatives	24 h PSG	<ul style="list-style-type: none"> • ↓ REM sleep • No diurnal variation in TST or sleep stages
Armour, Gottschlich et al., 2008, 2009, 2011, 2011 ^{24–27}	Randomized crossover study	40	3–18 y	PICU patients with severe burns randomized to zolpidem or haloperidol	Nocturnal PSG (22:00 h–07:00 h) for two 3-d periods in the 7–20 d post-burn injury First night of PSG = control night (no treatment) Sleep assessment by observers every 15 min over nighttime PSG periods	<ul style="list-style-type: none"> • ↑ Wakefulness on control and treatment nights • ↓ REM sleep • Zolpidem: ↑ stage 3 and REM sleep • Haloperidol: ↓ sleep latency and ↑ TST & N2 sleep • Zolpidem + Haloperidol: ↑ sleep continuity • Ketamine: ↓ REM sleep
Carno et al., 2004 ¹⁸	Cross-sectional	2	3 y	PICU patients on sedation and neuromuscular blockade after laryngotracheoplasty	PSG for 96 h beginning 2 h after surgery	<ul style="list-style-type: none"> • ↑ Stage 1 and 2 sleep and ↓ slow wave sleep
Cureton-Lane and Fontaine, 1997 ²²	Cross-sectional	9	15 mo–10.5 y	Children in the PICU for at least 24 h	PSBOT for a 10 h nighttime period	<ul style="list-style-type: none"> • Frequent awakenings • Mean length of nighttime sleep less than at home • ↑ Noise levels associated with wakefulness • Abrupt changes in noise increased arousals • ↑ Light levels and caregiver contact correlated with wakefulness
Coser et al., 1996 ¹¹	Cross-sectional	12	13–35 mo	PICU patients	PSBOT for 12 h nighttime period Sleep follow-up interview guide	<ul style="list-style-type: none"> • Arousals after sleep onset more than home baseline • Benzodiazepines: ↑ TST • No correlation between time to return to pre-illness sleep pattern and PRISM score, ICU, or hospital length of stay
Gottschlich et al., 1994 ²³	Cross-sectional	11	1.4–16 y	PICU patients with burns	Biweekly 24-h PSG measurements through discharge	<ul style="list-style-type: none"> • Mean TST over 24-h period of 10.5 h • Absence of stage 3/4 in 40% of PSG periods • ↑ Stage 1 early in hospitalization • Progressive ↓ stage 2 and ↑ stage 3 and REM sleep with recovery • Normalization of sleep associated with clinical improvement

PICU: pediatric intensive care unit; PSG: polysomnography; REM: rapid eye movement; TST: total sleep time; PICU: pediatric intensive care unit; PRISM: Pediatric Risk of Mortality Score; PSBOT: patient sleep behavior observation tool; PRISM: pediatric risk of mortality; ICU: intensive care unit.

^a Same study

Sueño en UCI pediátrica

- 1) Children in the pediatric intensive care unit (PICU) are exposed to many risk factors for sleep loss and disruption, including sedative medications, which are often increased to improve the subjective assessment of sleep;
- 2) Observational studies of children in the PICU demonstrate that critically ill children experience decreases in slow wave sleep and REM sleep, and subjective assessments do not correlate with objective measures such as polysomnography;
- 3) Noise is a major component of the environmental factors that may contribute to sleep loss and disruption

Fármacos

TABLE 5
Food and Drug Administration–Approved Drugs for Insomnia

Drugs	Adult Dose (mg)	Half-Life (hours)*	Onset (minutes)	Peak Effect (hours)	Major Effects/Clinical Comments
BzRAs					
Eszazolam (ProSom)	1–2	10–24	60	0.5–1.5	Caution in elderly patients. Tolerance to BzRAs develop to the sedative, hypnotic, and anticonvulsant effects. Short-term (7–10 days) treatment for frequent arousals, early morning awakening. Not as useful for sleep onset. Avoid in patients with OSA. Caution in elderly patients, liver disease. High doses can cause respiratory depression.
Flurazepam (Dalmane)	15–30	47–100	15–20	3–6	In general, avoid in hospitalized medical patients, especially elderly patients.
Quazepam (Doral)	7.5–15	25–114		1.5	In general, avoid in hospitalized medical patients, especially elderly patients.
Temazepam (Restoril)	15–30	6–16		2–3	Short-term (7–10 days) treatment for sleep onset and maintenance. Doses ≥ 30 mg/day: morning grogginess, nausea, headache, and vivid dreaming.
Triazolam (Halcion)	0.125–0.25	1.5–5.5	15–30	1.7–5	Maximum dose is 0.5 mg. Short-term (7–10 days) treatment. Rapid onset; should be in bed when taking medication. Contraindicated with atazanavir, ketocanazole, itraconazole, nefazodone, ritonavir.
Non-BzRAs					
Eszopiclone (Lunesta)	2–3	6–9		1	In elderly: difficulty <i>falling</i> asleep, then initial: 1 mg; maximum 2 mg. Difficulty <i>staying</i> asleep: 2 mg. Rapid onset; should be in bed when taking medication. For faster sleep onset, do not ingest with high-fat foods. No tolerance after 6 months.
Zaleplon (Sonata)	5–20	1	Rapid	1	Short-term (7–10 days) treatment for falling asleep and/or next-day wakefulness is crucial (eg, shift workers).
Zopiclone (Imovane)	5–15	3.8–6.5 (5–10 in elderly)	30	<2	Transient and short-term (7–10 days) treatment. Contraindicated in severe respiratory impairment. Caution in liver disease and depression; elderly prone to side effects. Anticholinergic agents may ↓ plasma level.
Zolpidem (Ambien)	5–20	1.4–4.5	30	2	Short-term (7–10 days) treatment for sleep onset and maintenance. Rapid onset; should be in bed when taking medication. For faster sleep onset, do not ingest with food. No tolerance after 50 weeks.
Melatonin agonist Ramelton (Rozerem)	8	1–2	30	1–1.5	For sleep <i>onset</i> . For faster sleep onset, do not ingest with high-fat foods. No tolerance. Contraindicated with fluvoxamine.

Abbreviations: ↑, increase; ↓, decrease; BzRAs, benzodiazepines; Non-BzRAs, non-benzodiazepines; OSA, obstructive sleep apnea; SWS, slow wave sleep; T_{1/2}, half-life of TST; TST, total sleep time.

Fármacos: resumen

- Uso limitado en niños
- Melatonina
- Evitar uso de sedantes y benzodiazepinas
- Interacciones medicamentosas

Tareas a investigar...

- Preguntar por sueño en hospitalizados!
- Reducir intervenciones
- Horas de sueño no son adecuadas en pacientes hospitalizados
- Pesquisa especialmente en niños con enfermedades predisponentes
- Evaluar intervenciones no farmacológicas
- No olvidar a las madres y padres