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A Systematic Review of Screening and Diagnosis of Sleep Disorders in Primary Care

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Abstract

Background

Sleep disorders are highly prevalent in the general population and contribute significantly to poor health outcomes, yet they remain under-recognised and underdiagnosed in primary care settings. As the first point of contact for most patients, primary care plays a critical role in early identification and diagnosis. However, gaps in screening and diagnostic practices may delay timely care and contribute to increased burden on tertiary services through higher referral volumes and resource use.

Objective

To synthesise evidence on screening and diagnostic practices for sleep disorders in primary care, with a focus on practices, clinician knowledge, and system-level factors impacting opportunities for timely screening and diagnosis of sleep.

Methods

A systematic review was conducted, to search for studies published before June 2026. Qualitative and quantitative studies examining screening and diagnostic practices for sleep problems in primary care were included. Data were extracted, synthesised, and appraised using the Mixed Methods Appraisal Tool (MMAT).

Results

A total of 36 studies from 19 countries were included. Documented screening occurred in only 2–25% of eligible primary care consultations, and 57% of family practice intake forms included no sleep prompt. Clinician knowledge was consistently inadequate; only 15–18% of the physicians reported any prior formal sleep training, and at least half of the respondents rated their confidence in identifying sleep disorders as low. Barriers were consistent across geographies, with studies reporting on short consultations, fragmented referral pathways, limited polysomnography access, and absent sleep curricula or accredited continuing professional development. Few studies reported structured approaches to integrating sleep assessment into routine care.

Conclusion

This review highlights significant gaps in screening and diagnostic practices for sleep disorders in primary care, influenced by limited clinician knowledge, unclear pathways, and system-level barriers. Strengthening sleep health education, standardising screening approaches, and improving integration between primary and specialist care may enhance early identification of sleep disorders and reduce diagnostic delays. These findings also support the need for capacity-building interventions for primary care practitioners and more accessible models of care within primary care settings.

Introduction

Sleep is a fundamental biological process that plays a critical role in maintaining physical, cognitive and emotional health (1). Adequate sleep supports metabolic regulation (2), immune function (3), mental well-being (4) and daytime functioning (5). Sleep disturbances are linked to a broad spectrum of negative health consequences, including cardiovascular diseases, metabolic conditions, mental health issues, and reduced quality of life (6–8). Despite the growing recognition of sleep as a key pillar of health alongside exercise and nutrition, sleep disorders remain widely underrecognized and undertreated worldwide (9, 10).

Common sleep disorders such as insomnia, obstructive sleep apnoea (OSA), restless legs syndrome and circadian rhythm disorders affect a substantial proportion of the adult population (11). Studies suggest that around 14% of the population experiences insomnia (12, 13), while OSA alone affects around 56–60% of the population globally, many of whom remain undiagnosed (14, 15). The burden of untreated sleep disorders extends beyond individual health, contributing to reduced productivity, increased health care utilisation, and higher risks of accidents and injuries (16). As awareness of the importance of sleep health continues to grow, improving the early identification and management of sleep disorders has become an important priority across health care systems.

Recently, there has been a growing emphasis on primary care-led models for diagnosing and managing sleep disorders (17, 18). Primary care plays an important role in the recognition and management of sleep-related problems. The World Health Organization (WHO) has defined primary care as "*a whole-of society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's need and as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment*"(19). Primary care practitioners are often the first point of contact for individuals seeking healthcare and, therefore, play an important role in identifying symptoms of sleep disorders. General practitioners, nurses, pharmacists, dentists, and allied health professionals are uniquely positioned to address sleep issues because of their regular contact with patients, ability to provide continuity of care, and understanding of patient contexts and comorbidities (20, 21). Routine consultations in primary care provide opportunities to recognise sleep-related symptoms, initiate preliminary assessments, and guide patients toward appropriate management pathways. The broad scope of primary care, which includes preventive care, chronic disease management, and long-term patient relationships, allows clinicians to consider sleep health within the context of overall patient well-being (22).

The screening of sleep disorders is particularly relevant for patients presenting with conditions that are commonly associated with poor sleep, including cardiovascular disease (6), obesity (23), diabetes (7), mental health conditions (8) and chronic pain (24). Early identification of sleep disorders can facilitate timely intervention, which may enhance sleep health indicators and related health conditions. A range of screening tools and assessment methods have been developed to assist clinicians in identifying sleep problems. These include brief questionnaires (STOP-BANG, ESS, OSA-50) and validated instruments designed to assess symptoms of insomnia, the risk of OSA and other sleep-related concerns (25). In addition to structured screening tools, clinical history taking and patient-reported symptoms are commonly used to assess the risk of sleep problems. Diagnostic processes may also involve referral to sleep studies when indicated. Across health care settings, primary care practitioners often serve as the front line in recognising and initially assessing sleep disorders. Despite the high prevalence and health consequences of sleep disorders, sleep problems remain underrecognized, underdiscussed and under-referred in Primary care (26).

Over the past few years, research has increasingly examined how sleep health is addressed in primary care settings (27–29). Studies have explored primary care practitioners' knowledge of sleep disorders, their perceptions of sleep health and their practices related to screening and diagnosis (28, 30–36). A synthesis of findings from these studies can offer a clearer understanding of how sleep disorders are screened and diagnosed in primary care. Bringing this evidence together is important to understand how sleep health is addressed in everyday clinical practice and to guide future research and improvements in care.

The review aims to identify practices, gaps, and barriers to primary care sleep disorder screening and diagnosis; map the enablers and challenges primary care clinicians face in providing sleep health care; and identify existing guidelines and frameworks used for sleep assessment in primary care. Specifically, this review asked: among primary care practitioners, what knowledge, perceptions, and practices have been reported regarding the screening and diagnosis of sleep disorders? By integrating findings from both qualitative and quantitative research, this review aims to provide a comprehensive overview of how sleep disorders are recognised within primary care and to highlight areas that may inform future research and clinical practice.

Methodology

A systematic review was conducted using searches of PubMed, Medline, Scopus, Embase, and CINAHL databases. The review protocol was developed a priori and defined the research question, eligibility criteria, search strategy, data-extraction procedure, quality-appraisal approach and synthesis plan. The objective of the review was to synthesize the existing evidence on screening and diagnostic practices for sleep disorders in primary care settings.

The review was registered prospectively on PROSPERO [CRD42024619934].

Search strategies combining indexing keywords relevant to sleep disorders and primary care were used for each database (Appendix A in supplementary file). The search included articles up to June 2026. Only studies published in English were included.

The initial database search for relevant studies was conducted by the first author (SK). The reference lists of the identified articles were reviewed to obtain any additional articles. All the retrieved records were exported to a reference-management application, and duplicates were removed in EndNote. The de-duplicated set was uploaded to a systematic-review screening platform (Covidence), where two reviewers independently screened titles and abstracts against the eligibility criteria. The full texts of potentially eligible records were then retrieved and independently assessed against the eligibility criteria. Disagreements at either stage were resolved by

discussion and, where consensus could not be reached, were adjudicated by a third reviewer (SE). Reasons for exclusion at the full-text stage were recorded and are reported in the PRISMA flow diagram (Appendix B in supplementary file).

Outcome of interest

This review addresses three primary outcomes. First, primary care practitioners' knowledge, attitudes and confidence regarding sleep disorders will be examined. Second, clinical practice and screening behaviour will be examined, including the frequency with which sleep problems are discussed in primary care consultations. Third, outcomes from implementation, including the effect of screening protocols on detection and referral rates, and the presence and characteristics of any frameworks or models guiding sleep health service delivery in primary care, will be examined.

To be included in the review, the studies had to be cohort studies, cross-sectional or qualitative analyses. Opinions, Editorials, Position papers, conference abstracts, reviews and studies not focused on primary care or the general practice setting were excluded.

Based on the concept of the study, the following concepts were included in the review:

- Any studies focused on sleep health service delivery in primary Care.
- Service delivery models and frameworks.
- Any studies focused on the views of primary care practitioners on sleep health service delivery.
- Studies examining the knowledge of sleep health and sleep health delivery.

Any study examining the Sleep Health Instrument validation or development of a sleep health diagnosis, or workforce capacity building for sleep health service delivery was excluded. None of the populations was excluded. Studies addressing the issue or examining it in a tertiary setting were excluded.

To maximise the applicability of the findings to general practice, only studies conducted in primary care settings were included, while those undertaken in specialised settings (e.g., universities, military or veterans' healthcare facilities, and community pharmacies) were excluded. Different terminologies for general practitioners were included as per the country or region.

Study quality:

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations on the reporting of systematic reviews were followed (Appendix C). Since the review included mixed methodologies, the MIXED METHODS APPRAISAL TOOL (MMAT) was used to assess the quality of the studies. The MMAT is a critical appraisal tool that is designed for the appraisal stage of systematic mixed methods studies reviews, i.e., reviews that include qualitative, quantitative and mixed methods studies (Appendix D in supplementary file)

Data extraction:

Information about the setting, sleep health issues addressed, focus of the study, materials and methods used, and results of the included studies were extracted for the evidence tables.

Data from eligible studies were entered into a Microsoft Excel spreadsheet by the reviewer. The following items from each included study were used: first author and year of publication; country and study setting; study design; participants' number, characteristics, sampling approach and response rate; the sleep disorder(s) addressed; data-collection method, including any validated screening or assessment instrument; and key findings relevant to screening and diagnostic practices in primary care. Discrepancies in the extracted data were resolved by discussion. Where additional information was required, study authors were contacted by email.

Data analysis

The findings were synthesised narratively and presented in structured tables grouped by outcome domain. Findings were summarised across studies by study characteristics: author, year, country, stakeholder group, sleep health condition addressed, data collection method and key findings.

To keep findings focused within each table and to avoid duplication of results across tables, the included studies were classified into three domains based on their primary research focus. The three domains represent different points along the pathway from practitioners' preparedness to clinical action. The first domain captures what the practitioners know and what they believe about sleep disorders, including their perceived role and confidence in identification and management. The second captures what practitioners actually do in routine care, including their use of validated tools, documentation of sleep concerns and referral behaviour. The third domain captures attempts to change practice through tools and service delivery implementation. Together, all three domains map directly onto the review's primary outcome- screening and diagnostic practice for sleep disorders in primary care,

A meta-analysis was not undertaken owing to substantial methodological and clinical heterogeneity across the included studies. The studies widely vary in the stakeholder group examined, the sleep health issue addressed, the measurement instruments used, the study design and the outcome metrics. Combining results from such different studies would produce an average number that is hard to interpret and could hide important differences between the groups of practitioners and the settings studied.

Results

A total of 36 studies were included in this review. After duplicates were removed from EndNote and Covidence, 7514 articles were examined for title and abstract, resulting in the selection of 278 articles for full-text review. After the full-text review, 36 articles were identified as meeting the inclusion criteria (Tables 1–3).

Table 1
Practitioner knowledge and attitudes

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
1	BaHammam 2000 (31)	Saudi Arabia	N = 209 47% Females	Primary health care physicians	Sleep disorders broadly, with emphasis on OSA	A self-administered questionnaire	Knowledge: 48% identified polysomnography as the gold standard. 15% had ever attended any sleep-disorder lecture. Attitude: Only 57% of PHC physicians considered sleep disorders a distinct speciality.
2	Papp et al. 2002 (36)	United States	N = 105 27% Female	Community-based Primary Care Practitioners (general internists, family physicians, GPs)	Sleep disorders generally- OSA, insomnia, narcolepsy, RLS, sleep hygiene	92-item structured survey	Knowledge: Mean knowledge score was 34% (range 3–94%). PCPs rated their own sleep knowledge as fair (60%) or poor (30%); none rated themselves excellent. Attitude: 90% agreed OSA is potentially life-threatening, and 68% agreed a sleep history is essential; only ~ 40% reported counselling patients on sleep (vs ~ 80% on diet/exercise
3	Tamay et al 2006 (52)	Turkey	N= 230 Female = 51%	Physicians	Obstructive sleep apnoea (OSA)	Self-administered OSAKA-KIDS questionnaire	Knowledge: The mean total knowledge score was 66.7%. Attitude: OSA importance was rated 3.9/5, and confidence in identifying and managing it was lower (3.1/5).
4	Faruqui et al. 2011 (38)	United States	N = 346, 64% Female	Primary care physicians (general pediatricians)	Pediatric sleep disorders (sleep-disordered breathing/OSA, snoring, narcolepsy, parasomnias, sleep hygiene)	15-item (multicomponent), closed-format questionnaire	Knowledge: 13% correctly answered OSA knowledge items, and a few answered narcolepsy items correctly.18% had received any formal sleep training Attitude: 96% of pediatricians believed it was their job to counsel patients on sleep hygiene.

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
5	Hayes et al. 2012 (55)	United States	N=401 Gender not reported	Generalists and Sleep specialists	Obstructive sleep apnoea (OSA) and Shift worker disorder	Mixed methods — semi-structured interviews/discussion groups plus online surveys	Knowledge: Gaps in assessment and diagnosis of sleep disorders, often relying on patients' subjective reports rather than formal tools/criteria. Attitude: 23% of generalists did not view SWD as a medical condition. Generalists lacked confidence in CPAP initiation (66.5%), polypharmacy (OSA 54.2%; SWD 62.6%) and addiction issues (61.8%).
6	Hassed et al. 2012 (33)	Australia	N = 15 40% Female	General practitioners	Sleep disorders generally, with a focus on OSA and insomnia	Dartmouth Sleep Knowledge Questionnaire (DSKQ) + Semi-structured Interviews.	Knowledge: GPs scored a mean of 13.1/24 (54%) on the DSKQ and described their knowledge as fair to poor. Attitude: Often linked sleep complaints to mental health problems, and preferred behavioural over pharmacological interventions for insomnia.
7	Saleem et al. 2016 (54)	Saudi Arabia	N = 223 49.8% Female	Primary care physicians	Sleep medicine and sleep disorders broadly (OSA, RLS, insomnia, and narcolepsy)	Pre-designed, validated questionnaires. ASKME Questionnaire	Knowledge: Mean ASKME score was 14.4/30 (48%); only 20.2% scored ≥ 60%. Knowledge was associated with prior exposure to sleep education. Only 57.7% knew OSA increases the risk of hypertension Attitude: 25.7% did not consider taking a sleep history important, and 39.2% considered sleep disturbances lifestyle (not medical) problems
8	Ozoh et al. 2017 (35)	Nigeria	N = 273 36.6% Female	General practitioners + Internal medicine doctors	Obstructive sleep apnoea (OSA)	Self-administered OSAKA questionnaire	Knowledge: Mean OSA knowledge was 10.7/18 (59%). Knowledge was positively associated with higher residency level and years in practice. Attitude: 68% considered OSA very/extremely

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							important, and 72% felt confident identifying OSA, but only 32% felt confident managing it and 17% felt confident managing CPAP.
9	Kale et al. 2020 (34)	India	N = 112 56% females	Dentists	Sleep Disordered Breathing	Self-administered 23-item validated questionnaire	Knowledge: Dentists had good knowledge of OSA definition (60.7%), general findings (76.2%) and risk factors (67.0%), but poor knowledge of screening/diagnosis (38.8%) and treatment/referral (36.0%). Attitude: Uniformly favorable (100%), but practice scores were poor (< 50%) on both practice domains.
10	Chang et al. 2020 (32)	Kenya, Nigeria, South Africa	N = 184 37% females	Primary care physicians	Obstructive sleep apnoea (OSA)	OSAKA and OSAKA-KIDS questionnaires	Knowledge: Median adult-OSA knowledge scores were 83.3% (South Africa), 66.7% (Kenya), and 61.1% (Nigeria); pediatric scores were lower. Attitude: 90–94% rated OSA as very/extremely important, confidence was low for diagnosis (55%), management (25%), and CPAP (18%).
11	Al-Rasheedi et al. 2022 (37)	Saudi Arabia	N = 264 54.9% Female	Primary care physicians	Obstructive sleep apnoea (OSA)	Self-administered OSAKA questionnaire	Knowledge: 43.9% of PCPs had low knowledge. 78% recognised polysomnography as the gold-standard diagnostic test. Attitude: 45.1% had low attitude scores, but only 21% referred OSA patients to a sleep clinic.
12	Su et al. 2022 (53)	China	N = 153, 71.9% females	Internal medicines trainees	Obstructive sleep apnoea (OSA)	Chinese OSAKA questionnaire	Knowledge: Mean knowledge was 12.6/18 (70%). Prior OSA training significantly improved knowledge. Attitude: 38% felt confident identifying patients at risk, 27.5% managing

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							OSA, and 26.2% managing CPAP. Prior OSA training did not improve confidence.
13	Berggren et al. 2022 (47)	Sweden	N = 13 84.6% female	Dental professionals	Obstructive sleep apnoea (OSA)	A qualitative, inductive approach. Semi-structured interviews. Content analysis	Knowledge: Inconsistent recognition of patients with or at risk of OSA, the oral–systemic link was inconsistent and dry mouth was often attributed to medication rather than OSA/CPAP Attitude: Visit was identified as an underused opportunity for OSA case-finding requiring screening tools and collaboration with sleep practitioners.
14	Alghamdi et al.2024 (30)	Saudi Arabia	N = 174 42% Female	Primary healthcare physicians	Obstructive sleep apnoea (OSA)	Phone-administered OSAKA questionnaire plus 18-item awareness questionnaire	Knowledge: 62.6% of physicians had a low overall knowledge level; 78.2% knew polysomnography is the gold standard. Attitude: 92.5% agreed that knowledge of OSA is essential, yet 63.8% disagreed with screening all patients for OSA.
15	Chauhan et al.2024 (57)	India	N=237 Gender not reported	Dentists	Obstructive sleep apnoea (OSA)	A self-constructed, validated questionnaire having 25 closed-ended questions	Knowledge: Overall Poor; polysomnography as the gold-standard test (58.6%) and snoring as a symptom (60.8%) were answered correctly by > 50%. Attitude: 11.4% felt equipped to diagnose OSA, only 31.6% asked patients about sleep habits.
16	Shekarian et al. 2024 (58)	Iran	N = 207 53.6% Female	Dentists	Obstructive sleep apnoea (OSA)	Validated Persian 29-question questionnaire covering demographics, OSA knowledge and attitude	Knowledge: Mean knowledge was 15.99/23. Orthodontic residents (18.28) scored significantly higher than general dentists (15.32) and dental students. Attitude: Attitude scores followed the

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							same pattern as knowledge.
17	Alquorain et al. (2026) (39)	Saudi Arabia	N = 279 57.7% Female	Primary care physicians	Obstructive sleep apnoea (OSA)	Cross-sectional online survey using the validated OSAKA questionnaire.	Knowledge: Mean total knowledge score 11.1 ± 2.9 out of 17 (~ 65%). General practitioners scored significantly lower than subspecialised consultants (9.4 vs 14.3, P < 0.001). 88.5% correctly identified overnight sleep study as the gold-standard test; 87.1% recognised that most OSA cases are underdiagnosed. Attitude: Mean attitude score 3.6 ± 0.7 out of 5 (~ 72%). Years of practice were significantly associated with attitude score (P = 0.040). 44% used OSA screening questionnaires; 74.6% referred high-risk patients to a specialist, most commonly internal medicine (63.1%), followed by ENT (26.5%).
18	Salem et al. 2026 (40)	Qatar	N = 110 60.9% Female	Primary care physicians	Sleep disorders broadly	Cross-sectional survey using the validated 30-item ASKME questionnaire, plus demographic and clinical-practice variables.	Knowledge: Mean ASKME score 56.5%; 44.5% achieved adequate sleep knowledge (≥ 60%). Attitude/practice: 63.6% reported providing sleep-related counselling; only 40% had received formal sleep training; 41.8% had never updated their sleep knowledge.

Table 3
Intervention and implementation

Sl No	Author (year)	Country	Participants	Stake holder group	Sleep Health issues	Data collection method/tools	Findings
1	Fuller et al. 2011 (49)	Australia	N=23 Gender not reported	Community Pharmacists	Multiple sleep disorders - insomnia, OSA and restless legs syndrome (RLS)	Pharmacist-administered protocol incorporating Epworth Sleepiness Scale (ESS), Insomnia Severity Index (ISI), International RLS Study Group Criteria (IRLSSGC), Multivariable Apnea Risk Index (MAPI), plus sleep-health items;	44% (142/325) of patients were identified as at risk of one or more sleep disorders; 847 delivered interventions, 49% of verbal counselling, 34% of written information and 16% physician referrals. Of 99 patients recalling a referral, 63 acted on it, and modest behavioural changes were observed (smoking 4%, caffeine 10%, alcohol 9%, sleep environment 19%).
2	Ononye et al. 2019 (50)	United States	N = 187, 53% female	Primary care physicians	Obstructive sleep apnoea (OSA)	STOP-BANG questionnaire administered during patient triage; chart audits; sleep-study (PSG) referrals for screen-positives	OSA screening rates increased from 3% (pre) to 43% (post). Referral rates rose from 0% to 39%. 61% scored ≥ 3 on STOP-BANG; only 39% of at-risk patients agreed to undergo sleep studies, of whom 67% were diagnosed with moderate-to-severe OSA requiring CPAP.
3	Cheung et al. 2023 (18)	Australia	N = 45 all female	Primary care physicians	Sleep health broadly (insomnia, OSA)	A 10-item digital health implementation instrument + semi-structured interviews	GPs were more familiar with and more likely to use sleep digital-health interventions (DHIs) than nurses or pharmacists and were most interested in the diagnostic features of sleep DHIs. Three qualitative themes emerged: scope for DHIs in current practice, practice gaps and training needs, and envisioning a sleep DHI model of care.
4	Soni 2023 (51)	United States	N = 100 Gender not reported	Primary care physicians	Obstructive sleep apnoea (OSA)	STOP-Bang Questionnaire	32% screened high-risk for OSA (STOP-BANG 5–8), 56% intermediate (3–4) and 12% low risk; all 32 high-risk plus 4 intermediate-risk obese patients (36% total) were referred for confirmatory diagnostic sleep testing.

The studies spanned a broad range of countries, with the largest number conducted in the United States (n = 12), followed by Saudi Arabia (n = 6) and Australia (n = 4). The remaining studies were distributed across Europe, Asia, Africa, and the Middle East. The full details of the countries and study characteristics are provided in Table 1.

Most studies have used cross-sectional survey designs to assess practitioner knowledge, confidence, attitudes and practices (30, 32, 35, 36) (31, 37–42). Several studies have employed retrospective chart reviews or database analyses to evaluate screening and diagnostic patterns in routine care (43–46). A smaller number of qualitative approaches were used to explore practitioner experiences and system barriers (18, 33, 47, 48). Four studies evaluated interventions or implementation strategies designed to improve sleep-related care (18, 49–51).

Twenty-three studies focused on obstructive sleep apnoea (OSA), eight addressed sleep disorders broadly (including insomnia, RLS, parasomnias, hypersomnia, narcolepsy and circadian disorders), six specifically addressed paediatric sleep disorders, and one examined shift work disorder (Table 1–3)

The studies are grouped into three evidence domains: practitioner knowledge and attitudes (n = 18), screening, diagnostic practices and referral patterns (n = 14) and intervention and implementation studies (n = 4).

Practitioner knowledge and attitudes (Table 1)

Across the included studies, primary care practitioners consistently held positive attitudes toward sleep health, yet scores on the knowledge items were moderate to poor, and practitioner confidence in clinical application was also low. The majority of practitioners agreed that sleep health falls within their professional role (30–32, 36, 38, 39, 52, 53). Notably, however, positive attitudes did not translate into corresponding knowledge or clinical behaviour (30, 42, 54, 55).

Knowledge scores were consistently inadequate across geographies, practitioner groups and measurement instruments, ranging from approximately 34% in primary care physicians (36), to 48% in Saudi primary care physicians (54), and 56–70% on OSAKA-based questionnaires (32, 35, 39, 40, 52, 53). When Bloom's style threshold (the minimum performance level required to demonstrate mastery of learning before progressing (56))was applied, the majority of practitioners were classified as having low overall knowledge (30, 37). Salem et al (40), similarly reported that only 44.5% of primary care practitioners achieved an adequate knowledge threshold of ≥ 60% on the ASKME (Assessment of Sleep Knowledge in Medical Education) The most consistent knowledge gaps were for OSA management, particularly recognition of CPAP as first-line therapy and surgical alternatives and in non-OSA conditions such as restless leg syndrome, narcolepsy, and pediatric sleep-disordered breathing (30, 35, 36, 38, 54). Among dentists, definitional and risk factor knowledge was relatively strong, but screening, diagnosis and treatment knowledge was poor (34, 57). Specialist trainees, orthodontic residents and practitioners with greater clinical experience consistently outperformed generalists, general dentists, and students (35, 53, 58) and this was reinforced by Alquorain et al (39), in which subspecialised consultants scored higher on the OSAKA compared with general practitioners. Prior formal sleep training was the single most conservative positive correlate of knowledge across settings (31, 38, 53, 54).

While knowledge was moderate to adequate in some groups, confidence in applying that knowledge clinically was consistently and markedly low (32, 35, 52, 53, 55, 57). Confidence in identifying OSA, initiating CPAP therapy and managing CPAP therapy was rated low or very low by 17–26% of respondents across three studies of physicians, dentists and generalists (32, 35, 53). Notably, prior training improved knowledge but not confidence, suggesting that educational interventions alone may be insufficient to translate knowledge into clinical self-efficacy (53).

Screening practices and referral patterns (Table 2)

Table 2
Screening practices and referral patterns

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
1	Lecrubier 1996 (59)	14 countries	N= 5438 Gender not reported	Primary care physicians	Sleep problems broadly	General Health Questionnaire (GHQ-12) + CIDI Primary Health Care version	Screening practices: Sleep problems increased GP recognition of ICD-10 disorders (51.2% vs 35%; OR 1.6). Only 13% of patients mentioned sleep as a presenting complaint. Of recognised insomnia cases, 85.9% offered treatment (53.9% pharmacological) Referral patterns: Not reported
2	Kramer et al. 1999 (43)	United States	N= 69 Gender not reported	Primary care physicians	Obstructive sleep apnoea (OSA)	Retrospective chart review of referral letters, progress notes and a structured screening worksheet	Screening practices:96% of PCP-referred patients had OSA on polysomnography (mean AHI 44.4). Asked about Snoring (93%), EDS (91%), and apnoea/gasping (67%). Referral patterns: Only 0.13% of the panel referred annually, and 11% ordered 49% of the studies. Worksheet included in only 33% of referrals.
3	Blunden et al. 2004 (48)	Australia	N = 361. 45.1% Female	Primary care physicians	Paediatric sleep problems broadly (SDB, insomnia, parasomnias, EDS, sleep–wake transitions, hyperhidrosis)	Parent-completed Sleep Disturbance Scale for Children (SDSC, 26 items) in waiting rooms	Screening practices: 24.6% of children had a clinically significant SDSC total T-score (> 70), and only 4.1% of parents raised sleep issues at the consultation. GPs reported sleep discussion in 7.9% of cases. Of children with significant scores, only 13.9% had had any sleep discussion with the GP in the prior year. Referral patterns: Not reported
4	Sorscher 2008	United States	N = 14 database batteries [Primary	Family physicians	Sleep disorders broadly include insomnia, hypersomnolence,	Audit of new-patient health-history intake questionnaires for	Screening practices: 57% (8 of 14) of batteries contained no

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
	(60)		care clinics = 121, Family medicine doctors = 935] Gender not reported		sleep-disordered breathing, parasomnias, and inadequate sleep	the presence of sleep-related screening items	sleep-related screening questions. 43% included at least one. By contrast, smoking and alcohol were screened in 100% of batteries, exercise in 93% and diet in 57%. Referral patterns: Not reported
5	Senthilvel et al. 2009 (61)	United States	N = 101 52% females	Primary care physicians	Multiple sleep disorders — insomnia, OSA, RLS, EDS, narcolepsy	CHSQ [ESS + Berlin questionnaire] STOP Questionnaire	Screening practices: At least one sleep symptom was documented by PCPs in only 24.8% of patients. By questionnaire, 33–34% screened high-risk for OSA, 30% had insomnia symptoms, 22% RLS symptoms, and 28% had ESS > 10. Documentation of a sleep disorder was 8.9%. Poor agreement between PCP documentation and questionnaire findings. Referral patterns: Sleep-clinic referral was 2%
6	Erichsen et al. 2012 (44)	United States	N=1032 Female = 50.1%	Primary care physicians (general pediatricians)	Obstructive sleep apnoea (OSA)	Retrospective manual chart review of EMRs for documentation of snoring, witnessed apneas, choking episodes, enuresis, and other SDB symptoms	Screening practices: Only 24.4% of children were screened for snoring. 34.1% of those screened reported snoring, The prevalence of diagnosed OSA was just 0.5%. No charts documented snoring frequency, choking episodes or enuresis. Referral patterns: 61.6% of snorers received no further evaluation.
7	Seng et al. 2016 (64)	United States	N = 95 76.8% Female	Primary care physicians	Insomnia and OSA	ISI index, Berlin Questionnaire	Screening practices: 31.6% of patients screened positive for clinical insomnia (ISI), 42.1% screened high-risk for sleep apnoea (Berlin), but only 12.6% were currently

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							receiving sleep care; only 32.6% slept 7–9 hours/night. 74.4% of practitioners found screening at least somewhat useful, and 51.4% said it brought sleep problems to their attention. Referral patterns: A few reported that it changed counselling/ testing/ referral.
8	Shoib 2018 (63)	India	N = 152 53% Female	Primary care physicians and Sleep Specialists	Obstructive sleep apnoea (OSA)	Cross-sectional observational study of referrals and PSG findings	Screening practices: Snoring (94.7%) and EDS (77.6%) were highly prevalent; mean AHI 21.79 and mean ESS 14.93. Referral patterns: GPs referred only 44.1% of suspected OSA patients, while specialists referred the majority (55.9%),
9	Grivell et al. 2021 (62)	Australia	N = 28 61% female	General Practitioners	Obstructive sleep apnoea (OSA)	Qualitative study using inductive thematic analysis	Screening practices: GPs currently have a limited role in OSA management. Inequities in access to OSA assessment exist, particularly in rural/remote and disadvantaged areas. Referral patterns: GPs see their primary OSA role as recognising symptoms and facilitating diagnosis by referral rather than diagnosing themselves
10	Triggs et al. 2022 (65)	United States	N = 234 37.7% Female	Dentists (orthodontists)	Obstructive sleep apnoea (OSA)	Anonymous online survey on demographics, screening practices and screening modalities	Screening practices: 61.5% of orthodontists screened all patients for OSA. The most common modalities were medical history (95%), anatomic parameters (85.7%), 2D lateral cephalogram (49.3%), CBCT (35.5%) and

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							written sleep questionnaire (34.8%); only 11.5% used a home sleep test. Referral patterns: Not reported
11	Arsic et al. 2022 (45)	United States	N = 30022, 66.1% female	Primary care physicians	Obstructive sleep apnoea (OSA)	Retrospective EHR/administrative database review using STOP-BANG-derived objective criteria	Screening practices: 31% had ever been assessed for OSA; 9% of the total population and 20% of high-risk patients had a confirmed OSA diagnosis. Referral patterns: The most common documented reasons for referral were snoring (29%) and follow-up of an existing diagnosis (19%).
12	Williamson et al. 2024 (46)	United States	N = 12,394,902 49.2% Female	Paediatric patients	Broad array of paediatric sleep disorders	Retrospective insurance claims review using ICD-10 diagnostic codes;	Screening practices: Any paediatric sleep disorder diagnosis prevalence was 2.36%. Insomnia was diagnosed in 0.52% vs 10–30% expected. Roughly 31% of sleep-disorder diagnoses occurred at primary care visits Referral patterns: Not reported
13	AlAlawi et al. (2025) (42)	Saudi Arabia	N = 245 60.4% Female	Family-medicine practitioners	Sleep disorders broadly	Cross-sectional online structured questionnaire distributed electronically.	Screening practices: 44.2% used self-reported questionnaires; 28.1% relied on clinical interview alone; 11.3% used polysomnography; 6.0% used home sleep apnoea testing; 8.0% used no diagnostic tools. 38.6% reported seeing 4–7 patients with sleep disorders per month, and 28.5% saw more than 7. Referral patterns: Among practitioners' patients with a diagnosed sleep disorder, referrals

Sl No	Author (year)	Country	Participants	Stakeholder group	Sleep Health issues	Data collection method/tools	Findings
							were to a specialist (18.1%),
14	Albert et al. 2025 (41)	France	N = 211 49% Female	General practitioners	Paediatric sleep disorders in children	Cross-sectional survey using a 20-item closed-question questionnaire developed and expert-panel-reviewed, distributed online.	Screening practices: Screening score lower in GPs (p = 0.0005). Sleep was raised by the physician (rather than the parent) in 56% of consultations overall. Only 9% of general practitioners had ever received formal training in sleep medicine (65% expressed a need for further training. Referral patterns: 31% referred for paediatric psychological consultation, 22% referred to parenting support services, 14% referred to a sleep specialist,

Routine sleep screening, documentation and referral were well below the practice patterns that practitioners in the same studies endorsed as important. Across both adult and pediatric populations, sleep was rarely raised in primary care consultations by either patients or practitioners. It was often absent altogether from standard assessments, with screening for sleep less consistent than for smoking, alcohol, diet and exercise (41, 48, 59, 60).

In some studies, findings suggest that structured screening was applied retrospectively, or in parallel to usual care, and practitioner documentation captured only a small fraction of the sleep disorder burden detected, with poor agreement between physician notes and findings (44, 61). Where screening did occur, a range of validated instruments were used. The STOP-BANG questionnaire was the most commonly applied OSA screening tool (45, 50, 51, 62), followed by the Berlin Questionnaire (61, 62), and the Epworth Sleepiness Scale (49, 61–63). Insomnia was screened with the Insomnia Severity Index and items from the Pittsburgh Sleep Quality Index (42, 49, 64). Pediatric studies used the Sleep Disturbance Scale for Children (48) or AAP-recommended single-item snoring questions (44). Polysomnography served as the diagnostic reference standard in five studies (43, 46, 50, 51, 63).

Referral pathways differed considerably, with system-level barriers contributing to an inconsistent and limited transition from a positive screening result to specialist care. A study done in U.S. medical practice reported that 11% of practitioners ordered 49% of all sleep-medicine referrals and that 96% of the referred patients had confirmed OSA on subsequent polysomnography (43, 63). Alquorain et al (39) reported that referrals were frequently diverted away from sleep medicine and were directed to internal medicine or to ear, nose and throat services, with only a small minority routed to a dedicated sleep clinic. The diagnosed prevalence of OSA, pediatric insomnia and parasomnias fell well below the epidemiological estimates. Erischsen et al (44) documented sleep problems at fewer than 15% of pediatric visits despite parental concern. Arsic et al (45) audited adult family medicine records and found that only a minority of Berlin questionnaire-positive patients were diagnosed with or referred for OSA. Williamson (46) analysed pediatric primary care records and reported a 2.4% diagnosed prevalence against a > 10% epidemiological estimate, alongside notable sociodemographic disparities in who was diagnosed (44–46). Practitioner role perceptions further constrained practice. Qualitative work with general practitioners showed that they framed their primary OSA role as recognising symptoms and facilitating diagnosis by referral rather than diagnosing themselves (62). Among dental professionals, a substantial minority reported doing no OSA screening at all and uptake of objective screening modalities such as home sleep testing remained low compared with less specific history-based and anatomic assessments (65).

Intervention and implementation (Table 3)

Four studies evaluated structured approaches to embedding sleep screening or sleep-health services in primary care workflows, spanning physician-led questionnaires, pharmacist-administered protocols, and digital health implementation tools. The implementation of the STOP-BANG questionnaire in primary care improved OSA screening from 3% to 43%, and referral from 0% to 39%. However, only 39% of at-risk patients agreed to undergo a sleep study (50). A separate STOP-BANG implementation identified 32% of patients as high-risk and 56% as intermediate-risk, with 36% referred for confirmatory testing (51). Outside the physician setting, a pharmacist-administered multi-instrument protocol identified 44% of patients as at risk of at least one sleep disorder and delivered 847 interventions (49). A digital health implementation study found that general practitioners were more familiar with and more willing to use sleep digital health interventions than nurses or pharmacists, but identified consistent themes of training need, unclear scope and the need for a model of care before such tools can be embedded in primary care(18). Notably, none of the included studies described a model or framework to guide sleep health service delivery in primary care practice

Quality assessment:

The quality of all the studies was evaluated using the mixed methods appraisal tool (MMAT) 2018 version (66), which provides a structured framework for assessing the qualitative, quantitative, and mixed-methods research. The MMAT involves two initial screening questions applicable to all studies, followed by five study design-specific criteria. Each study was scored based on the number of criteria fulfilled, with a maximum score of five (Appendix E in supplementary file)

The majority of studies scored between 4 and 5, indicating moderate to high methodological quality. Most studies clearly articulated research objectives and employed data collection strategies appropriate for their aims. Few studies were rated slightly lower due to those using convenience samples or lower response rates, mainly due to limited information on sampling methods or unclear reporting.

Discussion

This systematic review of 36 studies identified four convergent findings. First, sleep-medicine knowledge among primary-care practitioners is consistently low: mean scores fell between approximately 34% and 70% correct on validated instruments of knowledge of sleep physiology, behaviour, and lifespan development (30, 31, 33–38, 53, 54, 58). Prior formal sleep training was the strongest and most consistent predictor of better knowledge across geographies and disciplines (30, 31, 38, 53, 54, 63). Second, validated screening tools (STOP-Bang, Berlin, Epworth Sleepiness Scale, Insomnia Severity Index, PSQI, and SDSC (45, 50, 51, 61, 65) are available, but are rarely embedded in routine primary-care workflows. Documented screening rates range from approximately 2–25% of eligible primary care consultations (44, 46, 61), and over half of the family-practice intake forms contained no sleep item at all (60). Third, although some patients were screened, only a few went on to receive a confirmed diagnosis and treatment with substantial physician-level variation and frequent diversion of obstructive sleep apnoea (OSA) referrals away from sleep medicine, typically to ear, nose and throat services or general pulmonology. Fourth, a small body of implementation studies (18, 49–51) showed that structured, tool-embedded protocols can deliver detection. The finding that these challenges occur across multiple geographical settings and primary care practitioners suggests that these issues are not confined to a single healthcare system but represent ongoing, structural problems that have persisted despite major advancements in sleep medicine. Although a growing body of literature has examined sleep health within primary care, findings are dispersed across studies conducted in different countries and health care contexts. Research in this area has used different methods, including surveys, observational studies, and interviews with primary care practitioners.

We found that most studies examining sleep related primary care practices were conducted with a focus on OSA (present in 22 of 32 studies), which mirrors the broader sleep-medicine literature but contrasts with the population burden of insomnia, RLS, paediatric sleep disorders and circadian rhythm disorders, all of which are under-represented in the broader sleep medicine literature as well as primary-care evidence base identified in this systematic review. The prominence of allied health groups – non-physicians (dentists, orthodontists, pharmacists and nurses) within the included studies signals an emerging recognition that the touchpoints for sleep-disorder detection extend well beyond the general practitioner encounter alone, and that any future model of primary-care sleep screening must accommodate this multidisciplinary reality.

Knowledge and confidence among primary-care practitioners

The pattern of inadequate sleep-medicine knowledge across all clinician groups is one of the most striking findings of this review and is consistent across geographies, disciplines and decades. The strongest predictor of better knowledge in nearly every study was prior formal sleep training, yet exposure to training remains low, with only 18% of US (38), 15% of Saudi PHC physicians (31) reported any prior sleep training, and Albert et al (41) reported that only 11% of survey primary care practitioners had received any formal sleep training. Foundation-level training in medical curricula also remains sparse, with approximately two hours of undergraduate teaching (63) remaining typical globally.

The review findings showed that orthodontic residents above general dentists (58), paediatricians above general practitioners (38, 44, 46, 52), and senior residents above juniors and interns (53, 57), had greater sleep medicine knowledge), which is consistent with knowledge accumulating with both formal sleep training and years of clinical experience, rather than with speciality status. This was reinforced by recent studies (39, 40), which showed that higher knowledge was associated with speciality training, OSA-focused education, and greater clinical experience. Taken together, these results suggest that sleep knowledge is currently acquired primarily through speciality training rather than through routine primary-care exposure. The practical concern is not that primary-care practitioners should match specialist sleep physicians on knowledge, but that current levels of sleep knowledge and confidence in primary care are insufficient to consistently trigger screening, detection and referral for common sleep disorders, even though most patients are first present in primary care. Importantly, Su's (53) finding that training improved knowledge, but not confidence, implies that information-only interventions may be insufficient. Su suggests that clinicians require structured opportunities to apply screening and diagnostic skills in supervised settings if the gap between knowledge and behaviour is too close.

The screening–diagnosis pathway

The consistent gap between the population prevalence of sleep disorders and rates of clinical detection in primary care is exemplified by Williamson's (46) 2.36% diagnostic prevalence against an epidemiological ≥ 10%, and Senthilvel's (61) 24.8% PCP documentation rate against ~ 30% questionnaire-positive rates. Albert et al. (41) extended this finding to pediatric primary care, where physicians initiated the discussion of sleep in only 53% of consultations. These studies point to systemic rather than individual screening failure. The contrast between the universal screening for tobacco and alcohol that Sorscher (60) documented and the absence of any sleep question on 57% of family-practice intake forms cannot be explained by differential disease burden; it reflects the historical and policy prioritisation of other behavioural risks. Pediatric evidence (44, 48) extends this conclusion to children, where the American Academy of Pediatrics (AAP) guidelines call for a screening question about snoring at every well-child visit and structured evaluation for children with concerns, yet adherence remains low more than two decades after publication. These findings show that clinician motivation is not the main issue. The main problem is how intake forms and electronic health records (EHR) systems are designed. Sorscher (60) found no sleep prompt on 57% of intake forms, while Ononye et. al (50) and Soni(51) showed that detection rose sharply once a validated prompt was embedded in the workflow, indicating that low screening rates reflect a lack of structured prompts rather than disengagement by clinicians or patients.

Even where screening occurs, the pathway from positive screen to confirmed diagnosis and treatment is narrow and variable. The diversion of OSA referrals to ENT or pulmonology rather than sleep medicine reflects both training and access patterns (37, 39). Hayes'(55) finding that approximately two-thirds of primary care practitioners and specialists identify poor coordination as a major barrier underscores that fragmentation at the primary care–specialist interface is a shared concern, not solely a primary-care deficiency. Geographic differences also affect access to care. In some areas, clinical testing (e.g., polysomnography and actigraphy) is not available. This leads to the use of less suitable diagnostic methods. Because of this, referral systems cannot be copied from high-resource settings. They must be adapted to fit local resources and infrastructure. Even well-adapted referral pathways will be insufficient without parallel investment in diagnostic and treatment capacity; without that investment, delays simply migrate from the screening stage to the diagnostic-queue or treatment-access stage rather than being resolved.

Implementation evidence

The implementation evidence reviewed here, while limited in number, demonstrates that structured screening protocols can deliver substantial gains in detection within months. Ononye's (50)fourteen-fold increase in OSA screening rates and Soni's (51) 36% referral yield from a single STOP-BANG-driven encounter are clinically meaningful. Furthermore, the success of pharmacist-led screening in Fuller (49) and the clinician receptiveness to digital health interventions documented in Cheung et al (18) collectively support the benefits of a multi-touchpoint primary-care model. Importantly, Ononye (50) also documented that only 39% of at-risk patients accepted polysomnography, indicating that increased screening must be paired with patient-facing strategies, including health literacy, alternative diagnostic modalities such as home sleep testing, and the removal of financial and logistic barriers.

Implications for practice and research

Translating this evidence into practice needs coordinated action across several connected domains. First, sleep medicine should be formally integrated into foundational training (undergraduate) medical, nursing, dental and pharmacy curricula, expanding well beyond the ~ 2 hours of content currently typical in many medical schools and including supervised clinical exposure (63). Second, structured continuing professional development, accredited, repeating and case-based, should target practising clinicians across disciplines, with priority on OSA screening, insomnia management, pediatric sleep, and CPAP initiation. Third, validated screening tools with appropriate sensitivity and specificity for detecting sleep problems in the populations seen in a primary-care practice should be embedded as standard prompts in clinical intake forms and EHR workflows. Fourth, referral pathways require deliberate development, with particular attention to rural and remote settings: this should include formal primary care–sleep service agreements, validated portable diagnostic alternatives (such as home sleep testing) where polysomnography is unavailable, and tele-sleep models to redress the geographic inequities documented by Grivell (62)and Chang (32). Fifth, the field urgently needs longitudinal studies such as Australia's BEACH study (relaunched as OCEAN (67)) that link screening practices in primary care to patient-centred outcomes, symptom resolution, quality of life, cardiovascular events, motor-vehicle and occupational accident reduction, and healthcare utilisation rather than process measures alone. Such evidence is essential to inform guideline endorsement of routine screening and to justify the structural investments described above.

Strengths and limitations

The review has several strengths. It includes a large number of studies from multiple countries and uses a comprehensive approach to synthesise evidence across study designs. The inclusion of both qualitative and quantitative studies allowed for a more complete understanding of the challenges and opportunities in primary care sleep health. However, several limitations should be considered. The included studies varied in design, population and outcomes, which may limit comparability. A meta-analysis or meta-synthesis was not undertaken because of marked heterogeneity in study designs, populations, knowledge instruments and screening definitions; the synthesis is therefore narrative and thematic, and effect-size pooling was not possible. The search was restricted to English-language publications, which may have underrepresented evidence from non-English-speaking primary-care systems. Most of the included studies relied on self-reported clinician knowledge, attitudes and practices rather than direct observation or audited records, which may introduce social-desirability bias. Finally, only four intervention studies were available, limiting the strength of any causal inference about which implementation strategies work best, for whom and in what settings.

Conclusion

Sleep disorders are common, modifiable and consequential, yet across nearly three decades of evidence, screening and diagnosis in primary care have remained inadequate when measured against knowledge scores, routine screening and self-rated confidence. Validated tools exist, structured implementation programmes can rapidly improve detection, and a growing range of allied primary-care touchpoints offers additional opportunities for case-finding of sleep disorders within primary care settings. Building the capability and capacity of primary-care practitioners and the systems within which they work, through coordinated investment in clinician education and continuing professional development, structured screening workflows embedded in primary-care infrastructure, referral-pathway development for underserved geographies, and a research agenda that links screening to patient-centered outcomes, represents a substantial opportunity to address an under-recognised but pervasive contributor to global morbidity.

Declarations

Data availability statement: All data were derived from published studies identified in the review, and no new individual participant data were collected.

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References

1. Baranwal N, Yu PK, Siegel NS. Sleep physiology, pathophysiology, and sleep hygiene. Prog Cardiovasc Dis. 2023;77:59–69.
2. Sharma S, Kavuru M. Sleep and Metabolism: An Overview. Int J Endocrinol. 2010;2010(1):270832.
3. Besedovsky L, Lange T, Haack M. The Sleep-Immune Crosstalk in Health and Disease. Physiol Rev. 2019;99(3):1325–80.
4. Bacaro V, Miletic K, Crocetti E. A meta-analysis of longitudinal studies on the interplay between sleep, mental health, and positive well-being in adolescents. Int J Clin Health Psychol. 2024;24(1):100424.
5. McEwen B. The critical role of sleep in optimising health. J Australian Traditional-Medicine Soc. 2025;31(3):138–43.
6. Jaspan VN, Greenberg GS, Parihar S, Park CM, Somers VK, Shapiro MD, et al. The Role of Sleep in Cardiovascular Disease. Curr Atheroscler Rep. 2024;26(7):249–62.
7. Hussain N, Al Haddad AHI, Abbass S, Alfahl Z. The potential impact of habitual sleep quality on glycaemic control and inflammation: A study on geriatric patients recently diagnosed with type 2 diabetes mellitus (T2DM). Sleep Medicine: X. 2025;9:100139.
8. Chai L, Lu Z. The association between financial strain and mental health: The mediating and moderating roles of sleep problems in the UK household longitudinal study (UKHLS). J Affect Disord. 2025;377:245–53.
9. Buysse DJ. Sleep Health: Can We Define It? Does It Matter? Sleep. 2014;37(1):9–17.
10. Ramar K, Malhotra RK, Carden KA, Martin JL, Abbasi-Feinberg F, Aurora RN, et al. Sleep is essential to health: an American Academy of Sleep Medicine position statement. J Clin Sleep Med. 2021;17(10):2115–9.
11. McArdle N, Ward SV, Bucks RS, Maddison K, Smith A, Huang R-C, et al. The prevalence of common sleep disorders in young adults: a descriptive population-based study. Sleep. 2020;43(10):zsaa072.
12. Spiegelhalder K, Baglioni C, Morin CM, Nissen C, Palagini L, Perlis ML, et al. Insomnia disorder. Nat Reviews Disease Primers. 2026;12(1):17.
13. van Straten A, Weinreich KJ, Fábián B, Reesen J, Grigori S, Luik AI, et al. The Prevalence of Insomnia Disorder in the General Population: A Meta-Analysis. J Sleep Res. 2025;34(5):e70089.
14. Senaratna CV, Perret JL, Lodge CJ, Lowe AJ, Campbell BE, Matheson MC, et al. Prevalence of obstructive sleep apnea in the general population: A systematic review. Sleep Med Rev. 2017;34:70–81.

15. de Araujo Dantas AB, Gonçalves FM, Martins AA, Alves GÂ, Stechman-Neto J, Corrêa CC, et al. Worldwide prevalence and associated risk factors of obstructive sleep apnea: a meta-analysis and meta-regression. Sleep Breath. 2023;27(6):2083–109.
16. Gupta R, Pandi-Perumal SR, Mallick HN. Reforming Sleep Health: A Need to Focus on Sleep Health Policy to Reduce Disease Burden and Promote Health Equity and Equality. Sleep Vigilance. 2022;6(2):255–7.
17. Basheti MM, Bawa Z, Grunstein R, Grivell N, Saini B, Gordon CJ. Improving sleep health management in primary care: A potential role for community nurses? J Adv Nurs. 2023;79(6):2236–49.
18. Cheung JMY, Menczel Schrire Z, Aji M, Rahimi M, Salomon H, Doggett I, et al. Embedding digital sleep health into primary care practice: A triangulation of perspectives from general practitioners, nurses, and pharmacists. Digit HEALTH. 2023;9:20552076231180970.
19. World Health O. Primary Health Care. World Health Organization; 2025.
20. Clements J, Bowman E, Tolhurst R, Savage M, Piwko A, Chen C, et al. The role of the clinical pharmacist in the respiratory or sleep multidisciplinary team. Breathe (Sheff). 2023;19(4):230123.
21. Siengsukon CF, Al-dughmi M, Stevens S. Sleep Health Promotion: Practical Information for Physical Therapists. Phys Ther. 2017;97(8):826–36.
22. Safran DG. Defining the future of primary care: what can we learn from patients? Ann Intern Med. 2003;138(3):248–55.
23. Rahe C, Czira ME, Teismann H, Berger K. Associations between poor sleep quality and different measures of obesity. Sleep Med. 2015;16(10):1225–8.
24. Afolalu EF, Ramlee F, Tang NKY. Effects of sleep changes on pain-related health outcomes in the general population: A systematic review of longitudinal studies with exploratory meta-analysis. Sleep Med Rev. 2018;39:82–97.
25. Ellender CM, Ruehland WR, Duce B, Joyce R, Worsnop C, Mercer J, et al. Australasian Sleep Association 2024 guidelines for sleep studies in adults. Sleep. 2024;47(10):zsae107.
26. Chai-Coetzer CL, Antic NA, McEvoy RD. Identifying and managing sleep disorders in primary care. Lancet Respiratory Med. 2015;3(5):337–9.
27. Vargas I, Walker J, Egeler M, Vance A, Boyle JT, Muench A. Chapter 47 - Sleep health in the primary care setting. In: Grandner MA, editor. Sleep and Health. Second Edition): Academic; 2026. pp. 659–65.
28. Golden ME, Cosottile M, Meadows T, Parikh MR, O'Dell SM. Primary care providers' practices regarding patient sleep: Impact of integrated behavioral health. Fam Syst Health. 2023;41(2):192–200.
29. Ambrosi E, Mezzalira E, Canzan F, Leardini C, Vita G, Marini G, et al. Effectiveness of digital health interventions for chronic conditions management in European primary care settings: Systematic review and meta-analysis. Int J Med Informatics. 2025;196:105820.
30. Alghamdi MA, Alzahrani R, Ali MA, Alharthi Z, Alyahya AM, Alghamdi AH, et al. Knowledge, Awareness, and Attitude Regarding Obstructive Sleep Apnea Among Primary Healthcare Physicians in the Al-Baha Region of Saudi Arabia. Cureus. 2024;16(1):e51435.
31. Bahammam AS. Knowledge and attitude of Primary Health Care Physicians towards sleep disorders. Neurosciences (Riyadh). 2001;6(1):59–62.
32. Chang J-WR, Akemokwe FM, Marangu DM, Chisunkha B, Irekpita E, Obasikene G, et al. Obstructive Sleep Apnea Awareness among Primary Care Physicians in Africa. Annals Am Thorac Soc. 2019;17(1):98–106.
33. Hassed C, Antoniades J, Jones K, Rajaratnam S, Kiropolous L, Naughton M, et al. An examination of Australian general practitioners' knowledge, attitudes and practices in relation to sleep disorders. Malays Fam Physician. 2012;7(1):16–23.
34. Kale SS, Kakodkar P, Shetiya SH. Obstructive sleep apnea domains: Knowledge, attitude and practice results of dentists from a dental college in India. Sleep Sci. 2020;13(1):3–9.
35. Ozoh OB, Ojo OO, Iwuala SO, Akinkugbe AO, Desalu OO, Okubadejo NU. Is the knowledge and attitude of physicians in Nigeria adequate for the diagnosis and management of obstructive sleep apnea? Sleep Breath. 2017;21(2):521–7.
36. Papp KK, Penrod CE, Strohl KP. Knowledge and Attitudes of Primary Care Physicians Toward Sleep and Sleep Disorders. Sleep Breath. 2002;06(03):103–10.
37. Al-Rasheedi AN, Thirunavukkarasu A, Almutairi A, Alruwaili S, Alotaibi H, Alzaid W et al. Knowledge and Attitude towards Obstructive Sleep Apnea among Primary Care Physicians in Northern Regions of Saudi Arabia: A Multicenter Study. Healthc [Internet]. 2022; 10(12).

38. Faruqui F, Khubchandani J, Price JH, Bolyard D, Reddy R. Sleep Disorders in Children: A National Assessment of Primary Care Pediatrician Practices and Perceptions. Pediatrics. 2011;128(3):539–46.
39. Almulhem N, Alquorain S, Althumairi A, Alghamdi M. Knowledge and Attitude of Obstructive Sleep Apnea among Primary Care Physicians in the Eastern Province of Saudi Arabia. Saudi J Med Med Sci. 2026;14(1):48–55.
40. Salem M, Alhor F, Ouda A, Halawa S, Abuazab Y, Elmakaty I. Sleep and Sleep Disorder Knowledge Among Physicians Working in Qatar's Primary Health Care Corporation: A Cross-Sectional Study. Clocks Sleep [Internet]. 2026;8(1):13.
41. Albert A-L, Leblond P, Da Mota S, Schweitzer C, Ioan I. Evaluation of pediatric sleep screening practices in primary care in a northeastern region of France: A survey conducted among general practitioners. J Gen Family Med. 2025;26(5):458–64.
42. AlAlawi MF, Alsudairy NM. Sleep Disorders in Family Medicine: A Cross-Sectional Study on Prevalence, Screening, and Treatment Approaches in Saudi Arabia. Cureus. 2025;17(2):e78937.
43. Kramer NR, Cook TE, Carlisle CC, Corwin RW, Millman RP. The Role of the Primary Care Physician in Recognizing Obstructive Sleep Apnea. Arch Intern Med. 1999;159(9):965–8.
44. Erichsen D, Godoy C, Gränse F, Axelsson J, Rubin D, Gozal D. Screening for Sleep Disorders in Pediatric Primary Care: Are We There Yet? Clin Pediatr. 2012;51(12):1125–9.
45. Arsic B, Zebic K, Sajid A, Bhave N, Passalacqua KD, White-Perkins D, et al. Assessing the Adequacy of Obstructive Sleep Apnea Diagnosis for High-Risk Patients in Primary Care. J Am Board Family Med. 2022;35(2):320.
46. Williamson AA, Uwah EA, Min J, Zhang X, Griffis H, Cielo CM, et al. Diagnosis of sleep disorders in child healthcare settings. Sleep Med. 2024;119:80–7.
47. Berggren K, Broström A, Firestone A, Wright B, Josefsson E, Lindmark U. Oral health problems linked to obstructive sleep apnea are not always recognized within dental care—As described by dental professionals. Clin Experimental Dent Res. 2022;8(1):84–95.
48. Blunden S, Lushington K, Lorenzen B, Ooi T, Fung F, Kennedy D. Are sleep problems under-recognised in general practice? Arch Dis Child. 2004;89(8):708.
49. Fuller JM, Wong KK, Krass I, Grunstein R, Saini B. Sleep disorders screening, sleep health awareness, and patient follow-up by community pharmacists in Australia. Patient Educ Couns. 2011;83(3):325–35.
50. Ononye T, Nguyen K, Brewer E. Implementing protocol for obstructive sleep apnea screening in the primary care setting. Appl Nurs Res. 2019;46:67–71.
51. Soni SJ. Improving the screening process for obstructive sleep apnea in the primary care setting. J Am Association Nurse Practitioners. 2023;35(11).
52. Tamay Z, Akcay A, Kilic G, Suleyman A, Ones U, Guler N. Are physicians aware of obstructive sleep apnea in children? Sleep Med. 2006;7(7):580–4.
53. Su L, Chen R, Luo J, Xiao Y. Current medical education improves OSA-related knowledge but not confidence in residents: An underappreciated public health risk. Front Psychiatry. 2022;Volume 13–2022.
54. Saleem AH, Al Rashed FA, Alkharboush GA, Almazyed OM, Olaish AH, Almeneessier AS, et al. Primary care physicians' knowledge of sleep medicine and barriers to transfer of patients with sleep disorders. A cross-sectional study. Saudi Med J. 2017;38(5):553–9.
55. Hayes SM, Murray S, Castriotta RJ, Landrigan CP, Malhotra A. (Mis) perceptions and interactions of sleep specialists and generalists: obstacles to referrals to sleep specialists and the multidisciplinary team management of sleep disorders. J Clin Sleep Med. 2012;8(6):633–42.
56. Bloom BS. Learning for Mastery. Instruction and Curriculum. Regional Education Laboratory for the Carolinas and Virginia, Topical Papers and Reprints, Number 1. Evaluation Comment. 1968;1(2).
57. Chauhan M, Chauhan MR, Agrawal A, Chawla AR. Gauging the knowledge, attitude and practice of interns and dentists about obstructive sleep apnoea-A cross-sectional study. Lung India. 2024;41(1):25–9.
58. Shekarian M, Feizbakhsh M, Rafie M. Knowledge and Attitude of General Dentists, Senior Dental Students, and Orthodontic Residents Toward Obstructive Sleep Apnea. Clin Experimental Dent Res. 2024;10(5):e931.
59. Lecrubier Y, Weiller E, Privett M, Boyer P, Maier W, Üstün TB, et al. Recognition and treatment of patients with sleep problems in general health care. Eur Psychiatry. 1996;11(S1):s11–4.
60. Sorscher AJ. How is Your Sleep: A Neglected Topic for Health Care Screening. J Am Board Family Med. 2008;21(2):141.

61. Senthilvel E, Auckley D, Dasarathy J. Evaluation of sleep disorders in the primary care setting: history taking compared to questionnaires. J Clin Sleep Med. 2011;7(1):41–8.
62. Grivell N, Haycock J, Redman A, Vakulin A, Zwar N, Stocks N, et al. Assessment, referral and management of obstructive sleep apnea by Australian general practitioners: a qualitative analysis. BMC Health Serv Res. 2021;21(1):1248.
63. S. S. Role of General Practioners (GP) Verus Specialists in Recognising Obstructive Sleep Apnea (OSA). Ann Med Health Sci Res. 2018;8:74–6.
64. Seng EK, Cervoni C, Lawson JL, Oken T, Sheldon S, McKee MD, et al. The Burden of Sleep Problems: A Pilot Observational Study in an Ethnically Diverse Urban Primary Care Setting. J Prim Care Community Health. 2016;7(4):276–80.
65. Triggs A, Roberson G, Chaudhry K, Subramani K. Screening for obstructive sleep apnea by orthodontists in the United States - A survey study. J Clin Exp Dent. 2022;14(8):e625–32.
66. Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. Educ Inform. 2018;34(4):285–91.
67. Halcomb E, Mursa R, Randall S, Gordon J, Lu Y, Henderson J et al. Capturing the Work of Nurses in General Practice: Development and Testing of the OCEAN-GPN Tools. J Adv Nurs. 2026;n/a(n/a).

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