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REVIEW ARTICLES

Knowledge to action: a scoping review of approaches to educate primary care providers in the identification and management of routine sleep disorders

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Study Objectives: The referral burden on health care systems for routine sleep disorders could be alleviated by educating primary care providers (PCPs) to diagnose and manage patients with sleep health issues. This requires effective professional education strategies and resources. This scoping review examined the literature on existing approaches to educate PCPs in sleep health management.

Methods: A comprehensive literature search was conducted across 8 databases to identify citations describing the education of PCPs in diagnosing and managing sleep disorders, specifically insomnia and sleep apnea. A conceptual framework, developed from the knowledge-to-action cycle, was used to analyze citations from a knowledge translation perspective.

Results: Searches identified 616 unique citations and after selection criteria were applied, 22 reports were included. Reports spanning 38 years were analyzed using components of the knowledge-to-action cycle to understand how educational interventions were designed, developed, implemented, and evaluated. Interventions involved didactic (32%), active (18%), and blended (41%) approaches, using face-to-face (27%), technology-mediated (45%), and multimodal (5%) delivery. Educational effectiveness was assessed in 73% of reports, most commonly using a pre/post questionnaire (41%).

Conclusions: While this scoping review has utility in describing existing educational interventions to upskill PCPs to diagnose and manage sleep disorders, the findings suggest that interventions are often developed without explicitly considering the evidence of best educational practice. Future interventional designs may achieve greater sustained effectiveness by considering characteristics of the target audience, the pedagogical approaches best suited to its needs, and any environmental drivers and barriers that might impede the translation of evidence into practice.

Keywords: education, effectiveness, knowledge translation, pedagogy, primary care providers, scoping review, sleep disorder management

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INTRODUCTION

Sleep disorders such as insomnia and obstructive sleep apnea are increasingly common, with an estimated 4 in 10 people experiencing sleep health issues at some point in their lifetime.[1] Currently, diagnosis and management of such disorders typically require sleep specialist referral. The prevalence of sleep health issues in society places pressure on health systems, characterized by high expenditure on specialist sleep diagnostic testing, lengthy waiting times, and limited access to treatment, particularly in rural and remote regions. Equipping primary care providers (PCPs) with capacity to screen, diagnose, and manage routine sleep disorders could offset these challenges. Indeed, several randomized controlled trials demonstrate that when equipped with the necessary competence and tools, PCPs can do this effectively.[2–5] The key barrier to translating this trial evidence into practice, however, is the current lack of systematic education and training of PCPs to diagnose and manage sleep disorders.[6]

Diagnosing and managing sleep disorders inherently and frequently involves complex problem-solving. From a cognitive psychology perspective, complex problem-solving is not a generic skill.[7–10] Rather, it requires a well-organized knowledge base that can be applied to various cases.[11,12] Applying this knowledge requires the ability to understand differences and similarities between cases—a process known as "transfer."[13,14] To facilitate complex problem-solving, learning should combine and integrate fundamental knowledge and practical experience.[13,15] Yet, effectively designing such educational programs can prove challenging.

Little is known about the educational approaches (pedagogies) that have been used to upskill PCPs to diagnose and manage sleep disorders. This scoping review sought to address this gap by examining the existing literature to report on the pedagogies that have been used. Where provided, we also present the effectiveness of these educational approaches—for example, changes in clinician behavior, improved referral rates, and self-reported increases in knowledge and attitudes toward sleep disorder identification and management. While this has utility, we seek to extend the value of this research by combining 2 fields of inquiry: clinical sleep health, and health professions education (HPE). In so doing, we recognize the potential challenges of combining 2 distinctly different disciplines, such as navigating and reconciling discipline-specific

jargon.[16,17] Additionally, arguments may appear unconvincing in situations where disciplines hold diverse views about what constitutes evidence,[18] and which methodologies are valued. A fundamental difference between clinical and educational research relates to generalizability. Clinical research generalizes by showing what works, while educational research generalizes by showing why and how something works. In clinical research, evidence is considered generalizable regardless of context (eg, statins lower cholesterol irrespective of geography). Conversely, context (eg, relationships, culture, the environment) is integral to understanding interactions between educators and learners.[16,19–21] Although these differences highlight the complexities of interdisciplinary collaboration, each discipline offers a novel perspective, reflecting current views on knowledge translation (KT).

KT is the complex process of bridging the "know-do gap,"[22] moving from knowledge dissemination toward knowledge application to inform decision-making.[23] While much of the literature focuses on translating biomedical science knowledge to practice, KT concepts are equally applicable to HPE to understand how evidence can enhance clinical education and, ultimately, deliver quality health care.[24,25] KT requires the use of best-available clinical evidence that is, in turn, taught using best-available pedagogical evidence.[26]

KT models can facilitate the use of knowledge. One such model, the knowledge-to-action (KTA) cycle,[27] is an implementation framework involving 2 key processes (ie, knowledge creation and action) that include a series of phases and activities. The KTA cycle is a complex, dynamic process that is not always linear, and phases often occur simultaneously.[27] We used elements of the KTA cycle (specifically, the action component) as an organizational framework (referred to herein as the KTA organizational framework) to report on (1) the approaches that have been used to educate PCPs to diagnose and manage sleep disorders and (2) the effectiveness of these interventions. We complemented this with an explanatory framework using cognitive theories of learning.

METHODS

Search strategy

A logic grid of key concepts was constructed to aid the development of a comprehensive search. Search terms related to 4 key concepts: pedagogical approaches, primary health care professionals, management, and sleep disorders. We then created a search protocol and translated this across 8 databases (ie, Ovid MEDLINE, PubMed [non-MEDLINE content only], CINAHL, Embase [Ovid], Scopus, PsycINFO, ProQuest [including ERIC], and the health subset of the Australian Informit database). The reference lists of included studies were also scanned for studies missed by the electronic database strategies. The search strategy for Ovid/MEDLINE is provided in the supplemental material.

Eligibility criteria

Citations were included without date restriction if they were written in English with a focus on the education of health professionals in primary care to manage sleep disorders. PCPs constitute the first contact that patients have with the health system and often practice in family and community (as opposed to hospital) settings.[28,29] PCPs come from a range of health professions including medicine, nursing and midwifery, dentistry, allied health (including pharmacy and psychology), and Indigenous health.[28,29]

Exclusion criteria were as follows: (1) citations focused on comorbidities, of which sleep disorders were only 1 factor (eg, heart failure, attention-deficit/hyperactivity disorder, Alzheimer disease, restless legs syndrome, anxiety disorders, fibromyalgia); (2) articles describing treatment options (as opposed to education-focused articles); (3) justification studies providing a rationale for the management of sleep disorders in primary care; (4) studies assessing knowledge, attitudes, and practices of PCPs in the management of sleep disorders in the absence of an educational intervention; (5) patient education articles; and (6) health professional preregistration education. Also excluded from this review were papers focusing on the implementation of interventions, where the educational approach was not the primary focus.

Study selection

Titles and abstracts of candidate articles were screened by 2 authors (S.K. and R.D.) against the eligibility criteria. Full-text articles of the remaining potentially relevant studies were obtained for additional independent screening by 2 reviewers. Uncertainties or disagreements were resolved by consensus.

Data extraction

Data from relevant studies were extracted by 1 reviewer (S.K.) and checked by another (R.D.). Data were extracted according to 2 criteria: (1) study characteristics of interest (eg, aims, target group, educational approach, and evaluation methods) and (2) assessment of citations against the KTA organizational framework. As outlined above, this framework was developed by adapting and applying the KTA action cycle[27] phases to generate a series of assessment criteria (see **Table 1**).

Data synthesis

Heterogeneity of study methods and interventions eliminated the possibility of meta-analysis. The review, therefore, presents a narrative synthesis of themes and issues identified across the studies.

RESULTS

Electronic database searches, conducted on July 10, 2018, identified a total of 1,076 citations. Once duplicates were removed, 649 citations remained for title and abstract screening. From here, 38 citations required the full text to assess eligibility. After full-text review, 22 reports were deemed relevant for inclusion in this review. **Figure 1** presents the search and selection process in the form of a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.[30]

Study characteristics

The 22 included reports took various forms: journal article (9/22; 41%), conference abstract (7/22; 39%), tutorial/workshop guidelines (2/22; 9%), thesis (2/22; 9%), report (1/22; 5%), and

Table 1—Organizational framework for data analysis based on the knowledge-to-action cycle.[27]

Knowledge-to-Action Cycle Components	Assessment Criteria for Sleep Education Reports	Alignment With Knowledge-to-Action Cycle Components
1. Identify the problem 2. Identify, review, and select knowledge 3. Adapt knowledge to the local context 4. Assess barriers to knowledge use 5. Select, tailor, and implement interventions 6. Monitor knowledge use and evaluate outcomes 7. Sustain knowledge use	The *problem*[a] (that will be addressed by the intervention) is described.	1[b]
	The *intended audience* and their associated health professional context(s) are described.	3
	The *educational intervention* is described.	5
	The educational design of the intervention (eg, approach, mode of delivery) is informed by: • *Evidence of best pedagogical practice* (based on relevant literature) • *Enablers and barriers* of access to and application of knowledge in the clinical environment	2, 3, 4
	The *curriculum and learning objectives* are appropriate to the intended audience.	3
	Educational resources are adapted to suit the needs of the intended audience (eg, adaptation of country-specific guidelines).	3
	The *effectiveness* of the intervention is evaluated in terms of educational outcomes (eg, knowledge gain, behavior change).	6
	Sustained (long-term) knowledge use is assessed. Where included: outcomes are discussed.	7

[a]The italicized text denotes the terms used to summarize the results (see **Table 3**). [b]The numbers associated with each Knowledge-to-Action Cycle component indicate alignment with the assessment criteria as outlined in this paper and are not intended to imply sequential ordering.

randomized controlled trial study protocol (1/22; 5%). This literature spanned a 38-year period (1979–2017), with 4 reports published in 2016 (4/22; 18%) and 3 in 2017 (3/22; 14%), with an increasing number published in the last decade (see **Figure 2**).

Educational programs covered general sleep education (9/22; 41%), sleep apnea (4/22; 18%), insomnia (4/22; 18%), sleep/wake disorders (2/22; 9%), sleep history–taking (1/22; 5%), shift work disorder (1/22; 5%), and sleep disorders defined as insomnia, obstructive sleep apnea, and restless legs syndrome (1/22; 5%). This literature was predominantly produced by US researchers (15/22; 68%) with 1 multinational citation involving France, Germany, and Portugal (see Paiva et al[31]) (**Table 2**). Other countries (ie, Australia, Canada, Germany, Turkey, Portugal, and the United Kingdom) made single contributions to this literature (see **Table 2**).

Of the reports published in journals, *Sleep* published the greatest number (6/20; 30%) followed by *Studies in Health Technology and Informatics* (2/20; 10%). The remaining 12 reports were published in the following journals: *Annals of the American Thoracic Society*,[42] *Archives of Internal Medicine*,[36] *BMC Family Practice*,[49] *BMC Research Notes*,[43] *Chest*,[44] *Current Medical Research and Opinion*,[46] *European Archives of Psychiatry and Clinical Neuroscience*,[33] *Family Medicine*,[48] *Journal of the American Association of Nurse Practitioners*,[50*] *Journal of the American Medical Association*,[40] *Pediatrics International*,[38] and *Sleep Medicine*.[52]

Table 2 provides an overview of the included reports in terms of the study aim(s), target group(s), details of the educational intervention and any measures of educational effectiveness, and results and conclusions.

Assessment of KTA criteria

Each report was analyzed using the KTA organizational framework (see **Table 3**). While none of the included reports comprehensively addressed the 9 criteria of KTA, most criteria were attended to, to some extent. This section of the paper outlines the key findings of this analysis.

Educational interventions

The included reports described various components of the educational interventions, with varying levels of detail. Most reports (20/22; 91%), however, described the problem that was intended to be addressed by the intervention. Components of the educational interventions were categorized into target groups, educational approaches, mode of delivery, and duration. Because the descriptions and level of detail associated with each report were inconsistent and some information was absent, the results presented herein are based on available information.

Target groups

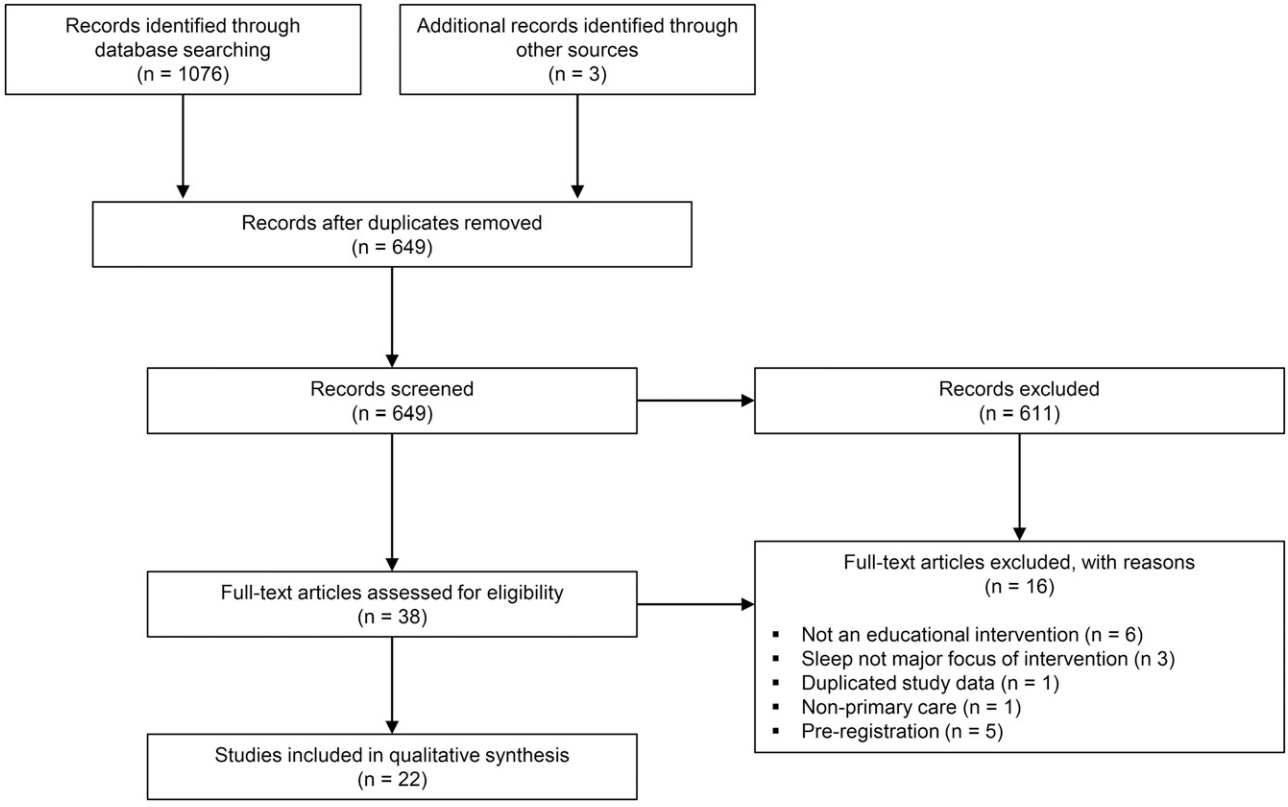
All 22 reports, to some degree, described the intended audience and the associated health professional contexts. Health professions included the following: medicine, including specialties (9/22; 41%); nursing practice (3/22; 14%); multidisciplinary groups with health professions that were both specified (6/22; 27%) and unspecified (2/22; 9%); and PCPs not otherwise specified (2/22; 9%). These results demonstrate that most educational interventions were targeted toward medical clinicians; 5 reports focused on general practice/family medicine.

Half of the reports (11/22; 50%) discussed the intended audience in relation to developing curriculum and learning objectives. Sixty-four percent (14/22; 64%) referred to the need to adapt educational resources to meet the learning needs of their intended target groups.

Educational approaches

Referring to **Table 3**, very few reports (6/22; 27%) provided a rationale for their educational intervention design with reference

Figure 1—Number of reports retrieved across 8 databases.



to the best-available evidence relating to pedagogical practice. Furthermore, only 8 reports (8/22; 36%) referred to the enablers and barriers of access to, and application of, knowledge in the clinical environment.

Among the included reports, a diverse range of approaches was described including traditional, passive didactic (teacher-led) approaches such as the delivery of lectures and presentations (7/22; 32%). Four of these reports (4/7; 57%) referred specifically to the use of PowerPoint (Microsoft Corporation, Redmond, WA) to deliver educational content. Four reports described the use of active approaches, including case-based discussion,[39] simulation,[47] academic detailing,[49] and a self-assessment questionnaire.[46] The majority, however, described a blended approach (9/22; 41%), incorporating both passive didactic and active approaches. These often included some form of didactic presentation coupled with case-based discussion (see Kales et al,[40] Paiva et al,[31] Phillips et al,[44] Amani et al,[32] Cook,[37] Paul et al,[43] and Parsons et al[42]). Ball et al[36] also described a blended approach that involved didactic approaches including delivery of a course, meetings, presentations, and invited speakers, coupled with active approaches including mentoring and the provision of technical support. Similarly, Schillinger et al[48] described a workshop incorporating blended approaches including role-play, patient videos, didactic teaching, and the provision of resources. Two of the reports either did not specify[41] or were unclear[45] in describing the approaches used.

Mode of delivery

Delivery modes varied across the reports. Six reports referred to face-to-face (6/22; 27%) delivery, of which 3 utilized passive didactic approaches. Of the other 3 reports, one utilized a blended approach, one utilized active learning, and one was unspecified. Many reports (10/22; 45%) referred to technology-mediated delivery, citing tools including videotape,[40] teleconference,[32,42] a mobile application,[37] CD-ROM,[45] and a website.[43] Other technology-mediated educational interventions were less specific in their descriptions of the use of tools, referring to "multimedia"[31] and "online"[39,47,50] platforms. One report[36] referred to a multimodal program, incorporating both face-to-face and

Figure 2—Number of reports retrieved per year.

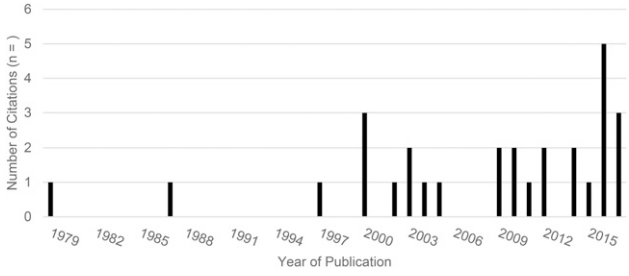


Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions.

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
Amani et al,[32] 2016, USA, conference abstract	To provide sleep education to remote multidisciplinary providers to improve their practice and level of comfort in sleep medicine content	Multidisciplinary providers (nurse practitioners, registered nurses, and physicians)	Delivery mode: technology-mediated	More than 50% self-reported practice changes and increased comfort in sleep medicine content presented.
			10 × 1-hour video-teleconferencing (SCAN-ECHO) using didactic and case review	Future evaluation needed to measure objective changes in clinical practice.
			Online 30-day follow-up evaluation to assess self-reported changes in practice and comfort with content	
Backhaus et al,[33] 2002, Germany, journal article	To evaluate the effect of short-term training of general practitioners on their diagnosis and treatment of chronic insomnia	General practitioners	Delivery mode: not specified	The following measures increased for the trained group of participants:
			Three-step randomized control group to evaluate participants' diagnosis and treatment of chronic insomnia:	• Diagnosis rates, but fell back to lower levels at T3
			T1: Baseline evaluation of diagnosis and treatment rates via doctor and patient questionnaires	
			T2: Half of the participants underwent a half-day training presenting information and a diagnostic guide (including patient handouts) that was required for use with all participating patients (the remaining half of the participants constituted the control group)	• Treatment rates, largely resulting in referral to a sleep specialist
			Follow-up training (duration not specified) focused on insomnia treatments	• Nonpharmacological treatments
			T3: General practitioners able to diagnose and treat insomnia patients at their discretion	Short-term general practitioner training can significantly improve insomnia diagnostic sensitivity and first-line treatment efforts
			Analysis of diagnostic rates and insomnia treatments at T1, T2, and T3	
Baldwin et al,[34] 2016, USA, conference abstract	To describe qualitative outcomes from a brief training session in a Doctor of Nursing Practice program	Doctor of Nursing Practice students	Delivery mode: not specified	Thematic analysis revealed 3 themes:
				• Application to clinical practice
				• Greater knowledge of sleep disorders
			Training module derived from an existing lay manual and delivered using PowerPoint	• Sleep disorders, lifestyle, and chronic disease
			Educational effectiveness was assessed by a post-training open-ended question related to area of greatest learning	The authors conclude that the training provides information that educates, informs, and leads Doctor of Nursing Practice students to incorporate sleep assessment and training into their practice.

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
Baldwin et al,[35] 2015, USA, conference abstract	To describe a newly developed brief training session incorporated into Doctor of Nursing Practice program for nurse practitioners	Doctor of Nursing Practice students	Delivery mode: not specified	Analysis revealed an increase in knowledge related to sleep disorders and sleep health promotion strategies following the training
			Brief training session with content derived from an existing manual for lay health workers delivered using PowerPoint	The authors conclude that a brief training session can be an effective way to introduce sleep disorders and sleep health promotion in a graduate nursing curriculum.
			Pre/post 10-item questionnaire related to sleep disorders, causative factors, sleep health, and misconceptions about sleep	
Ball et al,[36] 1997, USA, journal article	To enhance recognition of sleep apnea by community physicians and transfer the diagnostic testing and care of patients from tertiary care centers to the local community	Community physicians	Delivery mode: blended (face-to-face and technology-mediated)	Diagnostic testing for sleep apnea increased from 0.27% to 2.1% over a 2-year period in the community with few unnecessary tests ordered. The volume of patients receiving sleep-disorder related treatment also increased.
			Educational sessions and ongoing support and mentoring provided by sleep disorder specialists to community physicians to enhance their recognition of sleep disorders	
			Mixture of a face-to-face didactic course (weekend) with a follow-up course of similar length; weekly teleconferences; attendance at national meetings; delivery of presentations; invited speakers; and provision of diagnostic equipment	The authors conclude that a physician education program combined with ongoing support (through mentoring and technical support) can lead to an increase in successful diagnosis and treatment of patients with previously undiagnosed sleep apnea.
			Pre/postintervention chart review, patient questionnaire, and tabulation of polysomnographic data were used to determine increase in referrals for sleep testing and treatment plans	
Cook,[37] 2016, USA, thesis (Master of Science in Nursing)	To evaluate the impact of technology in the form of an educational mobile application in the assessment and documentation of sleep health in a primary care setting	Primary care physician	Delivery mode: technology-mediated	Clinician knowledge increased but this did not translate consistently to improved documentation.
			MySleep 101: a sleep-related educational mobile application comprising 8 learning modules and 3 clinical vignettes	
		Nurse practitioner	Pre/post-test questionnaire (ASKME survey) to assess clinician sleep knowledge	The author recommended assessing barriers to change in the health care setting before implementing the intervention, developing guidelines for use of the app, lengthening the timeframe of the study, and increasing the number of provider participants.
			Pre/postintervention patient chart review to assess documentation practices in relation to sleep quality, hours of sleep, diagnoses, medications, referrals, and sleep hygiene education given	
Ersu et al,[38] 2017, Turkey, journal article	To assess the effectiveness of a sleep health care education	Primary care pediatricians	Delivery mode: face-to-face	Short-term knowledge improved for the intervention

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
	program and to develop a Turkish acronym for brief sleep history taking for pediatric primary caregivers in the ambulatory setting		1 × 2-hour face-to-face didactic teaching (using PowerPoint) and a question-and-answer session	group but not the control group. The intervention group also reported increased provision of anticipatory guidance to families about sleep and the use of the acronym. Although intervention group confidence in managing sleep problems increased, it remains at a low level.
			Mnemonic device (acronym) used to facilitate history taking and identification of sleep issues in children	While a short course resulted in knowledge increases, the study cannot determine if this translates to behavioral change. Continuous training is necessary to maintain skills.
			Knowledge and attitudes were established at baseline, immediately after the intervention, and 3 months after the intervention	
Finnegan and Doghramji,[39] 2017, USA, conference abstract	To determine whether an online case-based intervention could effectively improve knowledge and competence in primary care physicians and psychiatrists regarding the diagnosis and management of insomnia	Primary care physicians and psychiatrists	Delivery mode: technology-mediated	There were statistically significant educational improvements for all participants in knowledge and competence in diagnosing insomnia and hypnotic choice.
			Interactive online text-based Intervention comprising 2 patient case scenarios that required clinicians to apply evidence-based recommendations	
			Effectiveness measured using a linked pre/post-assessment	The authors conclude that this intervention improves knowledge and competence among primary care physicians and psychiatrists to accurately diagnose and appropriately treat insomnia.
Kales et al,[40] 1979, USA, journal article	To test the effectiveness of a Continuing Medical Education workshop in expanding physicians' knowledge of the prevalent sleep disorders	Physicians and allied health professionals	Delivery mode: technology-mediated	Mean scores were 50% pretest; 69% during the course; and 79% post-test.
			Telecourse (50 minutes) presented in clinical-case format divided into 3 sections: pretest, instruction, post-test. Companion workbook including program instructions; self-assessment worksheet; supplementary educational materials including case management; multiple choice questions and answers; and recommended reading bibliography	The authors conclude that improvements in knowledge indicate general physicians are best able to manage most patients with sleep disorders without the need for costly diagnostic procedures. Continuing education programs can provide them with information on the most recent clinical advances on the topic.
			Pre/post-test questionnaires each comprising 6 validated multiple-choice questions plus a set of multiple-choice questions during the instructional section	
Ontiveros et al,[41] 2011, USA, conference abstract	To evaluate baseline knowledge and the effectiveness of continuing	Self-identified sleep specialists and primary care providers	Delivery mode: face-to-face	Both groups were found to have similar baseline deficits related to
			"Live" continuing education programs tailored to sleep	

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
	education in sleep/wake medicine for self-identified sleep specialists and primary care providers		specialists and primary care providers	knowledge- and practice-based statements, but significantly improved across educational content-specific statements.
			Stage 1 evaluation involved a pre/post 10-item Likert questionnaire to assess knowledge and practice behaviors related to sleep/wake disorders among participants	Self-reports indicated that practices and patient outcomes improved.
			Stage 2 evaluation involved self-reports of integration of education into practices and effects on patient outcomes	The authors suggest their educational programs reduced knowledge gaps in assessment and treatment of sleep/wake disorders.
Paiva et al,[31] 2000, France, Germany, and Portugal, journal article	To develop a prototype sleep tutorial for general practitioners to use in daily practice which can be commercialized in a range of European languages	General practitioners	Delivery mode: technology-mediated	This paper provides an overview of how the tool was developed and then reviewed by a "specialized firm."
			Describes the development of a multimedia tutorial (divided into chapters) which includes an outline, pictures, graphics, videos, histories, explanations, polysomnographic and imaging data, case study, clinical interview, conclusions and a "test your knowledge" section (quizzes)	Final prototype may be considered a useful tool.
			No evaluation processes	
Parsons et al,[42] 2017, USA, sleep tutorial overview	Describes the feasibility of an Extension for Community Healthcare Outcomes (ECHO) telementorship program for sleep medicine	Primary care providers (multidisciplinary)	Delivery mode: technology-mediated	Participants reported the content was highly relevant and anticipated practice change, especially around patient education (93%). Many felt more at ease in managing sleep complaints particularly sleep-disordered breathing, insomnia, and sleep in post-traumatic stress disorder (all components 80%).
			A recognized framework (ECHO) was used to establish an interactive virtual community of practice with learning spanning disciplines and geographical boundaries. This comprised video teleconference sessions (10 weekly × 1 hour) with video streaming, instant messaging, bidirectional audio, and an audience response system, and combined didactic teaching by sleep, pharmacy and mental health specialists and integrated case reviews	Future work is needed to identify objective measures of return on investment and address participation barriers.

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
			Evaluations were sent after each session and a final program evaluation was sent 22 days after the final session. Participants were offered a continuing medical education credit following completion of the evaluation	
Paul et al,[43] 2016, Australia, journal article	To examine the influence of enhanced invitations on uptake of online learning modules on obstructive sleep apnea by general practitioners and determine whether recent referrals of patients to sleep specialists influenced uptake	General practitioners in regional Australia	Delivery mode: technology-mediated	Only 2% accessed website and 4 completed modules over the 4-month study period. General practitioners using an enhanced letter accessed and completed the module less than those with a standard letter. Accessing website: 5/426 enhanced vs 11/427 standard. Completion: 1/426 enhanced vs 3/427 standard.
			Participants were provided with either a standard letter of introduction or an enhanced one offering Royal Australian College of General Practitioners–recognized continuing professional development points on module completion (the intervention). The 6-hour-long interactive learning module was designed to assist general practitioners identify and manage obstructive sleep apnea. It provided 5 sections of learning content, evidence-based guidelines, clinical issues, and links to resources.	General practitioners demonstrated a low level of interest in using Web-based learning for the identification and management of obstructive sleep apnea. There is a need to identify effective approaches to detecting and managing obstructive sleep apnea in general practice.
			General practitioner participation in the program was assessed.	
Phillips et al,[44] 2010, USA, conference abstract	To build an innovative outcomes-oriented continuing medical education curriculum for a primary care audience	Primary care providers	Delivery mode: not specified	Primary care providers reported an increased adherence to clinical standards and improved assessment of at-risk patients.
			Educational approaches included:	
			• Didactic presentations	
			• Audience participation	
			• Peer feedback	
			• Video-based patient screenings	The authors conclude that patient case studies are a powerful teaching tool but further work is required to examine how these can be used in different therapeutic settings. Primary care providers can improve patient outcomes when they understand their role in the initial screening and
			Assessments included:	
			• Immediate measurement of specific changes relative to baseline	
			• Follow-up to determine implementation of strategies to clinical practice	

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
				diagnosis and their role in supporting treatment and compliance.
Rosa,[45] 2000, Portugal, multimedia tutorial guidelines	Program objectives were to: (1) promote expertise and technology transfer in the development of cognitive behavioral therapy, (2) promote innovation in the development of training materials, and (3) develop training products for Continuing Education/ Distance Learning for general practitioners	General practitioners in different countries	Delivery mode: technology-mediated	Nine modules were developed. These covered biological rhythms, neurophysiology of sleep, sleep in children, sleep breathing disorders, insomnia, hypersomnia, parasomnias, circadian rhythms, and sleep hygiene.
			Guidelines for the design/layout and pedagogical approach to the development of a multimedia self-training program (CD-ROM) consisting of 30 hours of material	Only 5 of the 9 modules managed to follow the pedagogical model guidelines provided. Only 2 of these included a self-assessment questionnaire. None of the modules used animation and only 4 incorporated videos.
			Evaluated adherence to (or "implementation of") the pedagogical guidelines in the final construction of the sleep tutorial	No conclusion provided.
Roth et al,[46] 2010, USA, report	To provide a conceptual and educational framework to help primary care physicians assess, differentially diagnose, and appropriately manage patients presenting with excessive sleepiness or related sleep/wake disorders	Primary care physicians	Delivery mode: not specified	The process resulted in consensus statements on the topics of excessive sleepiness, insomnia, obstructive sleep apnea, circadian rhythm disorders, restless legs syndrome, and narcolepsy.
			A Sleep/Wake Disorders Working Group derived key concepts for the framework via a literature search and used a modified Delphi approach to create consensus recommendations. The authors included a self-assessment questionnaire which could be completed and submitted for continuing medical education points.	The authors concluded that their educational framework can improve patient outcomes in primary care by emphasizing recognition, prompt diagnosis, and appropriate ongoing management of sleep disorders.
			Effectiveness not measured—the focus was on establishing content for the development of an educational and conceptual framework	
Roy et al,[47] 2014, USA, conference abstract	To determine clinician experience, knowledge, competence, and performance in the assessment and diagnosis of shift work disorder	Primary care clinicians	Delivery mode: technology-mediated	More than half (55%) of the participants diagnosed a patient with shift work disorder. The majority (92%) chose to provide sleep hygiene guidance to the virtual patient, although 25% reported lack of familiarity

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
				with sleep hygiene principles and 22% were not confident that sleep hygiene improves sleep disorders.
			An online patient simulation (part of an accredited continuing medical education program) and adaptive feedback provided by a sleep specialist and a primary care clinician	Authors conclude that there is a lack of understanding of basic sleep assessments and management of shift work disorder in primary care. Standard assessments of learner competence are an important part of education programs.
			Assessed skills in taking a sleep history but it is not clear how skills were recorded for analysis	
Schillinger et al,[48] 2003, USA, journal article	To develop a workshop to teach sleep disorders (insomnia, obstructive sleep apnea and restless leg syndrome); to provide tools to apply knowledge with patients	Family medicine trainees	Delivery mode: face-to-face	Most students (64%) reported a change in their clinical practice following the workshop, including greater facility with patient interviewing and examination, and a heightened awareness of sleep problems in general.
			Workshop (3.5 hours) comprising role-play, videos of patients, didactic teaching (mini lectures, brief discussion), literature about sleep problems, and pocket references	Knowledge increased between pretest (51%) and at 2 weeks (68%) and was largely maintained at 6 months (67%).
			Student knowledge was assessed using pre/post-test questionnaires. Post-test questionnaires were administered 2 weeks and 6 months post workshop.	The authors conclude that a role-play workshop is an effective way to improve students' sleep knowledge and skills. Furthermore, students retain their knowledge over a 6-month period.
Siriwardena et al,[49] 2009, UK, study protocol (randomized controlled trial)	Protocol describing a pilot randomized controlled trial to test the procedures for a definitive trial investigating the effectiveness and cost-effectiveness of an educational intervention for primary care clinicians to deliver problem focused therapy to adult patients with sleep problems	General practice clinics (general practitioners, primary care nurses, practice managers)	Delivery mode: face-to-face	No results as a pilot randomized controlled trial protocol only.
			Academic detailing in the form of a 2 × 2-hour face-to-face practice-based educational intervention on problem-focused therapy for insomnia (involves careful assessment and modified cognitive behavioral therapy for insomnia)	The study has the potential to provide evidence on the effectiveness or noneffectiveness of a psychological intervention delivered in primary care as compared with standard drug therapy.
			Proposed primary outcome is patient global sleep quality measured across certain points of the trial. Secondary outcomes include sleep experiences measured using a range of self-report instruments (eg, sleep diaries). Follow-up assessments to be conducted via a phone call and postal questionnaires.	

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
Valerio and Heaton,[50] 2014, USA, journal article	To determine the effects of an online educational program on nurse practitioners' knowledge of identifying and evaluating adults at risk for obstructive sleep apnea.	Nurse practitioners	Delivery mode: technology-mediated	Post-test scores improved from pretest scores, particularly in terms of clinical prevalence, routine health evaluation, signs and symptoms, high-risk situations, and screening tools.
			Online educational program comprising a comprising a 53-minute narrated PowerPoint. Resource developed from guidelines from the American Academy of Sleep Medicine Adult Obstructive Sleep Apnea Task Force.	Most (97.4%) indicated they were likely or very likely to evaluate their patients for obstructive sleep apnea.
			Change in knowledge assessed using a pre/post-test questionnaire with 15 case-based questions	Increasing nurse practitioner knowledge of obstructive sleep apnea through education is likely to lead to improved rates of diagnosis and a reduction in associated chronic health problems.
von Aweyden,[51] 2003, Canada, thesis (Master of Nursing)	To enhance the use of effective behavioral treatment approaches for insomnia in primary care by designing a management tool to guide practitioners' selection of effective behavioral treatment options	Primary care providers (included general practitioners, family medicine residents, clinical nurse specialist, chaplain, and a nutritionist)	Delivery mode: face-to-face	All participants agreed content was accurate and useful or somewhat useful. Most (10/11) considered it relevant to practice. Responses on format and level of detail varied widely however the majority viewed it as new information that would change the way they managed insomnia.
			Management tool (or "desk reference") incorporates behavior treatments with evidence of effectiveness and suitability for primary care. Development was guided by principles of adult education and evidence-based practice.	The tool developed provided practitioners with clinically relevant information. The evaluation of the tool increased its validity and caused it to be adapted to make it more fit for purpose.
			The management tool was presented to participants via a 20-minute PowerPoint presentation. Practitioners used an evaluation form to provide feedback on the tool's content, format, and applicability.	
Zozula et al,[52] 2005, USA, journal article	To determine the rates of recognition of sleep disorders and referral for lab testing in a community-based outpatient clinic after an educational intervention for health professionals	Health professionals involved with outpatients: attending physicians, residents, nurses, social workers, psychologists, and counsellors	Delivery mode: face-to-face	Rates of referral to a sleep lab for testing progressively increased over the 4-year period.
			In-service training over 4 years consisting of face-to-face didactic sessions (10 × 1-2 hours)	Authors conclude that physicians trained in sleep disorders are more likely to inquire about sleep complaints. While sleep

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Table 2—Included reports outlining study aims, target groups, educational interventions, effectiveness measures, results, and conclusions. (*Continued*)

Citation, Year of Publication, Country of Origin, and Report Type	Study Aims	Target Group(s)	Educational Approach(es) Used and Evaluation Measure	Results and Conclusions
			Evaluated efficacy and outcome via number of patients referred for sleep testing; number of sleep-related diagnoses; and implementation of treatment. Data captured from lab and clinic databases and clinic chart review.	testing referrals have progressively increased, the number of patient referrals and diagnoses are still below the expected prevalence of sleep apnea in the population.

technology-mediated delivery. Five reports did not specify the delivery mode (5/22; 23%).

Examining delivery modes revealed no clear trend or preference toward either a face-to-face or technology-mediated approach over the 38-year timeline of the publications. This suggests that both modes are valued approaches to education in the context of this literature. There were, however, some subtle trends toward the use of face-to-face approaches (2003–2009) before a shift toward technology-mediated approaches (2014–2017).

In 3 reports, all using technology for delivery, educational interventions did not appear to involve any interaction with a facilitator. Cook[37] reported the use of an animated mobile application. Rosa[45] described the educational intervention as a "self-training" program, presented as a multimedia tutorial on CD-ROM. And Valerio and Heaton[50] described the use of a narrated PowerPoint delivered online.

Duration

The duration of the educational intervention varied in terms of both the level of detail provided and the duration of delivery. For example, Baldwin et al[35] described the education as "brief," Backhaus et al[33] described a half-day training and follow-up workshop, and Ball et al[36] described multiple components of their educational intervention without specifying the duration of each component. Conversely, Valerio and Heaton[50] were specific, stipulating a total time of 53 minutes (see **Table 2**). Many reports (8/22; 36%) did not specify the duration of their educational interventions. Of those that did, the range was 20 minutes to 30 hours, with an average time of 7.96 hours.

Evaluation of educational interventions

The effectiveness of the educational interventions was evaluated in all but 3 reports (19/22; 86%). One report[47] assessed sleep history–taking skills, but it was unclear how this information was recorded and analyzed. Three reports[32,34,42] (3/19; 16%) conducted evaluations only after the intervention and, in all 3 reports, there were improvements and increases in outcome measures.

Four reports[35,39,40,50] (4/19; 21%) utilized a pre/post intervention questionnaire format to assess self-reported changes in measures including knowledge, clinical practice, and confidence. Another 4 reports[38,41,44,48] (4/19; 21%) evaluated the effectiveness of their educational interventions using a pre/post questionnaire with follow-up, all of which identified increases in outcome measures.

One report[37] combined a pre/post questionnaire to assess knowledge changes and patient chart reviews to assess documentation practices. Although the author identified knowledge increases, this did not consistently result in improved documentation.

Three reports utilized different mechanisms for assessing the effectiveness of educational interventions. Paul et al[43] assessed participation rates of rurally practicing general practitioners to assess the effectiveness of their educational intervention. They found that only 2% of invited participants (16/796) accessed their intervention, and only 4 participants completed all 4 modules over the 4-month study period. Rosa[45] assessed adherence to pedagogical guidelines in a series of educational modules and found adherence in 5 of 9 modules. Finally, von Aweyden[51] sought information from participants in relation to the content, format, and applicability of a management tool. Participants reported that the content was useful and applicable to clinical practice.

Effectiveness of educational interventions

In the KTA organizational framework, monitoring and evaluation refers to both the effectiveness of the educational intervention and the assessment of sustained (long-term) knowledge use. In the case of the latter, only 4 reports assessed long-term outcomes of educational interventions. Ball et al[36] conducted a 2-year follow-up to assess diagnostic testing for sleep apnea and found an increase in testing rates (0.27%–2.1%). Similarly, Zozula et al[52] conducted an evaluation over a 4-year period, assessing referral rates for sleep testing, which progressively increased over this time. Ersu et al[38] conducted an evaluation after 3 months and found that knowledge and confidence in managing sleep health issues increased. Similarly, Schillinger et al[48] conducted a post-evaluation questionnaire and followed up with another evaluation after 6 months, finding that knowledge increased immediately after the workshop and was largely maintained at 6 months.

In contrast to this more sustained knowledge use (ie, ≥ 3 months postintervention), "short-term" effectiveness of the educational interventions was assessed in 16 of 22 reports (73%).

Nine of these reports utilized a pre/post-test design in which self-reported knowledge, behavior, attitudes, and clinical practice changes were evaluated. All 9 reports described increases across postintervention evaluation measures.

Four reports assessed the effectiveness of the intervention using a follow-up evaluation. The von Aweyden[51] evaluation focused on the educational tool that formed part of a randomized controlled trial pilot, as opposed to evaluating knowledge increases. Amani et al[32] conducted a postintervention evaluation to assess self-reported changes in practice and level of "comfort" with the content. Baldwin et al[34] evaluated their training using an open-ended question to determine the "area of greatest learning." Responses to this question were thematically analyzed and 3 themes were identified: application to clinical practice, increased knowledge of sleep disorders, and sleep disorders, lifestyle, and chronic disease. Finally, Parsons et al[42] evaluated their educational intervention following each of the 10 educational sessions and at 22 days postintervention. The evaluation measured changes in content relevance, anticipated practice change, and "ease" in managing sleep complaints, all of which increased.

Two reports evaluated the effectiveness of their educational interventions by examining clinical practice changes related to diagnosis, referral, and treatment rates. Zozula et al[52] found that referral rates increased over the 4-year duration of the in-service training provided. In their 3-step randomized controlled trial, Backhaus et al[33] found that diagnosis rates increased for trained participants but decreased to lower levels following the training. Additionally, treatment rates increased, taking the form of sleep specialist referral and nonpharmacological treatments.

Ball et al[36] incorporated multiple approaches to evaluating the effectiveness of their longitudinal educational program including a pre/post chart review, patient questionnaire, and the tabulation of polysomnographic data to determine whether there had been an increase in referrals for sleep testing and treatment plans, which was reflected in the data.

DISCUSSION

This scoping review sought to identify approaches that have been used to educate PCPs in diagnosing and managing routine sleep disorders and, where available, report on the effectiveness of these interventions. This review constitutes an act of knowledge synthesis and distillation as we gathered primary research findings (knowledge creation) and used these to disseminate knowledge.[23] Educating PCPs in sleep disorder diagnosis and management is a niche area, reflected in the relatively small number of journal articles identified in this review. This dearth of published literature was reflected in a recent narrative review of sleep education for health care providers.[6] Here, we speculate on reasons for this. In the HPE literature, fundamental educational principles may not necessarily be discussed in the context of sleep health. Similarly, sleep health research may emphasize implementation over purposive educational design. This is unsurprising given that approaches to research and development in these fields (ie, sleep health and HPE) often differ. Sleep research is typically primarily undertaken by clinicians and/or scientists who may not necessarily have had formal training in education. For clinicians, reaching a diagnosis and initiating treatment in a relatively short time frame is often central. Conversely, in education, the focus often relates to developing a deep theoretical understanding of the problem and subsequent educational design. So, it is fair to say that, by virtue of their training, clinicians often focus on identifying solutions, whereas HPE researchers typically seek to examine practical problems. Additionally, the lack of identified literature could also have historical origins, where disciplines were traditionally siloed. With the increased interest in KT, there may be greater emphasis on interdisciplinary collaboration, which could explain the increased publication output in 2016–2017.

What is missing is equally as important as what is included in this scoping review. There is minimal evidence to support the educational strategies and approaches that have been used to educate PCPs to diagnose and manage sleep disorders. Additionally, there is often missing information regarding the validity and reliability of outcome measures. Both issues represent a failure to utilize evidence from HPE research to make evidence-informed decisions. For example, how was the decision made to utilize didactic (teacher-centered), face-to-face teaching? The educational literature generally suggests that traditional lecture formats are passive forms of learning that can be difficult to adapt to learners' pre-existing knowledge and skills.[53] As discussed earlier, complex problem-solving requires learners to be supported to develop a well-organized knowledge base, and be supported to transfer their knowledge to practice through case-based learning. If we want to support PCPs to translate their learning into clinical practice, we should seek alternatives or, at least, additions to lecture formats to support learners to make difficult leaps to apply their knowledge to practice.

Effectiveness from an HPE perspective

Concrete descriptions of the educational interventions and outcome measures varied considerably across the studies. For example, Ersu et al[38] described the longer-term effectiveness of their intervention in a quasi-experimental study but did not provide any details about the type of intervention or the measurement qualities of their questionnaire.

As mentioned, clinical decision-making is complex, ideally requiring a prolonged training period combining background knowledge and practical experience. The Ball et al[36] study is a good example of this, with their outcome measures being optimally aligned with change in practice. Unfortunately, many studies used self-assessment questionnaires to measure knowledge gain, perceived change of practice, and level of comfort in the domain of sleep disorders. From an educational perspective, such self-assessments often are poor measures of actual competence[54,55] and would be better assessed using reliable and valid instruments[56,57] (eg, more formal case- or workplace-based assessments) and, consequently, sensitivity to detect any educational effect.

In summary, it is important to ensure that evaluation tools are fit-for-purpose. As is consistent with educational principles described earlier, recognizing the educational context, the learners' needs, and the purpose of evaluation are critically important

Table 3—Assessment of reports against the knowledge-to-action organizational framework.

	Knowledge-to-Action Assessment Criteria								
	Description of			Educational Design Informed by		Recognition of Audience in Developing		Monitoring and Evaluation	
Citation	Problem to be Addressed by the Intervention	Intended Audience and Context	Educational Intervention	Evidence of Best Pedagogical Practice	Enablers and Barriers	Curriculum and Learning Objectives	Educational Resources	Intervention Effectiveness	Assessed Sustained Knowledge Use
Amani et al[32]	Partially	Yes	Yes	Not specified	Partially	Not specified	Not specified	Yes	No
Backhaus et al[33]	Yes	Yes	Partially	Not specified	Not specified	Not specified	Yes	Yes	No
Baldwin et al[34]	Yes	Yes	Partially	Not specified	Not specified	Not specified	Yes	Yes	No
Baldwin et al[35]	Yes	Yes	Partially	Not specified	Not specified	Not specified	Yes	Yes	No
Ball et al[36]	Yes	Yes	Partially	Not specified	Not specified	Not specified	Yes	Yes	Yes (2 years)
Cook[37]	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Ersu et al[38]	Yes	Yes	Yes	Not specified	Not specified	Yes	Not specified	Yes	Yes (3 months)
Finnegan and Doghramji[39]	Yes	Yes	Yes	Not specified	Not specified	Not specified	Not specified	Yes	No
Kales et al[40]	Yes	Yes	Yes	Not specified	Not specified	Yes	Yes	Yes	No
Ontiveros et al[41]	No	Partially	Partially	Not specified	Not specified	Not specified	Not specified	Yes	No
Paiva et al[31]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Parsons et al[42]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Paul et al[43]	Yes	Yes	Yes	Not specified	Yes	Yes	Yes	No	No
Phillips et al[44]	Yes	Yes	Yes	Yes	Partially	Yes	Yes	Yes	No
Rosa[45]	No	Yes	Yes	No	Yes	Yes	Yes	No	No
Roth et al[46]	Yes	Yes	Yes	No	Not specified	Yes	Yes	No	No
Roy et al[47]	Yes	Yes	Yes	Not specified	Not specified	Yes	Yes	No	No
Schillinger et al[48]	Yes	Yes	Yes	Not specified	Not specified	Not specified	Not specified	Yes	Yes (6 months)
Siriwardena et al[49]	Yes	Yes	Yes	Partially	Not specified	Not specified	Not specified	N/A	N/A
Valerio and Heaton[50]	Yes	Yes	Partially	No	No	Not specified	Not specified	Yes	No
von Aweyden[51]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Zozula et al[52]	Yes	Yes	Yes	Not specified	Yes	Not specified	Not specified	Yes	Yes (4 years)

when selecting an evaluation tool.[58] For example, if the intention is to measure long-term behavior change, utilizing tools that measure referral rates for sleep studies 6 months following the educational intervention would have greater utility than a self-assessment questionnaire administered immediately following the intervention.

Additionally, several reports used pre/post causal comparative designs, which are, from an educational perspective, methodologically concerning. Because blinding to the intervention is not possible, the resulting evaluation data can be prone to participants altering their behavior in response to an awareness of being observed or compared with another group. Hence, more complex causal comparative designs may be needed (eg, the Solomon 4-group design,[59] or the multitrait-multimethod matrix).[60] Also, in some cases, assessments were used as the (pre/post) outcome measures. Here, it is important to recognize that test difficulty is hard to predict and requires some form of anchoring.

While this commentary could be viewed as critical of some of the studies, this is not our intention. Rather, we want to advocate for the co-development of educational programs that involve sleep and HPE experts to support PCPs to diagnose and manage sleep disorders. Such an approach is advantageous because of the inherent efficiency and effectiveness in

terms of time, money, and the utilization of relevant expertise. A co-development approach can ensure that educational programs are developed with a recognition of the context of participants (eg, their professional backgrounds) and the roles they can play in identifying and managing sleep disorders. Indeed, interprofessional collaboration was identified for further development in a recent narrative review of sleep education for health care providers.[6]

The KTA cycle recognizes the importance of improving practice in line with knowledge advancements. To this end, PCPs should be supported to remain current with their clinical practice by being provided with ongoing professional development with opportunities to integrate knowledge into clinical practice. Additionally, for many of these educational interventions, the overall aim was to facilitate long-term knowledge retention. With respect to long-term retention, much can be learned from the cognitive psychological literature on the development of expertise, especially with respect to nonalgorithmic or ill-defined problems.[13,15]

Several components are essential for long-term retention. First, the subject matter must be meaningful and relatable to practice. This explains why training programs that consist purely of a workshop, with no or few direct links to the learner's practice, are not highly effective.[9,61] Second, learning occurs by matching experiences (or cases) with underlying fundamental knowledge. This is important to create "transfer" (ie, the ability to recognize similarities and differences in fundamental principles across cases).[14,62] Third, optimal learning occurs when it begins with simple cases in simulated settings and gradually increases in complexity and authenticity, incorporating complex cases in authentic settings.[63,64] Finally, optimal learning occurs when learners are able to exchange experiences (eg, using communities of practice) to increase their repertoire of strategies to manage diverse cases of varying complexity.[65]

Limitations

This study was limited due to the varied format of the reports (ie, conference abstracts, journal articles, tutorial guidelines, and theses). Because each format requires a specific writing form and structure, the authors may have been constrained in the amount of information and detail provided about the educational intervention. Similarly, as some reports were not primarily focused on educational design, this information was not always included, rendering comparison difficult. While the date range of the reports may reduce the relevance and applicability of the findings, we argue that they offer a corpus of information about how authors have utilized educational principles in applying knowledge to clinical practice. For example, the Ball et al[36] study, with its multimethod approach to facilitate the application of theoretical knowledge to clinical practice, provides valuable information about how to support PCPs to diagnose and manage sleep disorders.

CONCLUSIONS

This scoping review has reported on existing educational interventions designed to support PCPs to diagnose and manage routine sleep disorders. While this review has utility in describing existing educational interventions to upskill PCPs to manage sleep disorders, the findings suggest that interventions are often developed without explicitly considering the evidence of best educational practice. As an interdisciplinary authorship team, we have combined our expertise to inform our critique. Future interventions should adopt a similar co-constructed, interdisciplinary model to ensure the designs are fit-for-purpose and reflect contemporary views of both sleep disorder management and education.

ABBREVIATIONS

HPE, health professions education
KT, knowledge translation
KTA, knowledge-to-action
PCP, primary care provider

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