

CONTINUING EDUCATION

Identifying Core Competencies for Occupational and Environmental Health Nurse Practitioners: An Integrative Review

Maria C. Lanzi, MS, MPH, ANP-BC, COHN-S, FAANP¹ , Rebecca Billings, MLIS², Julie Schexnayder, DNP, PhD, MPH, ACNP-BC¹, and Adelais Markaki, PhD, APRN-BC, FAAN¹ 

Abstract: *Background:* Occupational and environmental health (OEH) encompasses occupational and environmental medicine and OEH nursing. Nurse practitioners specializing in OEH (OEHNPs) assess and mitigate occupational hazards, thereby promoting health and safety among workers, drawing on advanced knowledge and skills. This review had a two-fold aim: (1) to determine whether core competencies for OEHNPs practicing in the United States exist; and (2) to identify relevant occupational and environmental medicine and OEH nursing core competencies for the future development of OEHP core competencies. *Methods:* An integrative review was conducted in accordance with Whittemore and Knafl's five-step process and the PRISMA guidelines. Peer-reviewed literature published in the United States within the last 50 years was searched across five databases. *Results:* Of the 31 articles included, 22 were OEH nursing-focused, seven were occupational and environmental medicine-focused, and two were nurse practitioner-focused. The OEH nursing articles addressed topics essential to OEH nursing practice, as well as standards of practice and core competencies. The occupational and environmental medicine literature addressed practice guidance, with core competencies periodically updated to reflect evolving practice. Lastly, the nurse practitioner articles focused on entry-level, general nurse practitioner core competencies. No articles explicitly identified core competencies for OEHNPs. *Conclusion:* Evidence establishes the need to develop specific core competencies that reflect the advanced scope of practice, clinical decision-making, and autonomy of OEHNPs. *Implication for Practice:* Employing a consensus-driven approach to agree upon a preliminary set of core

competencies for OEHNPs would support role delineation, inform OEHP education and certification, and ensure quality OEH care.

Keywords: core competencies, competency-based education, nurse practitioner, occupational and environmental health

Background

Nearly one-third of workers will experience a work-related health issue, injury, or illness at some point in their careers (Free et al., 2020). Annually, occupational injuries and diseases cause 2.93 million worker deaths and over 395 million non-fatal injuries worldwide (International Labour Organization, 2023). In the United States (US), 2.6 million nonfatal workplace injuries and illnesses were reported in 2023 (Bureau of Labor Statistics, 2023). Specialists in Occupational and Environmental Health (OEH) are critical to protecting the health of workers and surrounding communities. They include physicians practicing occupational and environmental medicine (OEM), nurse practitioners (NPs), and registered nurses practicing OEH. These professionals identify and mitigate workplace hazards, prevent, diagnose, and manage work-related injuries and illnesses, and advocate for the health and safety of workers, workplaces, and environments (American Association of Nurse Practitioners, n.d.; American Association of Occupational Health Nurses [AAOHN], n.d.; American College of Occupational and Environmental Medicine [ACOEM], n.d.). Their clinical and professional competency is ensured through

Applying Research to Occupational Health Practice

Occupational and Environmental Health Nurse Practitioners play an increasingly critical role in preventing and managing work-related injuries, illnesses, and environmental exposures affecting workers and surrounding communities. Their core competencies, grounded in nurse practitioner role competencies, are essential for guiding practice, education, credentialing, and professional identity. However, no evidence of specific occupational and environmental health nurse practitioner core competencies is reported in the literature. Existing core competencies in occupational and environmental medicine and occupational and environmental health nursing may inform the development of essential and actionable core competencies for occupational and environmental health nurse practitioners.

rigorous specialty education and training which directly impacts the quality of care and workers' health (Moran et al., 2016; Zaitoun et al., 2023).

As in other specialties, master's- and doctoral-prepared NPs working in OEH are increasingly assuming roles historically filled by physicians, including many of the clinical functions traditionally associated with OEM, such as complex exposure-related clinical evaluations and fitness-for-duty determinations (Harris, 2023). Approximately 3.2% of all NPs practice in employer or corporate health settings (American Association of Nurse Practitioners [AANP], 2024). NPs are also expected to provide OEH services in urgent-care settings and private practices. This expanding role highlights the need for NP-specific OEH specialty education and training, as well as a distinct professional title. Hence, for this review, the authors adopted the title Occupational and Environmental Health Nurse Practitioner (OEHNPP) to refer to licensed NPs who diagnose and manage work-related illnesses and injuries, initiate and conduct health surveillance, and implement preventive interventions across clinical, population, and environmental health contexts. The OEHNPP role also incorporates workplace health promotion, hazard prevention, and policy development, which are traditionally within the scope of occupational health nursing (AAOHN, n.d.). This combination of advanced education, scope of practice, and greater clinical authority distinguishes an OEHNPP from an occupational health nurse (OHN) and supports OEHNPPs' dual role in providing both direct clinical care and comprehensive leadership of OEH programs (McCleery et al., 2014).

Despite their growing presence, only 0.3% of NPs hold OHN certification or credentials (AANP, 2024). These credentials,

awarded to registered nurses, reflect proficiency in OEH nursing practice (ABOHN, 2025a) and are grounded in core competencies defined by AAOHN and rigorously validated through the American Board for Occupational Health Nursing (ABOHN, 2025a, 2025b) competency-based certification process. Requiring an unrestricted registered nurse license (or an international equivalent) and 3,000 hours of prior OHN work experience completed within 5 years of the examination, the Certified Occupational Health Nurse credential is clinically focused, whereas the Certified Occupational Health Nurse-Specialist is administratively focused. Only the Certified Occupational Health Nurse-Specialist requires a bachelor's degree or higher, which does not need to be in nursing (ABOHN, 2025b). Neither certification addresses advanced nursing concepts, broader clinical scope, diagnostic authority, or independent practice, limiting their relevance to OEHNPPs. This gap highlights the need for a distinct credential aligned with the OEHNPP role.

Competency is a widely used concept across health professions to describe clinical and professional capability (Axley, 2008; Englander et al., 2013; Laghezza et al., 2019; Mrayyan et al., 2023; O'Connell et al., 2014; Rugen et al., 2018; Wagner et al., 2018). Competency emphasizes observable, measurable performance against standards (American Association of Colleges of Nursing [AACN], 2021; Beaver et al., 2016; Englander et al., 2013). Many organizations, experts, and the public stress the importance of competency in healthcare delivery to ensure safe, effective, and patient-centered care (Institute of Medicine, 2000, 2003). The demand for public accountability and outcomes-based data to inform health policy prompted a paradigm shift from traditional structure- and process-based educational models to competency-based educational models. These models emphasize demonstrable knowledge, skills, and abilities, as well as learner-centeredness (Carraccio et al., 2002; Frank et al., 2010). Competency is essential to ensuring high-quality care and fulfilling public trust and accountability expectations (D'Aoust et al., 2022).

Globally, nursing programs are revising curricula to align with competency-based frameworks and measurable learning outcomes (Cline & Rinaldi, 2023; Mani, 2025). In the US, AACN has established competency-based education as foundational to nursing programs. *The Essentials* document requires nursing school graduates to demonstrate proficiency across multiple domains, including clinical judgment, leadership, interprofessional collaboration, and quality improvement (AACN, 2021). Building on this foundation, the National Organization of Nurse Practitioner Faculties (NONPF) has defined essential core competencies for the advanced practice NP role. NP education is further guided by the Consensus Model, which standardizes NP roles, titles, and scopes of practice by aligning education, certification, population focus, and clinical practice (APRN Consensus Work Group & The National Council of State Boards of Nursing APRN Advisory Committee, 2008). National certification, aligned with the Consensus Model, is required for NP licensure in all states

through organizations such as the American Nurses Credentialing Center and the American Academy of Nurse Practitioners Certification Board. Thus, NP education operationalizes these regulatory and professional standards through AACN's (2021) *The Essentials* document, the NONPF (2022) *NP Role Core Competencies*, and state requirements for initial entry-level licensure.

Core competencies are fundamental to defining a professional role and identifying educational needs (Mrayyan et al., 2023). They serve as a standard of excellence, define professional standards, promote high-quality care, and form the foundation for evaluating clinical and professional competence within a specialty, representing the essential attributes that collectively define a professional specialty and its role (Arends, 2024; Axley, 2008; Laloo et al., 2016). Developed by professional organizations, specialty core competencies align with prerequisite educational degrees, qualifications, experience, and regulatory requirements (American Academy of Emergency Nurse Practitioners & Emergency Nurses Association, 2021; AAOHN, 2015; Bobonich & Nolen, 2018; Hartenbaum et al., 2021; Rodgers et al., 2020; Wilbeck et al., 2017). A clearly defined set of core competencies enhances role clarity, supporting safe and effective patient care consistent with established professional standards and regulatory requirements (e.g., state Board of Nursing). They serve as the foundation for competency-based education, providing both a structured framework and guidance for developing residency and fellowship programs, and specialty certification (Ayvazian et al., 2021; Beaver et al., 2016; Kesten & Beebe, 2022; Stephens et al., 2023; Ten Cate & Scheele, 2007; Vasquez et al., 2021).

All physicians complete medical school, a 1-year internship, and a national certification examination; residency and fellowship are required for specialty practice. Specialty core competencies for OEM have been defined by the ACOEM since 1998 and are widely recognized. Though board certification is preferred, it is not mandatory (Hartenbaum et al., 2021). Similarly, the AAOHN established core competencies for OHNs in 1999 (AAOHN, 2015). While specialty certification is not mandatory for nurses working in OEH, it is preferred as evidence of competency. Specialty OEH nursing competencies build upon the foundational competencies of registered nurses, whereas OEM competencies build upon those of licensed physicians. Both are embedded in their respective specialty education and certification examinations.

All NPs are educated and certified as entry-level generalists across six designated population foci: family/individual across the lifespan, adult-gerontology, neonatal, pediatrics, women's health/gender-related, and psychiatric-mental health, with adult-gerontology and pediatric foci further differentiated into primary care or acute care roles. Entry into practice requires meeting NONPF competency standards and obtaining population-aligned national certification (Martsolf et al., 2020). However, these competencies do not encompass the specialized knowledge, skills, and attitudes required for OEHN practice (McCleery et al., 2014). Specialty-focused NP certifications are

necessary to validate advanced knowledge and clinical expertise beyond entry-level practice (American Academy of Nurse Practitioners Certification Board, n.d.; Campo et al., 2018; Dermatology Nurses Association, n.d.; Oncology Nursing Certification Corporation, n.d.; Ramirez et al., 2018). Currently, approximately 7% of NPs hold specialty certifications, including emergency (1.1%), oncology (0.9%), and dermatology (0.3%; AANP, 2024). These credentials reflect established educational and regulatory standards, grounded in competency-based NP education and licensure. Therefore, this review had a two-fold aim: (1) to determine whether specialty-focused core competencies exist for OEHNPs practicing in the US, and if absent, (2) to identify core competencies from OEM, OEH nursing, and NP practice that could be essential and actionable for OEHNPs in the US.

Methods

This integrative review was conducted following Whittemore and Knafl's (2005) five-step process, which provided a systematic and rigorous approach to synthesizing evidence across diverse methodologies. These steps ensured the transparency and reproducibility of the review process, including the identification, selection, evaluation, and synthesis of studies. Thus, methodological rigor was emphasized through: (1) problem identification, (2) literature search, (3) data evaluation, (4) data analysis, and (5) presentation of findings.

Problem Identification

Although OEHNPs are becoming more prevalent, their core competencies, scope of practice, roles, and responsibilities are still not well defined. Clearly establishing core competencies would help standardize OEHN practice in the US and improve the quality of care delivered. Through this review, the investigators sought after potential evidence of OEHN-specific core competencies, alignment with foundational NP competencies (NONPF, 2022), and implications for practice, education, and professional standards. Presence of such evidence would support the establishment of professional practice standards, whereas its absence would confirm the need to develop specific OEHN core competencies. The investigators also examined whether existing OEM and OEH nursing core competencies could fill specialty-specific gaps in entry-level skills for OEHN practice.

Literature Search Strategy

A comprehensive literature search was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). In collaboration with an academic reference librarian (RB), a search strategy was developed to ensure methodological rigor, reproducibility, and the inclusion of diverse sources. Five databases were searched: PubMed, Scopus, CINAHL, ERIC, and Web of Science. The final search was completed on June 25,

2024. Detailed search terms for each database are provided in Table 1.

Eligibility Criteria

The investigators used the Population, Concept, Context strategy framework by Peters et al. (2020) to refine eligibility criteria (Table 2). Article selection was limited to US-based studies focusing on NPs who practiced in the field of OEH as clinicians, and hold a US-based certification as emergency, family, adult, or adult-gerontology NP, or registered nurses who practiced as OHNs, or physicians who practiced OEM. To maintain focus and relevance, this review limited the selection of articles to those describing components of the OEH core competencies for physicians, registered nurses, and NPs.

Because the literature specific to OEHNPs was limited, the investigators expanded the search to include articles on entry-level NONPF NP role core competencies. Given that specialty NP competencies extend the NONPF NP role core competencies, this inclusion enabled assessment of their relevance to future OEHNP competency development. Relevant articles, such as position statements and expert guidance documents, were included. The search included full-text articles published in English between 1974 and 2024, spanning the 50 years since the first certified OHNs. Grey literature, such as abstracts (only), books, conference proceedings, dissertations, and theses, was excluded.

Screening

All articles were exported to Covidence, a web-based collaboration platform, for screening and selection. Titles and abstracts were independently screened by ML. Articles meeting initial eligibility were retrieved for full-text review, during which eligibility was further assessed independently by two authors (ML, AM) for relevance to OEHNP practice and conceptual alignment with competency development. Any discrepancies were resolved through discussion until consensus was reached.

Data Evaluation

While quality appraisal of studies is recommended in the integrative review process, it is not required for descriptive literature or conceptual clarification, but is required for evidence-based practice recommendations (Whittemore & Knafl, 2005). Emphasis was placed on identifying key themes from the literature that could inform the development of OEHNP-specific core competencies. For all included articles, the level of evidence was appraised using the *Adapted Rating System for the Hierarchy of Evidence* (Dang et al., 2021; Fineout-Overholt et al., 2010), with rankings from level I (highest quality) to level VIII (lowest quality) based on study design and relevance to practice.

Data Analysis

Record screening and data extraction were completed by the primary investigator (ML), and data synthesis was jointly

conducted by ML and AM. A data extraction table was used to organize, review, and synthesize the sampled articles according to: (a) lead author, year; (b) aim; (c) type of article and level of evidence; (d) target population; (e) key concept, conceptual model or framework, and relevance to OEHNP practice; and (f) theme. Consensus was achieved through independent review of the extracted data, followed by collaborative discussion to compare interpretations, resolve discrepancies, and agree on the final themes.

Results

A database search identified 809 articles. Although a formal ancestry or citation search was not conducted, two relevant seminal articles were added to ensure a comprehensive integrative review. After removing duplicates, 786 studies underwent title and abstract screening, resulting in the exclusion of 712 studies. The remaining 74 articles underwent full-text review; 31 met all eligibility criteria. The complete study selection process and reasons for exclusion are presented in the PRISMA flow diagram (Figure 1).

Data from the 31 sampled articles were extracted and analyzed, as presented in Table 3. A total of 22 articles addressed OEH nursing practice, seven addressed OEM practice, and two addressed entry-level NP core competencies. None of the articles identified OEHNP-specific competencies. Two articles presented OEH nursing core competencies (AAOHN, 2015; White et al., 1999), and two presented standards of practice (AAOHN, 2004, 2012). Three articles focused on OEM core competencies (Cloeren et al., 2014; Hartenbaum et al., 2021; Kesler et al., 2008), while four presented OEM practice guidelines (Hegmann et al., 2014; Mirza et al., 2018; Perkison et al., 2018; Townsend, 2000). Table 4 presents a comparison by discipline and represented domains across the three key themes that emerged: OEH nursing core competencies, OEM core competencies, and NP role core competencies.

OEH Nursing Core Competencies

Twenty-two articles delineated core competencies for OEH nursing practice. Six were expert opinion or AAOHN-endorsed professional guidance documents. Two established professional practice standards (AAOHN, 2004, 2012), one used a modified Delphi methodology to develop a finalized set of core competencies (AAOHN, 2015). One study traced the development of the 1999 OEH nursing core competencies using a consensus-based methodology (White et al., 1999). These documents defined the scope of practice, knowledge, and skills, as well as the legal and ethical OEH nursing framework, reflecting the changing scope of practice and knowledge (AAOHN, 2015; White et al., 1999). Three of the six endorsed articles were topic-specific expert opinions: mitigating risk in clinical practice (DiBenedetto, 2000); the role of the NP in OEH (McAndrew, 1999); and protocol development to standardize care parameters (Rogers, 1997). These authoritative statements

Table 1. Search Terms and Syntax by Electronic Databases

Database	Search terms/syntax
CINAHL Plus with Full Text, 288 results	MH "Environmental Exposure" OR MH "Environmental Health" OR MH "Medicine, Environmental" OR MH "Accidents, Occupational" OR MH "Occupational Diseases" OR MH "Occupational Exposure" OR MH "Occupational Health" OR MH "Occupational Health Nurses" OR MH "American Association of Occupational Health Nurses" OR MH "National Institute for Occupational Safety and Health" OR "employee health" OR "environmental health" OR "environmental-disease" OR "environmental medicine" OR "industrial health" OR "industrial hygiene" OR "industrial medicine" OR "industrial nursing" OR occupational-accident* OR occupational-disease* OR occupational-exposure* OR "occupational health" OR "occupational safety" OR "Advanced-Level-Nurse-Practitioner*" OR "American Association of Colleges of Nursing" OR AACN OR "American Association of Occupational Health Nurses" OR AAOHN OR "American College of Occupational and Environmental Medicine" OR ACOEM OR "Occupational and Environmental Medicine" OEM OR Occupational-and-Environmental-Health-Nurse-Practitioner* OR OEHP* OR "National Organization of Nurse Practitioner Faculties" OR NONPF AND MH "Benchmarking" OR MH "Clinical Competence" OR MH "Education, Competency-Based" OR MH "Nurse Practitioners/ST" OR MH "Physicians/ST" OR MH "Practice Guidelines" OR MH "Professional Competence" OR MH "Professional Regulation" OR TI(competen* OR best-practice* OR standard* OR "clinical skills" OR domains)
ERIC (EBSCO host), 30 results	DE "Occupational Safety and Health" OR "employee health" OR "environmental exposure" OR "environmental health" OR "environmental-disease" OR "environmental medicine" OR "industrial health" OR "industrial hygiene" OR "industrial medicine" OR "industrial nursing" OR occupational-accident* OR occupational-disease* OR occupational-exposure* OR "occupational health" OR "occupational safety" OR "Advanced-Level-Nurse-Practitioner*" OR "American Association of Colleges of Nursing" OR AACN OR "American Association of Occupational Health Nurses" OR AAOHN OR "American College of Occupational and Environmental Medicine" OR ACOEM OR "Occupational and Environmental Medicine" OEM OR Occupational-and-Environmental-Health-Nurse-Practitioner* OR OEHP* OR "National Organization of Nurse Practitioner Faculties" OR NONPF AND DE "Best Practices" OR DE "Competency Based Education" OR DE "Standards" OR competen* OR best-practice* OR standard* OR domains AND DE "Nurses" OR DE "Nursing" OR DE "Physicians" OR nurse* OR nursing OR physician* OR doctor OR doctors
PubMed, 249 results	"Environmental Exposure"[Mesh] OR "Environmental Health"[Mesh] OR "Environmental Medicine"[Mesh] OR "Occupational Diseases"[Mesh] OR "Occupational Exposure"[Mesh] OR "Occupational Health Nursing"[Mesh] OR "Occupational Medicine"[Mesh] OR "employee health"[tiab] OR "environmental exposure"[tiab] OR "environmental health"[tiab] OR "environmental-disease"[tiab] OR "environmental medicine"[tiab] OR "industrial health"[tiab] OR "industrial hygiene"[tiab] OR "industrial medicine"[tiab] OR "industrial nursing"[tiab] OR occupational-accident*[tiab] OR occupational-disease*[tiab] OR occupational-exposure*[tiab] OR "occupational health"[tiab] OR "occupational safety"[tiab] OR "Advanced-Level-Nurse-Practitioner"[tiab] OR NP[ti] OR "American Association of Colleges of Nursing"[tiab] OR AACN[tiab] OR "American Association of Occupational Health Nurses"[tiab] OR AAOHN[tiab] OR "American College of Occupational and Environmental Medicine"[tiab] OR ACOEM[tiab] OR "Occupational and Environmental Medicine" OEM[tiab] OR Occupational-and-Environmental-Health-Nurse-Practitioner*[tiab] OR OEHP*[tiab] OR "National Organization of Nurse Practitioner Faculties"[tiab] OR NONPF[tiab] OR "Int J Occup Environ Health"[Journal] OR "J Occup Environ Med"[Journal] OR "Workplace Health Saf"[Journal] AND "Practice Guidelines as Topic"[Mesh] OR "Benchmarking"[Mesh] OR "Clinical Competence"[Mesh] OR "Competency-Based Education"[Mesh] OR "Physicians/standards"[Mesh] OR "Nurse Practitioners/standards"[Mesh] OR "Professional Competence"[Mesh] OR competen*[tiab] OR best-practice* OR standard*[tiab] OR "clinical skills"[tiab] OR domains[tiab]
Scopus, 27 results	TITLE-ABS-KEY((employee health) OR environmental-exposure* OR (environmental health) OR (environmental-disease* OR (American College of Occupational and Environmental Medicine) OR (industrial health) OR (industrial hygiene) OR (industrial medicine) OR (industrial nursing) OR occupational-accident* OR occupational-disease* OR occupational-exposure* OR (occupational health) OR (States) OR Advanced-Level-Nurse-Practitioner* OR (American Association of Colleges of Nursing) OR AACN OR (American Association of Occupational Health Nurses) OR AAOHN OR (American College of Occupational and Environmental Medicine) OR ACOEM OR (American College of Occupational and Environmental Medicine) OEM OR Occupational-and-Environmental-Health-Nurse-Practitioner* OR OEHP* OR (National Organization of Nurse Practitioner Faculties) OR NONPF) AND TITLE-ABS-KEY(competen* OR best-practice* OR standard* OR (clinical skills) OR domains)
Web of Science, 213 results	(TI=("employee health" OR environmental-exposure* OR "environmental health" OR "environmental-disease" OR "environmental medicine" OR "industrial health" OR "industrial hygiene" OR "industrial medicine" OR "industrial nursing" OR occupational-accident* OR occupational-disease" OR occupational-exposure" OR "occupational safety" OR "Advanced-Level-Nurse-Practitioner" OR "American Association of Colleges of Nursing" OR AACN OR "American Association of Occupational Health Nurses" OR AAOHN OR "American College of Occupational and Environmental Medicine" OR ACOEM OR "Occupational and Environmental Medicine" OEM OR Occupational-and-Environmental-Health-Nurse-Practitioner* OR OEHP* OR "National Organization of Nurse Practitioner Faculties" OR NONPF)) AND (TI=(competen* OR best-practice" OR standard" OR "clinical skills" OR domains)

Table 2. Inclusion and Exclusion Criteria

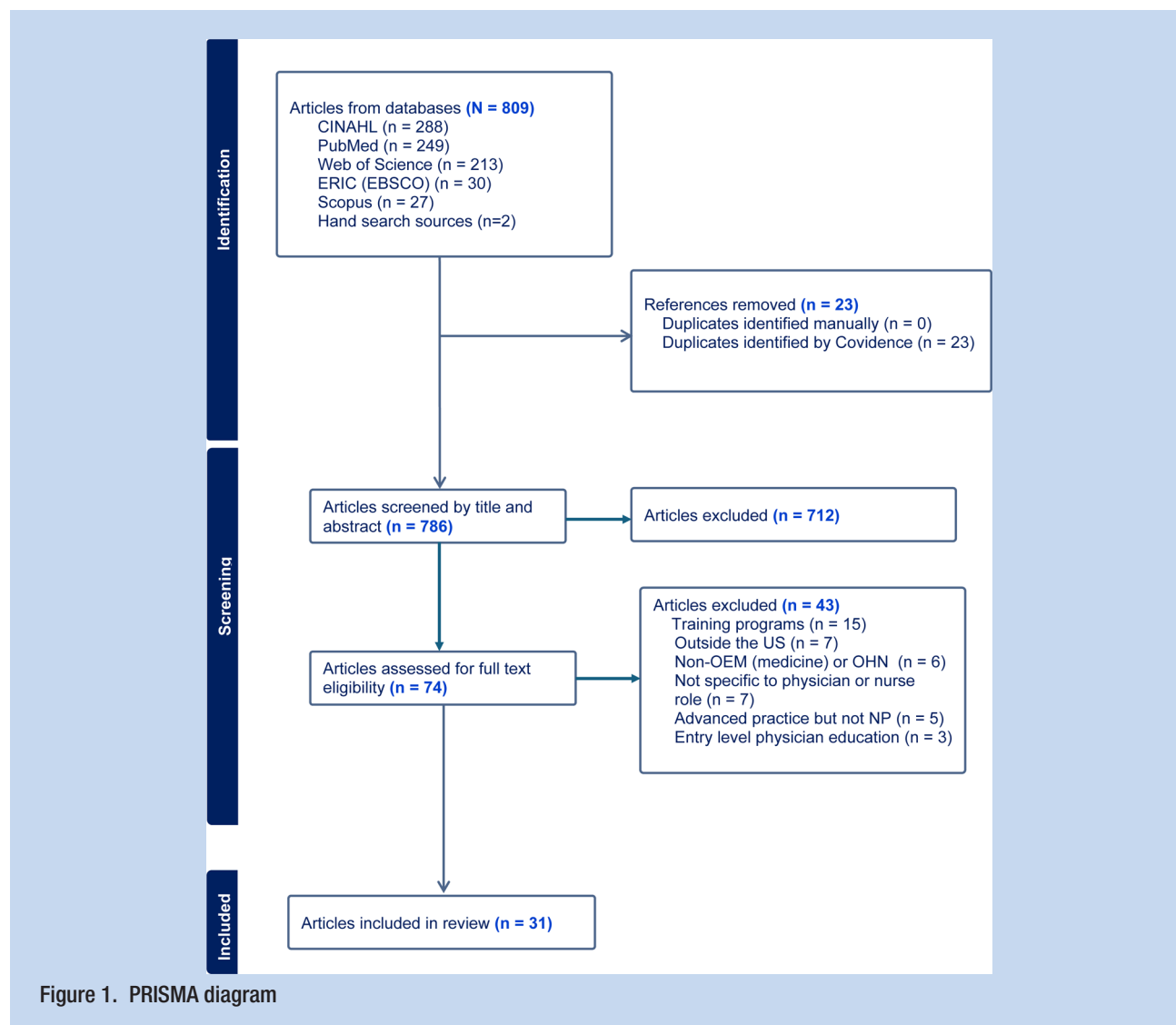
Search strategy component	Inclusion criteria	Exclusion criteria
Population	• NPs who practice OEH and have certification as emergency, family, adult, or adult-gerontology NPs in the US • Registered nurses who practice OEH nursing and are certified as an Occupational Health Nurse or an Occupational Health Nurse-Specialist • Physicians practicing OEM and are certified as OEM physicians	• NPs who practice pediatric, psychiatric/mental health, women's health, gender health • Registered nurses practicing outside of OEH • Physicians practicing outside OEM
Concept	• Established and adopted OEM core competencies for physicians • Established and adopted core competencies for OHNs • Established and adopted specialty NP core competencies within adult-gerontology and general practice (i.e., emergency, cardiology, dermatology, hematology/oncology, orthopedic, nephrology, palliative care, HIV/AIDs) • Entry-level NP role core competencies for the generalist role	• Core competencies for physicians outside of OEM • Core competencies for RNs outside of OEH • NP core competencies within a narrow field not applicable to full OEH practice (i.e., pediatric, psychiatric/mental health, or women's health/gender-related) • Training programs addressing competency achievement or evaluation
Context	• Settings in the US where workers receive occupational-related health services for injuries or illnesses ◦ Academic/hospital/emergency department ◦ Corporate/private practice/industry/urgent care ◦ Government/military practice	• Settings outside the US • Settings within the US that do not provide occupational-related health services for injuries or illnesses
Outcome	• OEHP core competencies	• General OEH competencies not specific to medicine or nursing
Sources of evidence	• Peer-reviewed literature • Articles published in the English language • Full text available • Years of publication: 1974–2024	• Grey literature, books, conference proceedings, dissertations, theses, websites • Articles published in languages other than English • No full text available • Articles published before 1974

Note. NP = nurse practitioner; OEH = occupational and environmental health; OEHP = occupational and environmental health nurse practitioner; OEM = occupational and environmental medicine; OHN = occupational health nurse.

conveyed nurses' accountability to OEH and embodied the profession's core values and priorities (AAOHN, 2004). Of these, only McAndrew (1999) addressed the NP role, specifically recognizing its potential contribution to OEH nursing.

Sixteen topic-specific, opinion-perspective articles addressed essential educational content for effective OEH nursing practice, including primers on toxicology (Arble, 2004), interpretation of hepatitis C blood titers (Cadet, 2019),

development of policy and procedures (Ebaugh, 1998; Randolph, 2006), Occupational Safety and Health Administration (OSHA) standards (Fell-Carlson, 2004), and confidentiality and reporting duties (McHugh, 2003). Other articles identified specific requirements of OSHA surveillance programs (Papp & Miller, 2000), financial resource management (Rainer & Papp, 2000), components of physical examinations (Rasmor & Brown, 2003), and the interpretation



of the OSHA Bloodborne Pathogen Standard (Roup, 1993). Four other articles described research integration into practice (Salazar, 2002), legal and regulatory requirements of practice (Thompson, 2006), proper medical recordkeeping (Thompson, 2010), and preventing asbestos exposure (Vork & Olson, 1990). One article addressed respiratory protection translated into instructional modules (Burns et al., 2014). Collectively, these articles reflected a broad, yet fragmented, body of essential knowledge for OEH nursing practice.

OEM Core Competencies

Seven articles addressed ACOEM-endorsed core competencies. Three articles traced the evolution of ACOEM core competencies from 2000 to 2021, reflecting changes in OEM practices over time while consistently emphasizing the foundational knowledge, skills, and behaviors required for this

specialization (Cloeren et al., 2014; Hartenbaum et al., 2021; Kesler et al., 2008). The remaining four articles addressed specific competency components through ACOEM-endorsed position statements, highlighting emerging areas of knowledge and practice. Townsend (2000) described the clinical application of spirometry in occupational respiratory surveillance. Hegmann et al. (2014) provided guidance on opioid use in worker populations and occupational settings. Mirza et al. (2018) outlined best practices for diagnosing noise-induced hearing loss. Perkison et al. (2018) expanded ACOEM competency requirements to include physician roles in managing and preventing climate-related health impacts, recognizing the growing importance of environmental conditions on health. Collectively, these seven professional position statements and documents reflected both continuity and evolution of ACOEM's core competencies.

Table 3. Characteristics of Included Studies and Key Themes (*n* = 31)

Author (year)	Aim	Type of article, level of evidence*	Target population	Key concept	Conceptual model or framework	Relevance to OEHP practice	Key theme
AAOHN (2004)	To disseminate OHN professional practice standards as reflected by AAOHN in 2004	Expert committee, Consensus panel, Level VIII	OHN	Professionalism and leadership	Not specifically identified	Supports OEHP role development and consistency in practice	OEHP, Nursing Core Competencies
AAOHN (2012)	To disseminate updated OHN professional practice standards as reflected by AAOHN	Expert committee, Consensus panel, Level VIII	OHN	Professionalism and leadership	Not specifically identified	Supports OEHP role development and consistency in practice	OEHP, Nursing Core Competencies
AAOHN (2015)	To disseminate a list of core competencies for OEHP nursing	Expert committee, Consensus panel, Level VIII	OHN	Professionalism and leadership	Not specifically identified	Supports OEHP role development and consistency in practice	OEHP, Nursing Core Competencies
Able (2004)	To provide an overview of basic toxicology concepts	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP clinical practice	OEHP, Nursing Core Competencies
Burns et al. (2014)	To develop OHN respiratory protection competencies	Qualitative Modified Delphi Study, Level VI (Delphi)	OHN	Foundational programmatic and operational OHN practice	AAOHN 2007 OEHP Nursing Competencies/ <i>Bennett's From Novice to Expert</i>	Supports safe, ethical, evidence-based OEHP practice	OEHP, Nursing Core Competencies
Cadet (2019)	To provide an overview of screening for chronic HCV	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP clinical practice	OEHP, Nursing Core Competencies
Chan et al. (2020)	To refine and reduce redundancy in the NP role core competencies, and to ensure that the final competencies were clear and measurable	Qualitative Delphi Study, Level VI	NP	Professionalism and leadership	Competency-based education	Entry-level NP role core competencies—could be modified for OEHP competencies.	NP Core Competencies
Cloeren et al. (2014)	To update the 2008 core competencies for OEM physicians	Expert committee, Consensus panel, Level VIII	OEM	Professionalism and leadership	Competency-based medical education	Provide OEM physician core competencies—could be modified to define OEHP core competencies.	OEM Core Competencies
DiBenedetto (2000)	To mitigate risks in practice	Authoritative opinion of respected authorities, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports safe, ethical, evidence-based OEHP practice and promotes safe and healthy work environments	OEHP, Nursing Core Competencies
Ebaugh (1998)	To define the scope of occupational health services through effective policy and procedure development	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP administrative practice—could be modified to clarify OEHP role boundaries	OEHP, Nursing Core Competencies

(continued)

Table 3. (continued)

Author (year)	Aim	Type of article, level of evidence*	Target population	Key concept	Conceptual model or framework	Relevance to OEHP practice	Key theme
Feil-Carlson (2004)	To provide an overview of OSHA, its history, major standards, and OHNs' practical applications	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP practice	OEHP, Nursing Core Competencies
Hartenbaum et al. (2021)	To update the 2014 OEM core competencies to align with ACGME competencies, identifying the need for alignment with CBE, and to remain relevant to evolving practice	Expert committee, Consensus panel, Level VIII	OEM	Professionalism and leadership	Competency-based medical education	OEM physician core competencies could be modified to define OEHP core competencies	OEM Core Competencies
Hegmann et al. (2014)	To provide evidence-based recommendations for providers regarding the use of opioids in working-age adults	Expert committee, Consensus panel, Level VIII	OEM	Clinical, medical, and scientific aspects of OEM	Competency-based medical education	OEM physician core competencies—could be modified to define OEHP core competencies	OEM Core Competencies
Kesler et al. (2008)	To update the 1998 original set of OEM competencies (for physicians)	Expert committee, Consensus panel, Level VIII	OEM	Professionalism and leadership	Competency-based medical education	OEM physician core competencies—could be modified to define OEHP core competencies	OEM Core Competencies
McAndrew (1999)	To describe the role of the NP in OEHP	Authoritative opinion of respected authorities, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	As an early descriptor of the NP role in OEHP	OEHP, Nursing Core Competencies
McHugh (2003)	To identify the legal and ethical implications for OHNs and to identify ways OHNs can assure confidentiality without breaching legal duty	Opinion perspective, Level VIII	OHN	Professionalism and leadership	Not specifically identified	Support the development of ethical OEHP competencies	OEHP, Nursing Core Competencies
Mirza et al. (2018)	To describe best practices in the diagnosis of noise-induced hearing loss	Expert committee, Consensus panel, Level VIII	OEM	Clinical, medical, and scientific aspects of OEM	Competency-based medical education	Supports safe, ethical, evidence-based OEHP practice	OEM Core Competencies
National Organization of Nurse Practitioner Faculties (2022)	To disseminate the generalist NP role core competencies	Expert committee, Consensus panel, Level VIII	NP	Professionalism and leadership	Competency-based education	Entry-level NP role core competencies—could be modified for OEHP competencies	NP Core Competencies
Papp and Miller (2000)	To provide a reference chart for OSHA standards requiring medical surveillance	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP practice for worker health quality and safety monitoring	OEHP, Nursing Core Competencies
Perkison et al. (2018)	To identify climate-related health challenges among workers and to describe the responsibilities of the OEM provider	Expert committee, Consensus panel, Level VIII	OEM	Clinical, medical, and scientific aspects of OEHP	Competency-based medical education	Supports safe, ethical, evidence-based OEHP practice	OEM Core Competencies
Rainer and Papp (2000)	To provide guidance on the management of financial resources	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP administrative practice	OEHP, Nursing Core Competencies

(continued)

Table 3. (continued)

Author (year)	Aim	Type of article, level of evidence*	Target population	Key concept	Conceptual model or framework	Relevance to OEHP practice	Key theme
Randolph (2006)	To describe the steps in developing policies and procedures	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP administrative practice	OEHP, Nursing Core Competencies
Rasmor and Brown (2003)	To describe the process and contents of a physical exam	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP clinical practice	OEHP, Nursing Core Competencies
Rogers (1997)	To define the process for developing protocols that help define and delineate appropriate and standardized parameters of care	Authoritative opinion of respected authorities, Level VIII	OHN	Foundational programmatic and operational OHN nursing practice	Not specifically identified	Supports OEHP administrative practice	OEHP, Nursing Core Competencies
Roup (1993)	To inform and guide OHNs for compliance with OSHA's bloodborne pathogen standard	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports safe, ethical, and evidence-based OEHP practice	OEHP, Nursing Core Competencies
Salazar (2002)	To describe effective use of research in OHN practice	Opinion perspective, Level VIII	OHN	Scholarship	Not specifically identified	Supports the development of evidence-based OEHP clinical practice	OEHP, Nursing Core Competencies
Thompson (2006)	To provide an overview of nursing practice legislation applicable in occupational settings in the United States to ensure the scope of practice and regulatory compliance	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP practice	OEHP, Nursing Core Competencies
Thompson (2010)	To identify the range of documents included in medical recordkeeping, the primary determinants of the content, maintenance, and retention of medical records, and available medical recordkeeping tools and resources	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports OEHP administrative practice	OEHP, Nursing Core Competencies
Townsend (2000)	To provide recommendations for the use of spirometry in occupational health	Expert committee, Consensus panel, Level VIII	OEM	Clinical, medical, and scientific aspects of OEHP	Not specifically identified	Supports safe, ethical, evidence-based OEHP practice	OEM Core Competencies
Vork and Olson (1990)	To identify the OHN role in the prevention of asbestos exposure	Opinion perspective, Level VIII	OHN	Foundational programmatic and operational OHN practice	Not specifically identified	Supports safe, ethical, evidence-based OEHP practice	OEHP, Nursing Core Competencies
White et al. (1999)	To describe the process of identifying competencies in OEHP nursing	Opinion perspective, Level VIII	OHN	Professional and leadership	Benner's (1982) Model: <i>From Novice to Expert: Excellence</i>	Provides potential theory to guide OEHP professional development, supporting continued competence growth	OEHP, Nursing Core Competencies

Note. Level of evidence was assessed using the Adapted Rating System for the Hierarchy of Evidence (Dang et al., 2021; Fineout-Overholt et al., 2010).

Table 4. Chronological List of Included Articles by Discipline (N= 31)

Discipline	Year/Author	Publication journal	Type of article	Content area topic
Occupational and Environmental Health Nursing	1990 Vork & Olson	<i>American Association of Occupational Health Nurses, AAOHN Journal</i>	Opinion perspective	Asbestos exposure prevention
	1993 Roup	<i>AAOHN Journal</i>	Opinion perspective	OSHA's bloodborne pathogen standard
	1997 Rogers	<i>AAOHN Journal</i>	AAOHN Advisory	Developing protocols for standardized care
	1998 Ebaugh	<i>AAOHN Journal</i>	Opinion perspective	Policy and procedure development
	1999 McAndrew	<i>AAOHN Journal</i>	AAOHN Advisory	NP role description
	1999 White et al.	<i>AAOHN Journal</i>	Opinion perspective	Process of OHN competency development
	2000 DiBenedetto	<i>AAOHN Journal</i>	AAOHN Advisory	Mitigating practice risks
	2000 Papp & Miller	<i>AAOHN Journal</i>	Opinion perspective	OSHA surveillance
	2000 Rainer & Papp	<i>AAOHN Journal</i>	Opinion perspective	Financial resources management
	2002 Salazar	<i>AAOHN Journal</i>	Opinion perspective	Effective use of research in practice
	2003 McHugh	<i>AAOHN Journal</i>	Opinion perspective	Confidentiality
	2003 Rasmor & Brown	<i>AAOHN Journal</i>	Opinion perspective	Physical exam process and contents
	2004 AAOHN	<i>AAOHN Journal</i>	AAOHN Position Statement	Professional Standards
	2004 Arble	<i>AAOHN Journal</i>	Opinion perspective	Toxicology Basics
	2004 Feli-Carlson	<i>AAOHN Journal</i>	Opinion perspective	OSHA standards
	2006 Randolph	<i>AAOHN Journal</i>	Opinion perspective	Developing policies and procedures
	2006 Thompson	<i>AAOHN Journal</i>	Opinion perspective	Nursing practice legislation and regulatory compliance
	2010 Thompson	<i>AAOHN Journal</i>	Opinion perspective	Medical recordkeeping
	2012 AAOHN	<i>Workplace Health & Safety</i>	AAOHN Position Statement	Professional Standards
	2014 Burns et al.	<i>Workplace Health & Safety</i>	Opinion perspective	Respiratory Protection
	2015 AAOHN	<i>Workplace Health & Safety</i>	AAOHN Position Statement	OEHN core competencies
	2019 Cadet	<i>Workplace Health & Safety</i>	Opinion perspective	Hepatitis C

(continued)

Table 4. (continued)

Discipline	Year/Author	Publication journal	Type of article	Content area topic
Occupational and Environmental Medicine	2000 Townsend	<i>Journal of Occupational and Environmental Medicine</i>	American College of Occupational and Environmental Medicine (ACOEM) Position Statement	Pulmonary Function Testing
	2008 Kesler et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Position Statement	Formal List of Core Competencies
	2014 Cloeren et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Position Statement	Formal List of Core Competencies
	2014 Hegmann et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Guidance Statement	Opioid use
	2018 Mirza et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Guidance Statement	Noise-induced hearing loss
	2018 Perkison et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Guidance Statement	Climate change challenges
	2021 Hartenbaum et al.	<i>Journal of Occupational and Environmental Medicine</i>	ACOEM Position Statement	Formal List of Core Competencies
	2020 Chan et al.	<i>Journal of the American Association of Nurse Practitioners</i>	Opinion perspective	Proposed List of Core Competencies
Advanced Practice Nurse Practitioners	2022 National Organization of Nurse Practitioner Faculties (NONPF)	<i>National Organization of Nurse Practitioner Faculties</i>	NONPF Position Statement	List of Core Competencies

Note. OSHA = Occupational Safety and Health Administration.

NP Core Competencies

Two articles addressed the core competencies of entry-level NPs. Chan et al. (2020) used a Delphi approach to refine existing NONPF NP role competencies, consolidating 139 original Doctor of Nursing Practice competencies into 49 across eight domains. This consolidation aimed to enhance clarity, eliminate redundancies, and improve relevance and practical applicability in both educational and clinical settings, supporting the integration of competency-based education into NP curricula and practice. Separately, the NONPF (2022) NP role core competencies introduced an integrated domain-based structure that emphasizes measurable, role-specific outcomes. Building on the foundational frameworks of AACN (2021) and NONPF (2017), NONPF (2022) addressed the evolving demands of the healthcare system, including social determinants of health, systems thinking, and population health. NONPF (2022) operationalized competency-based education for NPs by defining measurable, outcome-focused knowledge, skills, and attitudes required for entry-level NPs in general practice across all population foci. Thus, these competencies are considered essential and actionable, reflecting the principles of competency-based education by defining competencies that are critical for entry-level practice and can be observed, measured, and assessed in both educational and clinical settings.

Discussion

This literature review confirmed the existence of core competencies for OEH nurses and OEM physicians, while revealing the absence of an established set of OEHNPs core competencies. Although 22 articles broadly delineated OEH nursing core competencies, none explicitly addressed the OEHNPs unique role and responsibilities. Six articles presented the OEH nursing core competencies and professional standards, which were formally endorsed by AAOHN. The remaining 16 opinion perspectives addressed discrete components of OEH nursing practice, including toxicology (Arble, 2004), OSHA standards (Fell-Carlson, 2004), and legal and regulatory requirements (Thompson, 2006). Despite providing valuable educational content, these resources were framed through a traditional nursing programmatic lens rather than an NP-level perspective. Similarly, although Burns et al. (2014) defined respiratory protection competencies for OEH nurses, this work did not extend to the full range of clinical respiratory protection competencies required for the NP role.

As shown in Table 4, OEH nursing literature was largely role-driven, presenting diverse viewpoints and perspectives with limited consensus, highlighting a fragmented body of knowledge that did not explicitly address advanced practice NPs. Consequently, OEHNPs-specific functions, such as independent assessment, diagnosis, and management, remained largely unaddressed. Nevertheless, each article contained programmatic knowledge relevant to the OEHNPs role.

In contrast, OEM literature presented a more cohesive, consensus-driven set of core competencies that emphasized

clinical evaluation, diagnosis, and medical decision-making relevant to worker health, requiring precise clinical evaluation and an understanding of workplace environmental risk factors. Further, while earlier ACOEM position statements were primarily directed toward physicians, subsequent guidance explicitly included the term “OEM clinicians” or “advanced practice providers,” thereby acknowledging the role of NPs in the field (Berenji et al., 2024; Perkison et al., 2018). Regularly updated ACOEM core competencies and endorsed position papers provided clear, authoritative guidance for education, certification, and clinical practice (Cloeren et al., 2014; Hartenbaum et al., 2021; Hegmann et al., 2014; Kesler et al., 2008; Mirza et al., 2018; Perkison et al., 2018; Townsend, 2000). This inclusion of specific competency areas underscores efforts to adapt medical practice to emerging OEH challenges, such as climate change, emerging infectious diseases, an aging workforce, and the increasing prevalence of chronic diseases. Repeated publication and reaffirmation of established OEM core competencies illustrate the evolution of OEM practice expectations, ensure consistency in education and practice, and reinforce a structured, domain-specific framework for competency development.

Higher ACOEM endorsement rates (100% of sampled medical articles) compared with AAOHN endorsement rates (31.8% of sampled nursing articles) may reflect differing scope-of-practice needs and variations in organizational processes, priorities, or formal endorsement thresholds. As professional guidance documents, these endorsements provide clear, authoritative standards for OEH practice in the medical and nursing specialties, respectively.

These professional differences are evident in how each discipline prepares its practitioners and structures its education and training: nursing programs emphasize population-level and programmatic competencies, whereas medical programs prioritize clinically oriented competencies. For example, the National Institute for Occupational Safety and Health (NIOSH, 2024) Education and Research Centers’ nursing education program provides graduate-level coursework and interdisciplinary training that emphasize OEH systems, population-based prevention, and programmatic practice, conducted in worksites, public health agencies, or regulatory settings. The Educational and Research Centers’ nursing programs offer a public health-oriented specialization. While this model strengthens OEH nursing leadership and programmatic skills, it may not fully address the specialty-specific clinical education and advanced practice training required for OEHNPs practice, as defined by competencies and standards established by NONPF (2022), except in a limited number of programs that include dedicated NP tracks. Additionally, although some NIOSH Education and Research Centers’ nursing programs prepare nursing graduates for the ABOHN certification exams, thereby supporting OEH nursing credentialing, not all programs uniformly meet advanced clinical competency standards. In contrast, the NIOSH Education and Research Centers’ medical education programs support OEM

physician training that is fully aligned with Accreditation Council for Graduate Medical Education (2025) standards and the American Board of Preventive Medicine (2025) OEM certification requirements, including advanced clinical practice, highlighting a structural gap between Education and Research Centers' nursing education and the clinical scope required for OEHNPs practice.

The existence of both OEM and OEH nursing core competencies, as well as discrete professional practice standards and guidelines, highlights the importance of OEH and the need to establish a comparable, formalized set of core competencies for OEHNPs. This absence of formalized OEHNPs core competencies is especially notable when compared with those available for other NP specialty roles, such as dermatology and emergency care (Bobonich & Nolen, 2018; Wilbeck et al., 2017). The dual nature of NPs as both clinical providers and health system leaders necessitates that the OEHNPs core competencies integrate OEM and OEH nursing competencies. OEH nursing literature emphasizes clinical practice, case management, regulatory compliance, health promotion, and program management, whereas OEM emphasizes clinical diagnosis, treatment, and evidence-based decision-making. Positioned at the intersection of these disciplines, NPs are uniquely equipped to translate clinical knowledge into effective programmatic interventions and to apply system-level thinking to individual and population health management. This dual perspective calls for role-specific essential and actionable OEHNPs core competencies that support interprofessional practice, comprehensive worker care, and the mitigation of worksite-related hazards in communities. Further, the low rate of NPs' OHN certification may signal the need for a credential explicitly aligned with the OEHNPs role.

Strengths and Limitations

Integrative reviews compile diverse evidence to offer a comprehensive understanding of complex topics. This review analyzed literature from 1974 to 2024, covering the 50-year history of board certification for OHNs and intentionally including entry-level NP core competencies. Building on established NP core competencies allowed the researchers to trace competency-based progress and provided a structured framework for the future development of OEHNPs-specific competencies (AACN, 2021; NONPF, 2022). The review focused solely on OEM and OEH nursing because both disciplines not only emphasize integration with other OEH specialties and public health but also strengthen the dual clinical and professional identity of OEHNPs. This focus facilitated the identification of relevant core competencies, which are more likely to shape and define the role of OEHNPs. Including literature from outside these disciplines might have introduced variability inconsistent with the OEHNPs professional and clinical scope. Although broader search terms could have uncovered more studies, the search strategy was intentionally comprehensive, incorporating "OEHNPs" headings, and

keywords related to OEH, advanced practice nursing, professional organizations, and competency-based practice (e.g., competency, best-practice, clinical skills, domains). This approach aimed to capture the entire spectrum of literature on NP practice, competencies, and role standards in OEH environments, reducing the chance of missing relevant studies. However, even with an expert librarian-guided structured search, the absence of the key AAOHN (2015) article suggests some relevant articles might have been overlooked. Lastly, most of the sampled articles had a low evidence level, mostly consisting of perspectives, expert opinions, or consensus documents rather than empirical research. While opinion pieces are vulnerable to selection and confirmation biases that can limit their objectivity, consensus guidance documents reflect collective expertise and offer more credible recommendations. The predominance of lower-level evidence is expected since these publications aim to guide competency development rather than original research. Nonetheless, these sources remain valuable for shaping OEHNPs core competencies.

Implications for Practice

The rising use of NPs in OEH aligns with the need for specialized education and training in NP-specific OEH, which is beginning to develop at several NIOSH Education and Research Centers. Additionally, there is a movement toward adopting a distinct professional identity and title, OEHNPs. Officially recognizing this title would identify licensed NPs with advanced OEH training who are qualified to diagnose and manage work-related illnesses and injuries, conduct health surveillance, and implement preventive measures across clinical, population, and environmental health settings. Incorporating the OEHNPs role into practice also highlights the importance of establishing standardized core competencies for OEHNPs.

Developing standardized core competencies for OEHNPs is essential to guide competency-based education and training, ensuring practitioners acquire the knowledge, skills, and attitudes necessary for safe, evidence-based care. Such competencies would clarify the OEHNPs advanced scope, support certification pathways, strengthen workforce development, and enhance interprofessional collaboration, ultimately improving the quality, access, and outcomes for patient care (Bittner & Mueller, 2018; Harada et al., 2023; Reeves et al., 2017). A clear framework also fosters accountability, professional growth, continuous learning, quality improvement, and patient safety, central to care delivery (Meier et al., 2025; National League for Nursing, 2024; Notarnicola et al., 2025). Delphi studies have successfully defined core competencies for OHNs and entry-level NPs (AAOHN, 2015; Chan et al., 2020; NONPF, 2022; White et al., 1999). Future research should employ these consensus-generating initiatives to create measurable, integrated OEHNPs competencies that draw on both OEH nursing and OEM.

Despite these benefits, developing OEHNPs core competencies faces several challenges. First, established OEM

and OEH nursing core competencies may create professional resistance and impede the development of OEHNPs standards. Active engagement by both OEM physicians and OHNs in consensus panels is necessary to align expectations, clarify roles, and reconcile overlapping practice. Structured, collaborative dialogue would ensure that the final OEHNPs core competencies comprehensively address the full spectrum of workplace and environmental health concerns, including risk assessment, exposure management, health promotion, regulatory compliance, and interprofessional communication.

Second, the epistemological foundations of nursing and medicine pose a complex challenge for defining the core competencies of OEHNPs. OEH nursing core competencies (AAOHN, 2015) are consistent with nursing's broader emphasis on context- and practice-based knowledge. They are role- and practice-oriented and organized across practice levels. These competencies emphasize how OEH nursing is delivered in real-world contexts. In contrast, OEM core competencies (Hartenbaum et al., 2021) reflect medicine's normative and prescriptive epistemology. They emphasize what clinicians need to know and derive authority from standardized evidence appraisal and expert consensus rather than from context-specific practice. This fundamental epistemological divergence highlights the need to integrate context-sensitive nursing practice with authoritative, knowledge-based guidance to fully define and support the OEHNPs role.

Third, variability in NP entry-level educational preparation, including course content, curricula rigor, and clinical training, has led to inconsistent NP foundational knowledge and skills, complicating efforts to standardize competencies and clarify roles across settings (Ainslie et al., 2025; Hodges et al., 2019; Lavin et al., 2022; Nishikawa & Jackson, 2025; Pleshkan, 2024). Structured OEHNPs education and training, using standardized competency-based assessments and fellowship-style training models with direct supervision and mentorship from experienced, board-certified OEM/OEHNPs preceptors, could constitute a highly effective strategy. Alignment with the APRN Consensus Model and advocating specialty recognition through national professional certifying organizations would enhance role legitimacy and regulatory consistency. Robust academic-practice partnerships, particularly those involving the NIOSH-supported OEM and OEH nursing educational training programs, could align OEHNPs educational preparation with real-world practice demands.

Lastly, another consideration is whether employers prioritize registered nurses or NPs with specialized occupational and environmental health credentials, or physicians board-certified in OEM. Certification as an OHN is widely recognized as demonstrating proficiency and added value, with certified OHNs frequently involved in regulatory interpretation, leadership, and workplace health management, contributing to organizational benefits such as improved credibility and return on investment (ABOHN, n.d.; OSHA, n.d.). OSHA's guidance specifically recommends hiring professionals with specialty OEH training, including certified OHNs and OEM physicians

(OSHA, n.d.). Board-certified OEM physicians are recognized for their contributions to clinical evaluation, medical surveillance, and work-related disease management (Green-McKenzie et al., 2022). However, little is known about certification requirements in hiring, highlighting the need for studies on the impact of OEH nursing and OEM credentials on employment, role expectations, and career advancement.

Conclusion

This integrative review highlights a critical gap, demonstrating the absence of a consensus-driven set of core competencies for OEHNPs that explicitly address this advanced practice NP role. This gap contributes to ambiguity in role definition, education, certification, and workforce development. The NONPF 2022 NP role competencies provide a foundational framework that, when integrated with relevant OEM and OEH nursing core competencies, can guide the development of OEHNPs-specific core competencies. Such competencies are essential to defining the OEHNPs' professional identity, guiding competency-based education, and ensuring curricula that address the complex OEH needs of workers and communities while supporting OEHNPs' dual identity (medicine and nursing). In this direction, development of OEHNPs-specific core competencies to meet evolving clinical, public health, and occupational safety demands is a timely priority.

List of Acronyms

AACN	American Association of Colleges of Nursing
AANP	American Association of Nurse Practitioners
AAOHN	American Association of Occupational Health Nurses
ABOHN	American Board for Occupational Health Nurses, Inc.
ACOEM	American College of Occupational and Environmental Medicine
ANCC	American Nurses Credentialing Center
NONPF	National Organization of Nurse Practitioner Faculties
NP	Nurse Practitioner
OEH	Occupational and Environmental Health
OEHNPs	Occupational and Environmental Health Nurse Practitioner
OEM	Occupational and Environmental Medicine
OHN	Occupational Health Nurse

Author Contributions

Maria C. Lanzi made substantial contributions to the design, data extraction, analysis, and interpretation, drafting of the initial manuscript, and is accountable for all aspects of the work. Rebecca Billings is an academic research librarian who led the development of the literature search strategy, executed searches across multiple databases, managed study selection within Covidence, and approved the final version. Julie Schexnayder made substantial contributions to data interpretation, synthesis, organization, and editing of the manuscript, approved the final version, and is accountable for all aspects of the work. Adelais Markaki made substantial

contributions to the design, data interpretation, and synthesis; organizing and editing the manuscript; approved the final version; and is accountable for supervising all aspects of the work.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The primary author, ML, gratefully acknowledges scholarship support from the National Institute for Occupational Safety and Health (NIOSH) Deep South Center for Occupational Health and Safety (T42OH008436) as a PhD student.

Human Subjects Review

This literature review synthesizes existing published studies and does not involve engagement with human participants or collection of identifiable data. Therefore, this work does not meet the federal definition of human subjects' research (45 CFR 46) and does not require IRB review or approval.

Artificial Intelligence (AI)

The authors declare that the content, ideas, results, discussion, and conclusions presented are the sole responsibility of the authors. During the preparation of this manuscript, the authors used Grammarly (2024) solely to improve the clarity and readability of the writing. The tool was not used for data analysis, interpretation, or generation of scientific content. Following its use, all authors carefully reviewed and edited the manuscript as necessary and assumed full responsibility for the content of this publication.

ORCID iDs

Maria C. Lanzi  <https://orcid.org/0009-0002-4775-1234>
 Adelais Markaki  <https://orcid.org/0000-0002-2038-3139>

References

- Accreditation Council for Graduate Medical Education. (2025). *Program requirements for graduate medical education in occupational and environmental medicine*. <https://www.acgme.org/programs-and-institutions/programs/common-program-requirements/>
- Ainslie, M., Chan, T., & Bigley, M. B. (2025). Defining population-specific nurse practitioner educational parameters. *Nurse Educator*, 50(5), 242–246. <https://doi.org/10.1097/nne.0000000000001884>
- American Academy of Emergency Nurse Practitioners & Emergency Nurses Association. (2021). *Emergency Nurse Practitioner Competencies*. www.ena.org/sites/default/files/2025-01/enpcompetencies_final.pdf
- American Academy of Nurse Practitioners Certification Board. (n.d.). *Emergency nurse practitioner certification qualifications*. <https://www.aanpcert.org/certs/qualifications>
- American Association of Colleges of Nursing. (2021). *The essentials: Core competencies for professional nursing education*. <https://www.aacnnursing.org/essentials>
- American Association of Nurse Practitioners. (n.d.). *Scope of practice for nurse practitioners*. <https://www.aanp.org/advocacy/advocacy-resource/position-statements/scope-of-practice-for-nurse-practitioners>
- American Association of Nurse Practitioners. (2024). *2024 AANP practice report*. <https://www.aanp.org/practice/practice-related-research/research-reports>
- American Association of Occupational Health Nurses. (n.d.). *What is occupational & environmental health nursing?* <https://www.aaoen.org/About/What-is-Occupational-and-Environmental-Health-Nursing>
- American Association of Occupational Health Nurses. (2004). Standards of occupational and environmental health nursing. *American Association of Occupational Health Nurses Journal*, 52(7), 270–274.
- American Association of Occupational Health Nurses. (2012). Standards of occupational and environmental health nursing. *Workplace Health & Safety*, 60(3), 97–103. <https://doi.org/10.1177/216507991206000301>
- American Association of Occupational Health Nurses. (2015). Competencies in occupational and environmental health nursing. *Workplace Health and Safety*, 63(11), 493–494. <https://doi.org/10.1177/2165079915608192>
- American Board for Occupational Health Nurses. (n.d.). *Why employers hire certified occupational health nurses*. <https://www.abohn.org/employers>
- American Board for Occupational Health Nurses, Inc. (2025a). *Certification overview*. <https://www.abohn.org/certification>
- American Board for Occupational Health Nurses, Inc. (2025b). *COHN/COHN-S eligibility criteria and exam content*. <https://www.abohn.org/certification/cohn-cohn-s-eligibility>
- American Board of Preventive Medicine. (2025). *Occupational medicine certification overview*. <https://www.theabpm.org/certifications/occupational-medicine/>
- American College of Occupational and Environmental Medicine. (n.d.). *Why OEM?* <https://www.acoem.org/About-ACOEM/Why-OEM>
- American College of Occupational and Environmental Medicine. (1998). Occupational and environmental medicine competencies—v 1.0. The American College of Occupational and Environmental Medicine panel to define the competencies of occupational and environmental medicine. *Journal of Occupational and Environmental Medicine*, 40(5), 427–440.
- APRN Consensus Work Group & The National Council of State Boards of Nursing APRN Advisory Committee. (2008). *Consensus model for APRN regulation: Licensure, accreditation, certification & education*. https://www.nursingworld.org/globalassets/certification/aprn_consensus_model_report_7-7-08.pdf
- Arble, J. (2004). Toxicology primer: Understanding workplace hazards and protecting worker health. *American Association of Occupational Health Nurses Journal*, 52(6), 254–261; quiz 262–263.
- Arends, R. (2024). Competency-based curriculum in nurse practitioner education. *Journal of the American Association of Nurse Practitioners*, 36(1), 23–28. <https://doi.org/10.1097/jnx.0000000000000928>
- Axley, L. (2008). Competency: A concept analysis. *Nursing Forum*, 43(4), 214–222. <https://doi.org/10.1111/j.1744-6198.2008.00115.x>
- Ayvazian, J., Muirhead, L., Belizaire, S., King, S. S., Campbell, J., & Klink, K. (2021). Establishing competency-based measures for Department of Veterans Affairs post-graduate nurse practitioner residencies. *Journal of Professional Nursing*, 37(5), 962–970. <https://doi.org/10.1016/j.profnurs.2021.08.001>

- Beaver, C., Magnan, M. A., Henderson, D., DeRose, P., Carolin, K., & Bepko, G. (2016). Standardizing assessment of competences and competencies of oncology nurses working in ambulatory care. *Journal for Nurses in Professional Development*, 32(2), 64–73. <https://doi.org/10.1097/nnd.0000000000000250>
- Benner, P. (1982). From novice to expert. *American Journal of Nursing*, 82(3), 402–407. <https://www.jstor.org/stable/3462928>
- Berenji, M., Baker, B., Saberi, P., McLellan, R. K., Wendland, D., Trangle, K. L., Spaeth, K. R., Green-McKenzie, J., & Fagan, K. M. (2024). Addressing environmental health: Clinician training and practice of environmental medicine, ACOEM guidance statement. *Journal of the American College of Occupational and Environmental Medicine*, 66(12), 668–673. <https://doi.org/10.1097/JOM.0000000000003246>
- Bitner, C. A., & Mueller, M. (2018). The importance of role clarity for development of interprofessional teams. *The Journal of Continuing Education in Nursing*, 49(8), 345–347. <https://doi.org/10.3928/00220124-20180718-04>
- Bobonich, M., & Nolen, M. (2018). Competencies for dermatology nurse practitioners. *Journal of the American Association of Nurse Practitioners*, 30(11), 606–613. <https://doi.org/10.1097/jxx.0000000000000137>
- Bureau of Labor Statistics. (2023). *Employer-reported workplace injuries and illnesses-2021-2022*. <https://www.bls.gov/news.release/pdf/osh.pdf>
- Burns, C., Lachat, A. M., Gordon, K., Ryan, M. G., Gruden, M., Barker, D. P., & Taormina, D. (2014). Respiratory protection competencies for the occupational health nurse. *Workplace Health & Safety*, 62(3), 96–104. <https://doi.org/10.1177/216507991406200303>
- Cadet, M. J. (2019). Screening for chronic hepatitis C virus: Occupational health nurses interpreting the titers. *Workplace Health & Safety*, 67(9), 495–496. <https://doi.org/10.1177/2165079919865560>
- Campo, T. M., Comer, A., Dowling Evans, D., Kincaid, K., Norton, L., Ramirez, E. G., Roberts, E., Smith, A., Stackhouse, K., & Willbeck, J. (2018). Practice standards for the emergency nurse practitioner specialty. *Advanced Emergency Nursing Journal*, 40(4), 240–245. <https://doi.org/10.1097/tme.0000000000000209>
- Carraccio, C., Wolfsthal, S. D., Englander, R., Ferentz, K., & Martin, C. (2002). Shifting paradigms: From Flexner to competencies. *Academic Medicine*, 77(5), 361–367. <https://doi.org/10.1097/00001888-200205000-00003>
- Chan, T. E., Lockhart, J. S., Schreiber, J. B., & Kronk, R. (2020). Determining nurse practitioner core competencies using a Delphi approach. *Journal of the American Association of Nurse Practitioners*, 32(3), 200–217. <https://doi.org/10.1097/JXX.0000000000000384>
- Cline, G., & Rinaldi, K. (2023). A compelling case for the use of backward design to advance competency-based nursing education. *Nurse Educator*, 48(5), E168–E169. <https://doi.org/10.1097/nne.0000000000001388>
- Cloeren, M., Gean, C., Kesler, D., Green-McKenzie, J., Taylor, M., Upfal, M., Hodgson, M., Adamo, P., Harber, P., & McLellan, R. (2014). American College of Occupational And Environmental Medicine's occupational and environmental medicine competencies-2014: ACOEM OEM competencies task force. *Journal of Occupational and Environmental Medicine*, 56(5), e21–e40. <https://doi.org/10.1097/jom.0000000000000173>
- Dang, D., Dearholt, S., Bissett, K., Ascenzi, J., & Whalen, M. (2021). *Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines* (4th ed.). Sigma Theta Tau International.
- D'Aoust, R. F., Brown, K. M., McIltrout, K., Adamji, J. D., Johnson, H., Seibert, D. C., & Ling, C. G. (2022). A competency roadmap for advanced practice nursing education using PRIME-NP. *Nursing Outlook*, 70(2), 337–346. <https://doi.org/10.1016/j.outlook.2021.10.009>
- Dermatology Nurses Association (n.d.). *Eligibility requirements for DCNP certification*. <https://www.dnanurse.org/dnaeducation/certification/>
- DiBenedetto, D. (2000). AAOHN: Managing professional risk in occupational and environmental health nursing practice. *American Association of Occupational Health Nurses Journal*, 48(7), 324a–325a.
- Ebaugh, H. (1998). Defining the scope of occupational health services. Effective policy and procedure development. *American Association of Occupational Health Nurses Journal*, 46(11), 547–552.
- Englander, R., Cameron, T., Ballard, A. J., Dodge, J., Bull, J., & Aschenbrener, C. A. (2013). Toward a common taxonomy of competency domains for the health professions and competencies for physicians. *Academic Medicine*, 88(8), 1088–1094. <https://doi.org/10.1097/ACM.0b013e31829a3b2b>
- Fell-Carlson, D. (2004). OSHA 101: An introduction to OSHA for the occupational health nurse. *Journal of the American Association of Occupational Health Nursing*, 52(10), 442–449; quiz 450–451.
- Fineout-Overholt, E., Melnyk, B. M., Stillwell, S., & Williamson, K. M. (2010). Critical appraisal of the evidence: Part I. *American Journal of Nursing*, 110(7), 47–52.
- Frank, J. R., Mungroo, R., Ahmad, Y., Wang, M., De Rossi, S., & Horsley, T. (2010). Toward a definition of competency-based education in medicine: A systematic review of published definitions. *Medical Teacher*, 32(8), 631–637. <https://doi.org/10.3109/0142159x.2010.500898>
- Free, H., Groenewold, M. R., & Luckhaupt, S. E. (2020). Lifetime prevalence of self-reported work-related health problems among U.S. workers — United States, 2018. *Morbidity and Mortality*, 69, 361–365. <https://doi.org/10.15585/mmwr.mm6913a1>
- Green-McKenzie, J., Khan, A., Redlich, C. A., Margarin, A. R., & McKinney, Z. J. (2022). The future of occupational and environmental medicine. *Journal of Occupational and Environmental Medicine*, 64(12), e857–e863. <https://doi.org/10.1097/jom.0000000000002676>
- Harada, N. D., Traylor, L., Rugen, K. W., Bowen, J. L., Smith, C. S., Felker, B., Ludke, D., Tonnu-Mihara, I., Ruberg, J. L., Adler, J., Uhl, K., Gardner, A. L., & Gilman, S. C. (2023). Interprofessional transformation of clinical education: The first six years of the Veterans Affairs Centers of Excellence in Primary Care Education. *Journal of Interprofessional Care*, 37, S86–S94. <https://doi.org/10.1080/13561820.2018.1433642>
- Harris, E. (2023). Increasing proportion of visits delivered by NPs, PAs. *JAMA*, 330(16), 1516. <https://doi.org/10.1001/jama.2023.19209>
- Hartenbaum, N. P., Baker, B. A., Levin, J. L., Saito, K., Sayeed, Y., & Green-McKenzie, J. (2021). ACOEM OEM core competencies: 2021. *Journal of Occupational and Environmental Medicine*, 63(7), e445–e461. <https://doi.org/10.1097/jom.0000000000002211>
- Hegmann, K. T., Weiss, M. S., Bowden, K., Branco, F., DuBruelee, K., Els, C., Mandel, S., McKinney, D. W., Miguel, R., Mueller, K. L., Nadig, R. J., Schaffer, M. I., Studt, L., Talmage, J. B., Travis, R. L., Winters, T., Thiese, M. S., & Harris, J. S. (2014). ACOEM practice guidelines: Opioids for treatment of acute, subacute, chronic, and postoperative pain. *Journal of Occupational and Environmental Medicine*, 56(12), e143–e159. <https://doi.org/10.1097/JOM.0000000000000352>
- Hodges, A. L., Konicki, A. J., Talley, M. H., Bordelon, C. J., Holland, A. C., & Galin, F. S. (2019). Competency-based education in transitioning nurse practitioner students from education into practice. *Journal of the American Association of Nurse Practitioners*, 31(11), 675–682. <https://doi.org/10.1097/jxx.0000000000000327>
- Institute of Medicine Committee on the Health Professions Education Summit. (2003). *Health professions education: A bridge to quality*. <https://nap.nationalacademies.org/catalog/10681/health-professions-education-a-bridge-to-quality>

- Institute of Medicine (US) Committee to Assess Training Needs for Occupational Safety and Health Personnel in the United States. (2000). *Safe work in the 21st century: Education and training needs for the next decade's occupational safety and health personnel*. National Academies Press. <https://www.ncbi.nlm.nih.gov/books/NBK225528/>
- International Labour Organization. (2023). *A call for safer and healthier working environments*. <https://www.ilo.org/publications/call-safer-and-healthier-working-environments>
- Kesler, D., Upfal, M., Tacoronti, R., Avery, A. N., Martin, C., Singer, M., Wright, D., Hartenbaum, N., Patterson, W., Dreyzehner, J., Carson, C., Harber, P., McLellan, R., Orford, R., Dreger, M., & ACOEM Special Committee on Competencies. (2008). American College of Occupational and Environmental Medicine competencies - 2008. *Journal of Occupational and Environmental Medicine*, 50(6), 712–724. <https://doi.org/10.1097/JOM.0b013e318173a90d>
- Kesten, K. S., & Beebe, S. L. (2022). Competency frameworks for nurse practitioner residency and fellowship programs: Comparison, analysis, and recommendations. *Journal of the American Association of Nurse Practitioners*, 34(1), 160–168. <https://doi.org/10.1097/jxx.0000000000000591>
- Laghezza, M., Clapper, T. C., Christos, P. J., Sharma, R., & Naik, N. (2019). Measuring the effect of a competency-based education conference for PAs and NPs. *Journal of the American Academy of PAs*, 32(9), 44–47. <https://doi.org/10.1097/01.JAA.0000578772.39180.0c>
- Lalloo, D., Demou, E., Kiran, S., Cloeren, M., Mendes, R., & Macdonald, E. B. (2016). International perspective on common core competencies for occupational physicians: A modified Delphi study. *Occupational Environmental Medicine*, 73(7), 452–458. <https://doi.org/10.1136/oemed-2015-103285>
- Lavin, R. P., Veenema, T. G., Sasnett, L., Schneider-Firestone, S., Thornton, C. P., Saenz, D., Cobb, S., Shahid, M., Peacock, M., & Couig, M. P. (2022). Analysis of nurse practitioners' educational preparation, credentialing, and scope of practice in U.S. emergency departments. *Journal of Nursing Regulation*, 12(4), 50–62. [https://doi.org/10.1016/S2155-8256\(22\)00010-2](https://doi.org/10.1016/S2155-8256(22)00010-2)
- Mani, Z. A. (2025). Transitioning to competency-based education in nursing: A scoping review of curriculum review and revision strategies. *BMC Nursing*, 24(1), Article 1111. <https://doi.org/10.1186/s12912-025-03319-y>
- Martsolf, G. R., Gigli, K. H., Reynolds, B. R., & McCorkle, M. (2020). Misalignment of specialty nurse practitioners and the Consensus Model. *Nursing Outlook*, 68(4), 385–387. <https://doi.org/10.1016/j.outlook.2020.03.001>
- McAndrew, K. G. (1999). AAOHN advisory: Nurse practitioners in occupational and environmental health. *American Association of Occupational Health Nurses Journal*, 47(suppl 1–2).
- McCleery, E., Christensen, V., Peterson, K., Humphrey, L., & Helfand, M. (2014). *Evidence brief: The quality of care provided by advanced practice nurses*. Department of Veterans Affairs (US).
- McHugh, J. (2003). Confidentiality of employee health records: Ethical and legal dilemmas for occupational health nurses. *American Association of Occupational Health Nurses Journal*, 51(9), 378–383.
- Meier, L., Smith, J., & Torres, R. (2025). Measuring competency progression across the advanced practice nursing curriculum: A framework for continuous improvement. *Journal of Professional Nursing*, 61, 69–76. <https://www.sciencedirect.com/science/article/abs/pii/S8755722325001565>
- Mirza, R., Kirchner, D. B., Dobie, R. A., & Crawford, J. (2018). Occupational noise-induced hearing loss. *Journal of Occupational and Environmental Medicine*, 60(9), e498–e501. <https://doi.org/10.1097/jom.0000000000001423>
- Moran, K. M., Harris, I. B., & Valenta, A. L. (2016). Competencies for patient safety and quality improvement: A synthesis of recommendations in influential position papers. *Joint Commission Journal on Quality and Patient Safety*, 42(4), 162–169. [https://doi.org/10.1016/s1553-7250\(16\)42020-9](https://doi.org/10.1016/s1553-7250(16)42020-9)
- Mrayyan, M. T., Abunab, H. Y., Abu Khait, A., Rababa, M. J., Al-Rawashdeh, S., Algunmeeyn, A., & Abu Saraya, A. (2023). Competency in nursing practice: A concept analysis. *BMJ Open*, 13(6), Article e067352. <https://doi.org/10.1136/bmjopen-2022-067352>
- National Institute for Occupational Safety and Health. (2024, December 16). *Education and research centers*. Centers for Disease Control and Prevention. <https://www.cdc.gov/niosh/extramural-programs/php/about/ercs.html>
- National League for Nursing. (2024). *Competency-based education toolkit: Integrating competency-based education in the nursing curriculum*. <https://www.nln.org/detail-pages/news/2024/09/10/nln-offers-new-competency-based-education-toolkit-to-guide-the-future-of-nursing-education>
- National Organization of Nurse Practitioner Faculties. (2017). *Nurse practitioner core competencies content*. <https://www.nonpf.org>
- National Organization of Nurse Practitioner Faculties. (2022). *Nurse practitioner role core competencies*. <https://www.nonpf.org/page/14>
- Nishikawa, J., & Jackson, T. (2025). Optimizing FNP clinical education: A path toward standardized training and sustainable workforce development. *Standards*, 5(3), Article 24. <https://doi.org/10.3390/standards5030024>
- Notarnicola, I., Dervishi, A., Duka, B., Grosha, E., Gioiello, G., Carrodano, S., Rocco, G., & Stievano, A. (2025). A systematic review of nursing competencies: Addressing the challenges of evolving healthcare systems and demographic changes. *Nursing Reports*, 15(2), Article 56. <https://pmc.ncbi.nlm.nih.gov/articles/PMC11858704>
- Occupational Safety and Health Administration. (n.d.). *Best practices for non-health care employers with on-site health care services*. <https://www.osha.gov/sites/default/files/publications/OSHA3160.pdf>
- O'Connell, J., Gardner, G., & Coyer, F. (2014). Beyond competencies: Using a capability framework in developing practice standards for advanced practice nursing. *Journal of Advanced Nursing*, 70(12), 2728–2735. <https://doi.org/10.1111/jan.12475>
- Oncology Nursing Certification Corporation. (n.d.). *Advanced oncology certified nurse practitioner (AOCNP®) certification*. <https://www.oncc.org/advanced-oncology-certified-nurse-practitioner-aocnp/>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, Article n71. <https://doi.org/10.1136/bmj.n71>
- Papp, E. M., & Miller, A. S. (2000). Screening and surveillance. OSHA's medical surveillance provisions. *American Association of Occupational Health Nurses Journal*, 48(2), 59–72.
- Perkison, W. B., Kearney, G. D., Saberi, P., Guidotti, T., McCarthy, R., Cook-Shimaneck, M., Pensa, M. A., & Nabeel, I. (2018). Responsibilities of the occupational and environmental medicine provider in the treatment and prevention of climate change-related health problems. *Journal of Occupational and Environmental Medicine*, 60(2), e76–e81. <https://doi.org/10.1097/jom.0000000000001251>
- Peters, M. D. J., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., McInerney, P., Godfrey, C. M., & Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI*

- Evidence Synthesis*, 18(10), 2119–2126. <https://doi.org/10.11124/jbies-20-00167>
- Pleshkan, V. (2024). A systematic review: Clinical education and preceptorship during nurse practitioner role transition. *Journal of Professional Nursing*, 50, 16–34. <https://doi.org/10.1016/j.profnurs.2023.10.005>
- Rainer, S. R., & Papp, E. (2000). The self-employed occupational and environmental health nurse: Maximizing business success by managing financial resources. *American Association of Occupational Health Nurses Journal*, 48(4), 185–194; quiz 195–196.
- Ramirez, E., Schumann, L., Agan, D., Hoyt, K. S., Wilbeck, J., Tyler, D., & Evans, D. D. (2018). Beyond competencies: Practice standards for emergency nurse practitioners—A model for specialty care clinicians, educators, and employers. *Journal of the American Association of Nurse Practitioners*, 30(10), 570–578. <https://doi.org/10.1097/jnx.0000000000000139>
- Randolph, S. A. (2006). Developing policies and procedures. *American Association of Occupational Health Nurses Journal*, 54(11), 501–504. <https://doi.org/10.1177/216507990605401104>
- Rasmor, M., & Brown, C. M. (2003). Physical examination for the occupational health nurse: Skills update. *American Association of Occupational Health Nurses Journal*, 51(9), 390–401; quiz 402–403.
- Reeves, S., Pelone, F., Harrison, R., Goldman, J., & Zwarenstein, M. (2017). Interprofessional collaboration to improve professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*, 6(6), Article CD000072. <https://doi.org/10.1002/14651858.CD000072.pub>
- Rodgers, G. P., Linderbaum, J. A., Pearson, D. D., Fernandes, S. M., Housholder-Hughes, S. D., Mendes, L. A., Berg, N. C., Day, J., Drajpuch, D., Erb, B. Jr., Farquhar-Snow, M., Johnson, H., Keegan, P., Kindler, C., Larsen, R., Le, V. T., Nickolaus, M. J., Phillips, C. M., Ross, L., . . . Zado, E. S. (2020). 2020 ACC clinical competencies for nurse practitioners and physician assistants in adult cardiovascular medicine: A report of the ACC competency management committee. *Journal of the American College of Cardiology*, 75(19), 2483–2517. <https://doi.org/10.1016/j.jacc.2020.01.005>
- Rogers, B. (1997). AAOHN advisory: Developing clinical guidelines or protocols for practice. *American Association of Occupational Health Nurses Journal*, 45(10), 476a–476b.
- Roup, B. J. (1993). OSHA's new standard: Exposure to bloodborne pathogens. *American Association of Occupational Health Nurses Journal*, 41(3), 136–142.
- Rugen, K. W., Dolansky, M. A., Dulay, M., King, S., & Harada, N. (2018). Evaluation of Veterans Affairs primary care nurse practitioner residency: Achievement of competencies. *Nursing Outlook*, 66(1), 25–34. <https://doi.org/10.1016/j.outlook.2017.06.004>
- Salazar, M. K. (2002). Applying research to practice. Practical guidelines for occupational health nurses. *American Association of Occupational Health Nurses Journal*, 50(11), 520–525; quiz 526–527.
- Stephens, K., Carlucci, M., Duchnowska, A., Blumenthal, R., & Dickens, C. (2023). Creation of a critical care NP onboarding program. *Nurse Practitioner*, 48(8), 7–10. <https://doi.org/10.1097/01.Npr.0000000000000085>
- Ten Cate, O., & Scheele, F. (2007). Competency-based postgraduate training: Can we bridge the gap between theory and clinical practice? *Academic Medicine*, 82(6), 542–547. <https://doi.org/10.1097/ACM.0b013e31805559c7>
- Thompson, M. C. (2006). Legislation affecting occupational health nursing: Identifying relevant laws and regulations. *American Association of Occupational Health Nurses Journal*, 54(1), 38–45; quiz 46–47.
- Thompson, M. C. (2010). Medical recordkeeping in an occupational health setting. *American Association of Occupational Health Nurses Journal*, 58(12), 524–533; quiz 534–535. <https://doi.org/10.3928/08910162-20101201-02>
- Townsend, M. C. (2000). ACOEM position statement. Spirometry in the occupational setting. *Journal of Occupational and Environmental Medicine*, 42(3), 228–245. <https://doi.org/10.1097/00043764-200003000-00003>
- Vasquez, J. A., Marcotte, K., & Gruppen, L. D. (2021). The parallel evolution of competency-based education in medical and higher education. *The Journal of Competency-Based Education*, 6(2), Article e1234. <https://doi.org/10.1002/cbe2.1234>
- Vork, K. L., & Olson, D. K. (1990). Asbestos review and update. *American Association of Occupational Health Nurses Journal*, 38(4), 160–164.
- Wagner, L. M., Dolansky, M. A., & Englander, R. (2018). Entrustable professional activities for quality and patient safety. *Nursing Outlook*, 66(3), 237–243. <https://doi.org/10.1016/j.outlook.2017.11.001>
- White, K., Cox, A. R., & Williamson, G. C. (1999). Competencies in occupational and environmental health nursing: Practice in the new millennium. *American Association of Occupational Health Nurses Journal*, 47(12), 552–568.
- Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546–553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>
- Wilbeck, J., Roberts, E., & Rudy, S. (2017). Emergency nurse practitioner core educational content. *Advanced Emergency Nursing Journal*, 39(2), 141–151. <https://doi.org/10.1097/tme.0000000000000142>
- Zaitoun, R. A., Said, N. B., & de Tantillo, L. (2023). Clinical nurse competence and its effect on patient safety culture: A systematic review. *BMC Nursing*, 22(1), Article 173. <https://doi.org/10.1186/s12912-023-01305-w>