SCOPING REVIEW OPEN ACCESS

Outcome Indicators for Evaluating Interventions by Advanced Practice Nurses Specialising in Acute Pain: A Scoping Review

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ABSTRACT

Aim: To identify outcome indicators to evaluate interventions delivered by advanced practice nurses specialising in acute pain as reported in the scientific literature.

Design: Scoping review.

Data Sources: Three databases (PubMed, Scopus and CINAHL) were systematically searched in December 2023 to identify studies published between 1996 and 2023.

Review Methods: Search results were managed through the Rayyan platform. Two review authors independently performed data selection and extraction, and a third reviewer resolved conflicts.

Results: The search identified 1263 studies. After screening titles and abstracts, 14 full-text studies were selected for data extraction and analysis. These studies encompassed a variety of designs, including randomised controlled trials, cohort studies and observational studies. The outcome indicators used to evaluate advanced practice nurses' interventions in acute pain management were examined across three key dimensions: study population and setting, intervention and model of acute pain nurse care and quality-of-care assessment. The specific outcome indicators identified included 'pain score', 'side effects', 'analgesia prescription', 'non-pharmacological interventions', 'nurses' pain management knowledge', 'patient/parent education' and 'APN contact'.

Conclusion: This review underscores the growing and evolving role of advanced practice nurses (APNs) in acute pain management, highlighting the diversity of care models and interventions implemented across clinical settings. Key outcome indicators, such as 'pain score', 'side effects' and 'nursing staff's understanding of pain management', were identified, with certain indicators, like 'APN contact' and 'non-pharmacological interventions', more closely linked to the nurse-led approach.

Implications for the Profession: This scoping review underscores the importance of developing and evaluating outcome indicators to enhance the assessment of interventions provided by advanced practice nurses in acute pain management. While consensus on specific indicators has not yet been reached, this review highlights the need for further research to refine and standardise these indicators, thereby contributing to more uniform and comparative evaluations of care.

Impact: The identified outcome indicators can inform the evaluation of APN interventions in acute pain management, supporting efforts to optimise and standardise care. Further implementation and assessment of these indicators will be essential to enhance the quality and effectiveness of patient care.

Reporting Method: The PRISMA extension for Scoping Review guidelines was used.

Patient or Public Contribution: No patient or public contribution.

1 | Introduction

Acute pain is that which occurs suddenly, begins intensely and serves as an alarm signal for a disease or other threat to the body. It may be caused by injury, surgery, disease, trauma, or painful medical procedures, and it has a limited duration (Buckenmaier 2013; International Association for the Study of Pain (IASP) 2022; Raja et al. 2020). Despite the existence of clinical practice guidelines and international guidelines for pain management (Chou et al. 2016; Lynch et al. 2022; American Society of Anesthesiologists Task Force on Acute Pain Management 2012; Schug et al. 2020; The Joint Commission 2017), hospitalised individuals continue to bear high levels of acute pain (Buvanendran et al. 2015; Gregory and McGowan 2016; Kent et al. 2017). In surgical and medical inpatients, the estimated prevalence ranges from 23% to 84% (Gregory and McGowan 2016; Lin et al. 2021; Neuwersch-Sommeregger et al. 2024; Notaro et al. 2021; Vallano et al. 2006; Zhan et al. 2023).

Globally, studies report that 24%–69% of hospitalised patients experience inadequately controlled pain (Lin et al. 2021; Neuwersch-Sommeregger et al. 2024; Wu et al. 2020). Poorly managed acute pain has a significant clinical and socioeconomic impact (Baratta et al. 2014; Neuwersch-Sommeregger et al. 2022; Rawal 2016; Strohbuecker et al. 2005; Vallano et al. 2006) due to longer hospital stays, increased readmissions and an increased risk of persistent chronic pain after discharge (Baratta et al. 2014; Gan 2017; Glare et al. 2019; Hyland et al. 2022). On the other hand, appropriate acute pain management can reduce the factors that favour the transition to chronic pain (Buvanendran et al. 2019; Rosenberger and Pogatzki-Zahn 2022; Sluka et al. 2023; Tighe et al. 2015).

Effective acute pain management is a basic patient right (Brennan et al. 2019; International Pain Summit of the International Association for the Study of Pain 2011; World Health Organisation 2019), playing a key role in health outcomes by improving patients' recovery and quality of life (Baratta et al. 2014; Chou et al. 2020; Rawal 2016). Pain management nursing practice encompasses all nursing interventions aimed at relieving patients' pain, including pain assessment with validated scales, pharmacological and nonpharmacological pain treatments, and evaluation of pain management through the reassessment of the patient's condition (Alzghoul and Abdullah 2015; Fekede et al. 2023; Registered Nurses' Association of Ontario 2013). Thus, the advanced practice nurse (APN) is a central agent in the transformation of health care (Hamric et al. 2009; Sevilla Guerra et al. 2018), exemplifying an

approach focused on improving and ensuring patient safety and quality of care (Hamric et al. 2009; Tracy et al. 2022).

According to the International Council of Nurses, an advanced practice nurse (APN) is 'a generalist or specialized nurse who has acquired, through additional graduate education (minimum of a master's degree), the expert knowledge base, complex decision-making skills and clinical competencies for Advanced Nursing Practice, the characteristics of which are shaped by the context in which they are credentialed to practice'. (International Council of Nurses et al. 2020, 6; International Council of Nurses 2008).

The international recognition of APNs has expanded to include their pivotal role in pain management. Acute pain APNs have been shown to make significant contributions to improving patient care across diverse clinical environments by implementing evidence-based best practices (American Society for Pain Management Nursing and American Nurses Association 2016). Their expertise has been demonstrated to enhance clinical outcomes and improve the quality of life for individuals experiencing pain (Carr et al. 2010; Courtenay and Carey 2008; Fang et al. 2021; Sonneborn and Miller 2021). This specialised role underscores the importance of APNs in delivering effective, patient-centred acute pain management solutions.

Pain management is one of the core elements of nursing practice, and APNs who specialise in pain have great potential to improve the quality of life in people who suffer from it (American Society for Pain Management Nursing 2016; Carr et al. 2010; Courtenay and Carey 2008; Fang et al. 2021; Sonneborn and Miller 2021). Their diverse roles and competencies cover a wide range of healthcare areas and clinical settings, serving to advance and promote evidence-based best nursing practices (American Society for Pain Management Nursing 2016, 2018). Their roles include assessing and diagnosing pain, implementing tailored treatment plans, collaborating with interdisciplinary teams and providing patient education (Almukhaini et al. 2022; Bryant-Lukosius et al. 2017; International Council of Nurses et al. 2020, 2021; Scanlon et al. 2020, 2023).

Few studies have focused on specialised APN interventions for comprehensive acute pain management. Currently, only one review has been published on the impact and efficacy of nurse-led care in acute and chronic pain management (Courtenay and Carey 2008). The authors reported that nurses play a key role in the various models of care for acute pain

TABLE 1 | PAGER framework.

Dimension	Findings
Patterns	Consistent use of 'pain score' and 'side effects' as primary indicators; limited evaluation of nonpharmacological interventions
Advances	Improved patient outcomes with APN-led models, including reduced pain intensity and higher satisfaction. APNs enhanced nursing staff knowledge through training
Gaps	Lack of standardised indicators across regions; minimal focus on cost-effectiveness and PROMs; underrepresentation of nonpharmacological strategies
Evidence for practice	APN interventions are effective in acute pain management, emphasising education, assessment and safety monitoring. Recommendations include expanding roles and enhancing interdisciplinary collaboration
Research recommendations	Develop and validate standardised outcome measures; explore economic impacts of APN-led interventions; assess long-term outcomes, including transitions to chronic pain

but pointed to the need for more rigorous assessment. Since the publication of that review over 15 years ago, the APN role has seen significant development internationally, with roles and intervention models that could differ across countries and settings. We thus deemed it pertinent to conduct an updated scoping review, providing an analysis of outcome indicators sensitive to APN interventions for the management of acute pain.

2 | The Review

2.1 | Aim

This review aimed to identify outcome indicators to evaluate interventions delivered by advanced practice nurses specialising in acute pain as reported in the scientific literature.

2.2 | Methods

The scoping review followed the framework established by Arksey and O'Malley (2005) and the Joanna Briggs Institute (JBI) Scoping Review guidelines (Peters et al. 2020). Reporting complied with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-ScR; Tricco et al. 2018).

The key findings were synthesised using the PAGER Framework (Bradbury-Jones et al. 2022), which encompasses Patterns, Advances, Gaps, Evidence for practice, and Research recommendations. These components are detailed in Table 1, providing a structured summary of the analysis.

The research question driving the scoping review was:

- What are the outcome indicators used to evaluate interventions delivered by advanced practice nurses (APNs) specialising in acute pain management?

- Do the outcome indicators used to evaluate acute pain interventions by APNs differ according to the nomenclature and models of APN care?

Given the heterogeneity in the degree of development and the definition of the pain APN across different international contexts, the review encompassed a range of related terms, including advanced practice nurse, nurse practitioner, nurse clinician, nurse specialist, nurse anaesthetist and pain nurse.

2.3 | Search Methods

A systematic literature review was conducted between May 2022 and December 2023. An exhaustive search strategy was developed with the support of the library department of the University of Barcelona, using the National Library of Medicine and the National Institutes of Health (PubMed) portal, along with the Scopus and CINAHL databases. Studies identified by citation searches were also included.

The search strategy considered the combination of keywords in the title and abstract related to APNs in acute pain management and outcome assessment in health care (Full search strings in Data S1). The medical subject headings (MeSH) used for the systematic review are presented in Table 2. Our search covered the literature published from 1 January 1996 to 31 December 2023.

2.4 | Selection Criteria

We used the population, concepts and context categories specified by the Joanna Briggs Institute (Aromataris and Munn 2020; Peters et al. 2024), which allowed for a broad scope when investigating:

- Population: Studies involving adult and/or paediatric populations who received pain management interventions delivered by APNs specialising in acute pain management. Studies focusing on chronic pain or cancer pain or chest pain of cardiac origin were excluded. Similarly, studies focusing on other healthcare professionals, such as midwives or non-APN providers, were not included.

- Concept: The evaluation of interventions provided by acute pain APNs, including both pharmacological and

TABLE 2 | Key words/medical subject headings (MeSH).

Topic	MeSH	DeSC descriptors for the health sciences (Spanish)
Advanced practice nursing	Advanced practice nursing	Enfermería de Práctica Avanzada
	Nurse practitioners	Enfermeras Practicantes
	Nurse clinicians	Enfermeras Clínicas
	Nurse anaesthetists	Enfermeras Anestesistas
	Nurse specialists	Enfermeras Especialistas
	Nursing	Enfermería
	Nurses	Enfermeras y Enfermeros
Pain	Pain	Dolor
	Acute pain	Dolor agudo
	Pain, postoperative	Dolor Postoperatorio
	Chronic pain	Dolor Crónico
	Pain management	Manejo del dolor
	Pain measurement	Dimensión del Dolor
	Pain clinics	Clínicas de Dolor
Outcome assessment, health care	Health impact assessment	Evaluación del Impacto en la Salud
	Health evaluation	Evaluación en Salud
	Outcome assessment, health care	Evaluación de Resultado en la Atención de Salud
	Outcome and process assessment, health care	Evaluación de Procesos y Resultados en Atención de Salud
	Patient outcome assessment	Evaluación del Resultado de la Atención al Paciente
	Health status indicators	Indicadores de Salud
	Quality indicators, Health care	Indicadores de Calidad de la Atención de Salud
	Quality of health care	Calidad de la Atención de Salud
	Health plan implementation	Implementación de Plan de Salud
	Treatment outcome	Resultado del Tratamiento

nonpharmacological strategies, as well as patient and provider education and other advanced nursing practices aimed at improving outcomes in pain management.

- Context: Studies conducted in diverse healthcare settings (such as hospitals, outpatient clinics and specialised pain management services) where acute pain APNs delivered care. There were no geographical restrictions, allowing for the inclusion of evidence from global settings.

- Types of Sources of Evidence: Full-text reports from studies of any publication type, methodology, or study design. Editorials, opinion pieces, commentary reviews, news items and letters were excluded to maintain focus on primary research studies.

2.5 | Study Selection

Two review authors independently selected the publications for full-text review and inclusion, using the computerised systemic

review platform Rayyan (Ouzzani et al. 2016; https://www.rayyan.ai/). Records were first screened by title and abstract; papers that were deemed to be relevant or potentially relevant were retrieved for full-text review. At all stages, disagreements were resolved by consensus, involving a third review author if necessary. The final list of included articles was reviewed and approved by the entire review team prior to data extraction.

2.6 | Quality Assessment

A formal assessment of methodological quality was not performed, as the main objective of the review was limited to identifying outcome indicators to evaluate interventions delivered by advanced practice nurses specialising in acute pain as reported in the scientific literature.

Scoping reviews are designed to provide a broad overview of the existing evidence on a given topic (Colquhoun et al. 2014;

Pham et al. 2014), and the sources of included evidence are typically not critically appraised (Munn et al. 2018; Tricco et al. 2018). The scoping study does not seek to assess the quality of evidence. Consequently, it provides a narrative or descriptive account of available research (Arksey and O'Malley 2005).

2.7 | Data Charting and Extraction

A two-step process was employed for comprehensive data extraction (Arksey and O'Malley 2005; Levac et al. 2010; Tricco et al. 2018). Initially, two reviewers independently recorded the data using forms developed iteratively by the research team in Microsoft Excel. Subsequently, the reviewers compared and discussed the extracted data. To ensure alignment with the review's objectives, a third reviewer was involved for verification. In the subsequent step, data were systematically extracted from the included studies using tables in Microsoft Excel for subsequent analysis.

The data extracted included the following details (Table 3): author(s), year of publication, country, study aims, study design and methods, participant setting, sample size, intervention, findings and outcome indicators.

2.8 | Data Analysis

The narrative presentation of results reflects the heterogeneity of the included studies and aligns with the objective of mapping the outcome indicators utilised by acute pain advanced practice nurses.

The results of the present scoping review are presented in a descriptive manner, with the outcome indicators grouped according to three study parameters: (1) study population, demographics and setting; (2) intervention and model of pain APN care; and (3) quality of care assessment.

3 | Results

The initial search of electronic databases and citations yielded 1263 records; after deduplication, 725 articles were screened, and 14 were finally included. Details of the search and study selection are presented in a PRISMA flow chart (Figure 1; Page et al. 2021).

3.1 | Study Characteristics

Tables 3 and 4 provides a summary of the characteristics of the included studies:

Fourteen studies were included in the review, with publication dates ranging from 1996 to 2023. The majority (64.3%) were conducted between 2001 and 2023, reflecting a more recent focus on pain management interventions. However, a significant proportion (35.7%) of studies were conducted between 1990 and 2000, highlighting an earlier interest in the development

and evaluation of pain management strategies. This temporal distribution underscores an evolving research landscape, with increasing emphasis on diverse approaches and methodologies in recent decades.

The included studies employed a variety of methodological approaches, with mixed-method designs being the most common (28.6%), followed by descriptive studies (21.4%) and retrospective studies (14.3%). Systematic reviews and meta-analyses accounted for 14.3% of the studies, while randomised controlled trials (RCTs) and literature reviews each comprised 7.1%. It is noteworthy that one study (7.1%) employed a modified Delphi technique to reach consensus on a nurse-led pain management model, underscoring the diversity of methodological strategies employed to evaluate interventions in pain management.

The majority of the studies were conducted in Australia (4 studies, 28.6%) and the United Kingdom (4 studies, 28.6%), indicating a significant focus on pain management research in these regions. Studies from the United States accounted for three articles (21.4%), highlighting its contribution to advancements in this field. Additionally, Canada contributed two studies (14.3%), and China and Germany each contributed one study (7.1%).

When analysed by continent, Europe (comprising the United Kingdom and Germany) and North America (comprising the United States and Canada) each accounted for 35.7% of the studies, followed by Oceania (comprising Australia) at 28.6% and Asia (comprising China) at 7.1%.

The most frequently reported outcome was the 'pain score', which was evaluated in all 14 trials (100%). A significant proportion of the studies (85.7%) examined the prescription procedures for analgesia, indicating a considerable emphasis on pharmaceutical management. There was a notable interest in the more comprehensive psychosocial and knowledge-related facets of pain management, as evidenced by the 64.3% of research that examined 'patient satisfaction and education', whether for patients, parents or nurses. Furthermore, 35.7% of the studies assessed 'nurses' pain management knowledge', while 50% of the studies reported the occurrence of 'side effects'. Lastly, 28.6% of the research assessed 'non-pharmacological interventions'.

3.2 | Nomenclature and APN Pain Care Models

Included studies used several nomenclatures, which can be grouped under two models of APN-directed acute pain care:

The included studies employed a variety of terminologies to describe APN-led or nurse-led pain care models, reflecting the diversity of their scope and implementation:

3.2.1 | Acute Pain Teams and Acute Pain Service Model

These are multidisciplinary teams consisting of an anaesthesiologist and one or more nurses specialised in acute pain management who assume responsibility for postoperative

TABLE 3 | Characteristics of included studies.

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Allen et al. (2018), Australia	To evaluate the pain resource nurse role in sustaining evidence-based practice (EBP) changes for pain assessment and management, as part of a hospital-wide quality improvement project that had been implemented 8 years previously	Mixed-methods Interviews, questionnaire, survey, focus groups	Pain resource nurses and ward nurses at a large tertiary teaching hospital	Medical records were audited for this evaluation in 2015 (*n* = 177), and data were compared to results from the previous evaluation in 2008 (*n* = 220)	The intervention involved the introduction of three EBP change targets in pain assessment and management: (1) documentation of pain score on admission; (2) documentation of pain score at least once per each nursing shift; and (3) regular opioid prescriptions with prescribed and dispensed laxatives	The study found significant improvements in acute pain management through the actions of APNs, evaluated through indicators such as pain score documentation and laxative prescription for opioid-receiving patients. Qualitative content analysis was also used to understand the context of practice change	• Pain score • Prescribing and administering of laxatives for patients receiving opioids • Analgesia prescription • Nurses' pain management knowledge and attitudes
Coleman and Booker-Milburn (1996), UK	To identify the influence of a dedicated acute pain nurse on postoperative pain management with patient-controlled analgesia and epidural infusion analgesia before and after creation of this post in a teaching hospital	Pre- and postintervention study. Questionnaires, interviews and activity records	All patients aged ≥ 16 years who received patient-controlled analgesia or an epidural infusion, before and after the appointment of an APN. The study also included all qualified nursing staff on surgical wards. Teaching surgical hospital	135 patients interviewed during the first survey period and 188 during the second survey period. Additionally, 153 nurses responded to the questionnaire	The appointment of an acute pain nurse with the responsibility for patient and ward staff education, supervision of pain management in the ward setting, and establishment of activity records	The intervention improved patient-controlled analgesia efficacy, reduced hypotension incidence, and increased patient satisfaction with pain control. These outcomes were evaluated using indicators such as pain scores, patient satisfaction, hypotension incidence and duration of analgesia use	• Pain score • Side effects • Analgesia prescription • Patient satisfaction

(Continues)

TABLE 3 | (Continued)

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Courtenay and Carey (2008), UK	To identify, summarise and critically appraise the current evidence regarding the impact and effectiveness of nurse-led care in acute and chronic pain	Literature review Dates: 1996–2007. Articles assessed using a critical appraisal tool	The review included a variety of study populations and settings	21 relevant publications were identified and included findings from both primary and secondary care	Varied across studies but were all focused on nurse-led care in pain management	Nurse-led care in acute pain management improved pain intensity, self-efficacy, reduced disability, decreased depressive symptoms, increased patient satisfaction, improved quality of life, pain behaviour, overall well-being, knowledge, and attitudes towards pain, and resulted in positive treatment alterations, improved symptom control, enhanced independence ratings, and increased patient knowledge	• Pain score • Side effects • Analgesia prescription • Patient satisfaction • Patient education • Non-pharmacological interventions
Czarnecki et al. (2007), USA	To evaluate the effectiveness of an APN-directed, telephone-based, outpatient pain management programme for managing paediatric pain following spinal fusion surgery	Retrospective cohort study. Retrospective chart review	Children and adolescents who underwent spinal fusion surgery in a large children's hospital	61 children and adolescents	APN-directed, telephone-based, outpatient pain management programme	The APN model of care improved: -Pain management -Patient and families' satisfaction ratings -Compliance with pain management regimens The study highlights the importance of parent education in ensuring optimal pain management at home	• Pain score • Analgesia prescription (use of opioids at home) • Side effects • APN contact • Parents' education • Parents' satisfaction

(Continues)

TABLE 3 | (Continued)

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Desbiens et al. (1998), USA	To evaluate a nurse clinician-mediated intervention to relieve pain in a group of seriously ill hospitalised adults	RCT. Data collected from the medical record and interviews	Seriously ill hospitalised adults in five teaching hospitals	4804 patients: $N = 2652$ intervention group, $N = 2152$ usual care	The nurse clinician intervention involved pain assessment, patient education, empowerment, and feedback to healthcare providers	The intervention did not significantly reduce pain or increase satisfaction with pain control in seriously ill hospitalised adults. Despite efforts in pain assessment, education, and feedback, the intervention failed to ameliorate pain during hospitalisation or up to 6 months afterwards	• Pain score • Patient satisfaction • Patient education • APN (nurse clinician) contact
Fang et al. (2021), China	To evaluate the effect of using a nurse-led pain management model in abdominal surgical patients	Retrospective controlled before-after Patient records and a questionnaire	Patients aged 14 years and older, hospitalised for abdominal surgery and receiving patient-controlled analgesia after surgery in a Chinese hospital	2851 patients undergoing elective abdominal surgery, divided into two groups: a traditional anaesthesiologist-led group ($N = 1374$) and a nurse-led group ($N = 1477$)	The implementation of a nurse-led pain relief model for managing postoperative pain in abdominal surgical patients. This model aimed to improve the quality of acute pain management, reduce side effects and enhance nurses' knowledge and attitudes towards pain management	The nurse-led pain relief model improved acute pain management, reduced side effects and enhanced nurses' knowledge and attitudes towards pain management. The effects were evaluated using quality indicators from the American APS and a questionnaire assessing nurses' knowledge and attitudes	• Pain score • Analgesia prescription • Side effects • Patient satisfaction • Patient education • Nurses' pain management knowledge and attitudes

(Continues)

TABLE 3 | (Continued)

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Forster et al. (2022), Australia	To determine the pain levels of children following discharge from hospital, parent views on participation in their child's pain management, and parent perceptions of support from the nurse practitioner-led acute pain service (NpAPS)	Mixed-methods design Questionnaires and qualitative data	Consenting parents, all mothers, of children who had been discharged from large tertiary paediatric hospital	16 children	The NpAPS, which provided support for pain management to children and their parents after discharge from the hospital	The study found high pain scores in children post-discharge, indicating poorly managed postoperative pain. Parents felt supported by NpAPS but expressed concerns about communication, coordination of care, and managing their child's pain at home. The study suggests the need for improved parental support and clear communication during the transition to home care	• Pain score • Analgesia prescription • Parents satisfaction • Parents education
Kitowski and McNeil (2002), Canada	To evaluate the effectiveness of an acute pain service in a merged Canadian hospital system, focusing on quality of care, standardisation of protocols and the role of APNs	Mixed-methods design Surveys and focus group sessions	Acute pain service nurses and the medical staff of the clinical units Merged Canadian hospital system	21 acute pain service nurses and the medical staff of the clinical units	The nurses conducted daily rounds, taught ward staff and supported policy changes, aiming to improve patient outcomes and standardise protocols	The intervention resulted in improved patient outcomes and quality of care. The effects were evaluated using indicators such as patient satisfaction, side effects, efficacy of pain treatments, and the knowledge and beliefs of nurses about pain management. However, mixed results were found in areas like education and job satisfaction	• Pain score • Side effects • Patient satisfaction • Nurses' pain management knowledge and attitudes

(Continues)

TABLE 3 | (Continued)

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Mackintosh and Bowles (1997), UK	To evaluate the impact of a nurse-led inpatient acute pain service in three main areas: preoperative information provided to patients, patients' self-reported levels of pain, and the analgesics prescribed	Descriptive study Questionnaires	Patients who underwent major surgery in Calderdale Healthcare National Health Service (NHS) Trust	100 patients who had undergone major surgery at Calderdale Healthcare (NHS) Trust	The nurse-led intervention involved providing preoperative information, managing patients' self-reported pain levels, and prescribing analgesics.	Significant reductions in reported pain levels and changes in analgesic prescribing patterns were observed, indicating the effectiveness of the nurse-led intervention for improving postoperative pain control.	• Patient education (preoperative) • Pain score • Analgesic prescription
McDonnell et al. (2003a, 2003b), UK	To determine the effectiveness of acute pain teams in improving the quality of analgesia and other postoperative outcomes of adult patients undergoing surgery	Systematic review and meta-analysis Dates: 1966 to 2000. Articles assessed using a critical appraisal tool	A variety of study populations and settings	The review included 13 eligible studies for inclusion	Several of the studies included in the review featured nurse-led interventions as part of the acute pain teams or acute pain services	The review found that nurse-led interventions in acute pain teams and services were associated with improved pain management, reduced analgesic usage, increased patient satisfaction and decreased complications. The indicators used to evaluate these outcomes included pain scores, analgesic use, patient satisfaction scores and incidence of complications	• Pain score • Analgesia prescription • Side effects • Patient satisfaction
Meissner et al. (2006), Germany	To implement a continuous quality improvement programme for postoperative pain management at a university hospital, focusing on benchmarking, teamwork, transparency and feedback	Descriptive study Interviews and activity records	Patients who underwent surgery	6794 patients	Implementing a continuous quality improvement programme for postoperative pain management, focusing on benchmarking, teamwork, transparency, and feedback, and assessing its effectiveness	The outcome was evaluated using process and outcome quality parameters, including pain intensity at rest, during movement, and maximal pain, assessed on a point numeric rating scale. The number of patients receiving nonopioid analgesia was also used as an indicator	• Pain score • Side effects • Analgesia prescription

TABLE 3 | (Continued)

Author(s), year, country	Aim(s)	Study design and methods	Participants and setting	Sample size	Intervention	Findings	Outcome indicators
Muirhead et al. (2024), Australia	To develop a nurse-led model of analgesia to manage postoperative pain in the surgical neonate	A descriptive design using a four-round modified e-Delphi	Panel members consisted of multidisciplinary healthcare professionals associated with neonatal surgical tertiary centres across Australia and New Zealand	37 multidisciplinary healthcare professionals associated with neonatal surgical	NR	Four rounds of statements were required to reach consensus on a model of neonatal nurse-controlled analgesia. The model consists of criteria for use, over-arching guidelines and three separate pathways based on an individual baby's pain assessment scores, need for pain relieving interventions and time-lapsed postsurgical procedure	• Pain score • Side effects • Analgesia prescription • Non-pharmacological interventions • Parents' education
Schoenwald (2011), Australia	To evaluate the role of a nurse practitioner in acute pain management	Descriptive, case study. Collecting data	Patients receiving acute pain management services from a nurse practitioner in an Australian hospital	No mention of a specific sample size. Provided information on the number of clients who received care in the acute pain management service, including over 2000 surgery patients in 2010 and 2900 births in 2009	A nurse practitioner developing a pain service, improving patient access to pain management through nonpharmacological interventions, opioids, and nonopioid analgesics	The nurse practitioner role improved patient access to prompt analgesia, reducing service inadequacy. Indicators used to evaluate the effects included the number of patients receiving immediate review and intervention by the nurse and the detection of potential adverse drug events	• Analgesia prescription • Non-pharmacological interventions • Side effects
White (1999), Canada	The article does not explicitly state the aims of the study. However, it describes the intervention phase of a pain management programme in a hospital, which aimed to change current practice and improve pain assessment and management	Descriptive and case control study. Collecting data	Patients undergoing spinal surgery in a hospital	50 patients: 15 patients included in the baseline assessment and 35 patients in the assessment of pain outcomes	A pain management programme: included a nursing education programme and the introduction of different routes for pain control, including patient-controlled analgesia and the intrathecal route	The pain management programme led by a clinical nurse specialist showed both statistically significant and clinically important improvements in nursing documentation related to pain management and in patient pain outcomes	• Pain score • Analgesia prescription • Nurses' pain management knowledge and attitudes

Abbreviations: APN, advanced practice nurse; APS, acute pain society; NpAPS, nurse practitioner-led acute pain service; NR, not reported; RCT, randomised controlled trial.
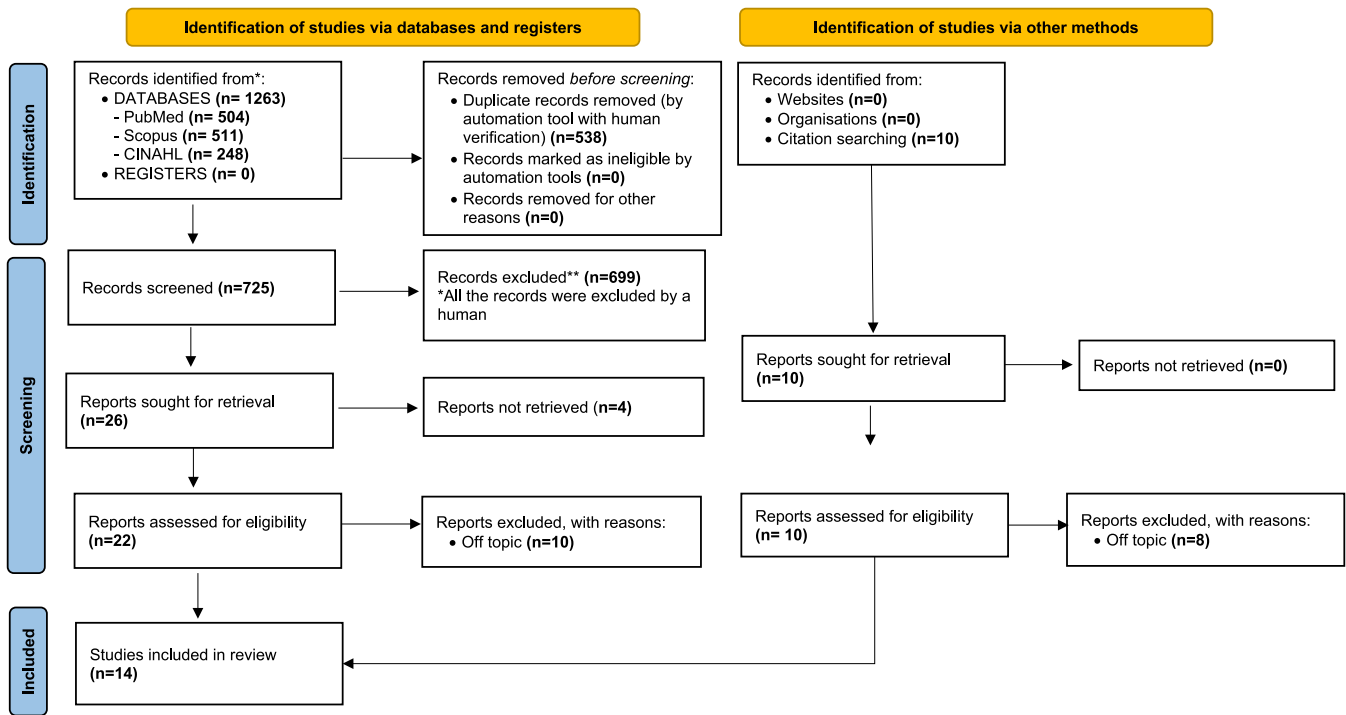
Identification of studies via databases and registers

Identification of studies via other methods

Identification

Records identified from*:
- DATABASES (**n= 1263**)
  - PubMed (**n= 504**)
  - Scopus (**n= 511**)
  - CINAHL (**n= 248**)
- REGISTERS (**n= 0**)

Records removed *before screening*:
- Duplicate records removed (by automation tool with human verification) (**n=538**)
- Records marked as ineligible by automation tools (**n=0**)
- Records removed for other reasons (**n=0**)

Records identified from:
- Websites (**n=0**)
- Organisations (**n=0**)
- Citation searching (**n=10**)

Screening

Records screened (**n=725**) → Records excluded** (**n=699**) *All the records were excluded by a human

Reports sought for retrieval (**n=26**) → Reports not retrieved (**n=4**)

Reports sought for retrieval (**n=10**) → Reports not retrieved (**n=0**)

Reports assessed for eligibility (**n=22**) → Reports excluded, with reasons:
- Off topic (**n=10**)

Reports assessed for eligibility (**n= 10**) → Reports excluded, with reasons:
- Off topic (**n=8**)

Included

Studies included in review (**n=14**)

FIGURE 1 | PRISMA 2020 flow chart.

pain management in acute hospitals (McDonnell et al. 2003a, 2003b). Nurses on these teams are responsible for inpatient pain management. They have an important role in educating patients, training staff, supervising treatments and introducing evidence-based guidelines (Courtenay and Carey 2008; McDonnell et al. 2003a, 2003b). The term used to designate the nurse in this model is the clinical nurse specialist (Courtenay and Carey 2008; Kitowski and McNeil 2002; McDonnell et al. 2003a, 2003b), or nurse practitioner APN (Forster et al. 2022).

In *the nurse-led pain management model*, the APN leads patient assessment, treatment and education with regard to pain. The nomenclature used to designate the nurse in this model is varied and includes the terms: pain resource nurse (Courtenay and Carey 2008); acute pain nurse (Coleman and Booker-Milburn 1996); pain specialist nurse (Fang et al. 2021; Meissner et al. 2006); clinical nurse specialist or clinical nurse (Allen et al. 2018; Courtenay and Carey 2008; Desbiens et al. 1998; Muirhead et al. 2024; White 1999); and nurse practitioner (Muirhead et al. 2024; Schoenwald 2011).

The exact term 'advanced practice nurse' was reported only in Courtenay et al.'s literature review (Courtenay and Carey 2008) and by Czarnecki et al. (2007).

3.3 | Outcome Indicators for Pain APNs, by Demographics, Setting and Study Population

The analysis of outcome indicators for specialised APN interventions in acute pain demonstrated variation across demographic characteristics, clinical settings and study populations (Tables 4 and 5).

3.3.1 | Demographics

The evaluation of outcome indicators revealed both commonalities and regional variations:

Global Commonalities: Indicators such as 'pain score', 'side effects' and 'analgesia prescription' were universally reported across all countries and continents included in the review. These indicators constituted the basis for the evaluation of pain management interventions.

With respect to regional disparities, the indicator 'APN contact' was documented exclusively in studies conducted in the USA, underscoring a regional emphasis on the direct involvement of advanced practice nurses (APNs) in patient care (Czarnecki et al. 2007; Desbiens et al. 1998). It is noteworthy that Fang et al. (2021) conducted the sole study from Asia included in this review. This study was distinguished by its comprehensiveness, incorporating a diverse array of indicators that align with the quality evaluation framework advocated by the American Acute Pain Society (Gordon et al. 2005). The findings underscore the potential of studies from Asia, despite their current underrepresentation, to provide a substantial foundation for the evaluation of acute pain management practices.

3.3.2 | Clinical Setting

The clinical setting influenced the application of outcome indicators, with the majority of studies being conducted in hospital-based environments. Twelve studies were conducted in hospital settings, including tertiary, teaching and specialised units. Indicators such as 'pain score', 'side effects' and 'analgesia

TABLE 4 | Outcome indicators, according to continent and country.

Indicator	Continent	Country	Study
Pain score	Americas	Canada	Kitowski and McNeil (2002)
			White (1999)
		USA	Czarnecki et al. (2007)
			Desbiens et al. (1998)
	Europe	UK	Coleman and Booker-Milburn (1996)
			Courtenay and Carey (2008)
		Germany	Meissner et al. (2006)
	Oceania	Australia	Allen et al. (2018)
			Forster et al. (2022)
			Muirhead et al. (2024)
	Asia	China	Fang et al. (2021)
Side effects	Americas	Canada	Kitowski and McNeil (2002)
		USA	Czarnecki et al. (2007)
	Europe	UK	Coleman and Booker-Milburn (1996)
			Courtenay and Carey (2008)
			Mackintosh and Bowles (1997)
		Germany	Meissner et al. (2006)
	Oceania	Australia	Schoenwald (2011)
			Muirhead et al. (2024)
	Asia	China	Fang et al. (2021)
Analgesia prescription	Americas	Canada	White (1999)
		USA	Czarnecki et al. (2007)
	Europe	UK	Coleman and Booker-Milburn (1996)
			Courtenay and Carey (2008)
			Mackintosh and Bowles (1997)
		Germany	Meissner et al. (2006)
	Oceania	Australia	Allen et al. (2018)
			Forster et al. (2022)
			Schoenwald (2011)
			Muirhead et al. (2024)
	Asia	China	Fang et al. (2021)
Nonpharmacological interventions	Americas	Canada	NR
		USA	NR
	Europe	UK	Courtenay and Carey (2008)
		Germany	NR
	Oceania	Australia	Schoenwald (2011)
			Muirhead et al. (2024)
	Asia	China	NR
Nurses' pain management knowledge and attitudes	Americas	Canada	Kitowski and McNeil (2002)
			White (1999)
		USA	NR
	Europe	UK	Courtenay and Carey (2008)
		Germany	NR
	Oceania	Australia	Allen et al. (2018)
	Asia	China	Fang et al. (2021)

(Continues)

TABLE 4 | (Continued)

Indicator	Continent	Country	Study
Patient/parent education	Americas	Canada	NR
		USA	Czarnecki et al. (2007)
			Desbiens et al. (1998)
	Europe	UK	Courtenay and Carey (2008)
			Mackintosh and Bowles (1997)
		Germany	NR
	Oceania	Australia	Forster et al. (2022)
			Muirhead et al. (2024)
	Asia	China	Fang et al. (2021)
APN contact	Americas	Canada	NR
		USA	Czarnecki et al. (2007)
			Desbiens et al. (1998)
	Europe	UK	NR
		Germany	NR
	Oceania	Australia	NR
	Asia	China	NR
Patient or parent's satisfaction	Americas	Canada	Kitowski and McNeil (2002)
		USA	Czarnecki et al. (2007)
			Desbiens et al. (1998)
	Europe	UK	Coleman and Booker-Milburn (1996)
			Courtenay and Carey (2008)
		Germany	NR
	Oceania	Australia	Forster et al. (2022)
	Asia	China	Fang et al. (2021)

Abbreviation: NR, not reported.

prescription' were universally reported, regardless of whether the focus was on medical or surgical units.

Two studies evaluated home-based care for paediatric patients using telephone follow-up (Czarnecki et al. 2007; Forster et al. 2022). These studies reported similar outcome indicators to hospital-based studies but uniquely included 'APN contact' and excluded 'adverse effects'. This highlights the adaptability of indicators to different care settings while reflecting the specific needs of outpatient populations.

3.3.3 | Study Population

The studies encompassed diverse patient populations and, in some cases, healthcare providers.

With respect to patient-focused studies, 12 of the 14 included studies evaluated patient-related outcomes. The majority of these studies focused on adult and paediatric patients undergoing surgery, with limited attention given to patients with medical conditions (Desbiens et al. 1998).

Regarding healthcare providers, four studies assessed nurses' knowledge, attitudes or practices. One study (Allen et al. 2018)

included both patients and nurses, reporting no significant differences in outcome indicators between these groups.

With respect to outcome indicators in adult versus paediatric populations, differences were primarily related to the inclusion of caregivers. Paediatric studies reported indicators such as 'parents' satisfaction' and 'parents' education', underscoring the integral role of family members in managing paediatric pain (Czarnecki et al. 2007; Forster et al. 2022).

In regard to utilisation of outcome indicators in surgical versus medical patients, the majority of studies focused on surgical patients, with a single study addressing patients with medical problems (Desbiens et al. 1998). The absence of discernible disparities in outcome indicators between surgical and medical patient populations suggests the generalisability of these findings across diverse clinical contexts.

3.4 | Outcome Indicators According to Intervention and APN Acute Pain Care Model

Acute Pain APNs play an integral role in pain management by implementing evidence-based interventions. The evaluation of the effectiveness of these interventions requires specific

TABLE 5 | Outcome indicators, by study population and setting.

Indicators	Population	Setting	Study
Pain score	Nurses	Hospital	Allen et al. (2018)
			Courtenay and Carey (2008)
			Kitowski and McNeil (2002)
			Muirhead et al. (2024)
	Patients		
	Adult		
	Surgical	Hospital	Coleman and Booker-Milburn (1996)
			Fang et al. (2021) (≥ 14 years)
			Mackintosh and Bowles (1997) (≥ 16 years)
			McDonnell et al. (2003a, 2003b)
			Meissner et al. (2006)
			White (1999)
	Medical		Desbiens et al. (1998)
	Surgical and medical		Allen et al. (2018)
			Courtenay and Carey (2008)
			Forster et al. (2022)
	Paediatric		
	Surgical	Home care	Czarnecki et al. (2007)
			Forster et al. (2022)
			Muirhead et al. (2024)
	Medical		NR
Side effects	Nurses	Hospital	Courtenay and Carey (2008)
			Kitowski and McNeil (2002)
	Patients		
	Adult		
	Surgical	Hospital	Coleman and Booker-Milburn (1996)
			Fang et al. (2021)
			McDonnell et al. (2003a, 2003b)
			Meissner et al. (2006)
	Medical		NR
	Surgical and medical		Courtenay and Carey (2008)
			Schoenwald (2011)
	Paediatric		
	Surgical	Home care	Czarnecki et al. (2007)
			Muirhead et al. (2024)
	Medical		NR
Analgesia prescription	Nurses	Hospital	Allen et al. (2018)
			Courtenay and Carey (2008)
			Muirhead et al. (2024)
	Patients		
	Adult		
	Surgical	Hospital	Coleman and Booker-Milburn (1996)
			Fang et al. (2021)
			Mackintosh and Bowles (1997)
			McDonnell et al. (2003a, 2003b)
			Meissner et al. (2006)
			White (1999)
	Medical		NR
	Surgical and medical		Allen et al. (2018)
			Courtenay and Carey (2008)
			Schoenwald (2011)

(Continues)

TABLE 5 | (Continued)

Indicators	Population	Setting	Study
		Paediatric	
	Surgical	Home care	Czarnecki et al. (2007)
			Forster et al. (2022)
			Muirhead et al. (2024)
	Medical		NR
Nonpharmacological interventions	Nurses	Hospital	Courtenay and Carey (2008)
			Muirhead et al. (2024)
		Patients	
		Adult	
	Surgical	Hospital	NR
	Medical		NR
	Surgical and medical		Courtenay and Carey (2008)
			Schoenwald (2011)
		Paediatric	
	Surgical	Home care	Czarnecki et al. (2007)
			Forster et al. (2022)
			Muirhead et al. (2024)
	Medical		NR
Nurses' Pain Management Knowledge	Nurses	Hospital	Allen et al. (2018)
			Courtenay and Carey (2008)
			Kitowski and McNeil (2002)
		Patients	
		Adult	
	Surgical	Hospital	Fang et al. (2021) (≥ 14 years)
			White (1999)
	Medical		NR
	Surgical and medical		Allen et al. (2018)
			Courtenay and Carey (2008)
		Paediatric	
	Surgical	Home care	NR
	Medical		
Patients or Parents education	Nurses	Hospital	Courtenay and Carey (2008)
			Muirhead et al. (2024)
		Patients	
		Adult	
	Surgical	Hospital	Fang et al. (2021) (≥ 14 years)
			Mackintosh and Bowles (1997)
	Medical		Desbiens et al. (1998)
	Surgical and medical		Allen et al. (2018)
			Courtenay and Carey (2008)
		Paediatric	
	Surgical	Home care	Czarnecki et al. (2007)
			Forster et al. (2022)
			Muirhead et al. (2024)
	Medical		NR

(Continues)

TABLE 5 | (Continued)

Indicators	Population	Setting	Study
APN contact	Nurses	Hospital	NR
	Patients		
	Adult		
	Surgical	Hospital	NR
	Medical		Desbiens et al. (1998)
	Surgical and medical		NR
	Paediatric		
	Surgical	Home care	Czarnecki et al. (2007)
	Medical		NR
Patient or parents' satisfaction	Nurses	Hospital	Courtenay and Carey (2008) Kitowski and McNeil (2002)
	Patients		
	Adult		
	Surgical	Hospital	Coleman and Booker-Milburn (1996) Fang et al. (2021) McDonnell et al. (2003a, 2003b)
	Medical		Desbiens et al. (1998)
	Surgical and medical		Courtenay and Carey (2008)
	Paediatric		
	Surgical	Home care	Czarnecki et al. (2007) Forster et al. (2022)
	Medical		NR

Abbreviation: NR, not reported.

outcome indicators, which vary depending on the type of intervention and care model employed (Table 6).

The following categories of interventions were identified in the review: pain assessment and management; medication safety monitoring and adverse effects of analgesics; prescription and administration of analgesia; independent drug prescription by the APN; nonpharmacological interventions; training for health professionals; health education for patients or parents; and telephone follow-up by the APN.

APNs specialising in acute pain management operate within distinct care models, primarily categorised in this review as *Acute pain teams and acute pain service models*, and *Nurse-led pain management models*.

3.4.1 | Acute Pain Teams and Acute Pain Service Model

The primary outcome indicator across studies in this model was the 'pain score', which was universally reported as a critical metric to assess the effectiveness of interventions. Pain scores were evaluated using validated tools such as the visual analog scale (VAS) and the McGill Pain Questionnaire, allowing consistent benchmarking of pain intensity during rest, movement or at maximum levels. Studies by Meissner et al. (2006) and McDonnell et al. (2003a, 2003b) demonstrated significant

reductions in pain scores associated with acute pain service interventions.

Another important indicator was 'side effects', highlighting the role of APNs in monitoring and managing the adverse effects of analgesics, such as sedation, nausea and hypotension. These outcomes were frequently tied to the APNs' ability to optimise multimodal analgesia, combining opioid and nonopioid medications to minimise harm while achieving effective pain control. Schoenwald (2011) emphasised that APNs in acute pain teams improved the detection and treatment of drug-related adverse events, demonstrating their critical role in medication safety monitoring.

'Analgesia prescription' was another indicator associated with this care model. While APNs in acute pain teams often influenced prescribing patterns indirectly through education and advocacy, studies such as Mackintosh and Bowles (1997) reported statistically significant improvements in standardised prescribing practices, including increased use of nonopioid analgesics. However, the prescribing authority of APNs in acute pain teams was limited in some contexts, reflecting variations in regulatory frameworks.

This model also incorporated 'nurses' pain management knowledge' outcome indicator. Studies by Fang et al. (2021) and Allen et al. (2018) highlighted the APNs' contributions to improving

TABLE 6 | Outcome indicators and interventions, according to advanced practice nurse (APN) model of care.

Outcome indicators	APN intervention	APN care model	Study
Pain score	Pain assessment and management	Acute pain teams and acute pain service model	Courtenay and Carey (2008) Forster et al. (2022) Kitowski and McNeil (2002) Mackintosh and Bowles (1997) McDonnell et al. (2003a, 2003b)
		Nurse-led pain management model	Allen et al. (2018) Coleman and Booker-Milburn (1996) Courtenay and Carey (2008) Czarnecki et al. (2007) Desbiens et al. (1998) Fang et al. (2021) Meissner et al. (2006) Muirhead et al. (2024) Schoenwald (2011) White (1999)
Side effects	Medication safety monitoring: adverse effects of analgesics	Acute pain teams and acute pain service model	Courtenay and Carey (2008) Kitowski and McNeil (2002) McDonnell et al. (2003a, 2003b)
		Nurse-led pain management model	Coleman and Booker-Milburn (1996) Courtenay and Carey (2008) Czarnecki et al. (2007) Fang et al. (2021) Meissner et al. (2006) Muirhead et al. (2024) Schoenwald (2011)
Analgesia prescription	Prescription and administration of analgesia	Acute pain teams and acute pain service model	Courtenay and Carey (2008) Forster et al. (2022) Mackintosh and Bowles (1997) McDonnell et al. (2003a, 2003b)
		Nurse-led pain management model	Allen et al. (2018) Coleman and Booker-Milburn (1996) Courtenay and Carey (2008) Czarnecki et al. (2007) Fang et al. (2021) Meissner et al. (2006) Muirhead et al. (2024) Schoenwald (2011) White (1999)
	Independent drug prescription by the APN	Acute pain teams and acute pain service model	NR
		Nurse-led pain management model	Czarnecki et al. (2007) Schoenwald (2011)

(Continues)

TABLE 6 | (Continued)

Outcome indicators	APN intervention	APN care model	Study
Nonpharmacological interventions	Nonpharmacological interventions	Acute pain teams and acute pain service model	Courtenay and Carey (2008)
		Nurse-led pain management model	Courtenay and Carey (2008) Muirhead et al. (2024) Schoenwald (2011)
Nurses' pain management knowledge	Training for health professionals	Acute pain teams and acute pain service model	Courtenay and Carey (2008) Kitowski and McNeil (2002)
		Nurse-led pain management model	Allen et al. (2018) Courtenay and Carey (2008) Fang et al. (2021) White (1999)
Patient/parent education	Health education for patients or parents	Acute pain teams and acute pain service model	Czarnecki et al. (2007) Forster et al. (2022) Mackintosh and Bowles (1997)
		Nurse-led pain management model	Courtenay and Carey (2008) Czarnecki et al. (2007) Desbiens et al. (1998) Fang et al. (2021) Muirhead et al. (2024)
APN contact	Telephone follow-up	Acute pain teams and acute pain service model	NR
		Nurse-led pain management model	Czarnecki et al. (2007) Desbiens et al. (1998)

Abbreviation: NR, not reported.

nurses' knowledge and attitudes towards pain management, often measured using tools like the Knowledge and Attitudes Survey Regarding Pain (Ferrell and McCaffery 2014). Enhanced training resulted in better adherence to pain management protocols and improved quality of care.

3.4.2 | Nurse-Led Pain Management Model

This model demonstrated a wider variety of interventions and outcome measures than acute pain teams.

The 'pain score' served as a key measure in this model, showing enhancements in pain evaluation and treatment among various patient groups. Research conducted by Czarnecki et al. (2007) and Schoenwald (2011) revealed that interventions led by nurses, especially in outpatient and postdischarge environments, considerably decreased pain intensity. Nevertheless, Forster et al. (2022) indicated elevated pain levels in paediatric patients after discharge, highlighting the requirement for increased parental assistance during the shift to home care. However, the study by Desbiens et al. (1998), involving critically ill hospitalised adults, concluded that pain control did not improve despite a multifaceted patient intervention that included pain assessment, education and feedback.

The ability for nurses to independently prescribe medications was a distinctive aspect of the nurse-led model. Research

conducted by Czarnecki et al. (2007) and Schoenwald (2011) showed that APNs were capable of safely and effectively prescribing opioids, nonopioids and multimodal analgesics, leading to enhanced pain management and patient safety. Telephone follow-up interventions enhanced this function, enabling APNs to oversee prescriptions and maintain continuity of care.

The model also emphasised nonpharmacological interventions, including relaxation techniques and psychological support. These approaches complemented pharmacological therapies, resulting in improved patient-reported satisfaction with pain management (Fang et al. 2021; Schoenwald 2011), such as relaxation methods and mental health support. These methods enhanced pharmacological treatments, leading to greater patient-reported contentment with pain management (Fang et al. 2021; Schoenwald 2011).

Education for patients and families was a fundamental intervention in the nurse-led model, particularly in paediatric and postdischarge care. Studies reported significant improvements in parental confidence, adherence to pain management regimens and overall satisfaction with care.

Forster et al. (2022) emphasised the critical role of effective communication and support for parents managing their child's pain in a home setting. Similarly, Czarnecki et al. (2007) demonstrated that APN-led education improved adherence

to prescribed treatment regimens, highlighting the importance of patient-centred care in optimising pain management outcomes.

Finally, nurses' pain management knowledge was consistently reported as a key outcome indicator in the nurse-led model. Studies by Fang et al. (2021) and Allen et al. (2018) showed that APN-led training for healthcare staff improved their understanding of pain management strategies, resulting in better adherence to evidence-based practices. This indicator reflected the broader impact of nurse-led interventions on institutional pain management protocols.

3.5 | Quality-of-Care Assessment

Quality of care was assessed based on the patient's care experience and through the variables captured in the quality-of-care assessment systems (Table 7). The patient experience was evaluated using the 'patient/parent satisfaction' indicator. In five studies, patients who received the APN intervention were more satisfied with their pain control than those who did not (Coleman and Booker-Milburn 1996; Courtenay and Carey 2008; Czarnecki et al. 2007; Kitowski and McNeil 2002; McDonnell et al. 2003a, 2003b). Coleman and Kitowski measured satisfaction using an ad hoc questionnaire and scale. The Courtenay and McDonnell study did not specify the scale used. However, the Desbiens study did not show a significant increase in patient satisfaction (Desbiens et al. 1998).

Three studies (Allen et al. 2018; Fang et al. 2021; Kitowski and McNeil 2002; Meissner et al. 2006) reported on the use of

quality-of-care assessment systems. Allen et al. evaluated the role of the pain resource nurse in maintaining changes in evidence-based practice, introduced as part of a quality-of-care improvement project (Allen et al. 2018). Fang et al. (2021) evaluated the effectiveness of the nurse-led pain management model, reporting indicators based on the quality evaluation system for acute pain management recommended by the American Acute Pain Society (Gordon et al. 2005), among others. Finally, Meissner et al. (2006) concluded that a continuous quality improvement process including benchmarking proved an effective tool for improving postoperative pain management.

4 | Discussion

This exploratory review examined the existing literature on outcome indicators utilised to evaluate pain management interventions delivered by APNs specialising in acute pain management.

The complexity of advanced practice nursing in the international context has been extensively documented. This debate is also present in the various titles, models and competencies of APNs specialising in acute pain (Bryant-Lukosius and DiCenso 2004; Chang et al. 2012; Jones 2005; Mantzoukas and Watkinson 2007; Sastre-Fullana et al. 2014).

4.1 | Outcome Indicators and Global Applicability

The review revealed uniform documentation of key outcome measures, including 'pain score', 'adverse effects' and 'analgesia

TABLE 7 | Quality-of-care assessment.

Quality domain	Outcome measure	APN care model	Study
Care experience	Indicator of 'patient/parent satisfaction'	Acute pain teams and acute pain service model	Courtenay and Carey (2008) McDonnell et al. (2003a, 2003b) Kitowski and McNeil (2002) Forster et al. (2022)
		Nurse-led pain management model	Courtenay and Carey (2008) Desbiens et al. (1998) Coleman and Booker-Milburn (1996) Czarnecki et al. (2007) Fang et al. (2021)
Use of quality-of-care assessment systems	NR	Acute pain teams and acute pain service model	NR
	Outcomes assessment according to evidence-based practice	Nurse-led pain management model	Allen et al. (2018)
	Quality evaluation system for acute pain management recommended by American Acute Pain Society		Fang et al. (2021)
	Continuous quality improvement based on benchmarking		Meissner et al. (2006)

Abbreviation: NR, not reported.

prescription', across various geographic areas, patient groups and healthcare settings. These indicators appear to be universally applicable for assessing acute pain management strategies employed by APNs.

Nevertheless, local indicators like 'APN contact' in the USA, along with caregiver-centred outcomes such as 'parent satisfaction' and 'parent education' in paediatric research, emphasise the necessity of tailoring outcome measures to particular contexts and target demographics. Research on home-based care highlighted distinctive features such as direct involvement of APNs, indicating that customising indicators to fit care models is crucial (Rico-Blázquez et al. 2021).

We did not observe substantial differences in outcome indicators by country and population of study, despite the heterogeneity of the health care systems, regulatory environments and cultural and social factors; however, various nomenclatures or designations and models of APN-led care in acute pain were identified. Our results suggest that these different nurse-led models can significantly improve pain management outcomes (Allen et al. 2018; Coleman and Booker-Milburn 1996; Courtenay and Carey 2008; Czarnecki et al. 2007; Desbiens et al. 1998; Fang et al. 2021; Meissner et al. 2006; White 1999).

4.2 | Outcome Indicators and APN Acute Pain Care Model

The findings of the review indicate that both the nurse-led and APN-assisted models exhibited significant improvements in acute pain management outcomes. The nurse-led approach encompassed a more extensive array of interventions and a broader spectrum of outcome indicators, particularly the independent prescribing capabilities of APNs (International Council of Nurses et al. 2021; Schoenwald 2011). Independent nurse prescribing has been adopted unevenly from country to country, despite the guidelines published by the International Council of Nurses (ICN) with recommendations for governments to ensure that appropriate levels of nursing education and regulation are in place to enable the expansion of nurse prescribing (Stewart et al. 2021). However, regulatory limitations on APN prescribing power in specific nations impede the full implementation of this role (Carr et al. 2010; International Council of Nurses et al. 2020; Sanclemente-Dalmau et al. 2022; Sonneborn and Miller 2021).

The results of our review concur with the literature review by Courtenay and Carey (2008), suggesting that nurses play a crucial role in pain assessment, management and education and that nurse-led interventions improve patient outcomes and reduce pain intensity. In addition, the included studies indicate that APN interventions in acute pain significantly improve patients' satisfaction with their pain control (Almukhaini et al. 2022; Bryant-Lukosius et al. 2017; Htay and Whitehead 2021) and decrease the side effects related to pain management (Coleman and Booker-Milburn 1996; Fang et al. 2021; Kitowski and McNeil 2002; McDonnell et al. 2003a, 2003b; Schoenwald 2011).

Regarding the pain APNs' interventions for nurse education, the included studies show that it contributes to improved pain

management outcomes in patients (Coleman and Booker-Milburn 1996; Courtenay and Carey 2008; Fang et al. 2021; Kitowski and McNeil 2002; White 1999). In contrast, nonpharmacological interventions for pain control were scarcely evaluated, despite recommendations in evidence-based practice guidelines on pain management (Registered Nurses' Association of Ontario 2013). However, other studies highlight the critical role of acute pain APNs in pain management by employing innovative approaches, prioritising patient education, utilising nonpharmacological interventions and collaborating with other healthcare professionals (Almukhaini et al. 2022; Bryant-Lukosius et al. 2017; International Council of Nurses et al. 2020, 2021; Scanlon et al. 2020, 2023).

Regarding the assessment of quality of care, the included studies commonly reported on the patient's care experience (satisfaction indicator). However, no article evaluated the effectiveness of care from the patient's perspective through patient-reported outcomes measures (PROMs) (Weldring and Smith 2013). Likewise, no study included an explicit measurement of cost-effectiveness indicators for acute pain APN interventions.

Since Courtenay's article in 2008, significant progress has been made in the outcome indicators of interventions carried out by APNs in acute pain management. Earlier studies, including those by Courtenay and Carey (2008), primarily focused on pain scores, side effects, analgesia prescriptions and patient satisfaction, mainly within the UK and select European countries. However, more recent research, such as studies from Australia (Allen et al. 2018; Forster et al. 2022; Muirhead et al. 2024) and China (Fang et al. 2021), indicates a broader geographical scope and an expanded set of outcome indicators. Newer studies have increasingly incorporated nonpharmacological interventions, patient/parent education, and APN contact as key measures of effectiveness. Additionally, research has evolved to assess nurses' pain management knowledge and attitudes, emphasising the importance of education and training in optimising APN-led care. The growing emphasis on patient involvement and standardised outcome measures reflects a shift towards a more holistic and globally applicable approach to acute pain management, enhancing both patient outcomes and APN practice.

4.3 | Research Implications

This review underscores the critical need for further research to bridge existing gaps in acute pain management by Advanced Practice Nurses (APNs). A key priority is the establishment of an internationally recognised framework defining APN competencies in this domain. Additionally, the development and integration of standardised outcome indicators, including patient-reported outcome measures (PROMs), are essential to accurately evaluate the effectiveness of APN-led interventions. Although patients were asked about pain frequency, severity and satisfaction, these measures were not explicitly documented as PROMs, highlighting a gap in patient-centred outcome assessment.

Moreover, future research should explore the economic implications of APN-directed pain management, particularly its

impact on hospital length of stay and readmission rates due to inadequate pain control. Addressing these factors will provide valuable insights into the cost-effectiveness of APN-led interventions and their broader healthcare implications. Ultimately, establishing a globally standardised framework for APN competencies, supported by a systematic set of evaluation metrics, will be instrumental in enhancing the quality, consistency and effectiveness of acute pain management across diverse healthcare settings.

5 | Limitations

A number of limitations must be considered when appraising the present evaluation. Primarily, the definition of an acute pain APN and the scope of their practice remain nebulous, resulting in inconsistencies in the conceptualisation and evaluation of their function. The comparability of studies is hindered by the substantial variations in APN responsibilities and competencies across nations, which are influenced by diverse regulatory frameworks. These variations also give rise to inconsistent outcome indicators.

Another significant drawback is the diversity of study designs and interventions, which reflects the various ways that APN responsibilities and professional boundaries have changed globally. This diversity makes it more difficult to identify conventional processes and synthesise findings. Because the included studies assessed mixed-gender populations without breaking down results by gender, the review also lacks a gender analysis.

Additionally, the studies examined did not evaluate economic outcomes such as length of hospital stays, readmissions associated with inadequate pain management or cost-effectiveness, resulting in a significant gap in understanding the broader impacts of APN interventions on healthcare systems.

Future research should focus on addressing key gaps to provide a more comprehensive evaluation of APN-directed acute pain management. Despite existing limitations, this review highlights the diverse models utilised in APN-led pain management, underscoring the need for consensus-based outcome measures to facilitate a more standardised and comparable assessment of interventions. Establishing these measures will help refine the APN scope of practice, ultimately enhancing the consistency and quality of acute pain management globally.

Additionally, future studies should explore the role of patient involvement in pain management, assessing its impact on clinical outcomes, patient engagement and overall effectiveness. Another critical area for investigation is the influence of gender on pain perception, reporting and treatment response, as well as its effects on patient-provider interactions and clinical decision-making. Integrating gender-specific analyses into research will support the development of more tailored, equitable and effective APN-led pain management strategies. By incorporating these elements, future research can contribute to the advancement of standardised, patient-centred and evidence-based approaches in acute pain management.

6 | Conclusions

This review highlights the evolving role of APNs in acute pain management, highlighting the diverse spectrum of care models and interventions used in various clinical settings. The findings show that, despite decades of study on acute pain care, the majority of these studies have been conducted in the past 20 years, indicating a growing emphasis on novel, patient-centred approaches.

The analysis revealed two primary care models: the multidisciplinary acute pain teams/acute pain service model and the nurse-led pain management approach. These models emphasise distinct advantages, with the first concentrating on cooperative, hospital-based care and the second showcasing the autonomy of APNs in leading interventions, particularly in outpatient and home care settings. In these models, 'pain score', 'side effects', 'pain relief medication', and 'nursing staff's understanding of pain management' were identified as universally relevant outcome metrics. However, specific indicators such as 'APN contact' and 'non-pharmacological interventions' were more frequently associated with the nurse-led model, underscoring its holistic approach to care.

Regional differences in the execution and assessment of APN interventions underscore the impact of regulatory systems and healthcare frameworks on practice. Although Europe and North America lead the literature, the underrepresented regions like Asia present an opportunity for worldwide perspectives on acute pain management techniques. Similarly, there are important gaps in the current body of information that are highlighted by the inadequate use of economic variables such as cost-effectiveness or duration of stay.

Notwithstanding the heterogeneity in study designs, settings and populations, the present review underscores the important contributions of APNs to improving pain management outcomes. The findings support the need for standardised outcome indicators and a clear definition of the scope of practice of APNs to allow for more uniform and comparable evaluations of interventions. Accordingly, the need for future research to incorporate economic indicators, gender-specific analyses and longitudinal outcomes arises, with the purpose of further elucidating the impact of APNs on acute pain management.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data available in article Table S1; Data S1 and S2.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.