

A PORTFOLIO ANALYSIS OF CANCER PAIN INTERVENTION STUDIES FUNDED BY THE NATIONAL INSTITUTES OF HEALTH (NIH) FROM 2014-2023



NATIONAL  
CANCER  
INSTITUTE

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Introduction

- Cancer pain is one of the most common symptoms reported in cancer survivors
- Cancer pain can stem from the tumor itself, which can cause pain by damaging tissues, pressing on nerves, or releasing chemicals that stimulate pain receptors, or from cancer treatment, such as surgery, chemotherapy, and radiotherapy
- Strategies to manage cancer pain involve pharmacological and/or non-pharmacological approaches, however, the effectiveness of these approaches varies widely
- In 2015, the National Cancer Institute (NCI) Symptom Management and Quality of Life Steering Committee identified cancer pain as a first-tier high-priority area for research
- In this portfolio analysis, we sought to understand the landscape of pain intervention studies in patients with a cancer diagnosis funded by NIH and identify gaps and opportunities to further cancer pain research

Methods

Search strategy

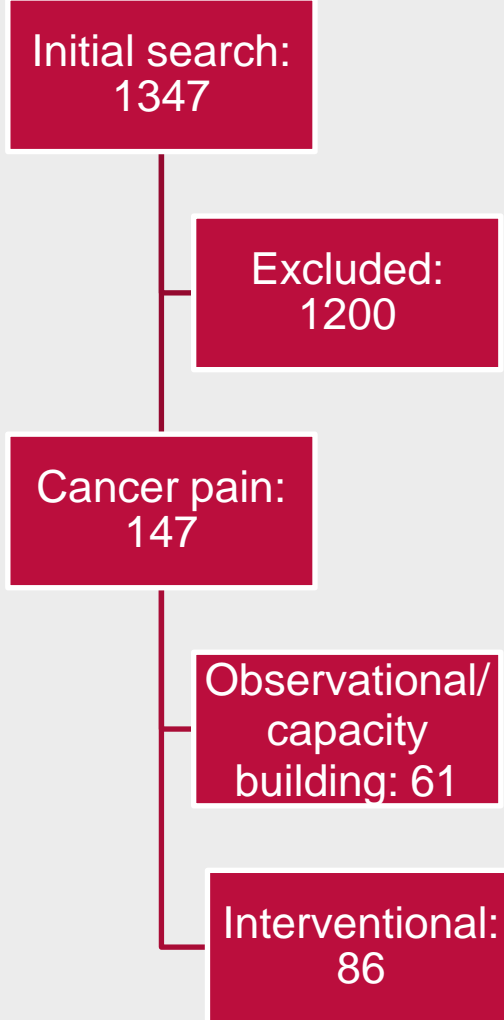
- Searched the NIH iSearch Grants tools (version 2.6) for competitive grants funded between 2014 and 2023 (Table 1)
  - Included grants that characterize/describe, prevent and treat pain
  - Pain was explicitly measured in humans by self-report, caregiver/proxy report or clinician-report
  - Pain was explicitly addressed as part of the primary, secondary or exploratory aims
  - Pain was related to cancer or cancer-directed treatments
  - Excluded grants without human subjects, consortium grants, cooperative groups, cores, and specialized programs of research excellence (SPORES)

Coding

- Manually reviewed grants to identify interventional studies and extracted data from the research strategy and human subject sections
- Interventional grants were coded for target population, study design, and pain outcomes

Table 1: Search Strategy Concept	Keywords
Treatment-related pain	chemotherapy pain; CIPN; chemotherapy induced peripheral neuropathy; post-surgical pain; radiation pain; headache; neuropathic pain; arthralgia; aromatase inhibitor-induced arthralgia; AIMSS; procedural pain; surgical pain; incisional pain
Cancer tumor/ neoplastic pain	myalgia; neuralgia; neuropath*; bone pain; osteopathic pain; cancer-induced pain; nociceptive pain; metastatic pain; plexopathy; bladder spasms; muscle spasms; liver capsular pain; visceral pain; abdominal pain
Other	pain
AND (Boolean)	
Cancer	cancer*; neoplasm*; malignan*; chemotherapy; radiation; tumor; palliative care

Figure 1: Search Results



Results

Figure 2: Awards by Year

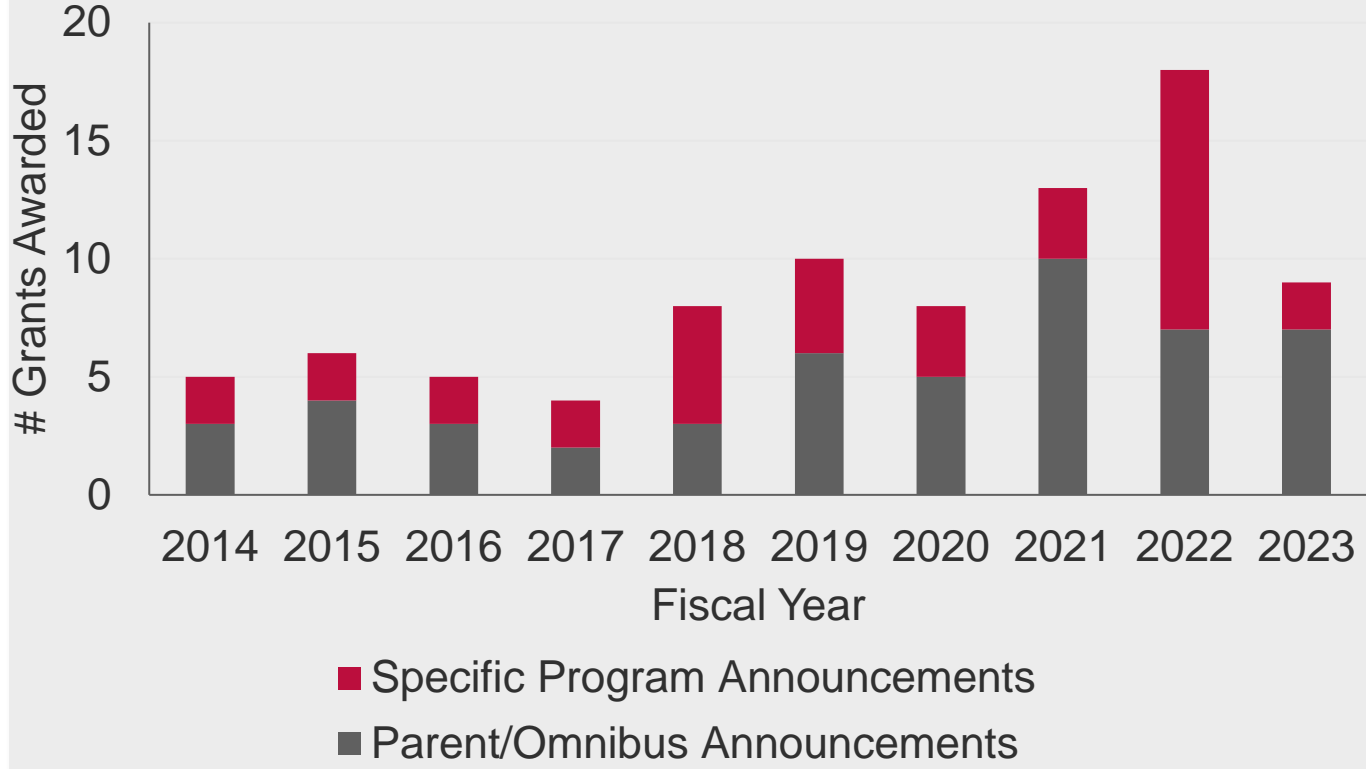


Table 2: Grant Details	n	%
Funding Mechanism		
Research project (R01)	32	37%
Small research grants (R03)	2	2%
Exploratory/Developmental grants (R21)	23	27%
Other Research and development (R) grants	8	9%
Cooperative agreement (U) awards	5	6%
Small business grants (SBIR/STTR)	3	4%
Training and development awards (F, K)	12	14%
Program project (P) awards	1	1%
NCI-managed grants	65	76%

Table 3: Clinical Trial Details	n	%
Study Phase		
Phase I	7	8%
Phase I/II	6	7%
Phase II	22	26%
Phase II/III	3	3%
Phase III	16	19%
Unspecified	32	37%
Study Design		
Randomized controlled trial (including SMART trials)	72	84%
Single-arm design	14	16%
Pilot/Feasibility	27	31%
Intervention Type		
Non-pharmacological	59	69%
Pharmacological	14	16%
Device	9	10%
Multi-component intervention	4	5%
Multilevel interventions	15	17%
Languages (Intervention Delivery)		
English	38	44%
English and Spanish	13	15%
English and Other Languages (not Spanish)	2	2%
Non-English	2	2%
Not Specified	31	36%

SBIR: Small business innovation research; STTR: Small business technology transfer; SMART: Sequential multiple assignment randomized trials

Figure 3: Source of Cancer Pain

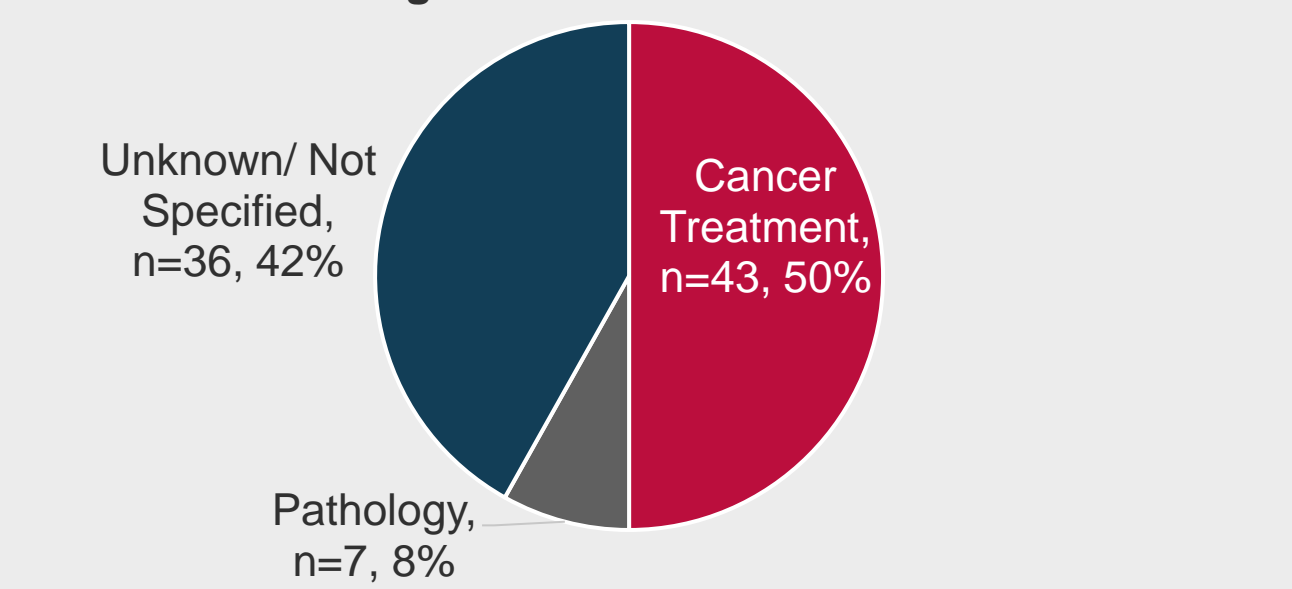


Figure 4: Treatment Exposure\*

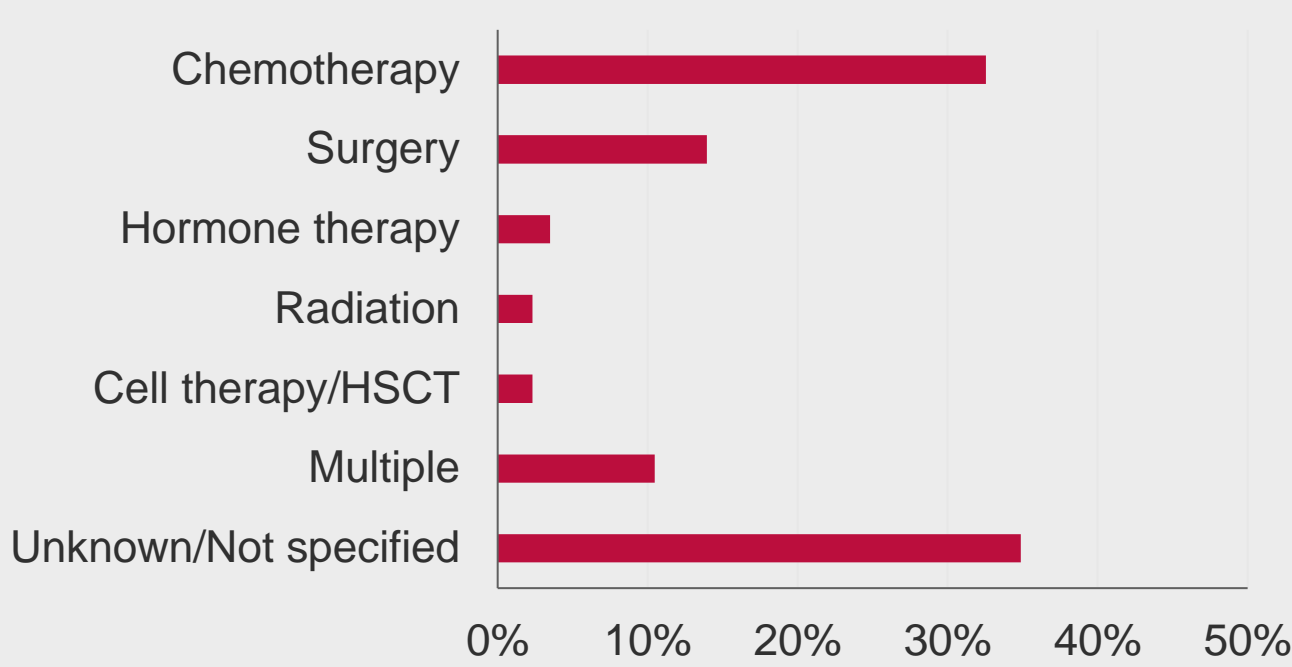
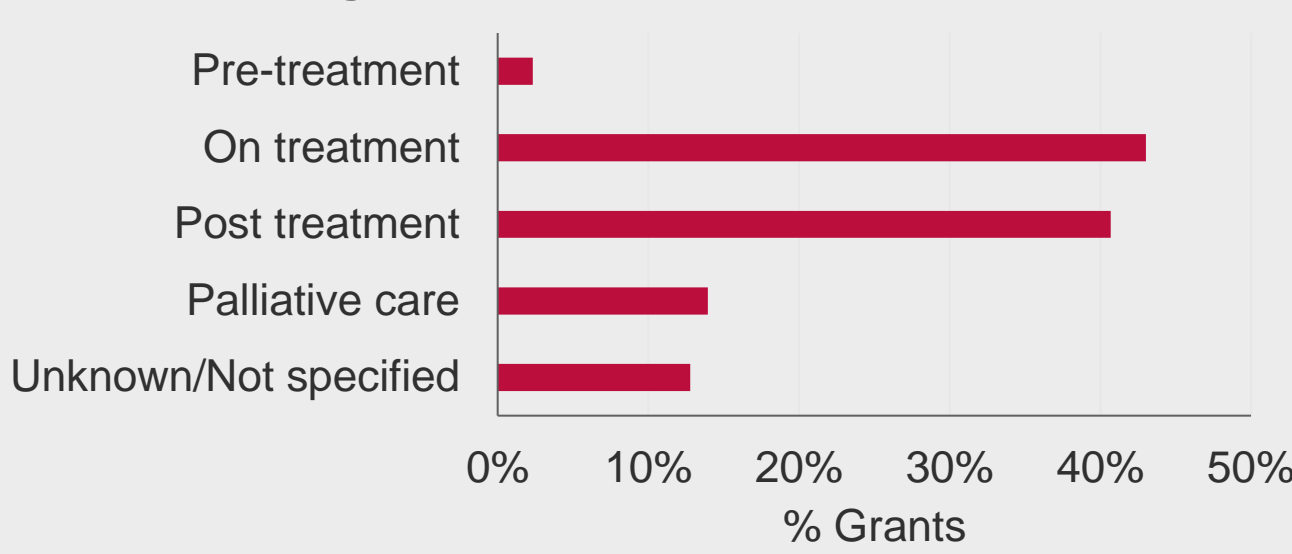


Figure 5: Cancer Care Continuum\*



Discussion

- The number of clinical trials for cancer pain generally increased over a 10-year period, peaking at 18 grants awarded in 2022
- Several populations of patients with specific cancer diagnoses were understudied, including head and neck, prostate, and gastrointestinal cancer; however, it is a strength that many of the trials were inclusive of patients regardless of cancer diagnosis
- There is a need for more research in special populations, such as pediatric and older adults, and non-English speakers
- While all studies included patient-reported pain outcomes, more than a third of all studies measured pain through multiple methods
- Consistent with scientific observations that pain often clusters with other symptoms, most of the studies also measured other concurrent symptoms
- This analysis was restricted to extramural research project grants; one limitation is that intramural studies, consortium studies, and non-NIH-funded studies were not included. We acknowledge that there is a global community of pain researchers not covered in this analysis

Future Directions

- Expand analysis to include observational and capacity-building studies and trials funded through NCI clinical trial networks
- Analyze the translational pipeline of research from preclinical studies to clinical studies

Acknowledgments

The content of this publication does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government

Table 4: Clinical Trial Population	n	%
Cancer Site*		
Breast	29	34%
Colorectal	9	10%
Head & neck	5	6%
Hematologic	5	6%
Gynecologic	4	5%
Gastrointestinal (not colorectal)	3	3%
Lung	1	1%
Prostate	1	1%
Sarcoma	1	1%
Not specified	33	38%
Special Populations*		
Advanced/Metastatic cancer	18	21%
AYA (age 15- 39 at diagnosis, explicitly identified)	8	9%
Racial/Ethnic minority	7	8%
Dyad/Family	6	7%
Pediatric cancer/adult survivors of pediatric cancer	6	7%
Providers	6	7%
Caregivers	4	5%
Rural	3	3%
Hematopoietic stem cell transplant survivors	2	2%
Older adults (65+)	1	1%

Table 5: Clinical Trial Outcome Measures	n	%
Pain Outcome Measure Types*^		
Instrumented outcomes	20	23%
Performance-based measures	9	10%
Mixed-methods/Qualitative	1	1%
Other (e.g. prescribing patterns)	13	15%
Multiple methods for measuring pain	32	37%
Other symptoms/QOL/functional status measured	79	92%
Feasibility/implementation outcomes	39	45%
Health services outcomes	38	44%

HSCT: Hematopoietic stem cell transplantation; QOL: Quality of life  
\*Categories are not mutually exclusive  
^All studies utilized patient-reported pain outcomes