Title: A Review of the Department of Health & Human Services Grants Focused on Teamwork in Cancer Care Delivery: A Portfolio Analysis

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Running head: Assessment of NCI-ASCO Collaboration to Improve Team-based Research

Abstract (350 words)

Overview
This paper summarizes U.S. Department of Health & Human Services grants awarded from 2012 to 2021 that focused on understanding and improving teaming and care coordination as part of a long-term evaluation of the 2016 National Cancer Institute (NCI) and American Society of Clinical Oncology (ASCO) Teams in Cancer Care Delivery (TCCD) project. The collaboration facilitated interdisciplinary collaboration and resulted a Journal of Oncology Practice (JOP) Special Series. This evaluation examined awarded grants led by authors associated with the Special Series before and after the NCI-ASCO TCCD project.

Background
It is well known that team-based care improves cancer care coordination and clinical outcomes, but inefficiencies and care delays still challenge cancer care delivery. This paper reports the assessment of DHHS grants awarded to improve outcomes of team-based cancer care after the publication of the 2016 JOP Special Series.

Methods
The federal Information for Management Planning Analysis and Coordination (IMPAC II) grants database was searched for grants awarded between 2012-2021 that focused on teaming and care coordination led by 2016 JOP Special Series authors. Analyses included number of awards, areas of research emphasis, and study characteristics.

Results
Sixteen grants met inclusion criteria and were included in analyses. Of those, 7 focused on teaming in cancer care delivery (CCD), 7 focused on teaming for another health condition, and 2 established a research core to advance team-based CCD. Of the 7 grants focused on teaming in CCD, 57.1% were observational and 42.9% were experimental. Cancer care team composition varied with 57.1% incorporating caregivers, 42.9% (n = 3) focusing on physician teamwork, and 57.1% (n = 4) integrating the patient into the care team. Analyses identified that 3 grants were funded prior to the NCI-ASCO Teams in Cancer Care Project, and 13 grants were funded after (2016 to 2021).

Conclusion/Discussion
Results illustrate the impact of the NCI-ASCO collaboration in stimulating interest in and research on cancer care teams and team processes. It also highlights research gaps and avenues for future research.

Introduction

Teamwork is critical for cancer care delivery, however clinicians, leaders, and health systems have struggled to implement evidence-[1–4] he National Cancer Institute (NCI) and the American Society of Clinical Oncology (ASCO) partnered in 2014 to address persistent coordination challenges and promote teamwork in cancer care delivery [2]. The NCI-ASCO Teams in Cancer Care Delivery (TCCD) project sought to identify key team structure variables and teamwork processes (e.g., cohesion, coordination, shared mental models) that contribute to care quality and improved patient outcomes for a diverse set of oncology case studies from diagnosis and treatment to end-of-life care.

The TCCD project encouraged the creation of multidisciplinary writing teams of clinicians, team science researchers, and patient advocates to facilitate dialogue across these key stakeholders in cancer care. Each team worked together to develop unique case studies that illustrate complex challenges facing cancer care delivery. Each case discussion integrated organizational and team theories to model effective teamwork strategies for managing care. Writing teams were encouraged to submit manuscripts to the Journal of Oncology Practice (JOP; now the Journal of Journal of Clinical Oncology-Oncology Practice; JCO-OP) Special Series: NCI-ASCO Teams in Cancer Care published in November 2016. The Special Series on teamwork in cancer care explored practical strategies for organizing effective healthcare teams, team-based strategies to improve clinical care, and each manuscript included implications for research.

This paper presents an evaluation of the NCI-ASCO project aimed at encouraging research on teaming and care coordination among its participants. To conduct this assessment, grants awarded by the US Department of Health & Human Services (DHHS) from

2012 to 2021 were analyzed. These grants specifically focused on improving teaming and coordination in healthcare. Project evaluations are an important tool for evaluating return on investment and progress toward goal achievement. Portfolio analyses offer one such approach to evaluate the current state of funding trends for a specific area of interest, recognize gaps, and evaluate potential opportunities for future research[5,6].

Accordingly, we first summarize efforts led by the NCI to promote healthcare team research following the NCI-ASCO project; then we evaluate how the Special Series impacted current literature and grant awards focused on teamwork and care coordination in cancer care delivery. In sum, the overarching aims of this paper are to 1) Examine the number of awarded grants where the principal investigator (PI) or co-investigator (CO-I) was an author that participated in the multidisciplinary writing teams of the JOP Special Series, 2) Define the areas of grant research emphasis and study characteristics, and 3) Identify gaps in team-based cancer care delivery.

Healthcare Teams Research in Cancer Care Delivery

Advancing research to understand and improve teamwork and care coordination across the cancer continuum is an area of interest for the NCI's Healthcare Teams Initiative. The aims of these efforts are to 1) Identify principles of team structure and teamwork processes that enhance the delivery of multidisciplinary cancer care; 2) Promote evidence-based interventions to strengthen teaming and care coordination across the cancer care continuum, particularly among underserved populations and during care transitions; and 3) Develop an interdisciplinary community of investigators whose research furthers an evidence-based understanding

of team-based care structures and teamwork process that influence care coordination and equitable access to high-quality cancer care to facilitate adoption of findings into cancer care practice.

The NCI has led several activities to improve teamwork and care coordination, including the solicitation of research applications that enhance team-based cancer care, development of a learning community for team-based learning and multidisciplinary collaboration, development of a conceptual model [4], and healthcare teams webinars[7] (See Appendix 1 for a description of all activities). These efforts have focused on the development of evidence-based practices to improve teaming and care coordination for cancer care. The NCI-ASCO project was a natural complement that aimed to stimulate dissemination and translation of what was known about effective team functioning and teamwork principles in oncology clinical practice. To understand how efforts of the National Cancer Institute efforts and JOP Special Series impacted awarded grants, a portfolio analysis was conducted.

Methods

To examine how the Special Series impacted grant awards, we conduct a portfolio analysis of the Special Series authors. A list of the 160 authors that participated in the JOP 2016 Special Series and their respective current and prior institutions was compiled. Author names were searched using the federal Information for Management Planning Analysis and Coordination (IMPAC II) grants database of extramural grant applications and awards. Results were cross checked against the JCO-OP Special Series authors and institutions to identify correct author matches. Results were limited to grants awarded from 2012 to 2021 that were focused on teamwork and care coordination. Descriptive statistics were calculated for grants awarded in the four years prior to the Special Series

(2012-2015) and the five years after the Special Series (2017-2021). Changes in grant submissions focused on teamwork and care coordination before and after the Special Series are described.

Grants that focused on teamwork in cancer care delivery between 2012-2021 were further analyzed for study content related to team-based care in cancer care. Authors (DV, VC) reviewed the resulting 81 grant titles and specific aims to determine if the grants focused on team-based care in cancer care delivery, team-based care for another condition, or established a research core to facilitate team-based care. This resulted in 16 grants. Due to the Special Series focus on advancing team-based care in cancer care delivery, we further examined this subset of awarded grants (n = 7) to determine how awardees defined the care team, the team composition, grant focus, theories used, study design, study methodology, study outcomes, and team-based care measures used.

Portfolio Analysis Results

A Special Series author served as the PI or CO-I on 8 grants that examined teamwork and care coordination awarded from 2017 to 2021. Most grants were funded by the NIH (n = 6), followed by the VA (n = 2; Table 1). The NIH institutes that awarded grants were the NCI (n = 2), NIA (n = 2), and NIMHD (n =2). Of the 8 funded grants, none were submitted by new investigators. New Investigators are defined by NIH as a person who has not yet competed successfully as a principal investigator to receive substantial independent NIH funding.

Changes in the number of awarded grants that examined teamwork and care coordination before and after the Special Series were also examined (Table 2). A total of 3 grants were awarded in the four years prior to the Special Series (2012 – 2015), with an average of 0 to 1 grant (M = .75) awards annually. In comparison, 8 grants were awarded in the five years following the Special

Series, with an average of 1 to 2 grants (M = 1.6) awarded annually (2017 – 2021; Table 2). On average, the number of funded grants increased by 3 grants annually in the 5 years following NCI-ASCO project that formed multidisciplinary writing teams.

Finally, all grants by Special Series authors that were funded from 2012-2021 were further examined to define their focus (Table 3). Of the 16 funded grants, 7 focused on teaming in cancer care delivery (CCD), 7 focused on teaming for another health condition, and 2 established a research core to advance team-based cancer care delivery. The 7 grants that focused on teaming in CCDR were further analyzed for study content. In terms of care team composition, 42.9% (n = 3) incorporated caregivers into the care delivery team, 28.6% (n = 3) integrated primary care physician, and 42.9% (n = 3) integrated the patient into the care team (Table 3). Fifty-seven percent (n = 4) of the grants were observational and 42.9% (n = 3) were experimental. Research designs varied and included qualitative studies 14.3% (n = 1), quantitative 28.6% (n = 2), and mixed-methods 57.1% (n = 4).

Only one grant integrated a theoretical framework into their study (i.e., Consolidated Framework for Implementation Research). Study outcomes included patient outcomes (n = 2; e.g., symptomology, survivorship, self-efficacy) and care delivery outcomes n = 5 (e.g., care access, quality of care, patient-center care). Finally, 57.1% of the grants focused on characterizing the actions and interactions of individuals within and across teams to improve coordination of multi-team efforts, 28.6% focused on improving communication within existing teams, and 28.6% focused on measuring patient outcomes of teamwork.

Discussion

The purpose of this paper is to provide a long-term evaluation of the NCI-ASCO Teams in Cancer Care Delivery project by evaluating how the 2016 JOP Special Series impacted grant awards that focused on understanding and improving teaming and care

coordination awarded from 2012 to 2021. Our review was limited to grants that had a PI or CO-I that participated in the NCI-ACSO multidisciplinary writing teams. Our review identified 8 grants were awarded in the five years following the special Series (i.e., 2017 to 2021). NIH funded 75% of the grants, with NCI sponsoring the largest percentage of grants.

We examined the number of grant application submissions by Special Series authors in the four years prior to the NCI-ASCO Special Series and the five years following the special Series. Analyses identified that 3 awards were made prior to the NCI-ASCO Teams in Cancer Care collaboration, 8 awards were made after, and 5 were awarded in 2016, the year of the Special Series was published. The number of grant awards examining teamwork and care coordination increased after the Special Series. Grant foci included teaming in cancer care delivery, teaming for another health condition, and established research cores to advance team-based cancer care delivery.

Our review included 7 grants that focused on teaming in cancer care delivery between 2012 and 2021. Of these, only one was funded before the Special Series. All other grants that examined teaming in cancer care were funded during or after authors' Special Series participation (i.e., between 2016 and 2021). This illustrates the positive impact that author participation in the NCI-ASCO multidisciplinary writing teams may have had on generating interest and collaborations necessary for high quality care delivery research on cancer care teaming.

Across the funded grants that focused on teaming in cancer care, there was no standard definition for the cancer care team. Grants focused on integrating caregivers into a team, inter-clinician teamwork, and/or the patient's role within the care team. Over half of the grants were observational studies that characterized the actions and interactions of care team members within and between

teams to define coordination of multi-team efforts. Only three grants were experimental in nature and focused on improving communication within existing teams and/or improving patient outcomes.

The results of the DHHS portfolio analysis highlight that teams research is moving forward for cancer care delivery. However, more research is needed to address gaps in healthcare delivery that demand well-functioning teams, including clinician burnout, a reduced oncology workforce, an aging population with comorbidities and increased treatment modalities across multiple settings[8]. Additional research is needed to better understand how care team inputs, such as team composition, impact teamwork processes and subsequent outcomes[9]. In addition, measures of team processes were unclear or not defined across the grants included in our review. This underscores the need to promote research that supports the development of validated, clinically-meaningful measures of team processes useful for evaluating care delivery and coordination [4,10]. Gaps identified in this portfolio analysis highlight opportunities for future research to address teamwork challenges in cancer care delivery.

Limitations

Interpretations of these findings should consider several limitations. First, only grants awarded by the US Department of Health & Human Services were included in our analysis. Therefore, grant awards from nonprofit organizations and other countries may be omitted. In addition, the scope of the portfolio analysis was limited to those that participated in the Special Series multidisciplinary writing teams. Other awards that focus on teaming in cancer care delivery may exist (e.g., training grants). However, conducting a portfolio analysis of all grant awards was beyond the scope of the evaluation of the NCI-ASCO collaboration to

stimulate research in teaming and this paper. Additionally, grants may have been omitted from our analyses if assessment of alternate author names could not be reconciled.

The results of this study are limited to descriptive trends, rather than causal effects of grant submission changes following author participation in the NCI-ASCO Special Series multidisciplinary writing teams. External factors may have also impacted the number of submitted applications and funded grants. For example, lack of familiarity with the federal grants process may have reduced the number of grants eligible for funding, while the COVID-19 pandemic may have inhibited investigators' ability to conduct research with health care teams, thus reducing grant submissions. Finally, agency funding policies may have impacted the number of fundable grant applications across the years of our assessment. Finally, unfunded applications were not examined. Therefore, it is unknown if studies proposed but not funded are different than this review.

Conclusion

Reducing cancer morbidity and mortality requires interactions between patients, clinicians, and clinical staff from primary care and multiple specialties and across healthcare settings. Challenges to and breakdowns in communication and coordination across the cancer continuum are common, diminish patient outcomes, and contribute to clinician burn-out[11]. Successfully addressing the ongoing issues of a fragmented and complex healthcare delivery system requires a cadre of researchers who can advance methods and experimental approaches to transform the inefficiencies in routine cancer through team-based science. Disciplines that NCI and ASCO brought together in 2016 and again in 2022[12] through the JOP Special Series on Teams in Cancer Care to continue to explore new avenues to enhance cancer care through cancer care delivery research. Such multidisciplinary perspectives are critical for

understanding and addressing the fault lines in effective team-based processes and care delivery[13–15]. Additional collaborations between multidisciplinary research teams and community practices are needed to translate cancer care delivery research into evidence-based practice[16]. Overall, opportunities remain for collaborative research that advances development of novel interventions that strengthen care team organization and functioning, implementation of evidence-based strategies that are known to improve care coordination through effective team-based care, and research advancing novel measures, methods, and experimental approaches to enhance routine cancer care through team-based science.

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Table 1. Funded grants by Special Issue Authors from 2012-2021 that Examined Teamwork or Coordination

Agency & NIH Institute	2012-2015 (4 YEARS) (N = 3)	2016 (N = 5)	2017-2021 (5 YEARS) (N = 8)	TOTAL N (N = 16)	Percent of Grants
Agency for Healthcare Research and Quality (AHRQ)	**1**	**2**	**0**	**3**	**18.75%**
AHRQ	1	2	0	3	18.75%
National Institutes of Health (NIH)	**2**	**3**	**6**	**11**	**68.75%**
NCI	2	2	2	6	37.50%
NIA	0	0	2	2	12.50%
NIMHD	0	0	2	2	12.50%
NINR	0	1	0	1	6.25%
Veterans Affairs (VA)	**0**	**2**	**2**	**2**	**12.50%**
HSRD	0	2	2	2	12.50%
New Investigator	0	1	0	1	6.25%
Funding Mechanism					
I01	0	0	2	2	12.50%
K24	0	0	1	1	6.25%
R01	0	3	3	6	37.50%
R03	1	1	0	2	12.50%
R18	1	0	0	1	6.25%
R21	0	1	0	1	6.25%
R61	0	0	1	1	6.25%
U54	1	0	0	1	6.25%
UM1	0	0	1	1	6.25%

Table 2. Results: Changes in Grant Awards after Special Series that Examined Teamwork

	Before Special Series 2012 - 2015		**Special Series Year** 2016	**After Special Series** 2017 – 2021	
	N	Avg / year	N	N	Avg / year
Awarded Grants: Research core	1	0.25	0	1	0.2
Awarded Grants: Teamwork for any condition	1	0.25	2	4	0.8
Awarded Grants: Teamwork in Cancer Only	1	0.25	3	3	0.6
Total	3	0.75	5	8	1.6

Note: N = Count of grants; Avg/year = average number of grants awarded per year

Table 3. Funded Grant Applications Qualitative analysis (deep dive into special Series authors and research teams)

	N	Percent of Grants
Care Team Composition*		
Caregiver	3	42.86%
Primary care physician	2	28.57%
Physician Specialist	2	28.57%
Patients	3	42.86%
Palliative care and/or hospice care	2	28.57%
Methodology		
Observational	4	57.14%
Experimental	3	42.86%
Design		
Qualitative (e.g., focus groups, semi-structured interviews)	1	14.29%
Quantitative	1	14.29%
Mixed methods (i.e., collection and integration of qualitative and quantitative data; e.g., sequential exploratory design)	5	71.43%
Teamwork Elements*		
Characterizing actions of individuals within and across teams	4	57.14%
Improving communication within existing teams	2	28.57%
Measuring patient outcomes of teamwork	2	28.57%
Grant outcomes		
Patient outcomes	2	28.57%
Care delivery outcomes	5	71.43%
Funding Year		
2015	1	14.29%
2016	3	42.86%
2018	1	14.29%
2019	1	14.29%
2020	1	14.29%
Funding Institution		
National Institutes of Health (NIH)	6	85.71%
NCI	4	57.14%
NIA	1	14.29%

NINR	1	14.29%
Veterans Affairs (VA)	1	14.29%
HSRD	1	14.29%

*Note, some grants integrated more than one element into their grants. Therefore, column totals will not = 100%

Appendix 1. NCI Healthcare Teams Research Activities

Year	Activity	Goal
2012-Present	The Healthcare Teams (HCT) Quarterly Cyber Discussion Series.	To facilitate engaging discussions among multidisciplinary disciplines in cancer care on topics that enhance the delivery of team-based cancer care, to stimulate research, enhance team-based clinical care coordination, and improve patient satisfaction.
2012-Present	Healthcare teams related peer-reviewed publications and reports	To disseminate results of a variety of research studies to advance the field of healthcare teams in cancer care delivery.
2017	Identifying KSAOs for Effective Teamwork in MTSs: Enhancing Effectiveness of Cancer Care Delivery Teams: A Delphi Survey	To identify competency domains to enhance coordination and effectiveness of cancer care teams (Chollette et al., 2020).
2017	The Research To Reality (R2R) Healthcare Teams Learning Community (Sunset 2021)	To foster collaboration among clinicians, researchers, and patient advocates on research projects, manuscripts, data analysis, and meetings that advance the science and practice of effective teamwork and care coordination.
2018	Cancer Prevention and Control Clinical Trials Grant Program (R01 Clinical Trial Required) Funding Opportunity Announcement	To fund healthcare delivery research focused on understanding and improving team-based care and care coordination.
2021	Cancer multiteam system (MTS) conceptual model	To develop a theoretical model of team effectiveness during post-diagnosis transitions and active treatment. (Verhoeven et al., 2021).
2022	NCI's Research Interests to Improve Interprofessional Teamwork and Coordination During Cancer Diagnosis and Treatment Funding Opportunity announcement	To fund research focused on understanding and improving interprofessional teamwork and coordination during cancer diagnosis and treatment.