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Capacity for Cancer Care Delivery Research in NCORP Community Practices: Availability of Radiology and Primary Care Research Partners

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Abstract

Purpose—Cancer care spans the spectrum from screening and diagnosis through therapy and into survivorship. Delivering appropriate care requires patient transitions across multiple specialties such as primary care, radiology, and oncology. From the program's inception, NCI Community Oncology Research Program (NCORP) sites were tasked with conducting cancer care delivery research (CCDR) that evaluates structural, organizational and social factors, including

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care transitions that determine patient outcomes. We aim to describe the capacity of NCORPs to conduct multidisciplinary CCDD that includes radiology and primary care practices.

Methods—The NCORP contains 34 community and 12 minority and underserved community sites. The Landscape Capacity Assessment was conducted in 2015 across these 46 sites composed of the 401 components and subcomponents designated to conduct CCDD. Each respondent had the opportunity to designate an operational practice group defined as a group of components and subcomponents with common care practices and resources. The primary outcomes were the proportion of adult oncology practice groups with affiliated radiology and primary care practices. The secondary outcomes were the proportion of those affiliated radiology and primary care groups that participate in research.

Results—87% of components and subcomponents responded to at least some portion of the assessment, representing 230 practice groups. Analyzing the 201 adult oncology practice groups, 85% had affiliated radiologists, 69% of whom participate in research. 79% had affiliated primary care practitioners, 31% of whom participate in research. Institutional size, multidisciplinary group practice and ownership by large regional or multi-state health systems was associated with research participation by affiliated radiology and primary care groups. Research participation by these affiliated specialists was not significantly different between the community vs minority/underserved community sites.

Conclusion—Research relationships exist between the majority of community oncology sites and affiliated radiology practices. Research relationships with affiliated primary care practices lagged. NCORP as a whole has the opportunity to encourage continued and expanded engagement where relationships exist. Where no relationship exists, the NCORP can encourage recruitment, particularly of primary care practices as partners.

Keywords

cancer care delivery; cancer; community oncology; radiology; primary care; cancer care delivery research

Introduction

How we provide and pay for cancer care continues to rapidly evolve. As alternative payment models explicitly linking reimbursement and clinical outcomes continue to expand, we need the capacity to conduct research designed to produce sustained and sustainable improvements within systems of cancer care delivery. The National Cancer Institute (NCI) defines cancer care delivery research (CCDD) as “the multidisciplinary field of scientific investigation that studies how social factors, financing systems, organizational structures and processes, health technologies, and health care provider and patient behaviors affect access to cancer care, the quality and cost of cancer care, and ultimately the health and well-being of cancer patients and survivors.” [1] For radiology as a specialty to increase its relevance in value-based clinical care, we need to participate in clinical care delivery research, including CCDD conducted within the NCI Community Oncology Research Program (NCORP) [2].

NCORP is a large network of approximately 900 independent community oncology practices, system-affiliated practices and safety-net institutions that participate in NCI

clinical research [1,3]. NCORP represents a unique research setting to evaluate multilevel organizational structures and contextual factors influencing the process and outcome of cancer care, including care processes that include any imaging component, for example, breast cancer screening.

The complexity of cancer care delivery, and thus CCDR, requires multidisciplinary collaboration that often extends beyond traditional clinical practice boundaries. For example, Weldon et al acknowledges that radiology is often the entry point for patients into the cancer care system [4] and is uniquely positioned to facilitate care initiation. Taplin et al illustrated the interdependency inherent in effective teams-based care by examining the care coordination between primary care, radiology and surgery to deliver care to a woman undergoing screening mammography and subsequent diagnosis of breast cancer [5]. Thus, care coordination has emerged as a key issue in effective patient care, with radiology and primary care taking active team roles. The model of CCDR that results in evidence-based practice change includes clinician collaboration in the design and conduct of studies [1]. Therefore, studies evaluating care coordination processes, and other processes of care, would benefit from collaborating with radiology and primary care research collaboration. However, currently undescribed is the capacity within the NCORP to conduct CCDR that includes radiology and primary care practices as active participants.

To better understand this capacity, we describe 1) the number of NCORP sites with affiliated radiology and primary care practices, a prerequisite for research participation and 2) the frequency of research participation among these affiliated practices using the 2015 NCORP Landscape Capacity Assessment.

METHODS

Survey population

The 46 NCORP sites, community sites (n=34) and minority and underserved community sites (n=12) consisting of 925 components and subcomponents [2], were identified. At the time of the survey, only a subset of the site components and subcomponents (n=401) formally designated to conduct cancer care delivery research (CCDR) were eligible to complete the 2015 Landscape Assessment as at the time of survey administration, only these designated components and subcomponents were permitted to conduct CCDR research. Practices that identified themselves as children's hospitals (n=29) were excluded for the current analysis.

2015 Landscape Assessment design and administration

Designed to evaluate the capacity within NCORP to conduct CCDR, the survey queried institutional characteristics (e.g. organizational ownership, practice size); clinical staff characteristics (e.g. range of care specialties represented including radiology and primary care, physician employment status); capacity to provide cancer care services (e.g. care navigation practices, palliative care). Additionally, the survey evaluated health information technology infrastructure, including picture archiving and communications systems (PACS) and radiology information systems (RIS).

The Landscape Assessment was designed by a multidisciplinary committee formed by the NCI's Division of Cancer Prevention and fielded by Wake Forest Research Base between August and December, 2015 using a web-based data collection platform. The principal investigators of 46 NCORP sites with designated CCDDR components or subcomponents were instructed to identify points-of-contact (POCs) at each component or subcomponent to be responsible for completing the survey. The POCs who completed the survey had the opportunity to designate which components or subcomponents had common care practices and resources and represented operational practice units, termed "practice groups". Using practice grouping patterns identified in the responders, non-responding components and subcomponents were manually assigned into similar practice groupings. Therefore, the unit of analysis is the oncology practice group level, rather than the component or subcomponent level; however the large majority (89.1%) of practice groups did represent a single component or subcomponent.

Survey analysis

Primary outcomes were the proportion of CCDDR adult oncology practices with 1) affiliated radiologists or radiology practices and 2) affiliated primary care providers. Secondary outcomes were the proportion of affiliated radiologists and primary care providers that participated in research. Independent correlates of the primary and secondary outcomes included organizational characteristics such as minority and underserved community site designation, practice size and ownership (Table 1).

For the primary and secondary outcomes, "don't know" and "no" responses were grouped together. For missing data, missing at random was assumed and a complete case analysis was performed. Univariate logistic regression was used to assess the impact of practice characteristics on whether the site had affiliated primary care providers or radiologists available. Univariate analysis was also used to assess the impact of practice characteristics on whether the practice's affiliated primary care providers or radiologists participate in research. When quasi-complete separation of the data points was detected, Firth's logistic regression [6] was used. A multivariate model was performed including all variables significant in univariate models. Backwards variable selection was performed to obtain a parsimonious multivariate model. Variables were removed until the remaining variables were significant with $P < 0.5$. Organization type was included as a 3-degree of freedom class variable. All analyses were conducted using SAS (SAS Institute, Inc. Cary, NC).

RESULTS

Of the 401 CCDDR designated NCORP components and subcomponents, 350 (87%) responded to at least some of the survey, representing 230 practice groups. 29 of these practice groups identified themselves as children's hospitals and were excluded from further analyses. The remaining 201 adult oncology care practices represent the survey population.

Adult oncology practice characteristics

Of the responding practices, 15.9% were NCORP designated minority and underserved community sites while 14.0% self-identified as a safety net hospital. 66.7% were owned by a

large regional or multi-state health system. 84.9% participated in at least one national quality or process of cancer care initiative.

Capacity for interdisciplinary CCDR

A majority of the oncology practices (85.0%) have affiliated radiologists or radiology practices with 69.4% of these affiliates participating in research (Table 1). Radiologists were more likely to participate in research if affiliated with multi-specialty practices (odds ratio (OR) 7.1, 95% confidence interval (CI) 2.4–21.3) or practices owned by a large regional or multi-state health system without a health plan (OR 3.8, 95% CI 1.1–13.0), when compared to those independently owned (Table 2). Nearly all (21/22) university-based practices with affiliated radiologists reported that those radiologists participated in research (OR 11, 95% CI 1.4–84.3). Practice participation in the National Surgical Quality Improvement Program (OR 8.4, 95% CI 1.9–36.7) was associated with an increase in the odds of radiology research participation, while participation in other quality initiatives such as the Physician Quality Reporting System did not. Increasing practice size as measured by the number of adult beds and the number of specialty physicians was also significantly associated with the odds of radiology research participation (Table 2). Under multivariate analyses, having a hospital-based outpatient clinic, multi-specialty physicians and a radiology information system (RIS) for cancer patients correlated significantly with having affiliated radiology practices (Table 3). Significant correlates of research participation by these affiliated practices were having at least 11 specialty physicians and an oncology practice with at least one in-patient hospital bed.

A majority of the oncology practices (78.9%) have affiliated primary care providers with 30.6% of these affiliates participating in research. Increasing practice size as measured by the number of adult beds was a significant correlate of an affiliated primary care provider (Table 2). Participation in the Quality Oncology Practice Initiative (QOPI) was associated with primary care practice research participation, unlike participation in other quality initiatives. Practices owned by large regional or multi-state health systems, that have a hospital-based outpatient clinic or at least one in-patient hospital bed were more likely to have an affiliated primary care practice (Table 2). However, the only correlate of research participation by these affiliated primary care practices was participation in the Quality Oncology Practice Initiative.

Approximately 84% of oncology practices have PACS and RIS while 86.9% have patient portals. However, these health information systems were not associated with research participation by either radiology or primary care practice affiliates.

DISCUSSION

Within the NCORP, we found that the majority (85%) of adult oncology practices have affiliated radiologists or radiology practices; most of these practices (69%) participate in research. While the majority (79%) of oncology practices have affiliated primary care providers, only a minority (31%) of these providers participate in research.

Delivery of imaging occurs throughout the cancer care process. The spectrum of cancer care starts with prevention and screening, through diagnosis and treatment and into palliative care, surveillance and survivorship [7]. Guidelines for imaging-based screening have expanded from mammographic screening of breast cancer to include low dose computed tomography (LDCT) lung cancer screening. HEDIS measures now incorporate CT colonography in addition to optical colonoscopy and fecal occult blood testing (FOBT) for colorectal cancer screening utilization. Increasingly, results from trial interventions are assessed by imaging-based surrogate endpoints. As alternative payment models proliferate, CCDR represents a mechanism to measure the value of imaging care. Affiliation with an NCORP community oncology practice can lessen the barrier to radiology practice participation in CCDR. Within NCORP, widespread access to affiliated radiology practices that participate in research provides opportunities for observational and intervention studies of care processes that begin in the imaging suite (such as screening) then transition into the oncology practice. Therefore, participation in CCDR is mutually beneficial for the radiology practice and the community oncology practice.

As life expectancy for the current 15.5 million cancer survivors [8] increases, primary care providers take a larger responsibility for coordinating both oncologic care, particularly monitoring late effects of cancer and treatment, as well as preventive care and management of comorbid conditions [9]. Effective studies evaluating care transitions, delivery and patient outcomes within NCORP require access to affiliated primary care providers who participate in research. While the majority of oncology practices report such affiliations, a smaller proportion of those primary care providers participate in research, suggesting the need for additional collaboration within the NCORP.

Participation in research by affiliated radiology and primary care practices was associated with institutional size as measured by the number of practitioners and total number of beds. The presence of physicians representing multiple oncologic specialties and ownership by large regional or multi-state health systems also indicated research participation. Arguably these latter two organizational characteristics are also a function of institutional size and capacity. Reassuringly, minority and underserved sites and safety net hospitals had similar capacity for radiology and primary care research compared to other community oncology sites and non-safety net hospitals.

As the first comprehensive evaluation of the NCORP's capacity to conduct CCDR, the Landscape Assessment collected information on a broad range of oncology practice characteristics, service provision, and electronic health record assets. A key limitation is the brevity of information available regarding the radiology and primary care research participation. We were unable to query the degree of integration and collaboration between the oncology practice and the affiliated radiology or primary care practice that would facilitate CCDR. The extent of and interest in research participation by the radiology or primary care practice or the individuals in these practices are unknown.

In this initial assessment, the NCORP demonstrates that a research relationship exists between the majority of community oncology sites and affiliated radiology practices. Research relationships with affiliated primary care practices lagged. NCORP as a whole has

the opportunity to encourage continued and expanded engagement where relationships exist. Where no relationship exists, the NCORP can encourage recruitment, particularly of primary care practices as partners. At minimum, the NCORP has described the potential to conduct CCDDR across the cancer care continuum as patients transition across traditional clinical specialty boundaries.

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Summary Statement

By strengthening research connections between radiology and primary care practices and affiliated community oncology sites, the NCI Community Oncology Research Program (NCORP) can enhance its capacity to conduct innovative and practice-changing cancer care delivery research.

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TAKE HOME POINTS

1. NCI Community Oncology Research Program includes independent community practices, system-affiliated practices and safety-net institutions making NCORP a unique research setting to evaluate multilevel organizational structures and contextual factors influencing the process and outcome of cancer care.
2. CCDDR examines how organizational structures and processes, health technologies and health provider behaviors affect cancer outcomes, access to and quality of care, costs and ultimately patient outcomes and well-being.
3. Radiology as a specialty benefits from participation in CCDDR by demonstrating the value of imaging in clinical practice.
4. A large majority of community oncology practices have affiliated radiology groups who are able to conduct research, compared to a minority of oncology practices with affiliated primary care groups who are able to do so.
5. Access to radiology and primary care practice partners contribute to the ability of the NCORP to conduct program-wide CCDDR.

Table 1

Proportion of adult oncology practices with affiliated radiology or primary care practices that conduct research.

	N	Denominator ^I	%
Number of adult oncology practice groups responding to at least some portion of the survey	201	230	87.4
Adult oncology practice groups with affiliated radiologists or radiology practices	170	200	85.0
Proportion of affiliated radiologists or practices that participate in research	118	170	69.4
Adult oncology practice groups with affiliated primary care providers	157	199	78.9
Proportion of affiliated primary care providers or practices that participate in research	48	157	30.6

^I Number of practice group responses.

Table 2

Correlates of having affiliated radiology and primary care practices that participate in research.

Organizational Characteristics ¹	N ²	%	OR	95% CI	Having affiliated radiologists or radiology practices that participate in research	OR	95% CI	Having affiliated primary care providers or primary care practices that participate in research	OR	95% CI
Minority or underserved site under NCORP (n=201)	32	15.9	1.2	0.4–3.8	1.3	0.5–3.3	0.4	0.2–0.9	1.0	0.3–2.7
Primarily a safety-net hospital (n=200)	28	14.0	2.5	0.6–11.3	1.6	0.6–4.2	4.0	0.9–17.5	0.8	0.3–2.1
Academic medical center (university-based practice) (n=200)	24	12.0	2.1	0.5–9.4	11.0	1.4–84.3	3.3	0.7–14.4	1.4	0.5–3.5
Hospital-based outpatient clinic included (n=200)	147	73.5	12.3	5.0–30.3	1.9	0.8–4.1	9.1	4.2–19.4	0.8	0.3–2.0
Multi-specialty (physicians with more than one specialty) (n=188)	153	81.4	12.2	4.9–30.1	7.1	2.4–21.3	5.0	2.3–11.1	2.5	0.7–9.2
Number of specialty physicians (n=201)										
Missing, 0	13	6.5	NA		NA		NA		NA	
1–5	56	27.9	Ref		Ref		Ref		Ref	
6–10	50	24.9	2.3	0.9–5.9	2.9	1.2–7.1	1.3	0.5–3.0	1.7	0.6–4.5
11–200	82	40.8	11.5	3.2–41.5	8.9	3.7–21.8	2.9	1.2–6.8	1.3	0.5–3.0
Organizational ownership (n=195)										
Independently owned	55	28.2	Ref		Ref		Ref		Ref	
Owned by large regional/multi-state health system that includes a health plan	86	44.1	4.6	1.8–12.2	0.6	0.3–1.4	10.7	4.2–27.4	1.6	0.6–4.2
Owned by large regional/multi-state health system without a health plan	44	22.6	2.6	0.9–7.3	3.8	1.1–13.0	6.1	2.2–16.8	0.9	0.3–2.9
HMO/Payor owned	1	0.5								
Publicly owned (e.g. state, county, city)	8	4.1	3.7 ³	0.4–31.6	3.6 ³	0.4–31.7	3.9 ³	0.8–19.8	1.8 ³	0.3–9.5
University owned	1	0.5								
Estimated number of beds (median (range))										
Adult beds (inclusive of oncology beds)										
Missing	11	5.5	NA		NA		NA		NA	
0	57	28.4	Ref		Ref		Ref		Ref	
1–250	51	25.4	5.4	1.8–15.6	2.1	0.9–5.2	11.0	3.8–31.7	0.5	0.1–1.6
251–450	82	40.8	47.2	6.1–365	6.5	2.7–15.9	23.2	7.5–72.1	1.7	0.6–4.5
Participation in National Quality and/or Processes of Cancer Care Initiatives										

		Having affiliated radiologists or radiology practices	Affiliated radiologists or radiology practices that participate in research	Having affiliated primary care providers or primary care practices	Affiliated primary care providers or primary care practices that participate in research					
Physician Quality Reporting System (PQRS) (n=196)	91	46.4	0.7	0.3–1.6	1.5	0.7–3.0	1.1	0.5–2.1		
Quality Oncology Practice Initiative (QOPI) (n=197)	101	51.3	2.4	1.1–5.4	1.9	0.99–3.8	1.5	0.7–2.9	5.0	2.3–11.1
Rapid Quality Reporting System (RQRS) (n=193)	103	53.4	3.6	1.5–8.6	1.0	0.5–2.0	8.5	3.5–20.4	1.3	0.6–2.8
National Cancer Data Base (NCDB) (n=199)	138	69.3	5.2	2.3–11.8	1.2	0.5–2.4	6.7	3.2–13.9	1.8	0.7–4.5
National Surgical Quality Improvement Program (NSQIP) (n=192)	31	16.1	14.6 ⁴	0.8–256.7	8.4	1.9–36.7	10.3	1.4–78.2	0.5	0.2–1.3
Health information systems for cancer patients										
Claims information systems (n=197)	183	92.9	3.5	1.1–11.3	1.9	0.5–7.3	2.2	0.7–6.8	9.3 ⁵	0.5–188.9
Patient portal (n=199)	173	86.9	3.1	1.2–7.9	1.1	0.4–3.2	6.0	2.5–14.3	1.4	0.4–5.3
Radiology information system (RIS) (n=197)	166	84.3	14.3	5.8–35.4	1.8	0.6–5.5	36.3	13.0–101	2.3	0.3–20.5
Picture archiving and communications system (PACS) (n=199)	167	83.9	6.0	2.5–14.3	1.4	0.5–3.8	10.8	4.7–25.2	2.4	0.5–11.3

¹The number of practices providing organization characteristics is in the parenthesis: (n=___).

²The number of practices with the characteristic is provided in the column..

³Odds ratio comparing the combination of HMO/Payor owned and Publicly owned and University owned compared to Independently owned.

⁴Due to quasi-complete separation of the data points (every practice participating in NSQIP has affiliated diagnostic radiologists or radiology practices), Firth's logistic regression was used.

⁵Due to quasi-complete separation of the data points (every practice with claims information systems has affiliated primary care providers or primary care practices that participate in research), Firth's logistic regression was used.

Table 3

Parsimonious model Adjusted Odds Ratios[/] having affiliated radiology and primary care practices that participate in research.

Organizational Characteristics	Having affiliated radiologists or radiology practices (n=185)		Affiliated radiologists or radiology practices that participate in research (n=146)		Having affiliated primary care providers or primary care practices (n=182)		Affiliated primary care providers or primary care practices that participate in research (n=155)	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Hospital-based outpatient clinic included	6.2	2.0–19.6			3.6	1.0–12.5		
Multi-specialty (physicians with more than one specialty)	4.3	1.4–13.3						
Number of specialty physicians								
	1–10		Ref					
	11–200		5.0	2.2–11.7				
Organizational ownership								
Independently owned			Ref		Ref			
Owned by large regional/multi-state health system that includes a health plan			0.4	0.2–1.1	4.9	1.3–18.3		
Owned by large regional/multi-state health system without a health plan			1.9 [/]	0.5–7.3	7.7	1.6–38.1		
HMO/Payor owned/Publicly owned (e.g. state, county, city)/ University owned			2.6	0.3–24.5	1.1	0.1–8.0		
Admits patients			3.1	1.1–8.4	5.3	1.5–18.9		
Participation in National Quality and/or Processes of Cancer Care Initiatives								
Quality Oncology Practice Initiative (QOPI)					5.0	2.3–11.1		
Rapid Quality Reporting System (RQRS)					4.2	1.2–14.2		
National Surgical Quality Improvement Program (NSQIP)								
Health information systems for cancer patients								
Radiology information system (RIS)	8.1	2.7–24.3			5.7	1.3–23.8		

[/] Odds Ratio for Owned by a large regional/multi-state health system without a health plan compared to Owned by a large regional/multi-state health system with a health plan is 4.7 (95% CI 1.5–18.0).