Radiology as the Point of Cancer Patient and Care Team Engagement: Applying the 4R Model at a Patient’s Breast Cancer Care Initiation

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Abstract

Radiologists aspire to improve patient experience and engagement, as part of the Triple Aim of health reform. Patient engagement requires active partnerships among health providers and patients, and rigorous teamwork provides a mechanism for this. Patient and care team engagement are crucial at the time of cancer diagnosis and care initiation but are complicated by the necessity to orchestrate many interdependent consultations and care events in a short time. Radiology often serves as the patient entry point into the cancer care system, especially for breast cancer. It is uniquely positioned to play the value-adding role of facilitating patient and team engagement during cancer care initiation. The 4R approach (Right Information and Right Care to the Right Patient at the Right Time), previously proposed for optimizing teamwork and care delivery during cancer treatment, could be applied at the time of diagnosis. The 4R approach considers care for every patient with cancer as a project, using project management to plan and manage care interdependencies, assign clear responsibilities, and designate a quarterback function. The authors propose that radiology assume the quarterback function during breast cancer care initiation, developing the care initiation sequence, as a project care plan for newly diagnosed patients, and engaging patients and their care teams in timely, coordinated activities. After initial consultations and treatment plan development, the quarterback function is transitioned to surgery or medical oncology. This model provides radiologists with opportunities to offer value-added services and solidifies radiology’s relevance in the evolving health care environment. To implement 4R at cancer care initiation, it will be necessary to change the radiology practice model to incorporate patient interaction and teamwork, develop 4R content and local adaptation approaches, and enrich radiology training with relevant clinical knowledge, patient interaction competence, and teamwork skill set.

Key Words: Cancer, breast cancer, breast cancer diagnosis, patient engagement, teamwork, team-based care, models of care, radiology care delivery


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The work of Ms Weldon and Dr Trosman was supported by a grant from the National Comprehensive Cancer Network and Pfizer (22896331), a grant from the J.B. & M.K. Pritzker Family Foundation, and a grant from the Lynn Sage Cancer Research Foundation. The work of Dr Kulkarni was supported by a James Ewing Foundation of the Society of Surgical Oncology Clinical Investigator Award in Breast Cancer Research, funded by Susan G. Komen for the Cure. The work of Dr Simon was supported by a grant from the National Cancer Institute (UG1CA189828), grants from the National Institutes of Health (U54 CA203000, CA2022995, CA2022997; R01CA163830), a grant from the National Comprehensive Cancer Network and Pfizer (22896331), a grant from the J.B. & M.K. Pritzker Family Foundation, and a grant from the Lynn Sage Cancer Research Foundation. The work of Dr Carlos was supported by a grant from the National Cancer Institute (UG1CA189828), grants from the National Institutes of Health (U54 CA203000, CA2022995, CA2022997; R01CA163830), a grant from the National Comprehensive Cancer Network and Pfizer (22896331), a grant from the J.B. & M.K. Pritzker Family Foundation, and a grant from the Lynn Sage Cancer Research Foundation. The work of Dr Carlos was supported by a grant from the National Cancer Institute (UG1CA189828). Ms Weldon and Dr Trosman have received funding from Foundation Medicine and Genentech. Dr Kulkarni has received funding from Pfizer. Dr Carlos is deputy editor of JACR. Drs Small and Bunce are employees and shareholders of Genentech/Roche. All other authors have no conflicts of interest related to the material discussed in this article.
BACKGROUND

The US health care system is undergoing seismic changes, guided by the Triple Aim of health reform: (1) improving population health, (2) reducing health care costs, and (3) enhancing the patient experience [1]. The radiology community has embraced the new paradigm, aspiring to play a relevant, value-adding role in the evolving health care environment [2,3]. Although radiologists are well positioned to contribute to the first two aims, their traditionally non-patient-facing practice model makes the third aim, improving the patient experience, challenging [2-5]. Committed to overcoming this challenge, the ACR launched initiatives to identify and meet patients’ needs and expectations for radiologic care [2], as well as expand the role of radiology into value-adding services [3,6].

Patients are no longer passive recipients of care but are active, informed, influential participants [7-9]. Thus, patient engagement is central to improving their experience and achieving the Triple Aim [10]. Patient engagement refers to patients, families, and health professionals working in active partnership to improve health and health care [11]. This relationship requires not only reframing how patients engage with providers but also how providers are engaged with patients and one another [9,12]. A team-based approach is an effective mechanism to forge partnerships between patients and providers [9] and improve care delivery [13,14]. This aligns with the ACR vision, which includes teamwork as a platform for improving satisfaction of both patients and clinicians upstream and downstream from radiology [3].

Cancer is a disease for which patient engagement and a team-based approach are particularly important and for which radiology has a unique opportunity to demonstrate value, given its involvement throughout the cancer care continuum. In many health systems, cancer care is complex, fragmented, and poorly coordinated [7,15-18], compelling patients to manage their own care and act as conduits across clinical domains [7,19]. This hardly constitutes patient engagement, as defined here. A team-based approach is considered integral in overhauling this “system in crisis” [18] but remains underused in oncology [20,21]. To address this gap, in 2015, the National Cancer Institute (NCI) and the American Society of Clinical Oncology (ASCO) launched the NCI-ASCO Teams in Cancer Care Delivery Project [20]. The project’s aim is to explore how intentional, rigorous teamwork can be applied to the continuum of cancer care and to initiate the development of innovative approaches for implementing teamwork in oncology care delivery [20].

Within this project, Taplin et al [22] highlighted barriers to patient care and engagement during breast cancer diagnosis and examined how intentionally designed teamwork could improve the diagnostic process and patient experience. Similarly, Trosman et al [23] focused on care breakdowns and opportunities for teamwork during breast cancer treatment. However, to our knowledge, the care initiation phase, from diagnosis to the start of treatment, remains unexplored in this context.

Patient engagement at care initiation is crucial yet especially difficult: patients are devastated by the diagnosis [7], overwhelmed by the complexity of care planning [24], and struggle shuttling among often disconnected specialties [25]. This results in care delays and breakdowns [26,27] and patient dissatisfaction [7,22]. Launching teamwork at care initiation may address these challenges. For a number of cancers, radiologists play a key role during diagnosis, postdiagnostic workup, and care initiation, often serving as the patient entry point into the cancer care system [3]. They have a distinctive opportunity in this setting to play a role in facilitating teamwork and enabling patient engagement, which expands their traditional scope into value-added activities.

Building on previous work by Taplin et al [22] and Trosman et al [23], in this article we explore barriers to optimal care during breast cancer care initiation and how they could be addressed by teamwork and patient engagement, highlighting the potential role of radiology in the optimized process. We analyze how the innovative 4R approach—Right Information and Right Care to the Right Patient at the Right Time—for facilitating teamwork in cancer care, introduced by Trosman et al, may be applied to breast cancer care initiation and a value-added role for radiology. We focus on breast cancer because of the key part radiology plays as the point of diagnosis and entry into the cancer care system, as well as during treatment and survivorship. Applying 4R at breast cancer diagnosis may serve as a model for other cancers in which radiology plays a similar part.

METHODS

We use the case-based method used by the NCI-ASCO teams project to systematically examine how principles of teamwork can improve cancer care delivery. This includes describing specific care delivery challenges, illustrating
them using patient cases, describing relevant aspects of teamwork, and analyzing how they could address challenges highlighted in the cases. Our case studies are based on challenges documented in the literature.

We follow the NCI-ASCO project’s framing of systematic, intentional teamwork, which extends far beyond multidisciplinary conferences and focuses on rigorous team-based design of the care planning and delivery processes to collectively achieve common goals [20,22]. This design incorporates patients, families, and caregivers [11]. In this article, references to patients include family and caregivers.

FOUR CHALLENGES OF CANCER CARE DELIVERY AND TEAMWORK

We focus on four interrelated challenges that exist throughout cancer care delivery, including diagnosis and care initiation. They negatively affect patient care and impede effective teamwork and patient engagement (see summary and examples in Table 1).

Timing and Sequencing of Interrelated Care

Managing the timing and sequencing of interrelated tasks across team members is considered a cornerstone of teamwork [28,29]. Contemporary, multimodality cancer care is highly interdependent across specialties and requires that interrelated care events be delivered not only at the “right” time but also in the “right” sequence. However, orchestrating this across clinical domains is complicated and difficult [9,19,30]. Failure to effectively time and sequence interdependent care impedes teamwork among providers [31,32] and causes care delays, breakdowns, and changes in care trajectories [16,22,23,33,34].

Unclear or Misplaced Responsibilities

Effective teamwork requires that team members formally agree and accept responsibilities for tasks [35-37]. The Institute of Medicine and the NCI-ASCO project call for identifying and documenting responsibilities for key care components for each patient with cancer [18,19,22]. At a given institution, identifying responsibilities for definitive cancer care (eg, surgery, chemotherapy, imaging or radiation) is relatively straightforward, as this care is tied to particular specialties. However, responsibilities for other, less specialty-dependent care are often unassigned or implicitly assumed. For example, a medical oncologist, surgeon, or palliative clinician may conduct the “goal-of-care” discussion; similarly, multiple specialists review a patient’s family history and could identify hereditary cancer risk and provide genetics referral. In the absence of formal responsibility, these tasks are missed, performed inconsistently, or conducted at the “wrong” time and out of sequence relative to other tasks [15,22,38].

Lack of One Cross-Domain Care Plan

Task timing and sequencing and responsibilities are meaningful only in the context of a team’s common work plan [36]. In cancer care, clinical domains develop their respective plans for patients (eg, surgical plan, systemic therapy plan). However, patients rarely receive one overall care plan outlining the roadmap from diagnosis through multispecialty treatment. The Institute of Medicine urged the development of a comprehensive, written, patient-centric care plan at diagnosis, which guides the patient and the care team through the cancer care continuum [18,24]. The plan facilitates patient and care engagement and enables timely, coordinated care [19]. A patient without a care plan is likened to a “pilot taking off without a flight pattern” [24].

Absence of Physician in Charge Across Domains Along the Care Continuum

Team leadership is a key principle of successful teamwork [39] and is considered an important element of a cancer care team [9]. Patients with cancer ask who will lead their care team and want to have one physician in charge of their care [7,18,19,40,41]. Although specialists may play the lead role within their respective clinical areas (eg, during surgery or chemotherapy), there is rarely a physician who formally acts as a team lead across domains from a patient’s diagnosis through treatment [7,18,40]. Patients seek one physician in charge so that he or she provides, among other things, continuity and resolution to inconsistent recommendations across domains and serves as the “last resort” for patient questions and problems [7]. Nurse navigators and case managers are effective in helping patients travel through the maze of cancer care, but this function cannot substitute for rigorous teamwork and physician leadership [19,42].

CASE STUDIES ILLUSTRATING CHALLENGES AT BREAST CANCER CARE INITIATION

Case A: Genetic Assessment Before Breast Cancer Surgery

Patient A receives a breast cancer diagnosis (clinical stage II) from her primary care physician (PCP), after a delay in
radiology-PCP communication and PCP appointment scheduling (Fig. 1a). Surgeon consultation is also delayed because of insurance issues. On the basis of patient A’s family history, the surgeon refers her to genetic counseling, as the surgical approach may be altered depending on the results. However, genetic assessment is prolonged because of a lack of access to the geneticist and a long wait time for results, along with insurance logistics and appointment delays. Breast MRI identifies additional indeterminate lesions that need to be evaluated with additional biopsies if the patient is seeking breast conservation. Additional lesions are biopsied and are determined to be benign. Patient A, anxious to move forward and initiate therapy, proceeds

Table 1. Challenges of cancer care delivery and teamwork and principles of the 4R model

<table>
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<tr>
<th>Challenge</th>
<th>Description and Examples</th>
<th>Project Management Elements Addressing the Challenge</th>
<th>Corresponding 4R Principles</th>
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| Timing and sequencing of interrelated care events | Management of synchronous tasks involving information exchange and mutual adjustment in action [28,29]  
- Timing of genetic assessment relative to definitive surgery [33,51,52]  
- Arranging neoadjuvant therapy before surgery [53,54]  
- Fertility preservation before systemic therapy [55]  
- Immunization before systemic therapy [56]  
- Dental care before radiation therapy [57]  
- Reconstructive consult before surgical decision [58] | Project plan identifies the systematic, coordinated schedule of interdependent events, with timing, sequencing and dependencies [46] | Care sequences, as patient care project plans, with timing and sequencing of care events across all relevant domains |
| Unclear or misplaced responsibilities | Relevant to “cross-specialty” or specialty-independent care  
- Distress screening and referral to psychosocial care [59]  
- Initial genetic susceptibility risk assessment and referral to counseling/testing [60]  
- Symptom management [18]  
- Identification of patient family and practical needs [18] | Team members are assigned responsibilities for each event in the project schedule [61,62] | Cross-domain 4R care project team, acting in accordance with the care sequence, with all members having explicit responsibilities |
| Lack of one cross-domain care plan | One care plan created at diagnosis, reflecting multimodality care through end of treatment, including surgery, radiation, impacting, systemic therapy, supportive and psychosocial care [19] | Project plan includes interdisciplinary groups and subteams [61] | Care sequence represents the care plan for the entire care episode, from diagnosis through treatment, or into hospice |
| Absence of physician in charge across domains along the care continuum | Physicians typically perform this role only within their domains (eg, surgical care, systemic oncology care), or across domains, but only while patients are within their domains [7,9] | A project requires a project lead with explicit responsibilities [63] | Quarterback function (physician and nurse tandem) acts across care domains along a patient’s care continuum; responsible for creating patient-specific care sequence from templates and ensure ongoing engagement of the care team |

Note: 4R = Right Information and Right Care to the Right Patient at the Right Time.
with a lumpectomy and receives genetic results after surgery indicating high risk for hereditary breast cancer. She undergoes adjuvant systemic therapy and decides to undergo bilateral mastectomy 9 months later.

Here, genetic assessment is not timed and sequenced relative to surgery, and insurance verification is not synchronized with consultations and tests. Responsibilities for insurance verification and genetics referral are not clear and are misplaced in timing. There is no overall care initiation plan shared between patient A and her providers, and no one who takes overall charge of her care.

In an optimized, streamlined scenario (Fig. 1b), the radiologist conveys the diagnosis to patient A and creates a care initiation plan, including all initial consultations. Radiology staff members (eg, breast cancer navigator) facilitate the necessary insurance verification (eg, by involving a hospital-based financial counselor) and referrals to surgery and genetics, thus allowing sufficient time to complete genetic assessment in time for surgical decision. The plan is shared between patient A and her providers; patient A understands the importance of making timely appointments. Radiology staff members convey to genetics the urgency of patient A’s testing and necessity to expedite. Informed by genetic results, and after consultations with her surgeon, reconstructive surgeon, radiation oncologist, and other relevant specialists, patient A proceeds directly to bilateral mastectomy, thus avoiding unnecessary biopsies and lumpectomy.

It is important to note that in the optimized scenario, the radiologist is not making cancer treatment recommendations but provides timely referrals to specialties, who work with the patient to make the treatment decisions.

**Case B: Neoadjuvant Therapy**

Patient B, a single mother of two, is diagnosed with clinical stage IIB breast cancer (Fig. 2a). Her diagnosis is delayed by radiologist-PCP communication, and her consultations along the way are affected by childcare and work schedule conflicts, as well as surgeon and medical oncologist appointment delays. Her surgeon determines the appropriate surgical approach and proceeds to mastectomy. Postmastectomy evaluation by the medical oncologist determines that the patient could have benefited from neoadjuvant systemic therapy.

Here, the medical oncology path is not synchronized with the surgical path, there is no overall care plan, and no one is in charge of patient B’s care. There is a lack of coordination with social work to address patient B’s childcare issues. The surgeon assumes the responsibility for medical oncology referral, but it is made too late relative to the surgical process and does not allow the

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**Fig 1. Case of patient A: genetic assessment before surgery.**
initiation of neoadjuvant treatment in a time frame appropriate for patient B.

In an optimized scenario (Fig. 2b), the radiologist conveys the diagnosis to patient B, works with her to create a care initiation plan, and refers her to surgery, medical oncology, and other relevant specialties, according to the plan. Patient B’s childcare issues are also identified at this time, and a social worker helps her proactively address them. Patient B and her providers use the care initiation plan; her oncologist appointment is scheduled in time to allow neoadjuvant therapy decision and preparation. After neoadjuvant therapy, patient B undergoes breast-conserving surgery.

As in case A, the radiologist is not making cancer treatment recommendations but provides timely referrals to specialties for treatment decisions.

ADDRESSING CHALLENGES OF CANCER CARE DELIVERY AND TEAMWORK: THE 4R APPROACH

The challenges described and illustrated here present barriers to systematic rigorous teamwork, undermine cancer patient engagement, cause care breakdowns, and result in suboptimal course of treatment. These issues are further exacerbated when a patient obtains care from multiple institutions or practices, which is common in oncology [7,43].

However, these issues are not unique to oncology or health care; a vast array of modern industries depend on rigorous, systematic teamwork, from construction and IT to fashion design. One of the disciplines broadly and successfully used to manage complex, multidisciplinary teamwork is project management [44-46]. Although its use in care delivery has been proposed [38,47,48], it remains underused in this context. Project management is uniquely suited to manage teamwork in oncology [23]. It inherently addresses the four care delivery challenges highlighted previously (Table 1). It provides a systematic, yet flexible approach to structuring teamwork and adapting to different care settings and environments. Also, it is familiar to many patients from their line of work and to many providers from institutional quality improvement projects [32,49].

We previously proposed the 4R approach to facilitate rigorous, patient-centric teamwork in oncology, leveraging the project management discipline [23,30,38] (Table 1). Under this approach, care for a cancer patient is managed as a project, using a care project plan (“care sequence”), which specifies the timing and sequencing of interdependent care events across clinical domains relevant to the patient’s care. A quarterback function is established as a tandem of a physician and a nurse. The quarterback function creates the care sequence from a predeveloped template for a newly diagnosed patient and identifies the 4R care team, which will use the care sequence in the process of care delivery. Within the quarterback function, the physician
determines clinical recommendations and/or referrals to relevant specialties to be included in the care sequence and serves as an ongoing physician resource for the patient (eg, to resolve conflicting clinical recommendations across specialties). The nurse facilitates the development of the care sequence, working with the physician and patient, and organizes patient care according to the sequence. This includes engaging members of the care team at the “right” time and in the “right” sequence, and updating the care sequence if needed. Many institutions employ a patient nurse navigator who helps a patient with breast cancer follow her care plan across different specialties once a plan is established but typically does not devise the care plan. In the 4R model, a navigator could also assume the responsibility of the nurse who works with the quarterback physician and patient to devise the care sequence as the patient care project plan.

The care sequence will specify responsibilities for each event in the project plan. The patient, family, or caregiver will be a team member with responsibilities for specific tasks in the sequence (eg, making timely appointments and adhering to the treatment course). The 4R structure and principles become the backbone for provider-patient teamwork and the mechanism for team and patient engagement.

APPLYING 4R AT BREAST CANCER CARE INITIATION AND THE ROLE OF RADIOLOGY

Applying the 4R approach at cancer diagnosis could greatly benefit the patient and her providers, directing initial steps in care and providing the patient with some level of certainty and control at this trying time. However, constructing the care sequence may be premature at diagnosis, as additional workup is often necessary, as well as treatment decisions reached after initial consultations with specialists. For example, a key decision necessary to construct a care sequence is whether the patient will undergo neoadjuvant therapy or will proceed with surgery and adjuvant treatment. Appointing a longer term quarterback function at diagnosis may also be premature, as treatment decisions inform the quarterback assignment (eg, medical oncology for neoadjuvant cases, surgery for “surgery-first” patients).

To assist a newly diagnosed patient in orchestrating the initial consultations and reaching the point of these decisions, we propose that an interim care project plan, care initiation sequence, be created at that time. It will serve as the basis for initial patient and care team engagement and will be replaced by a longer term care sequence when necessary workup is completed and key treatment decisions are reached. Radiology is well positioned to assume an initial quarterback function, constructing the care initiation sequence and engaging the care team. This role may then be transitioned to another domain, when the longer term care sequence is created. In this setting, the radiologist assumes the quarterback physician function, making the initial clinical determinations and recommendations. On the basis of these recommendations, a nurse constructs the care initiation sequence and works with the patient and other providers to organize this care. In organizations in which a breast cancer nurse navigator role exists, the nurse may construct the care initiation sequence and help the patient follow it.

Figure 3 provides an example of a care initiation sequence for a hypothetical patient C at breast cancer diagnosis. The sequence uses a Gantt chart format to manage the care as a project, including the sequence of care (diamonds and rectangles) and dependencies (lines and arrows). Gantt charts are widely used in project management to graphically depict and manage project task schedules, responsibilities, dependencies, and desired sequences of events across team members. This makes a Gantt chart a useful tool to visually represent and coordinate breast cancer care planning, which requires management of care interdependencies and sequences across a diverse group of care team members.

For illustrative purposes, patient C combines the needs of patients A and B described earlier. Patient C is indicated for genetic counseling and may be a candidate for neoadjuvant therapy. Patient C has childcare needs that may challenge her ability to obtain timely consultations. The radiology quarterback function (radiologist and nurse tandem) identifies the scope of initial consultations and care, determines patient C’s practical needs, and develops the care initiation sequence, incorporating patient preferences where relevant. The sequence specifies the timing, order, and responsibilities for key events, including patient’s tasks and responsibilities (eg, making specialist appointments). The sequence guides the resolution of patient C’s childcare needs in time for her projected specialist visits. The geneticist and medical oncologist referrals and appointments are planned early to avoid the pitfalls of cases A and B and allow timely origination of neoadjuvant therapy and/or genetic testing, if recommended for the patient. The care initiation period, while the patient is in the “waiting” mode, also offers an opportunity to plan.
other care recommended before cancer treatment (eg, immunizations) (Fig. 3). The quarterback function engages the initial care team, provides them the sequence, and informs them of the timing sensitivity of appointments and respective decisions.

This approach and process cannot be performed ad hoc, and the care initiation sequences cannot be created from scratch for individual patients. A concerted, systematic institutional implementation of this approach is necessary [23], including (1) developing care initiation sequence templates for typical patient subgroups, which could be personalized for individual patients; (2) establishing institutional criteria that radiology uses to personalize care initiation sequences (eg, for referral to genetics or to the oncologist for neoadjuvant therapy consideration); and (3) streamlining internal processes of relevant specialties (eg, expedited geneticist appointment and testing for newly diagnosed versus high-risk patients). Participation and buy-in from institutional leadership and relevant specialties are necessary for successful implementation. We are currently piloting the 4R approach for patients with breast cancer in academic, community, and safety settings, and we expect that our results and experience will inform broader adoption of the 4R approach at care initiation and during treatment.

**IMPLICATIONS FOR RADIOLOGY**

The application of the 4R approach at care initiation takes radiology into the territory that may be unfamiliar to many in this specialty. However, it emerges from the role radiology currently plays in cancer care for a number of cancers, as an entry point for diagnosed patients into the care system. Some radiologists already deliver breast cancer diagnosis to patients, advise them regarding the next steps, and even navigate them to their next steps in care. The 4R approach will allow radiologists to provide this service in a more systematic, comprehensive, and patient-centric manner. It is aligned with the call to rethink patient experience by applying “revolutionary and innovative ideas” and considering practices of other industries [50]. The 4R approach uses the concepts of project management, broadly used in other industries, and applies them to cancer care initiation and delivery.

The 4R approach to breast cancer care initiation supports the ACR’s vision for radiology, including expansion of value-added services, such as care coordination,
participating in multidisciplinary teamwork, and improving patient engagement [2,3]. Assuming the quarterback role for cancer care initiation sets up radiology as a value-adding team member and integrates it more seamlessly into the care team throughout cancer care continuum and during survivorship.

However, the implementation of 4R at cancer care initiation is far from trivial and will require substantial efforts. First, the radiology practice model must change to enable the role of cancer care initiator and care team member. The model should incorporate direct interaction with patients necessary to discuss the diagnosis and the care initiation sequence, including identification of relevant patient preferences (eg, interest in genetic assessment, if indicated), developing the care initiation sequence, and explaining the included referrals. This will require developing trusted relationships with them, which is important both to develop the care initiation sequence and to support the ongoing role of radiology during cancer treatment and survivorship. The radiology practice model should also incorporate the time and process for interactions with other specialties during initial care team engagement and ongoing teamwork.

Second, the 4R components must be developed, as described earlier in this article. This may necessitate efforts at two levels, and radiologists are key to both. Developing care initiation sequence templates, criteria for initial referrals to specialists, and framing of the quarterback and other team roles requires a collaboration of multiple specialties, and input from relevant medical societies, including the ACR and other radiology bodies. The implementation of 4R in practice entails adaptation of the templates and 4R components to the local and institutional practices, settings, and patient populations. Radiologists at specific care institutions are central to this effort and may champion it, demonstrating thought and organizational leadership.

Third, radiology training (eg, breast imaging fellowships) should include development of the skill sets that enable radiology’s role in the 4R approach in cancer care. Training should include the clinical background necessary for providing referrals to other specialties, competence for patient interaction and engagement, and a systematic teamwork skill set.

Although these efforts are considerable and extensive, they match the ambition, aspiration, and vision of radiology in the evolving health care environment. The proposed model may not be applicable to all care settings and populations, but it could be an important addition to radiology’s array of services.

In conclusion, radiology seeks to transform itself under the Triple Aim of health reform and improve patient experience and engagement. We propose implementing the 4R approach at breast cancer diagnosis, with radiology quarterbacking care initiation, and care team and patient engagement in a systematic, coordinated fashion. This model, and respective role of radiology, provides opportunities for value-added services and solidifying radiology’s relevance in the evolving health care paradigm. Three efforts will be necessary to implement 4R at care initiation: changing the radiology practice model to incorporate patient interaction and teamwork, developing the 4R content and local adaption approaches, and enriching radiology training with relevant clinical knowledge, patient interaction competence, and a teamwork skill set.

**TAKE-HOME POINTS**

- Postdiagnosis initiation of breast cancer care provides radiology with an opportunity to expand its value-added services and increase patient and care team engagement. Breast cancer care initiation is complex and requires orchestrating multiple care events across specialties in a short time.
- The 4R model may serve as the mechanism for this engagement and value-added service delivery. The 4R approach uses project management to create care sequences for patients and care teams, to manage the timing and sequencing of interdependent care events across specialties.
- Applying the 4R approach at breast cancer initiation, radiology can play the quarterback role for the patient and the care team and organize initial patient care by using a care initiation sequence, as the patient care “project plan.”
- To implement 4R at cancer care initiation, it will be necessary to incorporate patient interaction and teamwork into the radiology practice model, develop the 4R content and local adaption approaches, and enrich radiology training with relevant clinical knowledge, patient interaction competence, and a teamwork skill set.
- Radiology departments may start implementing 4R at care initiation by developing care initiation sequence templates for typical patient subgroups, establishing institutional criteria for personalizing care initiation sequences from templates and working with other specialties to streamline relevant care processes.
Radiology’s role at breast cancer care initiation may serve as a model for other cancers in which radiology serves as the entry point for newly diagnosed patients into the health care system.

ACKNOWLEDGEMENTS
We thank Debra L. Madden, Cancer Research Advocate, ECOG/ACRIN Cancer Research Group, for valuable discussions of the 4R model’s impact on patients, Dr. William Gradishar for guidance and leadership in applying the 4R model in practice, and Dr. Al Benson III for ongoing insight and support of the 4R model development.

REFERENCES
30. Weldon CB, Trosman J, Schink JC. Cost of cancer: there is more to it than containing chemotherapy costs. Oncology 2012;26:1116, 1118.