original contributions

Fostering a High-Functioning Team in Cancer Care Using the 4R Oncology Model: Assessment in a Large Health System and a Blueprint for Other Institutions

Raymond Liu, MD[1,2]; Christine B. Weldon, MBA[3,4]; Elizabeth Linehan, MD[1]; Nancy Gordon, ScD[2]; Thea Abbe, RN[1]; Marti Hennings, RN[5]; Henie James, RN[6]; Jed Katzel, MD[1]; Chun Ng, MD[5]; Megumi Tomita, MD[5]; Jeffrey B. Velotta, MD[6]; Stephanie Ossowski, MD[1]; Lori C. Sakoda, PhD[2]; Sharon Likely Sprague, DNP, RN[5]; Anna Dowling, RN[1]; Kimberly Beringer, MSN, RN[1]; Arliene Ravelo, MPH[7]; Elaine Yu, PharmD[7]; and Julia R. Trosman, PhD[3,4]

QUESTION ASKED: Effective multidisciplinary teamwork is crucial for addressing cancer care fragmentation, delivering complex care at the optimal time and sequence. Our question was does the innovative 4R Oncology model for team-based interdependent care delivery and patient self-management foster a high-functioning multidisciplinary cancer care team?

SUMMARY ANSWER: We successfully developed a high-functioning multidisciplinary team through a series of optimizations implementing 4R in breast and lung cancer. To serve as a blueprint for institutions, we further classified the optimizations on the basis of number of specialties involved, domains of care, methods of optimizations, level of effort, and whether the interventions improved care process efficiency.

WHAT WE DID: We deployed 4R in breast and lung cancers at four centers of Kaiser Permanente Northern California, a large community-based health system. The intervention encompassed team development and care delivery optimizations enabling teamwork. 4R Care Sequences—novel patient-facing care plans outlining timing and sequence of care—informed team formation, structure and goals, as well as team activities and functioning. Importantly, Care Sequences reflect a patient-centric, versus specialty-focused view of care timing and sequencing. We assessed the 4R intervention along four characteristics of high-functioning teams previously described in literature.

WHAT WE FOUND: 4R facilitated development of a high-functioning team along all four characteristics. (1) We formed a multidisciplinary team of 24 specialties who assumed team responsibilities for relevant care; (2) all participants committed to a shared goal of delivering interdependent care at the optimal time and sequence on the basis of 4R Care Sequences; (3) the team conducted 40 optimizations in breast and lung cancer to enable effective interdependent care, 50% of which entailed low level of effort, and 78% resulted in improved care process efficiency; and (4) an ongoing teamwork adaptation process was established.

BIAS, CONFOUNDING FACTORS, AND DRAWBACKS: Our intervention included the care domains of surgery and systemic therapy but did not include other important care domains, such as radiation therapy and survivorship, which will be addressed in future efforts. Our assessment did not evaluate impact on actual care at the patient level. Such evaluation is underway, and data from three optimizations indicate positive impact, including shortening turnaround time for molecular profiling before treatment decision in lung cancer, improving completion of advance care directives in breast cancer, and implementing pretreatment older adult assessment and referrals. We have not assessed intervention impact on clinical outcomes and hope to do so in the future.

REAL-LIFE IMPLICATIONS: 4R Oncology is an effective and feasible approach to fostering high-functioning teams, which contribute to optimization of multidisciplinary care delivery and support viability of the oncology workforce. Our intervention and taxonomy of results inform other institutions motivated to strengthen teamwork and improve delivery of complex interdependent care.

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CORRESPONDING AUTHOR

Raymond Liu, MD, Department of Hematology Oncology, The Permanente Medical Group, 2238 Geary Blvd 8SE, San Francisco, CA 94115; Twitter: @Rayliukpsfo; e-mail: raymond.liu@kp.org.

original contributions

SPECIAL SERIES: TEAMS IN CANCER CARE

Fostering a High-Functioning Team in Cancer Care Using the 4R Oncology Model: Assessment in a Large Health System and a Blueprint for Other Institutions

Raymond Liu, MD[1,2]; Christine B. Weldon, MBA[3,4]; Elizabeth Linehan, MD[1]; Nancy Gordon, ScD[2]; Thea Abbe, RN[1]; Marti Hennings, RN[5]; Henie James, RN[6]; Jed Katzel, MD[1]; Chun Ng, MD[5]; Megumi Tomita, MD[5]; Jeffrey B. Velotta, MD[6]; Stephanie Ossowski, MD[1]; Lori C. Sakoda, PhD[2]; Sharon Likely Sprague, DNP, RN[5]; Anna Dowling, RN[1]; Kimberly Beringer, MSN, RN[1]; Arliene Ravelo, MPH[7]; Elaine Yu, PharmD[7]; and Julia R. Trosman, PhD[3,4]

abstract

PURPOSE Delivering cancer care by high-functioning multidisciplinary teams promises to address care fragmentation, which threatens care quality, affects patient outcomes, and strains the oncology workforce. We assessed whether the 4R Oncology model for team-based interdependent care delivery and patient self-management affected team functioning in a large community-based health system.

METHODS 4R was deployed at four locations in breast and lung cancers and assessed along four characteristics of high-functioning teams: recognition as a team internally and externally; commitment to an explicit shared goal; enablement of interdependent work to achieve the goal; and engagement in regular reflection to adapt objectives and processes.

RESULTS We formed an internally and externally recognized team of 24 specialties committed to a shared goal of delivering multidisciplinary care at the optimal time and sequence from a patient-centric viewpoint. The team conducted 40 optimizations of interdependent care (22 for breast, seven for lung, and 11 for both cancers) at four points in the care continuum and established an ongoing teamwork adaptation process. Half of the optimizations entailed low effort, while 30% required high level of effort; 78% resulted in improved process efficiency.

CONCLUSION 4R facilitated development of a large high-functioning team and enabled 40 optimizations of interdependent care along the cancer care continuum in a feasible way. 4R may be an effective approach for fostering high-functioning teams, which could contribute to improving viability of the oncology workforce. Our intervention and taxonomy of results serve as a blueprint for other institutions motivated to strengthen teamwork to improve patient-centered care.

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BACKGROUND

Cancer care is complex, interdependent, and difficult to coordinate across multiple specialties, modalities, and settings along a patient's care continuum.[1-3] Efforts to organize appropriate timing and sequence of care are often ad hoc, inefficient, and onerous for clinicians and patients.[4-6] These challenges cause care breakdowns and delays, worsen patient outcomes, and exacerbate clinician burden and dissatisfaction.[1,6-9] The continuing advent of new diagnostics and treatments benefits patient survival but also expands specialties involved, adds appointments per patient, and places growing demands for care coordination on an already stretched oncology workforce.[6,10] Left unaddressed, these challenges jeopardize care quality, patient outcomes, and sustainability of the cancer care system.[3,6,11,12]

Fostering high-functioning teams and intentional teamwork is a promising strategy to enable well-coordinated and efficient delivery of high-quality cancer care, enhance patient experience, and improve viability of the oncology workforce.[7,13-15] High-functioning teams are characterized by (1) recognition as a team internally and externally; (2) commitment to an explicit shared goal; (3) enablement of interdependent work to achieve the goal; and (4) engagement in regular reflection to adapt objectives and processes.[6,16]

The necessity of high-functioning teams has been broadly recognized by oncology organizations and societies.[1,7,17,18] In response, over the past two decades, teamwork models emerged in cancer care, with the most common among them being multidisciplinary conferences and clinics (MDCs). MDCs typically occur postdiagnosis as multispecialty meetings and/or patient

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consults to review cases and recommend treatment plans.[19-22] MDCs have been shown to improve treatment planning, quality of care, patient and clinician satisfaction, and patient survival.[23-32] However, MDCs, and teamwork in general, encounter considerable adoption barriers, including siloed, specialty-based practice patterns[6,8,22,33]; concerns about feasibility and requirements for clinicians' time[22,33]; the challenge of managing teamwork over time along the care continuum, beyond the initial care planning[14,19,20]; and lacking practical knowledge of how to forge high-functioning teams.[20,21]

One approach intended to address these barriers is the 4R Oncology model. 4R is Right Information and Right Care for the Right Patient at the Right Time. Featured within the 2016 NCI-ASCO Teams in Cancer Care Delivery initiative, 4R aims to facilitate systematic delivery of interdependent multidisciplinary care by improving teamwork and enabling patient self-management.[9] 4R promotes high-functioning teams by helping manage care interdependence, a key teamwork principle and a crucial contributor to team effectiveness.[34-40] 4R has been demonstrated to enhance interdependent care delivery and improve self-management in patients with early breast cancer.[41] Herein, we describe the impact of 4R on fostering high-functioning teams in breast and lung cancers to enable delivery of interdependent care along the cancer care continuum. We assess the impact along the four characteristics of high-functioning teams,[6,16] report the feasibility of the 4R intervention, and discuss implications of our results for the oncology workforce. The assessment was conducted at Kaiser Permanente Northern California (KPNC)—a large community-based integrated health system. We discuss why our results are generalizable across settings and how our approach may serve as a blueprint to institutions motivated to strengthen teamwork.

METHODS

4R Oncology Model

4R applies project management, a discipline for managing interdependent tasks by multidisciplinary teams, to coordinating timing and sequence of interdependent care. Under 4R, a care team and a patient use a Care Sequence, a personalized, structured care project plan as a roadmap throughout a patient's care trajectory. Care Sequences reflect individual care recommendations emerging from workup and/or treatment planning (MDC or individual) and include oncologic, supportive, primary, comorbidity, and social care. They are developed after diagnosis and updated as needed thereafter. A Care Sequence outlines a course of care indicated for a patient, depicts care timing, sequence, and dependencies, and specifies responsibilities for different types of care.

Importantly, Care Sequences reflect a patient-centric, versus specialty-focused view of care timing and sequencing. Clinical specialties often deliver their care on the basis of internal workflows or ad hoc referrals, and may not have the full view of how their care fits into the overall journey of an individual patient. Care Sequences weave together care events delivered by various specialties in an end-to-end chronology optimal for an individual patient, and indicate when in that chronology different specialties should deliver care to that patient.

4R Optimization Intervention

As previously described,[9,42,43] institutional adoption of the 4R Oncology model involves two steps: 4R Optimization, the intervention assessed herein, and 4R Clinical Use, evaluated previously.[41] 4R Optimization aims to create and sustain the conditions enabling delivery of independent care according to Care Sequences. It starts before 4R launch in the clinic and continues after launch. 4R Optimization includes forming a multidisciplinary team of specialties relevant to care within Care Sequences; conducting collaborative optimizations of timing and sequencing of care to facilitate delivery on the basis of Care Sequences; and establishing an ongoing process for team-based optimizations. Care Sequences serve as a basis for the team formation and structure, as well as tools for facilitating team activities and functioning.

Setting

The intervention was conducted at four KPNC medical centers. The intervention in breast cancer occurred at the San Francisco center, with collocated breast cancer services. The lung cancer intervention occurred at Oakland (location of thoracic surgery), San Francisco (location of medical oncology), and two centers in Central Valley serviced by a shared clinical group. Multidisciplinary conferences existed for patients with breast and lung cancer at all locations; multidisciplinary clinic existed only for patients with breast cancer in the San Francisco center. 4R Optimization started in July 2020 and was assessed through December 2021. 4R was launched in the clinics with patients in October 2020.

Intervention Scope and Approach

Scope-related inclusion/exclusion was based on perceived need and feasibility of optimization. The intervention focused on care related to surgery and systemic therapy. We further defined scope not by specialty, but by care domain—a set of related multidisciplinary care events and processes. Five care domains were included: surgical care; systemic therapy care; genetics and biomarkers; imaging and other assessment; and supportive care. Preliminary Care Sequences were developed for systemic therapy and surgery, with desired timing and sequence of care. Within Care Sequences, 40 opportunities were identified for optimization of care timing and sequencing. Only opportunities for interspecialty optimizations (related to care involving two or more specialties) were included. We invited 24 specialties relevant to identified optimizations to participate. Although this setting represented a multiteam system,[44,45] we considered each specialty group as one team member, including physicians, nurses, nurse navigators, and others, as deemed relevant by each group. The goal of the initiative was to enable delivery of care to patients at optimal time and sequence according to Care Sequences. Impact of optimization on care efficiency was monitored throughout the intervention.

Assessment

The intervention was assessed along the four characteristics of high-functioning teams[6,16]:

1. *Internal and external recognition as a team.* The internal recognition was reported as a proportion of invited specialties who agreed to participate, and as a structure of the resulting team, including team composition and organization. The external recognition was assessed as attainment of formal support for the team from KPNC medical group leadership.
2. *Team's commitment to an explicit shared goal* was reported as members' agreement with the goal, provision of input into Care Sequence content, agreement to responsibilities for relevant care, and participation in related optimizations.
3. *Enabling interdependent work to achieve the goal.* We report optimizations of interdependent care performed by the team, stratified by cancer type; care process (care domain and point in care continuum); methods used for optimizations; feasibility (level of effort involved in individual optimizations and whether they were completed in the assessment period); and efficiency (whether one or more steps were removed from the care process). The level of effort was calculated as a weighted scale of six metrics: number of specialties involved; number of optimization iterations; time required from a lead; whether capacity barriers had to be addressed (eg, capacity of imaging); whether optimization included establishment of an institutional practice standard; and whether Electronic Medical Report Information Technology or an entity external to KPNC was involved.
4. *Engagement in regular reflection to adapt objectives and processes.* We report the establishment of an ongoing iterative learning process to monitor timing and sequencing of care according to Care Sequences and conduct necessary care optimizations.

RESULTS

Internal and External Recognition as a Team

All 24 invited specialties joined the initiative as team members (Table 1) with agreement to assume member responsibilities, including input to relevant Care Sequence content and participation in optimizing interdependent care. Team composition changed over time—starting from 10 members and increasing to 24 during the initiative as optimization opportunities were identified. Members agreed to the team structure and organization. The team was led by medical oncology and surgery. Three members were entities outside KPNC. Members were organized into subteams, each focused on a relevant optimization, with some members joining multiple subteams. KPNC medical group leadership at regional and local levels approved the intervention and supported the team efforts.

Team's Commitment to an Explicit Shared Goal

All members agreed to the shared goal. Demonstrating commitment to the goal, members provided input to the content of preliminary Care Sequences related to timing and sequence of care. Team leads integrated input and finalized Care Sequences, resolving inconsistencies by discussion and consensus with relevant members. The following Care Sequences were finalized in breast and lung cancers each: Care Initiation, Surgery, Neoadjuvant Therapy, and Adjuvant Therapy (see example in Fig 1). Two additional ones were finalized in lung cancer—Treatment for Advanced Disease and Chemoradiation. Further commitment to the goal was demonstrated by members' participation in subteams focused on relevant optimizations (Table 1). Subteams worked virtually or asynchronously, convening meetings only when broad practice standards were discussed. More than half (54%; 13/24) of the members engaged in one to two optimizations, and 37% (9/24) in three to nine optimizations. Medical oncologists and surgeons (9%; 2/24) participated in 32 and 23 optimizations, respectively. Most members (71%) participated in optimizations within one to two domains, and 29% engaged in optimizations within three to six domains.

Enabling Interdependent Work to Achieve the Goal

The team performed 40 optimizations, summarized in Table 2 and detailed in Table 3. Initially, 23 optimizations were identified in breast cancer and 17 in lung cancer. Eleven optimizations were further determined by subteams as benefiting both cancers and were applied accordingly, resulting in 22 breast cancer optimizations, seven lung cancer optimizations, and 11 optimizations in both.

The distribution of optimizations across care domains was relatively even overall and varied by cancer type. Most breast cancer optimizations addressed surgery and systemic therapy, most lung cancer optimizations focused on genetics and biomarkers and imaging and other assessment, and optimizations in both cancers centered primarily on supportive care.

Optimizations fell into several points along the cancer care continuum: workup, preparation for treatment (initial and/or subsequent, such as adjuvant therapy), and transition between treatments.

Four methods were used to conduct optimizations (Table 2). Most breast cancer optimizations required one or two methods, while most optimizations in lung and both cancers required three or four methods. Moving up timing of care in a

TABLE 1. Team Structure and Participation in Care Optimizations by Care Domains

Team Members—Clinical Specialist Groups and Departments	No. of Optimizations in Which Team Member Participated (N = 40)	No. of Optimizations by Care Domain, in Which Team Member Participated: Genetics and Biomarkers	Imaging and Other Assessment	Surgical Care	Systemic Therapy Care	Supportive Care	Multidomain Care	No. of Care Domains in Which Team Member Participated (n = 6)
Medical oncologists[a]	32	3	4	2	8	10	5	6
Oncologic surgeons[a]	23	4	2	8	2	5	2	6
Radiologists	9	—	2	3	2	—	2	4
Pathologists	9	4	—	1	3	—	1	4
Health educators	7	—	—	3	1	3	—	3
Reconstructive surgeons	5	—	—	3	—	1	1	3
Primary care and OBGYN providers	5	—	—	—	2	2	1	3
Radiation oncologists	4	—	—	—	2	—	2	2
Social workers	3	—	—	—	—	2	1	2
Genetics	3	2	—	—	—	—	1	2
Physical therapy	3	—	—	2	1	—	—	2
Infusion center	2	—	1	1	—	—	—	2
Endocrinologists	2	—	—	—	1	—	1	2
Pulmonologists	2	—	1	1	—	—	—	2
Palliative providers	2	—	—	—	—	2	—	1
Nutritionists	2	—	—	—	—	2	—	1
Clinical trials	2	1	—	—	—	—	1	2
External community organizations[b]	2	—	—	—	—	2	—	1
External NGS laboratory[b]	2	2	—	—	—	—	—	1
Cardiologists	1	—	1	—	—	—	—	1
Infectious disease providers	1	—	—	—	1	—	—	1
DME and prostheses	1	—	—	1	—	—	—	1
Fertility preservation center	1	—	—	—	—	1	—	1
External GEP laboratory[b]	1	—	—	—	1	—	—	1
No. of specialties involved in each care domain	NA	6	6	10	11	10	11	NA

Abbreviations: DME, durable medical equipment department; GEP, gene expression profiling; NGS, next-generation sequencing; OBGYN, obstetrics and gynecology; Optimization, optimization of timing and sequence of interdependent care.
[a]Team leads.
[b]Team members external to Kaiser Permanente Northern California.

patient's care trajectory was the most common method in lung and breast cancers, while establishing standards was the most common method for optimizations applied to both cancers. Establishing scheduling priority was used in 71% of lung cancer optimizations, as they addressed genetics and biomarkers and/or imaging, where capacity is typically limited and requires prioritization of patients for timely care.

The majority of all optimizations required low or medium effort. The numbers of high-effort optimizations were similar across cancers, but proportionally more optimizations in lung (45%; 3/7) and both cancers (45%; 5/11) required high effort than those in breast cancer (18%; 4/22). Most optimizations (70%; 28/40) were completed within the assessment period, while 27% (6/22) breast cancer optimizations,

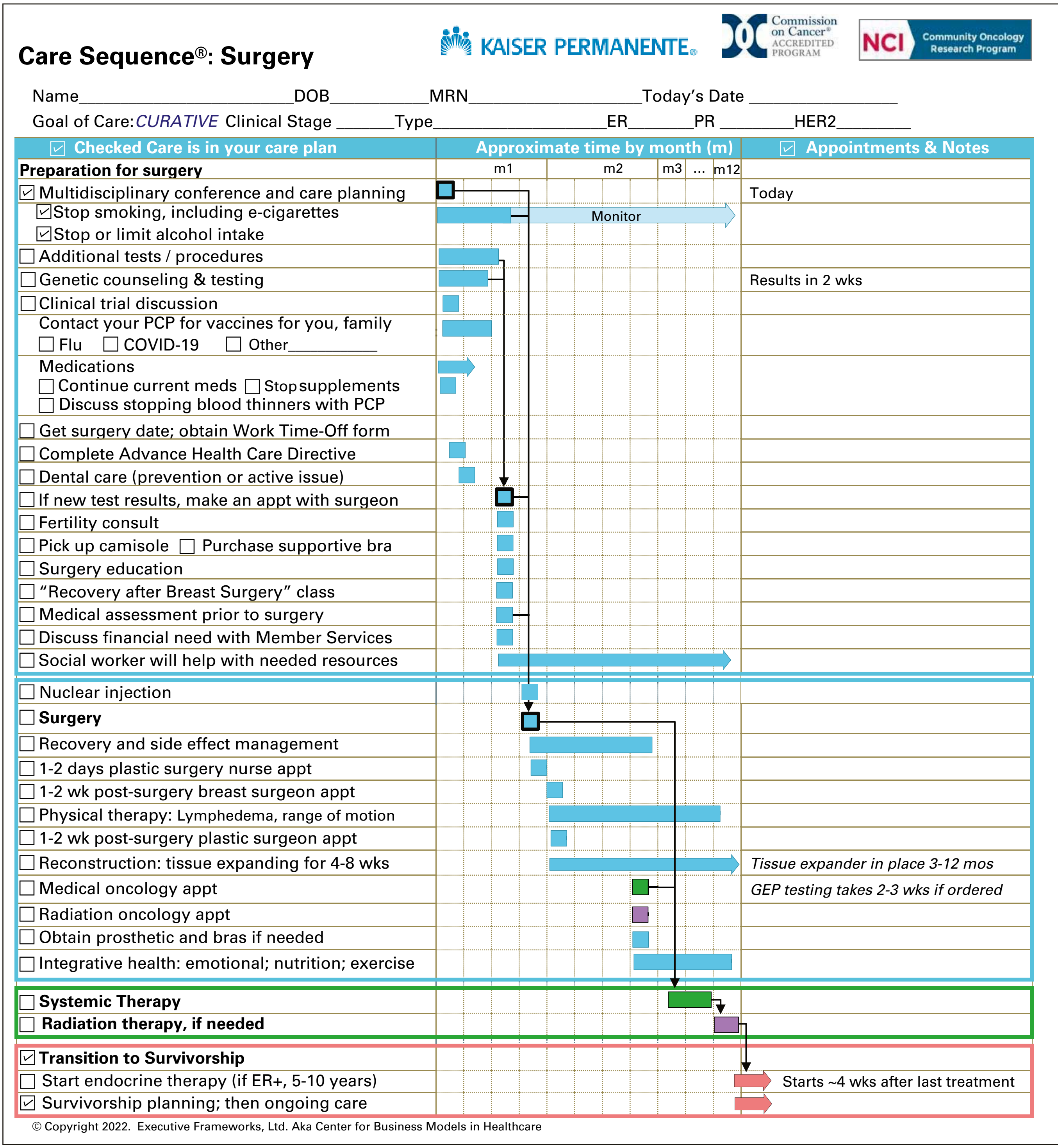

FIG 1. Care Sequence: Surgery. Care Sequences contain a preprinted list of care, which is personalized for each patient by checking boxes and making notes. This Care Sequence is intended for patients indicated for breast surgery, adjuvant systemic therapy, and radiation therapy. Systemic and radiation therapy are described in summary. Patients receive a subsequent Care Sequence specific to adjuvant systemic therapy at an appropriate point in care. Squares are shorter events, such as tests or appointments; bars are longer care processes, for example, genetic counseling and testing or postsurgical recovery. Arrows indicate care dependencies: what care events should be completed before other care starts–responsibilities/resources component is not shown. All content and configuration of the graph may be adapted by an institution to reflect local services and processes. This is an abbreviated schematic for illustration purposes, not an actual Care Sequence template. Actual Care Sequences may contain additional care. ER, estrogen receptor; GEP, gene expression profiling; HER2, human epidermal growth factor receptor 2; PCP, primary care physician; PR, progesterone receptor.

TABLE 2. Taxonomy of Timing and Sequencing Optimizations of Interdependent Care Performed by the Team

Aspect Characteristic	Optimizations by Cancer: Breast Cancer (n = 22), %	Lung Cancer (n = 7), %	Both Cancers (n = 11), %	Total Optimizations (N = 40), %
Care process				
Care domain				
Care related to surgery	32	14	—	20
Care related to systemic therapy	27	14	9	20
Genetics and biomarkers	14	29	—	13
Imaging, other assessment	9	29	—	10
Supportive care	5	14	73	25
Multidomain	14	—	18	13
Point in care continuum				
Workup	41	57	27	40
Preparation for treatment[a]	27	14	73	38
Transition between treatments	32	29	—	23
Optimization methods				
Methods used in individual optimizations[b]				
Establishing scheduling priority	14	71	36	30
Establishing practice standards	59	71	100	73
Moving up timing	77	86	82	80
Updating and/or formalizing workflow	68	71	82	73
No. of methods used per optimization				
1	14	—	—	8
2	59	43	36	50
3	23	14	27	23
4	5	43	36	20
Feasibility of optimization				
Level of effort[c]				
Low	55	43	45	50
Medium	27	14	9	20
High	18	43	45	30
Completion status[d]				
Completed	73	43	82	70
Ongoing	27	57	18	30
Efficiency				
Optimization reduced number of steps in care				
Yes	77	100	64	78
No	23	—	36	22

[a]Includes preparation for initial treatment and/or subsequent treatment, for example, adjuvant therapy.
[b]Does not amount to 100%, as multiple methods could be used per optimization.
[c]A scale ranging from 1 to 10, further categorized into low (1-3.3), medium (3.4-5), or high (5.1-10) level of effort.
[d]Reflected as of the end of assessment period.

18% (2/11) of optimizations in both cancers, and 57% (4/7) of lung cancer optimizations required further optimization cycles. These were identified later in the assessment period, for example, implementing consistent biomarker testing after lung surgery; were related to a capacity constraint (eg, operating room capacity); or required a broad institutional consensus, for example, implementing pretreatment older adult assessment and referrals (data not shown).

TABLE 3. Timing and Sequencing Optimizations, How it Is Achieved, Number of Specialties, and Effort Score

		Optimization Methods					
Cancer Type, Point in Care Continuum, and Care Domain	Timing/Sequencing Optimization	Established Scheduling Priority	Established Practice Standards	Moved-Up Timing	Updated or New Workflow	No. of Specialties	Level of Effort[a]
Breast cancer							
Workup							
Medical oncology	Move up pretreatment pregnancy test; establish workup process if positive		✓	✓	✓	4	Low
	Move up bone density scan for ER+ postmenopausal women to pretreatment to inform multidisciplinary treatment decisions		✓	✓	✓	7	Med
Genetics and biomarkers	Move up genetics consult time to pre-MDC to ensure receipt of results before surgical decision	✓		✓		5	Low
	Streamline genetic result delivery and surgical decision making for patients with positive results		✓		✓	2	Low
	Move up receipt of ER, PR, and HER2 results to ensure availability for MDC decisions		✓	✓		3	Low
Imaging and other assessment	Move up imaging to receive results for MDC decisions		✓	✓		3	Low
	Move up and streamline cardiac assessment before neoadjuvant therapy	✓	✓	✓	✓	4	High
Multidomain	Define clinical stage on the basis of workup data before MDC			✓		3	Low
	Ensure availability of tumor board recommendations before MDC			✓	✓	9	High
Preparation for treatment[b]							
Surgery	Move the timing of teaching for postsurgery self-care close to presurgery to improve memorability and patient preparation			✓		3	Low
	Implement presurgery lymphedema assessment and referral to prehab		✓	✓		5	Med
	Shorten time from MDC to scheduled surgery	✓	✓			2	High
Medical oncology	Move up timing and streamline process for obtaining cold caps in time for neoadjuvant therapy start			✓	✓	3	Low
	Streamline, formalize IUD removal for ER+ patients before treatment		✓	✓	✓	3	Low
Supportive care	Integrate community support organizations pretreatment to proactively address needs (cold caps, financial assistance, transportation, etc)			✓	✓	4	Med
Transition between treatments							
Surgery	Streamline postsurgery drain removal process		✓		✓	2	Low
	Streamline process for patients to obtain mastectomy prostheses				✓	6	Low

(continued on following page)

TABLE 3. Timing and Sequencing Optimizations, How it Is Achieved, Number of Specialties, and Effort Score (continued)

Cancer Type, Point in Care Continuum, and Care Domain	Timing/Sequencing Optimization	Optimization Methods: Established Scheduling Priority	Established Practice Standards	Moved-Up Timing	Updated or New Workflow	No. of Specialties	Level of Effort[a]
	Streamline reconstructive visits and care after surgery			✓	✓	4	Med
	Optimize timing and sequence of surgical visits during and after neoadjuvant therapy to shorten transition to surgery			✓	✓	7	Med
Medical oncology	Streamline transition from radiation to endocrine therapy		✓		✓	4	Med
	Streamline GEP testing, improve turnaround time for GEP results, and align oncology visit to optimize transition to adjuvant therapy		✓	✓	✓	5	High
Multidomain	Streamline the sequence of visits in transition from surgery to next treatment—systemic therapy or radiation		✓	✓	✓	8	Med
Lung cancer							
Workup							
Surgery	Streamline transition from pulmonary screening to surgery	✓	✓	✓	✓	5	High
Genetics and biomarkers	Improve turnaround time of molecular profiling before treatment decision	✓	✓	✓	✓	7	High
Imaging and other assessment	Move up timing of PET to inform biomarker testing, further workup	✓		✓		3	Low
	Move up timing of PFT to inform treatment decisions	✓		✓		4	Low
Supportive care	Move up palliative care consult to pretreatment in advanced disease	✓	✓	✓	✓	3	Low
Transition between treatments							
Medical oncology	Streamline transition from surgery to adjuvant therapy		✓		✓	3	Med
Genetics and biomarkers	Implement consistent biomarker testing after lung surgery during transition to medical oncology		✓	✓	✓	6	High
Both cancers							
Workup							
Medical oncology	Establish screening for HIV before cancer treatment		✓		✓	4	Low
Multidomain	Develop a Care Sequence and systematic process to screen patients for clinical trial eligibility		✓		✓	2	High
Supportive care	Implement pretreatment older adult assessment and referrals		✓	✓	✓	4	High
Preparation for treatment							
Supportive care	Improve consistency of pretreatment referral to guideline-based vaccinations		✓	✓	✓	4	Low
	Implement recommendations for alcohol use pretreatment		✓	✓		4	Low

(continued on following page)

TABLE 3. Timing and Sequencing Optimizations, How it Is Achieved, Number of Specialties, and Effort Score (continued)

Cancer Type, Point in Care Continuum, and Care Domain	Timing/Sequencing Optimization	Optimization Methods: Established Scheduling Priority	Established Practice Standards	Moved-Up Timing	Updated or New Workflow	No. of Specialties	Level of Effort[a]
	Implement recommendations for pretreatment dental care		✓	✓		4	Low
	Streamline and standardize early fertility referral and navigation process	✓	✓	✓	✓	3	Med
	Move up timing of social worker's first contact with patients to before first physician consult	✓	✓	✓	✓	4	High
	Move up nutrition referral to pretreatment	✓	✓	✓	✓	4	High
	Move to pretreatment and streamline completion of advance care directive	✓	✓	✓	✓	5	High
Multidomain	Establish pretreatment identification of comorbidities; referral to PCP/specialists for management		✓	✓	✓	3	Low

Abbreviations: ER, estrogen receptor; GEP, gene expression profiling; HER2, human epidermal growth factor receptor 2; IUD, intrauterine device; MDC, multidisciplinary clinic; Optimization, optimization of timing and sequencing interdependent care; PCP, primary care provider; PET, positron emission tomography scan; PFT, pulmonary function test; PR, progesterone receptor.

[a]A scale ranging from 1 to 10, further categorized into low (1-3.3), medium (3.4-5), or high (5.1-10) level of effort.

[b]Includes preparation for initial treatment and/or subsequent treatment, for example, adjuvant therapy.

Most optimizations in breast and both cancers (77% and 64%, respectively), and all lung cancer optimizations resulted in improved process efficiency.

Regular Reflection by the Team to Adapt Objectives and Processes

Following the dynamic sustainability framework,[46] the team established a learning, problem-solving, and adaptation process, making the effort of fostering a high-functioning team dynamic and ongoing. This entailed monitoring of new opportunities to optimize care timing and sequencing, involving new specialties and forming new subteams. After the 4R launch in the clinics, a feedback loop from team members was established, which enabled continuous identification of new optimization needs. Care Sequences were adjusted to reflect the results of optimizations. This adaptive approach allowed the team to reframe 11 optimizations to apply to both breast and lung cancers, thus expanding their impact, as described above. Going forward, monitoring for new opportunities will be supported by a data-driven dashboard.

DISCUSSION

We assessed how a 4R Optimization intervention, a component of the 4R Oncology model, affected team functioning in breast and lung cancers at four locations of a community-based integrated health system. 4R facilitated development of a high-functioning team along the four characteristics of such teams. We formed an internally and externally recognized team of 24 specialties committed to a shared goal of enabling interdependent care delivery at the optimal time and sequence from a patient-centric viewpoint. The team enabled interdependent work with 40 optimizations of care timing and sequencing and established a learning process for ongoing teamwork adaptation. Optimizations addressed six care domains at several points along the care continuum. Half of the optimizations entailed low effort, while 30% required a high level of effort. Most optimizations resulted in improved process efficiency.

Our results suggest that 4R represents a promising and practical approach to forging high-functioning teams, which may help address challenges of multidisciplinary teamwork, dovetail with other teamwork models, and contribute to viability of the oncology workforce. Below, we discuss these implications, highlight opportunities for further model enhancement, and suggest how our results can serve as a blueprint for other institutions.

Specialty-based, siloed approach to care is a recognized barrier to multidisciplinary teamwork.[1,6,8,33] Using patient-centered Care Sequences to orient teamwork, 4R allowed us to assemble a team of 24 diverse specialties who changed many of their silo-focused practice patterns (such as scheduling and consult workflows) to align 40 types of interdependent care from a patient-centric view of care timing and sequence. This suggests that 4R may help develop important team competencies, such as providing patient-centered care.[47]

Our results indicate that 4R helps address another challenge—organizing teamwork longitudinally, along the patient care continuum.[14,19,20] 4R helped us improve teamwork at several points in the care continuum—workup, preparation for initial and subsequent treatments, and transitions in care. Other team-based care models, such as MDC or Oncology Medical Home, do not address the challenge of longitudinal teamwork: MDCs focus on point-in-time treatment decision making, and Oncology Medical Home provides the overall structure and metrics for team-based practice but does not provide specific tools for team functioning.[19-22,48] These models address needs outside of the 4R scope, making them synergistic. Integrating them with 4R may improve a broad scope of teamwork and should be evaluated.

Perhaps the greatest obstacle to teamwork is concern about the feasibility of establishing and sustaining high-functioning teams.[22,33,49] We showed that 4R can facilitate an ambitious scope of teamwork in an attainable way. The team performed 40 optimizations of interdependent care in two cancers in a relatively short time. Half of the optimizations required low effort, indicating that not all teamwork is arduous. However, we were able to also carry out optimizations requiring a high level of effort (30%; 12/40). Strategies enabling feasibility included straightforward optimization methods; structuring teamwork in subteams; using virtual and asynchronous communication; and identifying synergies between two cancers to expand the impact. Participation burden was low for most specialties, but medical oncology and surgery had higher involvement as team leads to make the initiative successful. Institutions aspiring to conduct similar optimizations should plan accordingly.

Our assessment showed that 4R enabled efficiency of care delivery in 78% of conducted optimizations, suggesting that it may support feasibility of both establishing and sustaining teamwork. However, we did not evaluate direct impact of 4R on clinician time required to deliver the optimized care, which must be done in the future to address the inefficiency concern. Broadly, on the basis of this and previous 4R evaluations, we believe that 4R can contribute to sustainability of the oncology workforce by improving team functioning, reducing the burden of ad hoc coordination of interdependent care, and streamlining care delivery. Previous studies demonstrated that using 4R in the clinic increased clinicians' satisfaction and ability to manage multidisciplinary care,[50] as well as improved patient self-management.[41] These factors also support workforce viability and reduce burden. Future studies should thoroughly examine how the ongoing use of the overall 4R Oncology model affects oncology workforce.

This intervention was conducted at an integrated health system. However, our results are generalizable to other settings, such as nonintegrated systems, academic institutions, and accountable care organizations. The optimizations performed at KPNC addressed obstacles to teamwork common to other settings, such as siloed practices and challenges with interdependent care.[4,5,8,9,42] 4R Optimization was shown to be feasible, practical, and thus repeatable. Our intervention may serve as a blueprint for other institutions motivated to create high-functioning teams and optimize care delivery. The taxonomy of our results may help institutions frame intervention scope, including cancer types and care domains, identify needed optimizations, prioritize them on the basis of required effort, form a multidisciplinary team, and use relevant optimization methods to collaboratively conduct optimizations.

Our assessment had limitations. The intervention did not include important care domains, such as radiation therapy and survivorship, which will be addressed in future efforts. Our assessment did not evaluate impact on actual care at the patient level. Such evaluation is underway, and data from three optimizations indicate positive impact, including shortening turnaround time for molecular profiling before treatment decision in lung cancer,[51] improving completion of advance care directives in breast cancer,[52] and implementing pretreatment older adult assessment and referrals.[53,54] We have not assessed intervention impact on clinical outcomes and hope to do so in the future.

In conclusion, we assessed how 4R Optimization, a component of the 4R Oncology model, affected team functioning in a community-based integrated health system. 4R fostered a large high-functioning team and enabled 40 optimizations of interdependent care in two cancers along the cancer care continuum in a feasible and practical way. Our results suggest that 4R may be an effective approach to teamwork and could contribute to viability of the oncology workforce. Our intervention and taxonomy of the results may serve as a blueprint for other institutions motivated to strengthen teamwork.

AFFILIATIONS

[1]Department of Hematology Oncology, The Permanente Medical Group, San Francisco, CA
[2]Division of Research, Kaiser Permanente Northern California, Oakland, CA
[3]Center for Business Models in Healthcare, Glencoe, IL
[4]Feinberg School of Medicine, Northwestern University, Chicago, IL
[5]Department of Hematology Oncology, The Permanente Medical Group, Modesto, CA
[6]Department of Hematology Oncology, The Permanente Medical Group, Oakland, CA
[7]Genentech, Inc, South San Francisco, CA

CORRESPONDING AUTHOR

Raymond Liu, MD, Department of Hematology Oncology, The Permanente Medical Group, 2238 Geary Blvd 8SE, San Francisco, CA 94115; Twitter: @Rayliukpsfo; e-mail: raymond.liu@kp.org.

PRIOR PRESENTATION

The data described in the manuscript have not been previously presented or published.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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AUTHOR CONTRIBUTIONS

Conception and design: Christine B. Weldon, Nancy Gordon, Thea Abbe, Jed Katzel, Chun Ng, Megumi Tomita, Stephanie Ossowski, Sharon Likely Sprague, Arliene Ravelo, Elaine Yu, Julia R. Trosman
Financial support: Arliene Ravelo, Elaine Yu
Administrative support: Nancy Gordon
Provision of study materials or patients: Thea Abbe, Marti Hennings, Henie James, Megumi Tomita, Sharon Likely Sprague, Anna Dowling
Collection and assembly of data: Christine B. Weldon, Nancy Gordon, Thea Abbe, Marti Hennings, Henie James, Chun Ng, Megumi Tomita, Stephanie Ossowski, Sharon Likely Sprague, Anna Dowling, Kimberly Beringer, Arliene Ravelo, Elaine Yu, Julia R. Trosman
Data analysis and interpretation: Christine B. Weldon, Nancy Gordon, Lori C. Sakoda, Julia R. Trosman
Manuscript writing: All authors
Final approval of manuscript: All authors
Accountable for all aspects of the work: All authors

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Fostering a High-Functioning Team in Cancer Care Using the 4R Oncology Model: Assessment in a Large Health System and a Blueprint for Other Institutions

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Lori C. Sakoda
Stock and Other Ownership Interests: Johnson & Johnson
Research Funding: AstraZeneca (Inst)

Julia R. Trosman
Consulting or Advisory Role: Genentech (Inst)
Research Funding: The Merck Foundation (Inst), Pfizer (Inst), National Comprehensive Cancer Network (Inst), Genentech (Inst)

Christine B. Weldon
Consulting or Advisory Role: Genentech (Inst)
Speakers' Bureau: Genentech
Research Funding: National Comprehensive Cancer Network (Inst), Pfizer (Inst), The Merck Foundation (Inst), Genentech (Inst), Lilly (Inst)
Travel, Accommodations, Expenses: Genentech (Inst)

Chun Ng
Employment: The Permanente Medical Group NorCal

Elaine Yu
Employment: Genentech/Roche
Stock and Other Ownership Interests: Roche
Research Funding: Genentech/Roche (Inst)
Patents, Royalties, Other Intellectual Property: Listed as inventor on a pending patent application for Display screen with icon or graphical user interface
Travel, Accommodations, Expenses: Genentech/Roche

Arliene Ravelo
Employment: Genentech/Roche
Stock and Other Ownership Interests: Roche

Raymond Liu
Research Funding: Genentech

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