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Multilevel Influences on Patient-Oncologist Communication about Genomic Test Results: Oncologist Perspectives

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Abstract

Thousands of women with early-stage breast cancer receive gene-expression profile (GEP) tests to guide chemotherapy decisions. However, many patients report a poor understanding of how their test results inform treatment decision making. We applied models of patient-centered communication and informed decision making to assess which variables oncologists' perceive as most influential to effective communication with their patients about GEP results and intervention modalities and approaches that could support more effective conversations about treatment decisions in routine clinical care. Medical oncologists who were part of a practice group in the Mid-Atlantic US completed an online, cross-sectional survey in 2016. These data were merged with de-identified electronic patient and practice data. Of the 83 oncologists contacted, 29 completed the survey (35% response rate, representing 52% of the test-eligible patients in the practice network.). There were no significant differences between survey responders and non-responders. Oncologists reported patient-related variables as most influential, including performance status [65.5%], pre-testing preferences for chemotherapy [55.2%], and comprehension of complex test results [55.2%]). Oncologists endorsed their experience with testing [58.6%] and their own confidence in using the test results [48.3%]) as influential as well. They indicated that a clinical decision support tool incorporating patient comorbidities, age, and potential benefits from chemotherapy would support their own practice and that they could share these results and other means of communication support using print materials (79.3%) with their patients in clinic (72.4%). These preferred intervention characteristics could be integrated into routine care, ultimately facilitating more effective communication about genomic testing (such as GEP) and its role in treatment selection.

Keywords

breast cancer; genomics; oncology

Introduction

Patients with estrogen-receptor positive (ER+), human epidermal growth factor receptor (HER2) negative early-stage disease represent more than half of all newly-diagnosed breast cancer patients in the US (Noone et al., 2017). Clinical guidelines for these women include the use of gene expression profiling (GEP) tests, such as the *Oncotype DX*[®] test, to assist in chemotherapy treatment decision-making (Harris et al., 2016; National Comprehensive Cancer Network, 2018). This test examines 21 genes within a patient's tumor to provide information about how likely a cancer is to recur and how beneficial the receipt of chemotherapy would be to reducing this risk. The primary benefits of GEP testing are identification of patients with a low risk of recurrence, when chemotherapy can be safely omitted, and determining the subgroup of high risk patients for whom chemotherapy is clearly necessary. Adoption of GEP testing in routine clinical practice has been significant, with the likelihood of being tested influenced by disease-related factors, such as comorbidities, disease pathology and age, and social factors such as marital status and out-of-pocket costs (Dinan et al., 2015; Hassett et al., 2012; O'Neill et al., 2015). For example, if a patient could not safely tolerate chemotherapy or holds strong preferences for or against receiving chemotherapy, the test might not be ordered.

Despite wide adoption of GEP testing into routine clinical care, effective communication of test results and their therapeutic implications to patients and family members remains a barrier to the recognition of the full potential benefits of GEP testing. For example, many tested patients report a poor understanding of how their test results inform treatment decisions, take a passive role in treatment decisions, or receive treatment that is not consistent with their preferences and/or test results (Evans et al., 2016; Potosky et al., 2015; Richman, Tzeng, Carey, Retel, & Brewer, 2011; Sulayman et al., 2012). In 2016, the American Society of Clinical Oncology (ASCO) issued guidelines regarding the use of biomarkers, including *Oncotype Dx* and other tumor profiling tests, to guide decisions about adjuvant therapy in this population (Harris et al., 2016). ASCO called specific attention to the need to educate patients, family members and caregivers about the results of testing and how this information supports treatment plans. The guidelines emphasize the need to communicate this information clearly and with an appreciation of the emotional distress faced by patients and families that could interfere with their ability to understand the information conveyed. They offer recommendations regarding the content of these discussions, including explaining the importance of determining the biologic characteristics of the tumor and various pathology results, how these results are interpreted, and how the results inform treatment recommendations. Unfortunately, while specific acknowledgement of the importance of communication about these key details is a significant step forward, the process of this communication and how it can support treatment decision making was not addressed in these guidelines.

Models of patient-centered communication and informed decision making (Braddock, Edwards, Hasenberg, Laidley, & Levinson, 1999; Marteau, Dormandy, & Michie, 2001; McCormack et al., 2011; Street, Makoul, Arora, & Epstein, 2009) suggest that the clinical encounter should be a source of information exchange and emotional support that allows informed treatment decision making to occur. A patient must have an adequate

understanding of her disease and its treatments in order to select a treatment that aligns with her preferences for care. Effective communication can influence these proximal patient outcomes as well as satisfaction and involvement in care decisions and potentially longer-term outcomes of treatment adherence and quality of life. However, effective communication can be limited due to a physician's belief in the usefulness or effectiveness of a test, his/her expertise in a certain area of practice or approach to patient communication. Communication also is influenced by the patient's ability or interest in participating in care decisions, the impact of important others, and aspects of the clinical environment itself (Brandes, Linn, Smit, & van Weert, 2015; Fagerlind, Kettis, Glimelius, & Ring, 2013; Visser, Deliens, & Houttekier, 2014). Identifying variables most influential to patient-provider communication in this setting is key to determining how to support patient outcomes.

Several clinical decision support tools have been developed to support the care of women diagnosed with breast cancer over the past two decades, including Adjuvant! Online and PREDICT (Clinical Care Options, 2018; National Health Service (NHS), 2017; Shachar & Muss, 2016). These oncologist-facing tools utilize patient and disease characteristics, such as age, tumor size, grade and hormonal status, and proposed treatments to yield personalized, numerical mortality estimates. While neither of these tools currently integrates *Oncotype DX* or other GEP test results, the manufacturers of the *Oncotype DX* test provide a personalized test report to patients that graphically and numerically describes risk of recurrence and the potential benefit of chemotherapy. While this genomic-driven test report is designed to be shared with patients and is used frequently in practice (Spellman et al., 2013), it is not intended to specifically support either patient-provider communication or informed decision making. Prior studies suggest that these tools in this setting can influence patients' treatment decisions (Peele, Siminoff, Xu, & Ravdin, 2005; Siminoff, Gordon, Silverman, Budd, & Ravdin, 2006), though many patients report difficulty with risk comprehension (Brewer, Richman, DeFrank, Reyna, & Carey, 2012). Indeed, patients' level of numeracy is associated with the accuracy of their estimates of cancer-free survival (Lipkus, Peters, Kimmick, Liotcheva, & Marcom, 2010).

Given the opportunity to build upon the recent ASCO guidelines, we applied models of patient-centered communication and informed decision making (Braddock et al., 1999; Epstein & Street, 2007; Marteau et al., 2001; McCormack et al., 2011; Street et al., 2009) to assess which variables oncologists' perceive as most influential to effective communication with their patients about GEP results and intervention modalities and approaches that could support more effective conversations about treatment decisions in routine clinical care.

Methods

The protocol was reviewed and approved by the Institutional Review Boards of Georgetown University and Hackensack University Medical Center.

Setting and Population

The target population was physician members of a large regional oncology multi-site practice in New Jersey (N=94). Eligible oncologists (n=83) had treated a minimum of one

patient with breast cancer in the past year. Of the 83 oncologists who were contacted, 29 completed the survey (35% response rate; Figure 1).

Practice members were sent a secure email survey link between April and December 2016 to complete informed consent and survey measures. Oncologists had four weeks to complete the survey and received three email prompts to do so (one each week after the survey was sent). For participants who did not complete the survey in that time frame, a final email prompt was sent, followed by a phone follow-up with the option to complete the survey via phone or in-person with a member of study staff. Upon survey completion, participants received a thank you card and a \$50 gift card.

Measures

Data in the current analysis consist of de-identified clinical data from the years 2013–2015 (available on 83 eligible oncologists and 2,027 patients) and self-report survey data (for 29 responders and their 1,054 patients).

Clinical data.—De-identified patient data were used to calculate the following variables for each oncologist: percent of test-eligible patients tested, the median age of test-eligible patients, and the percent of test-eligible patients who received chemotherapy. Oncologist age, gender, race, and practice size were obtained through the Cota database. These data allowed for comparison of survey responders and non-responders on key sociodemographic and practice-level variables. Aggregated de-identified information about the oncologists and patients were obtained via the Cota Inc. database in use throughout the oncology practice sites.

Self-report survey data.—We developed a survey instrument, adapting our prior physician surveys in the areas of germline genomic testing and cancer screening (Davis, Haisfield, Dorfman, Krist, & Taylor, 2011; O'Neill et al., 2009; O'Neill et al., 2010) by applying the literature on the use of GEP testing for breast cancer (Brewer et al., 2012; Dinan et al., 2015; Hassett et al., 2012; O'Neill et al., 2015; Spellman et al., 2013; Sulayman et al., 2012).

Variables that influence communication.—Oncologists indicated how frequently patient, practice, and oncologist-related factors influenced their discussion of GEP test results with their patients with breast cancer (1 = *Never influences* to 5 = *Almost always influences*). Scores of 4 or 5 were considered influential. Patient factors addressed variables related to the patient's health, such as her performance status (defined as the status of symptoms and functions with respect to ambulatory status and need for care), her prior knowledge or the oncologist's perception of her ability to understand complex test results, as well as other factors that could enhance or hinder communication (language, influence of family of friends, pre-testing chemotherapy preferences). Practice variables included lack of time, the practice policies of their clinic, lack of reimbursement, and additional aspects of the patient's care plan. Oncologist variables included their own confidence and experience in using tests and their perceptions of the clinical utility of test results (results do not inform clinical impression or are too complex to apply to practice).

Intervention modalities and approaches.: Questions also queried intervention approaches across three domains: the timing of patient education and support (prior to, during or after the appointment; with the oncologist or with a member of the clinical support staff), the format that this support should take (print vs. online), and the patient data that they would find useful to have integrated into an online tool to support their clinical practice using these test results. Oncologists indicated their endorsement of each of these separately on a 1 = *Definitely would not assist* to 5 = *Definitely would assist* scale. Oncologists were noted to endorse an item if they responded that it would assist (4) or definitely assist (5) them, endorsing each item independently.

Data Analysis.—We compared the characteristics of survey respondents to non-respondents using Fisher's exact test and t-test statistics using SAS 9.4. We then examined the overall endorsement of variables related to communication and preferred tool characteristics, and how these responses varied by patient sociodemographic and clinical factors and physician practice variables. Continuous variables (oncologist age, annual volume in 2013–2015 of patients with newly-diagnosed breast cancer, annual volume of Oncotype DX tests ordered among test-eligible patients, overall rate of chemotherapy among test-eligible patients) were dichotomized at their median.

Results

Oncologists in our target population were, on average, 52 years old (range 32–72 years), 72% male and primarily (80%) White (Table 1). Survey responders did not differ from non-responders on demographic or practice-related variables. The responders treated the majority of test-eligible breast cancer patients (52%) in the practice network.

Considering groups of patient-, practice-, and oncologist-related variables that influence effective communication regarding GEP testing, oncologists endorsed patient-related variables most frequently, followed by oncologist- and practice-related variables (Table 2). Considering the top five most influential variables, three were patient-related: performance status (65.5%), pre-testing preferences for chemotherapy (55.2%), and that test results are too complex for patients to understand (55.2%). The other two most-commonly endorsed variables were oncologist-related, specifically their experience with testing (58.6%) and confidence in using the test results (48.3%). The influence of patients' family and friends in the treatment decision-making process (44.8%) and the oncologist's belief that the tests do not add to their clinical impression (44.8%) were also endorsed by almost half of participants. Twenty-eight percent reported that their practice's policies or norms regarding testing were influential, with other practice-related variables endorsed less frequently.

Examining the top five most influential variables by oncologist characteristics (age, gender, and practice patterns), endorsement of performance status was relatively similar across all oncologist subgroups. A noted exception was that those who worked in high volume clinics and those who were more likely to prescribe chemotherapy endorsed this variable more frequently. A patient's pretesting preferences were noted as influential by these same groups, as well as by younger vs. older oncologists. Younger oncologists and those

practicing in low volume clinics also endorsed the complexity of the test results more frequently than their relevant counterparts.

Regarding variables related to the oncologists themselves, oncologists who more likely to prescribe chemotherapy noted their personal experience and confidence with genomic testing as more influential than their counterparts. Lack of experience with GEP testing was more frequently endorsed by older vs. younger oncologists, while female vs. male oncologists expressed less confidence in their use of testing.

Oncologists' preferred intervention characteristics are presented in Table 3. Regarding the timing of an intervention, they preferred to use materials with the patients in clinic (72.4%), rather than have through another member of their staff (55.2%). This preference for communication within the clinical encounter also was greater than having patients view information on their own before (44.8%) or after (65.5%) the appointment. Most oncologists preferred using print-based education materials in a format that they can share with patients during the appointment (79.3%) rather than a web tool (62.1%).

Regarding tools that would support their own integration of test results into clinical decision making, 86% of the sample endorsed a tool that would incorporate patient comorbidities in a tool to help communicate treatment recommendations. There also was strong endorsement for a tool that would incorporate additional patient characteristics, such as their risk of recurrence from GEP results, and the potential risk reduction from systemic therapy (82.8%) and patient age (75.9%), given GEP results.

Discussion

Models of patient-centered communication and informed decision making (Braddock et al., 1999; Epstein & Street, 2007; Marteau et al., 2001; McCormack et al., 2011; Street et al., 2009) acknowledge that a patient must have an adequate understanding of her disease and its treatments in order to participate in the selection of a treatment that aligns with her preferences for care. These preferences can be influenced not only by the information conveyed by clinicians, but also a patient's physical and emotional symptoms, as well as the influence of close others (Epstein & Street, 2007).

In this preliminary study, oncologists' endorsement of the influence of patient- and oncologist-level variables, rather than related to broader practice issues such as time or reimbursement, reflect multiple levels of influence on the communication process. While oncologists noted that the patient's performance status was most influential, perhaps due to its impact on testing choice and treatment options (Kimmick et al., 2014; Wu et al., 2015), as well as the challenge that some symptoms present in the ability of the patient to effectively communicate in the treatment decision-making process (Yennurajalingam et al., 2018), they also noted that the patients' treatment preferences and inability to understand complex genomic test results were important.

The most commonly-noted oncologist-related variables included their experience with GEP testing and their confidence in using genomic test results. These results mirror findings on prior surveys regarding physicians' confidence regarding the utilization of germline genomic

testing that provides information about the risk that patients and their families have regarding future disease risk (Freedman et al., 2003) and the use of tumor molecular testing to guide treatment planning (Gray, Hicks-Courant, Cronin, Rollins, & Weeks, 2014; Johnson et al., 2017). These prior studies underscore practicing physicians' self-ratings of low confidence in their genomics-related knowledge. While perceived need for additional training deserves remedy for its own sake, it also has implications for patient care. Several studies have found that those who were confident in their skills related to the interpretation and utilization of genomic testing were more likely to use testing in their practice and to discuss genomic testing results as a part of their clinical care (Gray et al., 2014; Johnson et al., 2017).

In the context of Oncotype DX testing, limiting the use of testing due to provider self-efficacy could limit the opportunity of patients to receive optimal care suggested by clinical guidelines. Further, if a genomic test is used to inform treatment planning, but not discussed with the patient, it could limit the ability of a patient to make an informed treatment decision. These barriers could be remedied through continuing education and/or a well-designed practice tool that would provide practice supports. These supports could include brief explanations of the test results and how these influence a patient's risk for recurrence, and the clinical implications of the GEP results regarding potential benefits of chemotherapy versus hormonal therapy. Test-eligible patients represent more than half of all newly-diagnosed breast cancer patients in the US (Noone et al., 2017) and testing is integrated into numerous clinical guidelines (Harris et al., 2016; National Comprehensive Cancer Network, 2018). Therefore, supporting oncologist self-efficacy in the integration of testing in routine care has the potential to impact many patients each year.

In regard to tool characteristics which might facilitate more effective communication, the majority of oncologists preferred a physician-facing web-based tool that incorporated patient characteristics, such as age and comorbidities, into a treatment recommendation algorithm along with the GEP results. This preference perhaps underscores the need for practice support noted above. In contrast to the modality they prefer for their own education and treatment decision support, oncologists did not strongly endorse a web-based tool for communication with their patients. Oncologists in this study favored print-based patient education materials that they could share directly with their patients in the clinic. Given variables seen to impact communication in our study and the high literacy demands of existing tools (M=12.1 grade) (Brewer et al., 2012; Cortez, Milbrandt, Kaphingst, James, & Colditz, 2015; Lipkus et al., 2010), intervention modalities that support patient comprehension, value clarification and perceived risk accuracy are needed (Brewer et al., 2009; Lea, Kaphingst, Bowen, Lipkus, & Hadley, 2011; Reyna, Nelson, Han, & Dieckmann, 2009). Additional novel techniques that could be useful in this context include the use of metaphor for communicating about molecular tumor testing and targeted treatments (Pinheiro et al., 2017). Metaphors allow lay terminology to be used to explain complex concepts related to genomic risk, testing and treatments. These methods could be combined with methods of patient activation, such as a question prompt list (Clayton et al., 2003). Such an intervention also could encourage effective conversations between oncologists and patients that promote alignment of patients' treatment preferences and oncologists' clinical recommendations (Street, 2013). A print intervention also would allow for continued

research and reflection following their appointment and the consultation of family and friends.

Study limitations included small sample size, low response rate, the limited geographical region (primarily urban and suburban) and similar practice settings. This would have led to the lack of endorsement of practice-related variables as influential. However, a strength of this study was the access to linked anonymized clinical data. This allows us to compare our respondents and non-respondents on several key variables, demonstrating that our participants were a representative sample of oncologists in this private practice, as well as to note how communication might vary by practice characteristics, such as an oncologists' likelihood to prescribe chemotherapy or the overall volume of their practice. Of note, our responders treated the majority of test-eligible breast cancer patients (52%) in the database.

Overall, our results suggest several ways in which oncologists and patients influence communication and decision support using GEP testing in routine care, as well as the preferred modalities through which additional support should to be delivered. Our finding should be replicated in larger samples and diverse practice settings. Meanwhile, we hope that these data, which confirm gaps in effective communication and enumerate physician preferences for solutions, will begin to inform future development and testing of novel communication aids required in this evolving aspect of clinical cancer care.

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Figure 1. Oncologist recruitment and enrollment and corresponding data of test-eligible patients treated from 2013–2015

Table 1.

Sociodemographic and clinical variables: Responders vs. non-responders

	All Participants (N=83)		Responder (N=29)		Non-responder (N=54)		p-value
	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)	
Physician Age		51.8 (10.3)		51.3 (10.2)		52.0 (10.4)	0.784
Male Gender (% male)	60 (72.3)		19 (65.5)		41 (75.9)		0.312
Physician Race							0.373
African American	1 (1.2)		0 (0.0)		1 (1.9)		
Asian American	15 (18.1)		3 (10.3)		12 (22.2)		
Other	1 (1.2)		0 (0.0)		1 (1.9)		
White	66 (79.5)		26 (89.7)		40 (74.1)		
Number of oncologists at practice (median-split)							0.085
<7 (Smaller practice)	38 (45.8)		17 (58.6)		21 (38.9)		
7 (Larger practice)	45 (54.2)		12 (41.4)		33 (61.1)		
Number of Test-Eligible (median-split)							0.284
0–8 (Low volume)	41 (49.4)		12 (41.4)		29 (53.7)		
9+ (High volume)	42 (50.6)		17 (58.6)		25 (46.3)		
Percent of Patients with Oncotype tests (median-split)							0.441
< 66.7% (Low test)	41 (49.4)		16 (55.2)		25 (46.3)		
>= 66.7% (High test)	42 (50.6)		13 (44.8)		29 (53.7)		
Percent of Patients with Chemotherapy (median-split)							0.991
< 13.7% (Low chemo)	43 (51.8)		15 (51.7)		28 (51.9)		
>= 13.7% (High chemo)	40 (48.2)		14 (48.3)		26 (48.1)		

Table 2.
Variables that Influence Communication about Molecular Test Results by Oncologist and Practice Characteristics

Factors that influence communication	Oncologist Reporting Influence N (%)	Oncologist Characteristics									
		Younger %	Older %	Male %	Female %	Low volume %	High volume %	Low test %	High test %	Low chemo %	High chemo %
Patient variables											
Language barrier	4 (13.8)	14.3	13.3	10.5	20.0	8.3	17.6	12.5	15.4	6.7	21.4
Patients pre-testing treatment preferences	16 (55.2)	64.3	46.7	52.6	60.0	33.3	70.6	43.8	69.2	46.7	64.3
Patient well-informed about testing	10 (34.5)	50.0	20.0	26.3	50.0	41.7	29.4	31.3	38.5	33.3	35.7
Influence of patient's family or friends	13 (44.8)	57.1	33.3	42.1	50.0	75.0	23.5	62.5	23.1	53.3	35.7
Test results are too complex for patients to understand	16 (55.2)	64.3	46.7	52.6	60.0	66.7	47.1	56.3	53.8	53.3	57.1
Patients performance status	19 (65.5)	64.3	66.7	68.4	60.0	58.3	70.6	62.5	69.2	60.0	71.4
Practice variables											
Lack of time in the appointment	3 (10.3)	14.3	6.7	5.3	20.0	25.0	0.0 ^a	12.5	7.7	13.3	7.1
My practices policies or norms	8 (27.6)	28.6	26.7	26.3	30.0	25.0	29.4	37.5	15.4	26.7	28.6
Lack of reimbursement for the discussion	5 (17.2)	14.3	20.0	21.1	10.0	25.0	11.8	18.8	15.4	13.3	21.4
Other aspects of the patient's care plan	6 (20.7)	28.6	13.3	10.5	40.0	16.7	23.5	25.0	15.4	20.0	21.4
Oncologist variables											
Lack of personal experience with testing	17 (58.6)	50.0	66.7	57.9	60.0	53.8	58.8	56.3	61.5	40.0	78.6
Test results do not inform clinical impression	13 (44.8)	57.1	33.3	36.8	60.0	41.7	47.1	43.8	46.2	46.7	42.9
Confidence in using the tests	14 (48.3)	50.0	46.7	42.1	60.0	50.0	47.1	43.8	53.8	33.3	64.3
Test results too complex to apply to practice	8 (27.6)	42.9	13.3	26.3	30.0	41.7	17.6	31.3	23.1	33.3	21.4

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Note: Columns do not add to 100%. Oncologists could endorse several barriers. Younger (< 51.8 years), Older (≥ 51.8 years); Low volume (0–8 patients), High volume (≥ 9 patients); Low test (< 66.7% of eligible patients); High test (≥ 66.7% of eligible patients); Low chemo (<13.7% of patients), High chemo (≥ 13.7% of patients).

Table 3.
Timing and Format of Interventions to Support Communication about Molecular Test Results by Oncologist and Practice Characteristics

Tool Characteristic	Oncologist Endorsement N (%)	Oncologist Characteristics							
		Younger %	Older %	Male %	Female %	Low volume %	High volume %	Low test %	High test %
Preferred Timing of Patient Education Materials									
Patient education materials to be reviewed by the patient <u>before</u> we discuss test results	13 (44.8)	35.7	53.3	42.1	50.0	75.0	23.5	43.8	46.2
Patient education materials to be used in the office in <u>collaboration with me</u>	21 (72.4)	71.4	73.3	68.4	80.0	83.3	64.7	81.3	61.5
Patient education materials to be used in the office <u>with my staff</u> prior to meeting with me	16 (55.2)	42.9	66.7	42.1	80.0	75.0	41.2	50.0	61.5
Patient education materials to be sent home with the patient <u>after</u> the consultation with me	19 (65.5)	78.6	53.3	63.2	70.0	75.0	58.8	56.3	76.9
Preferred Format of Patient Education Materials									
Patient education materials and a treatment decision tool that is web-based tool	18 (62.1)	50.0	73.3	63.2	60.0	58.3	64.7	50.0	76.9
Patient education materials and a treatment decision tool in a <u>print format</u> that I can hand out	23 (79.3)	78.6	80.0	78.9	80.0	91.7	70.6	75.0	84.6

Tool Characteristic	Oncologist Endorsement N (%)	Oncologist Characteristics									
		Younger %	Older %	Male %	Female %	Low volume %	High volume %	Low test %	High test %	Low chemo %	High chemo %
Preferred Components of Oncologist Tool											
Tool that uses patient data to provide risk algorithms (i.e., for risk of recurrence and the benefits of treatments in reducing this risk)	24 (82.8)	85.7	80.0	84.2	80.0	83.3	82.4	81.3	84.6	86.7	78.6
Tool that incorporates the patient's age in a treatment recommendation algorithm	22 (75.9)	85.7	66.7	78.9	70.0	75.0	76.5	68.8	84.6	73.3	78.6
Tool that incorporates the patient's comorbidities in a treatment recommendation algorithm	25 (86.2)	92.9	80.0	89.5	80.0	91.7	82.4	87.5	84.6	86.7	85.7
Tool that incorporates the patient's treatment preferences in a treatment recommendation algorithm	20 (69.0)	78.6	60.0	63.2	80.0	58.3	76.5	56.3	84.6	66.7	71.4

Note: Columns do not add to 100%. Oncologists could endorse several intervention characteristics. Younger (< 51.8 years), Older (≥ 51.8 years); Low volume (0–8 patients), High volume (≥ 9 patients); Low test (< 66.7% of eligible patients); High test (≥ 66.7% of eligible patients); Low chemo (< 13.7% of patients), High chemo (≥ 13.7% of patients).