Improvement in Clinical TNM Staging Documentation Within a Prostate Cancer Quality Improvement Collaborative

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OBJECTIVE To assess the effectiveness of a feedback and educational intervention to increase documentation of clinical tumor-node-metastasis (TNM) stage among urologists in a statewide quality improvement collaborative.

METHODS The Michigan Urological Surgery Improvement Collaborative (MUSIC) is a consortium of urology practices that aims to improve the quality and cost-efficiency of prostate cancer care. In pilot data collection activities, trained abstractors recorded medical record documentation of clinical TNM stage by participating urologists. We compared levels of TNM stage documentation in 12 MUSIC practices at baseline and after performance feedback and a collaborative-wide educational intervention. We examined patient and practice characteristics associated with documentation of TNM stage.

RESULTS We accrued 491 and 581 men with newly diagnosed prostate cancer during the baseline and postfeedback phases of data collection, respectively. At baseline, 58% of patients had clinical TNM staging in the medical record, ranging from 19% to 96% across 12 practices ($P < .05$). After the intervention, documentation improved to 79% of patients overall, with 7 individual practices achieving significant improvements (all $P < .05$). The greatest improvements in documentation occurred among patients treated in smaller practices (ie, 1-4 urologists).

CONCLUSION After collaborative review of staging criteria and feedback of baseline performance, urologists in MUSIC practices dramatically improved documentation of clinical TNM stage. This finding underscores the behavioral change possible with the collaborative quality improvement model and ensures the necessary risk stratification data for our ongoing efforts to improve care. UROLOGY 83: 781–787, 2014. © 2014 Elsevier Inc.

Providing cost-effective and quality patient care is one of the highest priorities in today's health care environment. Among men with prostate cancer, observed variation in treatment patterns and disparities in outcomes have raised concerns about a "quality gap."[1-4] In response to this concern, various investigators have identified potential quality indicators for the care of men with prostate cancer.[5,6] One such measure is the accurate documentation of clinical tumor-node-metastasis (TNM) stage for all patients diagnosed with prostate cancer.[5] From a clinical perspective, assessment and documentation of clinical TNM stage are essential for accurate communication regarding the extent of disease, both between individual providers and across different health care settings. This information also serves as the cornerstone for the initial management of men with prostate cancer, including decisions about radiographic staging and optimal local or systemic therapies. Finally, documentation of clinical TNM stage is essential for evaluating compliance with other established prostate cancer quality measures based on cancer risk strata, including measures for bone scan use and adjuvant androgen deprivation therapy promulgated by both Medicare's Physician Quality Reporting System and the National Quality Forum.[6,7]

However, despite the value of clinical TNM stage for both clinical care and quality control, its documentation is often infrequent and highly variable across different care settings.[8,9] Although previous work has documented such shortcomings, there have been few efforts to improve care in this area. The Michigan Urological Surgery Improvement Collaborative (MUSIC) provides a unique opportunity to address this concern. Funded by Blue Cross Blue Shield of Michigan, MUSIC (www.musicurology.com) is a

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consortium of community and academic urology practices from across the state of Michigan that aims to improve the quality and cost-efficiency of prostate cancer care.[10] At the heart of this effort is a web-based clinical registry that includes granular demographic and clinical data for all men seen in participating practices for newly diagnosed prostate cancer. Included among the recorded variables is the clinical TNM stage. Accordingly, MUSIC provides a unique laboratory for better understanding true baseline levels of clinical TNM stage documentation, including whether this varies according to patient and/or practice characteristics. Moreover, the collaborative structure provides an opportunity to determine whether performance feedback and education can improve documentation of clinical TNM stage by urologists in diverse practice settings.

In this context, we examined levels of documentation for clinical TNM stage among men with prostate cancer treated at the first wave of MUSIC practices. We then assessed changes in both collaborative-wide and practice-specific documentation of this quality indicator after baseline performance feedback and an educational intervention that highlighted the appropriate assignment of TNM stage and its value for clinical decision-making. Finally, we assessed the relationship between patient and practice characteristics and documentation of clinical TNM stage.

MATERIALS AND METHODS

The Michigan Urological Surgery Improvement Collaborative

Established in 2011 with funding from Blue Cross Blue Shield of Michigan, the MUSIC is a physician-led, statewide collaborative that currently comprises 29 urology practices from throughout Michigan (including >70% of urologists in the state).[10] The data for this analysis come from the first 12 participating practices. Each practice participates under local institutional review board approval (or exemption) and trained local abstractors perform data collection. One urologist in each practice serves as the clinical champion, with responsibilities that include oversight of the local data collection process, regular attendance and participation in the tri-annual collaborative-wide meetings, and leadership around local implementation of quality improvement (QI) activities. The Coordinating Center at the University of Michigan is responsible for the overall administration and management of collaborative activities.

All participating practices submit data to a web-based clinical registry developed in conjunction with a private software vendor. The MUSIC registry includes data for all patients undergoing a prostate biopsy in participating practices and all patients seen for newly diagnosed prostate cancer. The registry includes approximately 150 unique variables with information on patient demographics; laboratory, imaging, and pathology results; comorbid conditions; prostate cancer treatments; and patient outcomes, including complications and mortality, among others. Because MUSIC focuses on QI, its work is exempt from requiring informed consent for collection of patient data. Furthermore, each participating practice submitted an application to its local institutional review board and received either approval or more commonly exemption from review for MUSIC-related activities. Data collection is guided by standard variable definitions and collaborative-wide operating procedures. Each of the abstractors also completes a formal training session before commencement of data collection and participates in quarterly educational Webinars developed and administered by the Coordinating Center. In terms of quality assurance, members of the Coordinating Center also conduct on-site audits designed to ensure the appropriate identification of cases and the integrity of data entered into the registry.

Primary Outcome

For this analysis, the primary outcome was medical record documentation of clinical TNM stage. On entering TNM staging information in the MUSIC registry, data abstractors specify whether the TNM stage was documented explicitly in the medical record by the treating urologist, assigned by the clinical champion after review of the record with the data abstractor, or inferred by the data abstractor alone after review of information in the medical record (ie, results from the digital rectal examination and any relevant imaging studies). Because of its importance for both communication of clinical information and QI activities, we focused the current analysis on the outcome of explicit documentation in the medical record by the treating urologist.

Explanatory Factors

Other characteristics relevant to the cancer diagnosis were also recorded including results from the digital rectal examination, imaging studies performed, family history of prostate cancer, pretreatment prostate-specific antigen, biopsy Gleason score, and selected comorbid conditions. Measured practice characteristics included the number of active urologists.

Feedback and Educational Intervention

For this analysis, baseline data were collected for men with newly diagnosed prostate cancer seen in 12 practices from March to June 2012. At a collaborative-wide meeting in June 2012, clinical champions then received comparative performance feedback regarding the practice-specific proportion of patients with prostate cancer in the registry with clinical TNM staging documented in the medical record (comparative data for all other practices were deidentified). In addition, clinical champions were educated with a detailed presentation describing on the criteria for proper assignment of clinical TNM stage and its importance for clinical decision-making and our planned QI activities. The clinical champions then shared the performance data and educational information with other members of their practice through local meetings and conversations. Data on clinical TNM stage documentation were again collected and analyzed for patients with prostate cancer entered into the registry during the postfeedback phase from July 2012 to January 2013.

Statistical Analysis

As a first analytical step, we generated summary statistics and used chi-squared tests to compare patient and tumor characteristics from the baseline and postfeedback phases of data collection. Next, we again used chi-squared tests to compare the frequency of clinical TNM staging before and after the performance feedback and educational intervention, both for the entire collaborative and for each of the 12 practices.

Next, we fit a multivariable logistic regression model to examine the association between medical record documentation

Table 1. Comparison of characteristics in baseline and postfeedback phases and association of variables with documentation of clinical TNM staging

Covariate	Baseline (n = 491) n	%	Postfeedback (n = 581) n	%	*P*	% Documentation of Clinical TNM Stage	*P*	Multivariable OR‡ (95% CI)
Patient age					.21		<.01	
≤65	267	54.4	297	51.1		72.5		2.88 (1.82-4.55)
65-75	174	35.4	205	35.3		69.7		2.16 (1.35-3.47)
>75	50	10.2	79	13.6		56.6		1.00
D'Amico tumor risk*					.07		.06	
Low	164	35.2	159	28.6		65.3		1.00
Intermediate	208	44.6	276	49.6		70.7		1.26 (0.90-1.77)
High	94	20.2	122	21.9		74.5		2.16 (1.37-3.39)
Charlson comorbidity score†					.91		.05	
0	314	66.7	388	67.7		70.9		1.00
1	90	19.1	100	17.5		64.2		0.99 (0.67-1.47)
2	39	8.3	51	8.9		75.6		1.48 (0.84-2.62)
3+	28	5.9	42	5.9		80.7		1.70 (0.83-3.50)
Prostate cancer family history					.54		.47	
First degree relative	89	18.1	120	20.7		72.7		1.00
Second degree relative	27	5.5	28	4.8		65.5		0.56 (0.26-1.16)
No family history	375	76.4	433	74.5		69.1		0.83 (0.58-1.21)
Practice size					.20		<.01	
1-4 urologists	77	15.7	76	13.1		60.8		1.00
5-9 urologists	174	35.4	234	40.3		58.1		0.70 (0.47-1.05)
10+ urologists	240	48.9	271	46.6		81.4		3.10 (2.02-4.77)
Period							<.01	
Baseline phase						58.0		1.00
Postfeedback phase						79.4		3.02 (2.24-4.07)

CI, confidence interval; OR, odds ratio; TNM, tumor-node-metastasis.
* Missing in 49 cases.
† Missing in 28 cases.
‡ Model adjusted for clustering at the practice level.

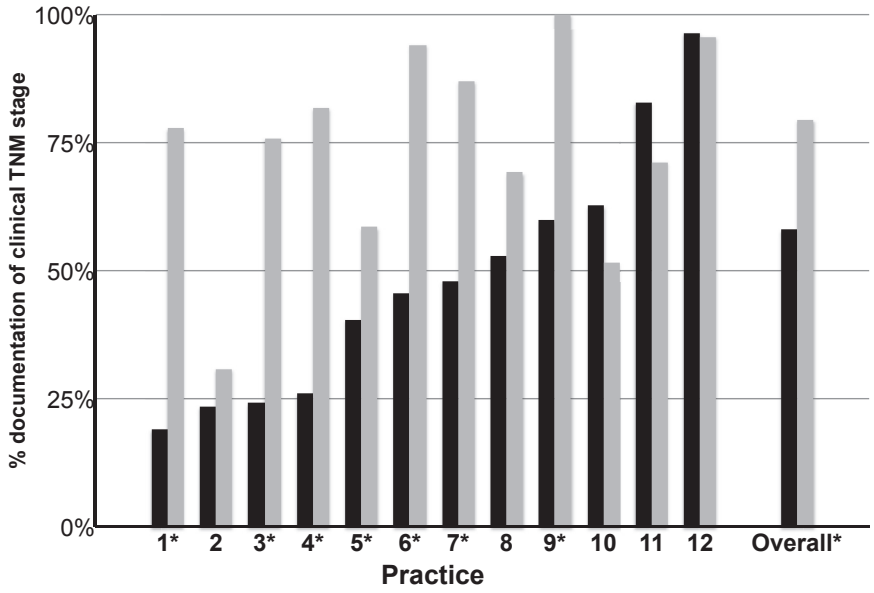

Figure 1. Proportion of patients with medical record documentation of clinical tumor-node-metastasis (TNM) stage by the treating urologist before and after performance feedback and educational intervention. The proportion of patients with clinical TNM stage documented in the medical records by the treating urologist for the 12 original Michigan Urological Surgery Improvement Collaborative practices is shown. The black bars depict the percentage of patients with documentation before the feedback and educational intervention. The gray bars depict this percentage after the intervention. Practices denoted with an asterisk achieved a significant improvement ($P < .05$) in documentation from before to after the intervention.

of clinical TNM stage and patient demographics (age, comorbidity), tumor risk (based on D'Amico criteria[11]), and practice size. Finally, we fit multivariable logistic regression models with the same outcome and covariates, but after stratifying by practice size (ie, 1-4 urologists, 5-9 urologists, and 10+ urologists). This approach allowed us to evaluate for differential effects of the intervention across distinct practice structures. All model estimates were adjusted for clustering of patients within urology practices using robust Huber-White sandwich estimators.[12,13] Statistical testing was performed using STATA version 11.2, with 2-sided significance testing and a type-I error rate set at 5%.

RESULTS

We accrued 491 and 581 men with newly diagnosed prostate cancer during the baseline and postfeedback phases of data collection, respectively. Patient characteristics, including demographics, comorbidity, and cancer severity, were similar between these 2 cohorts (Table 1). At baseline, clinical TNM staging was documented in the medical record by the treating urologist for 58% of patients entered into the registry. However, baseline rates of documentation varied significantly between practices during this phase (median 46.8%; range, 19.1%-96.4%) with only 2 practices having evidence of documentation for over 75% of patients. After feedback and education, documentation of clinical TNM staging improved to 79.4% for the entire collaborative (median 76.9%; range, 30.8%-100.0%) with 6 practices demonstrating rates over 75% (Fig. 1). Furthermore, 7 of 12 individual practices also achieved statistically significant improvements in the proportion of patients having clinical TNM staging documented in the medical record by the treating urologist (all $P < .05$; Fig. 1). As illustrated in Figure 2, the observed improvements in clinical documentation by physicians coincided with fewer patients having clinical TNM stage assigned by the data abstractors alone (33.1%-12.1% before and after the intervention, respectively, $P < .01$). In addition, there was only 1 patient (0.2% overall) with the clinical TNM stage missing in the registry postintervention.

In multivariable analyses, we observed that younger patients (72.5% $\leq$ 65 years vs 56.6% $>$ 75 years, odds ratio [OR] 2.88, 95% confidence interval [CI] 1.82-4.54) and those with high-risk tumors (74.5% high-risk vs 65.3% low-risk disease, OR 2.16, 95% CI 1.34-3.47) were more likely to have medical record documentation of clinical TNM stage (Table 1). Furthermore, patients seen at larger practices had a higher likelihood of medical record documentation compared with men seen in smaller practices (81.4% 10+ urologists vs 60.8% 1-4 urologists, OR 3.10, 95% CI 2.02-4.77). After adjusting for clinical and practice characteristics, patients entered into the registry after the feedback intervention more than 3 times as likely to have clinical TNM stage documented in the medical record by their treating urologist (OR 3.02, 95% CI 2.23-4.07).

Figure 3 presents changes in documentation before and after the intervention according to practice size strata.

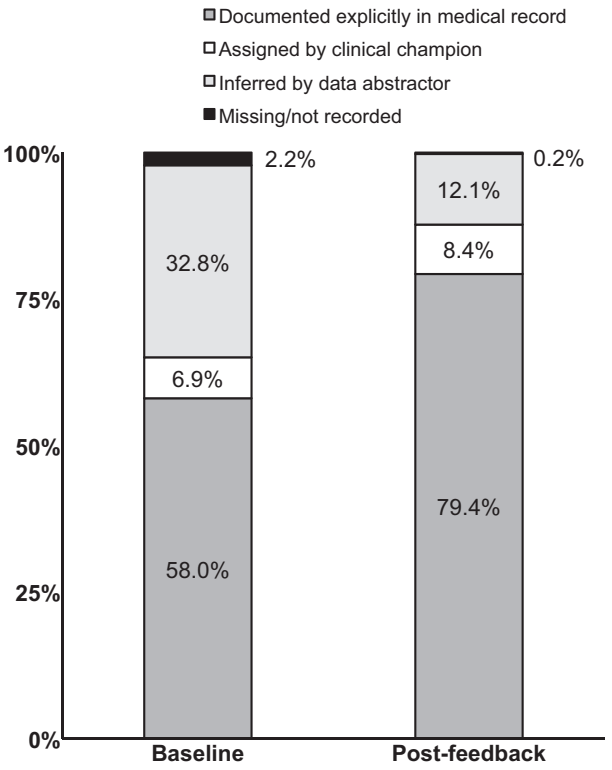

Figure 2. Determination of clinical tumor-node-metastasis (TNM) stage at baseline (n = 491) and after performance feedback and an educational intervention (n = 581). Clinical tumor-node-metastasis (TNM) staging was determined before and after a collaborative-wide performance feedback and educational intervention. The charts present information for all patients with prostate cancer entered into the registry during the baseline and postfeedback phases of data collection, respectively. Consistent with the Michigan Urological Surgery Improvement Collaborative data entry protocol, the method by which clinical TNM stage was ascertained includes 4 discrete categories: (1) clinical TNM stage explicitly documented in the medical record by the treating urologist (dark gray); (2) clinical TNM stage assigned by the clinical champion after review of the record with the data abstractor; (3) clinical TNM stage inferred by the data abstractor alone after review of information in the medical record (ie, results from the digital rectal examination and any relevant imaging studies); and (4) clinical TNM stage missing/not available (black). There was a significant change in the proportion of patients in these categories before and after the intervention ($P < .01$).

We observed the greatest improvement in documentation among small practices (ie, 1-4 urologists) (36.4% baseline vs 85.5% postfeedback, OR for pre vs postintervention 9.04, 95% CI 3.68-22.21). Improvements were also seen with medium-size (5-9 urologists; 52.9% vs 62.0%, OR 1.70, 95% CI 1.10-2.63) and larger practices (10+ urologists; 68.8% vs 92.6%, OR 4.96, 95% CI 2.77-8.90).

COMMENT

After collaborative review of staging criteria and feedback of baseline performance, urologists in MUSIC practices

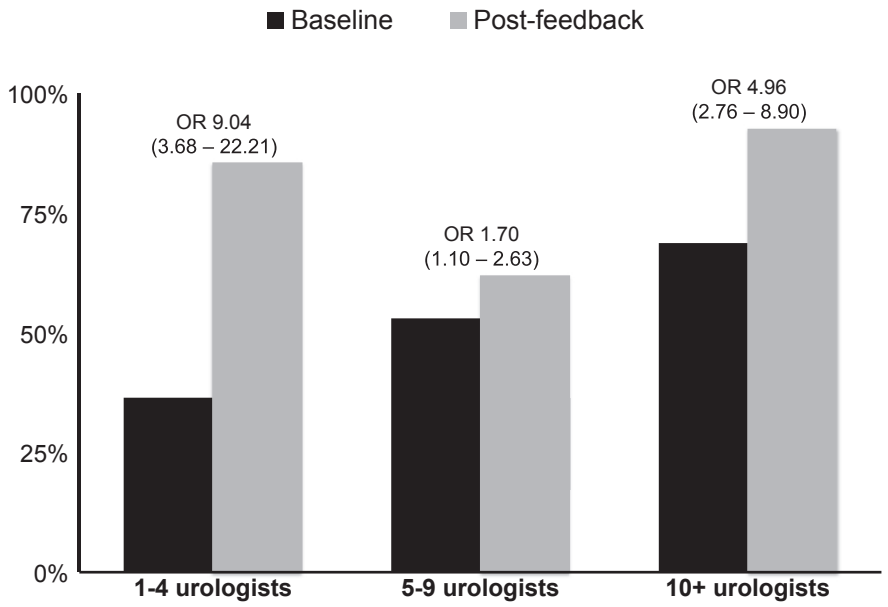

Figure 3. Medical record documentation of clinical tumor-node-metastasis (TNM) stage according to practice size. This figure displays rates of documentation at the patient-level, stratified by practice size. The y-axis is percent of patients with prostate cancer with documentation of clinical TNM stage in the medical record. The x-axis shows the 3 groups of practice sizes. The black bars represent baseline levels of documentation and the gray bars represent postfeedback levels. The odds ratios (OR) represent the adjusted likelihood of clinical TNM stage documentation before and after the intervention for each practice size stratum, adjusting for age, comorbidity, and tumor risk. Standard errors were also adjusted to account for clustering at the practice level.

dramatically improved medical record documentation of clinical TNM stage. Namely, 7 of the 12 practices achieved significant improvements in documentation, and nearly 80% of patients entered into the clinical registry during the postfeedback phase of data collection had a clinical TNM stage recorded in the medical record by the treating urologist. Although we noted progress among groups of all sizes, the greatest improvements were observed for smaller practices comprising 1-4 urologists.

Our findings are consistent with existing literature demonstrating significant variation (and often relatively low) medical record documentation of clinical TNM stage for patients with prostate cancer, including differences according to patient characteristics such as age and prostate-specific antigen.[8,9] At the same time, however, our results also underscore the positive changes that can be achieved with the collaborative QI model. The conceptual framework that underlies the success (and potential sustainability) of QI programs emphasizes strategic vision, an understanding of organizational culture, optimal technical ability for data management, and structural means for efficient dissemination of results.[14] Indeed, using this framework, similar improvements in adherence with best practices have been achieved with physician-led collaborative activities in different aspects of prostate cancer care (ie, radiographic imaging) and in a wide range of other clinical specialties.[15-18]

The present study builds on this body of work through its demonstration of a robust response among urologists in smaller practices to the QI intervention; namely, among groups that comprised 1-4 urologists, explicit documentation of clinical TNM staging more than doubled from before to after the intervention. Perhaps because they have less access to practice-level and quality-of-care data, it has been reported previously that smaller physician practices are less likely to initiate QI activities.[19] This concern, combined with the significant response of smaller practices in MUSIC to an intervention related to documentation of clinical TNM stage, underscores the importance of including such groups in collaborative QI activities.

This project does have several limitations. First, MUSIC aims to improve the quality of care for patients in all participating practices. As such, there is no control group for these analyses, and it is possible that the observed improvements in documentation may have occurred without the intervention. However, it seems unlikely that such a large degree of improvement would have happened in the absence of our collaborative activities. It is also possible that the observed changes are a consequence of measurement alone (ie, the Hawthorne effect), rather than the feedback and education provided through MUSIC's infrastructure and activities.[20] That being said, it can also be argued that a central tenet of MUSIC's activities is actually to capitalize on changes that occur in response to measured (rather than perceived) practice patterns. Finally, although the observed changes in documentation are encouraging, we have not yet been able to demonstrate improvements in care that have occurred as a direct consequence of this intervention. The potential impact of more complete

documentation of clinical TNM stage remains undefined, and more work is needed to determine whether specific outcomes (eg, appropriate use of radiographic imaging and use of surveillance strategies) might be improved as a consequence of the more explicit risk stratification achieved through better documentation of clinical TNM stage.

Despite these limitations, our findings have several important implications. First, better documentation of clinical TNM stage may allow the MUSIC registry to serve as a resource for providers submitting data for Medicare's Physician Quality Reporting System measures for bone scan use and adjuvant androgen deprivation therapy.[7] Second, we believe that more frequent assignment of TNM stage by the treating urologist (rather than this being inferred by the data abstractors) is likely to facilitate—and perhaps improve—real-time clinical decisions (eg, radiographic staging, primary therapy) that depend on purposeful and complete risk stratification. Such explicit documentation may also enhance communication and care coordination among patients referred to practices outside the collaborative. This may be particularly relevant for nonacademic practices that may be less likely to document clinical stage for research or educational purposes (eg, teaching conferences), but that still seek to participate in outcomes measurement and the provision of value-based clinical care.

Third, as described previously, our study highlights the ability of physician-led QI collaboratives to engage smaller practices (including those in rural environments) and provide them with previously unavailable resources for measuring and improving care. Finally, and perhaps most importantly, our results underscore the behavioral changes attainable with the collaborative QI model and ensure that MUSIC practices have the necessary risk stratification data for our ongoing efforts to improve health care outcomes for men with prostate cancer.

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EDITORIAL COMMENT

Filson et al report that an insurance-funded physician-led statewide collaborative can improve urology clinicians' TNM stage documentation of prostate cancer staging through a process of ongoing education and continuous feedback. This is the latest community urologic oncology collaborative effort focusing on diagnosis and pretreatment evaluation from the novel Michigan Urological Surgery Improvement Collaborative (MUSIC). An earlier effort reported improvements in radiographic staging practices in men with low-risk prostate cancer.[1] MUSIC represents a complex interplay among community and academic urologists (who in essence are "data recorders" of TNM stage information in the medical record), the insurance industry (the funder in this case, Blue Cross Blue Shield of Michigan), the University of Michigan (the "coordinating

center"), and a practice-specific urology "champion" trained on TNM staging and its importance for optimal patient care.

After prostate cancer stage data are entered into the medical record, trained abstractors enter this information into a database coordinated by the University of Michigan data analysts, who then provide a performance report to urologists who review the findings at a collaborative meeting with clinical champions of TNM staging (with comparative data for other practices deidentified also being provided at the meeting). The urologists then meet at local meetings or have conversations with urology practice members and interpret the findings. Finally, clinical champions educate urology partners on the importance of the TNM stage and lead a review of practice-specific feedback. After a month off, this is repeated ensuring an iterative process. This complex initiative builds on the Quality Improvement (QI) paradigm outlined previously.[2] There is a strategic vision, organizational culture, optimal technical ability for data management, and structural means for efficient dissemination of results.[2] As noted by Shortell et al (an international expert on QI), each of these 4 components is necessary to implement and sustain a QI initiative.

We applaud efforts of the MUSIC team to move beyond identifying deficiencies in practice patterns to craft a conceptually sound intervention to facilitate this important QI. A similar physician-led QI improvement project, the Urological Surgery Quality Collaborative, illustrated that although only 35% of patients likely to benefit from intravesical chemotherapy received it, more than 50% of patients who did not receive the therapy were excluded for medically appropriate reasons.[3] This finding suggested that the potential opportunity for guideline compliance in urologic oncology may not be as large as initially hypothesized.

Sustainable and efficient comparative performance feedback and ongoing education interventions are pivotal in efforts to improve quality in urologic oncology care. Similar efforts will be essential for maintaining high quality treatment care for other prostate cancer practices, such as intensity-modulated radiation therapy performed by radiation oncologists at the MUSIC centers.[4] Collaborative urologic oncology efforts that include smaller practices may yield the greatest impact in QI programs that provide feedback at the practice-level, whereas larger practices need feedback at the individual urologist level. Clearly, when TNM staging deficiencies in a small 4-urologist practice are identified, each of the urologists is likely to take some ownership of the deficiency and QI is likely to occur, as was noted in the MUSIC study. However, 2 of the 4 critical components of the QI initiative—technical ability for data management and structural means for efficient dissemination of results—may not be sustainable without ongoing financial support. In summary, the financial support of the insurer, the data management skills of the university, and committed time and support of the clinical leader are likely critical for ongoing success. The circumstances for this successful QI initiative are unique, let us hope that they are sustainable as well.

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