Challenges and Opportunities for Stewardship of Urological Imaging

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Abstract

Purpose: Since 2014, the American Urological Association (AUA) has convened several Quality Improvement Summits to provide education and promote dialogue around issues of quality improvement and patient safety. The 2017 Summit*, Challenges and Opportunities for Stewardship of Urological Imaging***,** organized in partnership with the American College of Radiology (ACR) and the American College of Emergency Physicians (ACEP), highlighted opportunities for collaborative improvement in the value, safety, and quality of imaging for patients with urological conditions.

Materials and Methods: The Summit was held at AUA headquarters in Linthicum, Maryland on October 21, 2017. Each talk, panel, and working group held during the summit highlighted gaps in care being addressed by physician-led stewardship initiatives in imaging, in general, as well as multiple specific examples related to prostate cancer and urinary stone disease.

Results: Presentations facilitated information exchange on quality efforts between clinicians across disciplines and care settings and served to educate urology practitioners, primary care physicians, and specialists about existing patient-centered quality improvement programs.

Conclusions: This exchange serves to accelerate adoption of evidence-based practices and brings together stakeholder organizations to form partnerships that facilitate the further development of both research and policy agendas to advance physician-led stewardship of advanced imaging across emergency medicine, radiology, and urology. In parallel, this meeting established a consortium to develop and disseminate tools for facilitating organizational improvement activities needed to enhance the quality and safety of medical care.

Key Words: Imaging, stewardship, urinary stones, prostate cancer, urological imaging, CT scan, MRI, value, quality, patient safety

The diagnostic capabilities of radiological imaging represent one of the greatest technological advances in modern medicine.[1] In recent years, however, these services have come under increasing scrutiny, given disproportionate increases in volume and estimates that up to half of current imaging use is unnecessary.[2] The 2012 IOM report "Best Care at Lower Cost" estimates that approximately $30 billion is wasted annually on unnecessary imaging in the US.[3] In addition, despite the intentionally broad scope of the *Choosing Wisely* campaign, imaging studies comprise over half of the identified potentially avoidable interventions,[4] reflecting the growing demand for physician-led stewardship of advanced imaging services. Durand et al. articulated a conceptual framework to this end, drawing on principles of systematic persuasion, education, and practice support from the well-established antibiotic stewardship movement.[5]

To lead the stewardship effort, the American Urological Association (AUA) convened the 2017 Quality Improvement Summit to address appropriate use, costs, and harms associated with advanced imaging for urinary stones and prostate cancer. For this Summit, the AUA partnered with the American College of Emergency Physicians (ACEP) and the American College of Radiology (ACR) as part of a collaborative effort dedicated to improving quality by reducing variation and the inappropriate use of advanced imaging while mitigating associated costs and harms to patients. The Summit, *Challenges and Opportunities for Stewardship of Urological Imaging***,** was held on October 21, 2017 at the AUA headquarters in Linthicum, Maryland and brought together clinicians, researchers, policy-makers, and scientists from the emergency medicine, radiology, and urology communities with the shared goals of improving performance and patient safety and reducing associated costs.

Need for Physician-Led Stewardship of Imaging in Urology
Matthew E. Nielsen, MD MS FACS, Summit Chair, AUA Quality Improvement and Patient Safety Committee, University of North Carolina, Chapel Hill

Dr. Nielsen started the program by laying out the values and purposes animating the 2017 QI Summit. The Merriam-Webster dictionary defines stewardship as "the careful and responsible management of something entrusted to one's care." Advanced imaging has a major role in the care of patients with urological conditions, but a growing body of evidence points to significant opportunities for physicians to improve the safety, efficiency, and quality of care related to its application. In addition to concerns about the costs of potential avoidable imaging, a large body of evidence describes significant potential of harm from radiation exposure, in particular from computed tomography (CT) scans. The AUA and other urological organizations have been at the vanguard of efforts in this space, with a variety of activities familiar to many urologists focused on minimizing overuse of staging imaging for low risk prostate cancer. While these important efforts are currently being brought to scale nationally through the AUA Quality (AQUA) Registry, there are also a number of existing and emerging opportunities for urologists to collaborate with colleagues in radiology and emergency medicine, particularly in the area of imaging for urinary stone disease. The careful and responsible management of advanced imaging requires a complex team effort, and a major focus of the Summit was to build a national interdisciplinary consortium around a health services research and policy agenda to improve quality, safety, and costs associated with advanced imaging. The Summit aimed to provide a roadmap of the opportunities for urologists to assume a leadership role, as well as provide attendees and AUA members with a variety of practical tools, including resources from the ACR and ACEP, imaging equipment manufacturers, and other organizations involved in imaging management to support stewardship efforts.

Imaging Wisely: Improving the Value of Medical Imaging (Keynote)
Keynote Speaker: Rebecca Smith-Bindman, MD MPH, University of California, San Francisco

There has been spectacular increase in the volume of CT scans in the US, from approximately 3 million studies performed in 1980 to over 85 million in 2011.[6, 7] Much of this growth has been in recent years, with population-based data demonstrating an approximate tripling of volume between 1996 and 2010.[8] Data from several US healthcare systems show that CT rates *continued* to rise at a rate of 7 percent per year from 2012 to 2016.[8] Put another way, on average, more than 1 in 5 US patients receives a CT scan every year. Concerns have been raised that the rapidly growing utilization of CT scan may reflect, in part, overuse of CT in contexts where it may be avoidable as well as potentially inappropriate indications for CT.

In addition to the profound costs associated with the rapid growth in CT utilization, there is increasing recognition of the potential for harm, in particular harm associated with exposure to ionizing radiation. When evaluating a CT scan to determine if it is necessary, the benefits must be weighed against harms. Though the benefit of rapid and accurate diagnosis of a treatable disease that can improve patient outcomes is certainly important, potential harms include false positives, incidental findings, over-diagnosis, excess radiation exposure, and distraction that may lead to missed opportunities for appropriate treatment. One important aspect of imaging stewardship is educating patients and providers that while tests may be important in effective diagnosis and treatment of many diseases, unnecessary testing is harmful.

Of the imaging techniques utilizing ionizing radiation, CT accounts for 75 percent of exposure. No carcinogen has been studied more rigorously than radiation, and modeling studies suggest that two to five percent of projected future cancers will be caused by radiation from medical imaging.[9] The Biologic Effects of Ionizing Radiation (BEIR) report from the National Academy of Sciences provides a thorough summary of the literature on the harmful effects of radiation and its link to cancer.[10] This report includes multiple historical examples, such as data from Hiroshima and Nagasaki atomic bomb survivors, in whom the average exposure was 40 mSv, whereas the average exposure associated with multiphase abdomen-pelvis CT is 30 mSv.[4, 11] This report concludes that the doses we use routinely use for CT will cause cancer in some patients and that the higher the dose, the greater the risk.

Recent evaluations of real-world practice settings demonstrate profound variation in effective dose for a given CT protocol within and across institutions, in many cases by orders of magnitude, at doses much higher than required for diagnosis.[12-14] These findings suggest that **variability in how safely tests are performed** represents a key quality gap. Thus, beyond questions regarding the appropriateness of any individual test, important gaps in current practice provide additional system-level opportunities to mitigate harms from medical imaging. The lack of comprehensive standards or guidelines leaves radiologists to rely on the overarching principle that dose should be “as low as reasonably achievable,” but widespread practice variation introduces unnecessary harm due to excessive radiation.

Dr. Smith-Bindman shared her experience with a number of efforts oriented towards addressing the observed wide variation in CT dosing. The University of California Dose Optimization and Standardization Endeavor (UC DOSE) project, a collaboration across the five University of California medical centers, brought together medical physicists, radiologists, and technologists to review detailed audits of dose-monitoring data. Next, clinical leads worked together to identify areas in which dose reduction was possible and concrete steps to achieve that goal. Remarkably, these changes led to a 50 percent reduction in high doses and a 25 percent reduction in average doses.[15] Similar efforts are underway on an international scale, based on education, audit and feedback of dose and protocol data, and dissemination of best practices. In order to effectively reduce excess radiation dose and variation, hospitals and imaging facilities must assess doses, compare doses with benchmarks, develop concrete

strategies or guidelines to meet benchmarks, ensure staff education, and repeat the process as needed.

As a concrete next step for attendees, Dr. Smith-Bindman suggested that urologists engage in dialogue with radiologists and let them know that the issue of radiation dose is important to them and ask, for instance, if the stone protocol at their institution is automatically low dose. Many institutions have special protocols when low-dose CT is specifically requested, but in practice, every stone protocol should be low dose. Further, emergency department (ED) physicians have tremendous power to make the issue of dose reduction and variability a priority for their institutions. Though the task of system-wide dose optimization may seem daunting, the impact of reducing even just the highest outlier doses may prevent tens of thousands of future cancers.

Opportunities for Imaging Stewardship in the Care of Patients with Stone Disease

Urinary stone disease exerts a huge burden on patients and the health system, affecting nearly 10 percent of the population. There are over a million CT scans performed annually in the US for stones in EDs alone; many more when all care settings are taken into account. Stewardship of imaging in this context is also somewhat more complex than that of prostate cancer staging. Whereas the quality gap in low risk prostate cancer is an archetype of imaging that can be eliminated entirely in most instances, imaging is central to diagnosis and management in most episodes of care for stone disease.
Given the complexity of the issue and the extent to which CT is employed (especially in patients with recurrent disease), there are numerous opportunities to enhance quality, value, and patient safety. Importantly, the effective and systematic deployment of innovative care processes supporting appropriate use of CT scan for urinary stones is predicated on collaboration of stakeholders from multiple disciplines.

The DOSE Initiative: Supporting Dissemination of Reduced-dose Renal Colic CT

Christopher Moore, MD, Summit Co-Chair, Yale University

Paralleling the rise of CT more broadly, the use of CT in kidney stone encounters in EDs grew from approximately 21 percent to 71 percent in the past ten years, resulting in a massive 238 percent increase.[16] In spite of this increase, there were no significant changes in the proportion of patients receiving interventions, being admitted, or receiving a diagnosis in this time period.[16, 17]

In response to the known risk of radiation exposure, special low-dose, and ultra-low-dose renal stone protocols have been developed. It is now possible to maximize renal stone detection while delivering effective radiation doses as low as 1-3 mSv.[18] Dr. Moore led a study, funded by the Agency for Healthcare Research and Quality (AHRQ), to examine patterns of care related to CT imaging for stone disease. Consistent with observations in Dr. Smith-Bindman's keynote for CT protocols in general,[12] Dr. Moore and colleagues found, in nearly 50,000 patients in the ACR Dose Index Registry (DIR), wide variation in institutional mean effective dose (range: 4.6 to 22.5 mSv).[19] In addition, this study found profoundly low utilization of low-dose protocols, with only two percent of studies performed below the low-dose threshold of 3 mSv.[19]

To address these gaps, Dr. Moore's group received additional funding from AHRQ for the Dose Optimization in Stone Evaluation (DOSE) study. This funding supports the development and deployment of educational materials, coaching, and practical support to disseminate the effective implementation of low-dose CT for urinary stones. This study utilizes the ACR DIR to provide audit and feedback for participating institutions on the radiation doses observed in their practice for renal colic CT, with an online radiology continuing medical education (CME) platform and a library of scanner-specific protocols

to facilitate local implementation. Currently, 300 participating facilities have been identified and are in the process of engagement with the project team. More information on the DOSE study, including contact information for AUA members interested in engaging with study team on the QI Summit Imaging Stewardship Toolkit website. Discussion with attendees highlighted the complexity of scanner-specific protocols as a barrier to implementation of low-dose CT; Dr. Moore's group is available to share materials with interested physicians, even beyond those participating in the DOSE study.

National Quality Initiatives in Renal Colic Imaging from the ACEP
Arjun Venkatesh, MD MBA MHS, Yale University

In addition to efforts aimed at reducing variability in CT dose, strong data support the use of alternative methods to CT scans for common urological indications. For example, the STONE trial, published in the *New England Journal of Medicine*, compared point of care ultrasound by ED physicians, radiology ultrasound, or CT for patients presenting with suspected nephrolithiasis. Initial ultrasound was associated with lower radiation exposure than initial CT, with no significant difference in high-risk diagnoses with complications or serious adverse events.[20] The authors concluded that ultrasound should be used as the initial diagnostic imaging test, with further imaging studies performed at the discretion of the treating physician's clinical judgment. Despite this demonstrated clinical utility, observational data suggest ultrasound was used in only five to six percent of ED visits for kidney stones in the US.[16] In this context, ACEP recommended avoidance of CT for patients with suspected recurrent stone disease presenting to the ED, one among several ACEP *Choosing Wisely* statements recommending against potentially avoidable CT in the ED. Implementation and dissemination of this recommendation is underway as a quality measure through national efforts supported by ACEP.[21]

Dr. Venkatesh presented background on ACEP E-QUAL, a national learning collaborative seeking to improve the quality and safety of emergency care. One focus of this effort is the suite of ACEP *Choosing Wisely* recommendations to reduce low-value imaging, including abdominal CT for suspected recurrent renal colic. Currently, approximately 1,000 emergency departments are actively engaged in the US, including 150 critical access hospitals and approximately 100 rural hospitals. E-QUAL provides monthly CME webinars, as well as quality improvement toolkits, metrics, guidelines, and other supportive materials. Participants receive credit from the Centers for Medicare & Medicaid Services (CMS) Merit-Based Incentive Payment System (MIPS) program. Preliminary analyses suggest substantial variation in imaging utilization rates, with feedback to participating hospitals underway.

In parallel, ACEP established the Clinical Emergency Data Registry (CEDR) as a qualified clinical data registry (QCDR), analogous to the AUA's AQUA registry. CEDR encompasses one-third of all ED visits in the United States. Currently, the registry includes one measure (out of 45) to track the appropriateness for CT in suspected renal stones. Factors for CT scan appropriateness include patient age (18 to 50 years), flank pain, back pain, and history of kidney stones. Defining each of the parameters has been a challenge, especially given the lack of guidelines around when a low-dose CT scan may be considered and the difficulty of capturing complete scan information from different electronic health records.

Multispecialty Collaboration on Best Imaging Practices in Renal Colic: ACEP/ACR/AUA E-QUAL Workgroup
Christopher Moore, MD, Summit Co-Chair, Yale University; Kevan Sternberg, MD, University of Vermont; and Erick M. Remer, MD, Cleveland Clinic

As outlined in Dr. Venkatesh's presentation, ACEP is disseminating their *Choosing Wisely*

recommendation supporting alternatives to CT for patients presenting to the ED with suspected recurrent renal stones through a variety of national programs. In the field, this activity has highlighted areas of uncertainty around best practices for the large volume of patients presenting to the ED with suspected renal colic. In this context, E-QUAL has convened a multispecialty collaboration on best practices for renal colic imaging with representation from AUA, ACEP, and ACR. This work in progress was presented by participants representing each of the societies.

In the ED setting, it has been noted that over half of patients who had flank pain CT scans did not, in fact, have stone disease.[22] Dr. Moore and colleagues developed the S.T.O.N.E. score as a clinical prediction tool for renal colic in the ED setting, based on the pre-test probability of stones.[23] For patients with moderate S.T.O.N.E. scores in whom imaging may be appropriate, point-of-care ultrasound is a valuable tool, eliminating radiation exposure without significant differences in high-risk diagnoses.[20] In addition to ultrasound, Dr. Moore reinforced the message that ultra-low-dose CT protocols may be implemented to detect renal stones with a CT scan that has an overall sensitivity of 90.2 percent and a specificity of 98.9 percent while reducing CT radiation dose by 85 percent.[24]

Dr. Sternberg provided the urologist perspective on the E-QUAL working group. When Dr. Sternberg first began to see more patients presenting in his office with ultrasounds, he developed a study to compare CT and ultrasound. Of the 20 percent of the patients who started their work up with an ultrasound, only 20 percent of those patients eventually got a CT, either right after ultrasound in the ED or within 90 days. Of the 53 percent of patients who did not get a CT in the ED, only 10 percent of ended up with a CT scan within 90 days. The study concluded that undergoing an ultrasound, with respect to renal colic, resulted in most patients avoiding a CT altogether, and it led to lower cost of imaging.

Dr. Remer began his talk by stating that that for any particular clinical situation, multiple considerations may determine appropriate imaging. While clinical decision models such as the S.T.O.N.E. score or alternative modalities such as ultrasound may be equally effective as CT scan in many instances, there are instances for which CT for flank pain is appropriate, especially when a low-dose exam is considered. While low-dose CT remains ill-defined,[25] in the setting of stone CT, the AUA guideline definition is 4 mSv, and several ACR documents indicate 3 mSv. Nonetheless, as noted by Dr. Moore's earlier presentation, the adoption of low-dose CT remains low, and in one recent study only 20 percent of institutions had a dedicated stone-specific CT protocol.[26] While there are many possible reasons for this low uptake, differences in scanner and software vendors across hospital enterprises, lack of education for radiologists on how to reduce dose or switch to a lower dose scan, and the additional effort required to interpret a grainier scan may each contribute to clinical inertia.

Dr. Remer shared some practical opportunities to reduce dose. Reducing the area of the scan to cover only from the top of the kidneys to the bladder base or increasing slice thickness from 1-3 mm to 5 mm can spare between 30-50 percent of the total CT dose. Automated tube current modulation, available on all modern CT scanners, pre-scans the patient to measure patient thickness so that tube current adjustment may be adjusted accordingly as the tube rotates around the patient and can reduce radiation dose.

In the audience discussion, concerns were raised about ultrasound having limitations in anatomic detail and potential for missed stone diagnoses, reflecting some of the tension around practice change in this context. One audience member observed that urologists' perspective on the utility of CT scan in the ED may be biased by seeing only the minority of patients with more significant stone disease selected out from a much larger denominator of patients presenting with nonspecific symptoms and/or patients with

stones able to pass spontaneously. The discussion underscored the value of the multidisciplinary best practice guidance currently under development.

Practical Issues in CT Dose Optimization: Panel Discussion
George Shiu-Kai Fung, PhD, Siemens; Rebecca Smith-Bindman, MD MPH, University of California, San Francisco

Dr. Fung gave an overview of the average radiation dose per CT exam over the last 40 years demonstrating fluctuation related to technological advances. For example, in the 1990s, dose increased with dissemination of spiral CT and thinner image slices, and decreased in the late 2010s due to development of multiple dose-reduction technologies.

Echoing points raised by Dr. Remer in the preceding session, Dr. Fung offered several suggestions for reducing CT dose. In addition to automated dose-reduction technologies available in most dose software programs, current modulators accounting for variations in patient thickness on initial topographic scans can also reduce dose. Furthermore, variations in spectrum beyond the standard 200 kVp to adjust for patient size may also reduce dose; for smaller patients, a kVp as low as 70 can be sufficient.

Dr. Fung presented several case studies comparing images obtained with lower doses using iterative construction to those obtained with higher doses, each of which showed a minimal difference between images and a retained ability to identify and measure the stone. By utilizing some of the currently available dose reduction strategies, the dose associated with necessary scans may be reduced in many cases by 50 percent or more.

Dr. Smith-Bindman commented, from her experience working with international centers, that the granularity of innumerable indication-specific protocols may be a barrier to broader implementation of dose reduction. A focus on limiting complexity may afford the greatest yield of reducing doses across the board.

This presentation prompted a discussion of other possible adjustments to urology practice that can reduce CT dose. One audience member suggested that for post-partial nephrectomy, a single-phase exam is sufficient because multi-phasic exams are unlikely to lead to information that will change management. Another audience member commented on uncertainty regarding the utility of pelvic imaging in this setting. Further, in post-cystectomy patients, a CT urogram, which requires a much higher radiation dose, may be unnecessary, given that most of these scans are intended to detect metastatic disease rather than metachronous upper-tract disease in late-stage patients. The discussion highlighted opportunities for the AUA and ACR to collaborate on more specific recommendations for common urologic imaging indications.

Panel Discussion of Toolkit from AUA Imaging Stewardship Workgroup
Matthew E. Nielsen, MD MS FACS, Summit Chair, AUA Quality Improvement and Patient Safety Committee, University of North Carolina, Chapel Hill; Justin Ziemba, MD, University of Pennsylvania; Thomas Chi, MD, University of California, San Francisco; Kevan Sternberg, MD, University of Vermont

Opening up the working lunch session, Dr. Nielsen highlighted resources from Summit presentations available to AUA members on the Summit's Imaging Stewardship Toolkit website. Following this, capitalizing on the unique convergence of physicians from multiple specialties, Dr. Sternberg led a discussion of patient follow-up after ED visits including but not limited to imaging-related issues. Acute

evaluation practices within EDs are widely variable, and urologists are often faced with incomplete information to guide management in follow-up. Following a visit to the ED for urinary stones, there is significant variation in discharge instructions and ambiguity surrounding which patients should follow up with a urologist. To best equip patients to facilitate their own care, discharge instructions should include the signs and symptoms that should prompt return to the ED and instructions and equipment to strain urine to confirm that the stone has passed. In addition, patients should be advised to acquire scans if at an outside hospital and that their stone may still be present even if pain has resolved. Finally, patients should be informed that dietary changes and preventative measures can be addressed once the stone episode has resolved.

Though most patients pass their stone without intervention, patients with a history of recurrent stones should see a urologist for metabolic evaluation and discussion surrounding prevention. The need for outpatient CT scan is shaped by symptoms, certainty that the stone has passed, definitive diagnosis in the ED with CT, stone size and location, presence of hydronephrosis, and whether the identified stone is radio-opaque.

Follow-up imaging options include low- and standard-dose CT, ultrasound, kidney, x-ray, or no imaging. Measures that may help prevent excessive imaging are cumulative dose measures in electronic medical records and discharge instructions. Informing patients of their cumulative dose exposure may have an impact on patient demand for tests or inadvertent repetition of tests. Following the presentation, the attendees broke out into discussion groups to explore further opportunities for ED/Urology collaboration along the continuum of care for stone patients.

Resources from the ACR to Support Stewardship of Imaging
Erick M. Remer, MD, Cleveland Clinic

In 2014, the Protecting Access to Medicare Act (PAMA) directed CMS to establish a program to promote appropriate use criteria (AUC) for advanced diagnostic imaging services. These evidence-based criteria aim to assist physicians and imaging professionals in making appropriate decisions for a specific medical condition. Against this backdrop, Dr. Remer informed summit attendees on the ACR Appropriateness Criteria (AC),[27] one of many ACR quality and safety programs.

In developing AC, ACR considers why inappropriate imaging might occur. Potential causes include patient expectations and demands, liability concerns, potential for delayed diagnosis, interests presented by physician ownership of imaging equipment or self-referral, lack of specific guidelines from radiologists, and lack of knowledge by ordering physicians and other providers (ordering is increasingly delegated to allied health professionals). With the aim of maximizing benefits of medical imaging while minimizing risk to patients, the ACR recommendations seek to optimize utilization.

The ACR task force is comprised of 22 expert panels divided by specialty, each with separate methodology subcommittees. Once a topic is identified, ACR staff performs a systematic literature search and creates an evidence table for the panel to review based on methodological criteria. Following this process, the panel rates the appropriateness of interventions in particular setting.

Each recommendation is accompanied by a summary of the literature and a review of imaging modalities by variant. Currently, there are 21 urological topics in the ACR database that are continuously updated. The ACR AC are incorporated into the radiology decision support product, ACR Select, which can be integrated into electronic order entry systems.

Radiology Support, Communication and Alignment Network (RSCAN)
Nancy Fredricks, MBA, American College of Radiology

The Radiology Support, Communication, and Alignment Network (R-SCAN)[28] is a program to support collaboration, care coordination, and communication between radiologists and referring physicians to reduce unnecessary imaging based on *Choosing Wisely* topics. R-SCAN is a free support service that any practice, even those outside of radiology, can initiate, and both radiologists and referring physicians can obtain MIPS improvement activity credits for participating. All participants have free access to the ACR Select clinical decision support (CDS) system through a web-based portal.

All tools for a turnkey project are provided through the R-SCAN website, carried out in three phases. Phase 1 begins with an informal collaboration in which a project is identified (for example, avoiding CT abdomen for recurrent colic or CT and bone scan for low risk localized prostate cancer), and participants review baseline data. The ACR Select CDS is applied to evaluate a retrospective sample of cases based on the ACR AC. The retrospective sample is presented as a summary that includes the average appropriateness score across all cases, highlighting opportunities for improvement.

During Phase II, the team works together to design and carry out an educational program. Programs may be selected from a menu including PowerPoint presentations, podcasts, patient handouts, and journal articles (with available CME credit). Finally, an additional case review is carried out to show the impact of the collaboration, and a final report is generated. R-SCAN thus provides infrastructure for audit and feedback on performance, practice change support materials, and an opportunity to gain experience with CDS. During her presentation, Ms. Fredricks noted that five AUA *Choosing Wisely* recommendations relate to imaging and would make an excellent addition to the urology-focused topics already available through R-SCAN. Further collaboration between ACR R-SCAN and AUA is a planned outgrowth of the meeting.

Urologist-Led Success Stories in Stewardship of Imaging for Prostate Cancer
James Montie, MD, Michigan Urologic Surgery Improvement Collaborative (MUSIC)

MUSIC, a consortium of 261 urologists from 44 practices, representing 90 percent of the urologists in Michigan, aims to improve the quality and value of urologic care by sharing actionable data to inform effective quality improvement. Dr. Montie explained the MUSIC experience related to imaging stewardship in prostate cancer care.

CT and Bone Scan Appropriateness in Prostate Cancer
Following the 2013 AUA *Choosing Wisely* campaign on bone scans in prostate cancer, analysis of the 42,000 prostate cancer patients in the MUSIC registry showed that while there was a decrease in the use of these imaging studies in low-risk patients, there were still very few positive imaging studies in intermediate-risk patients, suggesting that bone scan and CT indications could be further limited through refinement of criteria. Based on a review of the literature and several thousand imaging cases in the MUSIC registry, the MUSIC imaging appropriateness criteria were developed. These criteria recommend bone scan for patients with a Gleason score ≥8 or a prostate specific antigen (PSA) >20 ng/mL, and a CT scan for patients with a Gleason score ≥8, PSA >20 ng/mL, or clinical stage T3. Tools for implementing these criteria included slide presentations (presented by each group's clinical champion at monthly practice meetings), videos, in-office toolkits to remind practitioners of guidelines at the point of care, a script for providers to use when educating patients on the potential harms of unimportant

incidental finding from a CT scan, and site visits to 32 different practices to review imaging recommendations and determine how recommendations can be integrated into existing workflows. Following these interventions, a substantial and persistent decrease in inappropriate imaging utilization was observed.[29] The decrease in scan number was restricted to patients who did not meet screening criteria and was not due to an overall decrease in scanning in both appropriate and inappropriate patients.

Prostate MRI in MUSIC

By 2016, the dissemination of magnetic resonance imaging (MRI) in prostate cancer had reached a point where 84 percent of MUSIC urologists were ordering MRIs for this indication**.** During an initial period of data collection, it was apparent that inconsistent reporting standards and associated uncertainty contributed to skepticism on the part of urologists about the clinical utility of MRI. With the ultimate aim of improving the quality and consistency of prostate MRI, MUSIC worked to validate registry parameters, evaluate technical aspects of MRI equipment, and develop a strategy to improve the quality of imaging. A central part of this effort was development of a template that improves interpretation and facilitates reliable data extraction. Further, participants are encouraged to use the Prostate Imaging Reporting and Data System (PI-RADS) to record the suspicion level of each target lesion. Currently, 96 percent of the MRIs reported in the state of Michigan use the PI-RADS reporting system. In conjunction with the template, PI-RADS will make data extraction more reliable as well as improve the quality of individual interpretations. Collaboration between radiologists and urologists is critical for improvement, as both specialists must be able to understand and trust the MRI data to treat patients effectively. Following data collection and analysis, each practice will be provided with a prostate MRI scorecard that gives them their results as well as results for the rest of the collaborative, including information on the timing of when MRI is being used in different indications. A fusion biopsy scorecard has also been developed to allow each practice to see their high-grade cancer detection rate and their performance relative to a benchmark obtained from the literature.

Optimizing Implementation of Prostate MRI

Andrei Purysko, MD, Cleveland Clinic

Since its first reported use in the early 1980s,[30] several technological advances, coupled with changes in the way that prostate cancer is treated, have moved prostate MRI to the forefront of prostate cancer diagnosis and treatment. Dr. Purysko reviewed the basic components of a state-of-the-art prostate MR protocol and current standard reporting criteria and provided resources to assist in implementation and optimization of prostate MR programs.

While improvement in technology has been central to the expansion of MRI in prostate cancer, the lack of standardization or scoring systems to describe findings led to inconsistency in study results. In 2012, an international collaboration published the PI-RADS version 1. In 2016, in collaboration with the ACR, PI-RADS version 2 was published. This more comprehensive guidance includes not only the minimal acceptable technical parameters for prostate MR but also standardizes lexicon to ensure clarity in communication among radiologists and referring physicians. PI-RADS version 2 also provides a revised, straightforward scoring system that is a substantial improvement over the system in version 1. This scoring system includes assessment categories that summarize levels of suspicion for clinically significant findings to facilitate patient triage to appropriate management.

While many institutions are already starting to implement prostate MR, it is critical to involve the referring physician as well as administration to ensure necessary resources for potential scanner

upgrades and acquisition of fusion-guided biopsy platforms. In addition, information technology department support may be needed to facilitate availability of data for urologists, radiologists and technologists. In most cases, a local MR champion can navigate the process of implementing an MRI program. The ACR can also provide support through provision of guidelines and AC. In addition, consistency in describing lesions and their location is critically important for urologists performing any procedures. Dr. Purysko emphasized the importance of hands-on training and tutoring from experts in MR technique.

Future developments will include working with urologists to define biopsy recommendations more clearly as well as additional standardization in both reporting and collection of data. Currently, ACR is developing an accreditation program for prostate MR that will require that a physician review a minimum number of cases per year and participate in specified training activities. In addition, sites will be required to demonstrate that they can either help perform the biopsy or plan the biopsy for the urologist, a capacity of particular importance in community settings where urologists carry out most biopsies.

Cross-Cutting Measures: A Novel Vision for Quality Measurement
Arjun Venkatesh, MD MBA MHS, Yale University

Dr. Venkatesh opened his presentation with a discussion of the limitations of historical approaches to quality measurement for many groups of physicians. Many established measures primarily focus on conditions relevant to primary care. One development supporting needed change is the emergence of QCDRs, such as ACEP's CEDR and the AUA's AQUA registry. These afford enhanced clinical relevance and physician engagement, through specialty societies' ownership of quality measures, and the potential for more real-time quality reporting. While there is great enthusiasm for the potential for QCDRs to advance the goal of quality measurement, Dr. Venkatesh argued that a more integrative approach, cutting across specialties, may be needed to realize the potential of quality measurement to translate into meaningful improvements in care.

Current measures are restricted to interactions between a single provider and patient, whereas, the reality of many episodes of care spans a team of providers. For example, while infection rates may be attributed to a surgeon, in reality a number of providers may contribute to the outcome. If quality measures reflect the contribution of all personnel involved, for example if the quality of care provided by an ED was partially measured by whether or not surgical patients had a higher infection rate, quality scores would be the responsibility of the entire care team. In order to have meaningful team-based measures, clinicians and measure developers must agree upon the ideal outcome, commit to sharing accountability as well as attribution of patients, and engage colleagues in a way that emphasizes the shared goals.

Another challenge for the measurement community is expanding beyond easily measured clinical outcomes to a broader scope of outcomes aligned with patients' goals of care, including outcomes reported by the patients themselves. Whereas "hard" clinical outcomes such as mortality may be relevant for a subset of conditions, many common urological conditions or treatments are not immediately life threatening. Illustrating the potential disconnect between clinical and patient-centered outcomes, Dr. Venkatesh presented a vignette with the physician saying, "Congratulations, all the tests are negative," while the patient is thinking "I missed three days of work, I can't sleep, I am not eating, and I still can't bend because of my back pain." For kidney stones, measures of how quickly pain resolved, allowing return to work or other activities, may be more relevant than clinical measures such

as post-operative creatinine. To the extent such functional status outcomes are more aligned with patient priorities and can be developed into quality measures, the enterprise may be more relevant to patients and physicians, potentially expanding into use in the informed consent setting.

An anticipated component of the MIPS program includes physician profiling based on cost, or resource use, either as individuals or as a group. Current National Quality Forum-endorsed measures of cost do not include ED physicians, urologists, or radiologists. Though CMS is due to issue measures in 2019, it remains unclear if and how hospital costs will be linked to office-based providers. Further, the proportion of outcomes that can be attributed to individual physicians involved in the care of a single patient remains unclear, as does the link between individual clinical decisions and observed costs. Defining the duration of an episode, especially for a condition like kidney stones, is difficult, and episodes must be defined so that there is no temptation to shift the patient into another "episode" rather than change the trajectory of care. Stratifying episodes based on intensity may allow for risk adjustment, alleviating undue pressure on physicians to minimize the use of resources when they are needed. Hearkening back to the earlier discussion of team-based care measurement, the attribution of costs and resource use across specialties will be another driver of collaborative care improvement.

Reflections from QI Summit Trainee Scholars and Attendees

To promote engagement from young AUA members, residents, and fellows, AUA awarded travel support to several trainees through a competitive application process. Five scholars (Dr. Justin Ahn, Dr. Josh Halpern, Dr. Dima Rashkolnikov, Dr. Jennifer Robles, and Dr. Emily Slopnick) were selected for the award. Each award recipient offered reflections from his/her own experience in urological imaging stewardship as well as how the information from the AUA QI Summit will help them to continue their commitment to quality improvement in urological imaging. Overall, trainees expressed excitement with the opportunity to connect with like-minded colleagues focusing on improving outcomes and quality of care and facilitate evidence-based changes in imaging rather than focusing solely on the "bottom line." The trainees noted a need for supportive research to be made available to residents as part of their training as a way to promote awareness and affect deeper cultural change in urology, ED, and radiology departments.

Closing Remarks

Timothy Averch MD, AUA Quality Improvement and Patient Safety Committee Chair, University of Pittsburgh Medical Center

Dr. Averch closed the summit by emphasizing to attendees that the summit is truly the beginning of many collaborations and stewardship efforts, not simply a venue to report outcomes of completed efforts. He then thanked attendees, speakers, and collaborators, as well as AHRQ for its support. Resources from programs presented at the Summit will be available as an Imaging Stewardship Toolkit on the AUA website, with future additions anticipated as AUA, ACR, and ACEP continue to build on the foundation of shared goals brought together at the meeting.

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