



Variability in Medicare Utilization and Payment Among Urologists

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OBJECTIVE	To analyze variability in urologists' Medicare utilization and payment and estimate potential cost savings of standardized service utilization using information from the recently released Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File (PUF) and to highlight potential limitations of PUF analysis.
MATERIALS AND METHODS	The Centers for Medicare and Medicaid Services just released the PUF with payment or utilization data for 8792 urologists participating in Medicare in 2012. Linear regression correlated total number of patient visits with total Medicare payments to each urologist. Physicians were categorized into quartiles by actual payment in excess of predicted payment modeled by this regression. Utilization variability was calculated as a relative risk for the 40 most highly reimbursed services per patient visit, comparing the highest vs lowest quartile of urologists. Potential cost savings for those 40 services were calculated if services per visit >50% above the median were eliminated.
RESULTS	Medicare reimbursement was strongly predicted by the number of patient visits ($R^2 = 0.70$). Utilization variability of services performed per visit had a relative risk up to 3.52. The potential cost savings was \$125,199,007 (9.0% of total 2012 Medicare urologist reimbursements).
CONCLUSION	Overall Medicare payment to urologists was strongly predicted by number of patient visits. Substantial variability existed in utilization of services per patient visit. Standardized utilization may result in significant Medicare cost savings. However, future analyses accounting for variable patient characteristics are needed to accurately determine appropriate service utilization. UROLOGY 85: 1045–1051, 2015. © 2015 Elsevier Inc.

Rising costs of health care in the United States have renewed focus on the practice of cost-conscious medicine. The American Board of Medical Specialties has participated in this effort by establishing the “Choosing Wisely” initiative to discourage overuse of low-value service to patients.¹ However, more costly, high margin care, rather than just high volume, is considered a major culprit that results in overutilization of resources and higher costs in the US health care sector.² Detailed analyses of the payment and utilization patterns of health care providers may help determine the extent of utilization of costly care.

As part of the Affordable Care Act, to make the health care system more transparent, affordable, and accountable, the Centers for Medicare and Medicaid Services (CMS) recently released the Medicare Provider

Utilization and Payment Data: Physician and Other Supplier Public Use File (PUF), detailing information on services and procedures provided to Medicare beneficiaries by physicians and other health care professionals.^{3,4} The data, however, do not account for providers who administer expensive medications, treat more complicated patients, or those whose individual billing totals represent the reimbursement of an entire provider group.^{5,6} Despite these limitations, the PUF granted the public, media, and academia unprecedented access to information regarding Medicare payments to individual providers. According to these data, Medicare paid >880,000 distinct health care providers \$77 billion in 2012 alone. With the PUF release, many physicians are concerned about privacy invasion that may mislead the public and paint an unfairly negative picture, with media outlets already starting to target the highest paid providers.^{7,8}

Urology as a specialty is a rapidly changing area of medicine that increasingly uses technology-driven services.^{9,10} Some believe reimbursement has a significant effect on urologists' practice patterns.^{11–14} Using the PUF, we aimed to determine the extent of variability in Medicare utilization and payment among urologists.

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In addition, we estimated potential cost savings that would result from eliminating utilization of services well above the median. Furthermore, we sought to describe the PUF's lack of confounding clinical variables and patient demographic information in an attempt to highlight the potential limitations of PUF-based analysis.

MATERIALS AND METHODS

The Medicare Provider Utilization and Payment Data: Physician and Other Supplier PUF, released April 9, 2014, was obtained from www.CMS.gov.³ This data set included submitted charges organized by National Provider Identifier, Healthcare Common Procedure Coding System (HCPCS) code, and place of service. Notably, this fee-for-service data set did not include indications (beneficiaries' clinical characteristics) for the listed services and procedures. We organized the file by provider type and limited our analyses to the 8792 urologists who received Medicare payments in 2012. The number of patient visits as indicated by HCPCS codes for new patient visits (99201, 99202, 99203, 99204, and 99205) and for return visits (99211, 99212, 99213, 99214, and 99215) was totaled for each urologist.

Linear regression was used to correlate the total number of patient visits with total Medicare payments to each physician. The resulting model was used to generate a predicted Medicare payment for each urologist based on the number of patient visits. Urologists' actual payments were then compared with their predicted payments and ranked by the amount of "excess" payment above that which was predicted. Urologists in the top quartile of actual payments in excess of predicted payments were identified and compared with urologists in the lowest quartile.

We then identified 40 common services with the highest total payments by the gross reimbursement amount (Table 1). For these 40 services, the ratio of number of services per patient visit for the top quartile urologists relative to urologists in the bottom quartile was calculated as a relative risk using negative binomial regression models.

Finally, we calculated the potential cost savings of each service by eliminating "overutilization," defined as $>1.5 \times$ median number of these services per patient visit ($>50\%$ above the median ratio of number of service per patient visit). For example, the median number of cystourethroscopy (HCPCS 52000) per patient visit was 0.114 for all urologists who performed this procedure. The potential cost savings by the standard utilization of cystourethroscopy for a given urologist was calculated using the following formula:

$$(A - [B \times C] \times 1.5) \times D$$

where A is the total number of cystourethroscopies performed by a specific urologist, B is the median number of cystourethroscopies performed per patient visit for all urologists (0.114), C is the total number of patient visits for the specific urologist, and D is the median Medicare payment amount for cystourethroscopy for the specific urologist. The potential cost savings for this procedure were the aggregate of cost savings for all urologists who used this procedure at a rate >1.5 times the median. The overall potential Medicare cost savings were calculated by adding the potential cost savings from the standardized utilization of all 40 services.

All data analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, NC).

RESULTS

Total Medicare payment to the 8792 urologists participating in Medicare in 2012 was \$1,385,385,392. The median Medicare payment among urologists that year was \$125,997 (interquartile range, \$58,812-\$213,162) although the highest payment to an individual urologist was in excess of \$2,000,000. We included 8671 urologists (98.6%) in our analysis after excluding 121 who did not receive any payments for any new or return patient visits. The median number of patient visits per urologist was 851 (interquartile range, 470-1299).

Linear regression analysis revealed that the total number of patient visits (new and established) was strongly associated with overall Medicare payment ($R^2 = 0.70$). The analysis also showed that established visits ($R^2 = 0.69$) were more strongly associated with overall payment than new visits ($R^2 = 0.35$). Linear regression of total Medicare payment to providers on total patient visit numbers was used to stratify urologists into quartiles as defined by percentile of residual (actual payments in excess of predicted payments based on the number of total patient visits; Figure 1). This group of urologists received a minimum of \$15,989 (up to a maximum of \$1,691,340) in excess of predicted payment based on this linear regression model. The total amount in excess above predicted payments to these urologists was \$180,486,870 (13.0% of total Medicare payment to all urologists).

We then identified the 40 most highly reimbursed HCPCS codes by the highest gross reimbursement amount to all urologists (Table 1). These 40 HCPCS codes accounted for \$693,210,926, or 50% of the total Medicare payment to all urologists. The top 40 HCPCS codes billed to Medicare by urologists are listed in Table 1. The table also includes the relative risk of performing the services per patient visit by the top quartile urologists over the bottom quartile urologists in terms of excess payment and median Medicare reimbursement amount for each code.

All services were used significantly more frequently per patient visit by the top quartile urologists compared with urologists in the lowest quartile. Some of these services were highly reimbursed. For example, their utilization of higher reimbursed services, such as cystometrogram with voiding pressure studies (HCPCS 51728, \$227) and cystometrogram with voiding pressure studies and urethral pressure profile studies (HCPCS 51729, \$252), was >2 -fold higher than their peers in the bottom quartile (relative risk = 2.14 and 2.18, respectively). However, the utilization of services by top quartile urologists did not completely correlate with the reimbursement amount per procedure.

Table 2 includes potential Medicare cost savings by standardizing utilization of the 40 most reimbursed

Table 1. Relative risk of performing the 40 most frequently reimbursed HCPCS codes/services per patient visit by the top quartile urologists vs bottom quartile urologists

	HCPCS Code	Description	Relative Risk (95% CI), <i>P</i> Value	Median Reimbursement Per Service (\$)
1	J9217	Leuprolide acetate suspension	1.59 (1.58-1.60), <.0001	171.09
2	52000	Cystoscopy	1.41 (1.40-1.42), <.0001	147.61
3	51798	Ultrasound urine capacity measurement	1.47 (1.46-1.47), <.0001	14.16
4	55700	Biopsy of prostate	1.54 (1.52-1.57), <.0001	163.61
5	84153	Assay of total PSA	1.29 (1.29-1.30), <.0001	25.96
6	76942	Ultrasound-guided biopsy	1.63 (1.60-1.65), <.0001	151.38
7	76872	Transrectal ultrasound	2.29 (2.26-2.32), <.0001	96.69
8	52601	Transurethral resection of prostate	1.40 (1.36-1.44), <.0001	652.48
9	99223	Initial hospital care	2.19 (2.15-2.23), <.0001	155.03
10	52281	Cystoscopy and treatment (dilation)	1.87 (1.84-1.91), <.0001	210.24
11	50590	Fragmenting of kidney stone	1.53 (1.49-1.58), <.0001	433.68
12	99232	Subsequent hospital care	2.27 (2.24-2.29), <.0001	55.19
13	99222	Initial hospital care	1.76 (1.74-1.79), <.0001	104.28
14	52224	Cystoscopy and treatment (fulguration)	2.14 (2.07-2.21), <.0001	467.49
15	53850	Prostatic microwave thermotherapy	2.78 (2.49-3.10), <.0001	1683.47
16	51728	Cystometrogram with voiding pressure studies	2.14 (2.10-2.19), <.0001	227.38
17	88305	Tissue examination by pathologist	2.34 (2.31-2.38), <.0001	54.55
18	51729	Cystometrogram with voiding pressure studies and urethral pressure profile studies	2.18 (2.13-2.24), <.0001	252.22
19	76770	Retroperitoneal ultrasound, complete	2.20 (2.17-2.24), <.0001	97.52
20	55866	Laparoscopic radical prostatectomy	2.34 (2.14-2.56), <.0001	1287.32
21	52332	Cystoscopy and treatment (insertion of indwelling ureteral stent)	1.45 (1.43-1.47), <.0001	85.46
22	76775	Retroperitoneal ultrasound, limited	2.26 (2.23-2.30), <.0001	84.97
23	74178	CT abdomen and pelvis, with and without contrast	1.87 (1.82-1.92), <.0001	262.58
24	52648	Laser surgery of prostate	1.40 (1.35-1.46), <.0001	544.80
25	76857	Pelvis ultrasound, limited	2.78 (1.74-2.82), <.0001	65.11
26	51784	EMG of anal or urethral sphincter	2.34 (2.31-2.38), <.0001	76.90
27	51797	Intra-abdominal voiding pressure studies	2.20 (2.17-2.24), <.0001	91.90
28	51741	Complex uroflowmetry	2.52 (2.50-2.54), <.0001	13.10
29	76856	Pelvic ultrasound, complete	3.52 (3.43-3.61), <.0001	96.96
30	J3315	Triptorelin pamoate	1.11 (1.09-1.13), <.0001	139.04
31	81000	Urinalysis, nonautomated with microscopy	1.01 (1.00-1.02), <.0001	4.45
32	J0897	Denosumab injection	2.17 (2.15-2.19), <.0001	11.48
33	99231	Subsequent hospital care	1.58 (1.56-1.59), <.0001	29.79
34	51702	Insertion of temporary indwelling bladder catheter	1.10 (1.09-1.12), <.0001	54.62
35	96402	Antineoplastic hormonal therapy, intramuscular or subcutaneous injection	1.42 (1.40-1.43), <.0001	25.27
36	52310	Cystoscopy and treatment	1.43 (1.40-1.47), <.0001	181.08
37	52353	Cystoureteroscopy with lithotripsy	1.44 (1.38-1.49), <.0001	325.25
38	51720	Treatment of bladder lesion	1.30 (0.28-1.32), <.0001	84.71
39	99221	Initial hospital care	1.41 (1.39-1.44), <.0001	75.86
40	81003	Urinalysis automated without microscopy	1.10 (1.09-1.11), <.0001	3.16

CI, confidence interval; CT, computed tomography; EMG, electromyography; HCPCS, Healthcare Common Procedure Coding System; PSA, prostate-specific antigen.

HCPCS codes, that is, eliminating services per patient visit in excess of 50% above the median number for each code. The potential overall Medicare cost savings was \$125,199,007 (9.0% of total Medicare reimbursement to all urologists in 2012).

COMMENT

Substantial variability in Medicare utilization and payment existed among urologists in 2012 according to the recently

released Medicare Provider Utilization and Payment PUF by CMS. Overall Medicare payments correlated well with the number of patients seen by each provider. However, some providers received significantly more payment than would be predicted based on their number of patient visits. These providers were more likely to perform select high-margin procedures per patient visit than their counterparts. A standardized utilization of common procedures may result in significant Medicare cost savings. However, future analyses with beneficiaries' clinical characteristics need to

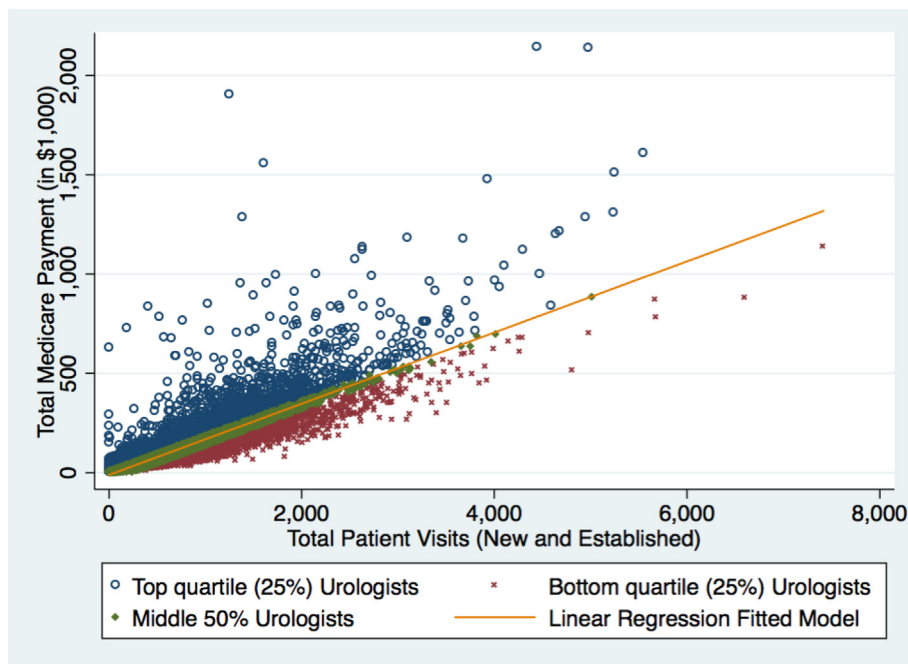


Figure 1. Total Medicare payment vs total patient visits among urologists. (Color version available online.)

be performed to more accurately determine the appropriate utilization of the services.

The recent release of the PUF prompted a quick response from media with immediate scrutiny of top-earning providers.⁵ However, more costly care, rather than just high volume, is considered a major reason for overutilization of resources and higher costs in the US health care system.² Until now, the extent of variability was unknown in the payment and utilization of costly care. Our analyses demonstrated that the overall reimbursement is strongly associated with the number of patient visits, suggesting that patient volume in itself, especially established patient visit volume, is responsible for a significant portion of overall costs in urologic care. However, there were urologists who received significantly higher reimbursement for the number of patient visits compared with their peers. Compared with their peers, the utilization patterns of these urologists were significantly different in all 40 of the common services provided that were analyzed. For example, their utilization of services, such as pelvic ultrasound and complex uroflowmetry, was up to 3-fold higher than their peers. However, their utilization of services did not completely correlate with the reimbursement.

Only days before the release of the PUF, JAMA Viewpoint by Steinbrook was published, predicting that the release of Medicare payment data was imminent. In his article, he warned that “there may be insufficient context about what the data mean and how they should be interpreted.”⁸ Higher utilization of certain services by some providers may simply reflect differences across patient populations. For instance, a practice with a large referral base of advanced prostate cancer patients would have higher utilization of leuprolide, denosumab, and

triptorelin administration than average. Similarly, urologists who specialize in localized prostate cancer treatment may perform more laparoscopic radical prostatectomies per patient visit than their peers. Alternatively, the observed variability in utilization may simply mirror that individual providers have different thresholds for diagnostic and therapeutic intervention.¹⁵ Also, some providers bill on behalf of colleagues in their practice, falsely inflating perceived earning by these individuals.⁶ Still, there may truly exist some element of over or unnecessary utilization of select services.

Recognizing potential variability in service utilization, the American Board of Urology currently requires its diplomats to submit a 6-month practice log as a part of the Maintenance of Certification process to assess practice patterns and management decisions. This process can identify outliers with overutilization of select services within the declared subspecialty focus and practice volume.¹⁶ However, the current analyses of the PUF demonstrated that significant variability in Medicare payment and utilization still exists in the field of urology.

Ownership or leasing of computed tomography (CT) scanners by nonradiologist physicians is a rapidly growing trend that raises concerns regarding self-referral.¹⁷ In 2013, Mitchell published a study asserting that urologists who had acquired ownership of intensity-modulated radiation therapy, a commonly used radiation treatment for prostate cancer with a high reimbursement rate, increased their use of intensity-modulated radiation therapy significantly more than those without ownership of these services, raising concern for self-referral.¹⁴ Radiographic procedures, such as CT or ultrasound, were among the service codes significantly associated with the top quartile urologists in our study. This raises the

Table 2. Potential Medicare cost savings by standard utilization of 40 most frequently reimbursed HCPCS codes or services

	HCPCS Code	Description	Potential Amount Saved (\$)
1	J9217	Leuprolide acetate suspension	15,531,865.30
2	52000	Cystoscopy	7,475,292.43
3	51798	Ultrasound urine capacity measurement	6,212,563.42
4	55700	Biopsy of prostate	1,858,634.60
5	84153	Assay of total PSA	1,952,074.76
6	76942	Ultrasound-guided biopsy	1,846,655.67
7	76872	Transrectal ultrasound	4,260,536.98
8	52601	Transurethral resection of prostate	1,602,742.48
9	99223	Initial hospital care	4,383,947.39
10	52281	Cystoscopy and treatment (dilation)	5,585,914.48
11	50590	Fragmenting of kidney stone	1,693,659.81
12	99232	Subsequent hospital care	5,909,891.31
13	99222	Initial hospital care	3,340,400.46
14	52224	Cystoscopy and treatment (fulguration)	4,955,620.40
15	53850	Prostatic microwave thermotherapy	3,110,866.20
16	51728	Cystometrogram with voiding pressure studies	3,389,095.28
17	88305	Tissue examination by pathologist	2,255,146.86
18	51729	Cystometrogram with voiding pressure studies and urethral pressure profile studies	3,252,052.98
19	76770	Retroperitoneal ultrasound, complete	4,755,240.07
20	55866	Laparoscopic radical prostatectomy	3,373,207.43
21	52332	Cystoscopy and treatment (insertion of indwelling ureteral stent)	1,420,763.13
22	76775	Retroperitoneal ultrasound, limited	4,459,061.30
23	74178	CT abdomen and pelvis, with and without contrast	1,339,492.12
24	52648	Laser surgery of prostate	1,293,545.21
25	76857	Pelvis ultrasound, limited	4,935,149.76
26	51784	EMG of anal or urethral sphincter	3,306,251.02
27	51797	Intra-abdominal voiding pressure studies	2,372,794.71
28	51741	Complex uroflowmetry	4,305,536.55
29	76856	Pelvic ultrasound, complete	3,982,200.28
30	J3315	Triptorelin pamoate	1,074,729.61
31	81,000	Urinalysis, nonautomated with microscopy	180,082.50
32	J0897	Denosumab injection	1,427,346.18
33	99231	Subsequent hospital care	2,616,777.68
34	51702	Insertion of temporary indwelling bladder catheter	1,062,698.50
35	96402	Antineoplastic hormonal therapy, intramuscular or subcutaneous injection	811,313.72
36	52310	Cystoscopy and treatment	917,689.30
37	52353	Cystoureteroscopy with lithotripsy	792,224.98
38	51720	Treatment of bladder lesion	633,940.63
39	99221	Initial hospital care	1,293,385.95
40	81003	Urinalysis automated without microscopy	228,615.57
	Total		125,199,007.01

Abbreviations as in Table 1.

question of whether these urologists are indeed ordering more radiographic studies in comparison with average urologists. However, a pattern of self-referral cannot be fully ascertained within the confines of the current data set because referrals to independent radiology centers for CT scans were not documented in the PUF as a means for comparison.

Analysis of possible overutilization is necessary to combat rising health care costs. In fact, a standardized utilization of common procedures may result in significant cost savings without sacrificing quality. For example, Intermountain Healthcare in Utah and Idaho measured practice variation in common treatments since 1986.¹⁸ They learned that there was significant variation in utilization across physicians, even for the same condition.

Subsequently, Intermountain Healthcare standardized their obstetric delivery protocol and saved an estimated \$50 million in Utah each year while maintaining high levels of clinical outcome.¹⁸

There are several limitations of the present study that deserve mention. Most importantly, beneficiaries' clinical characteristics were not included in the PUF. Therefore, it is not possible to adjust service utilization for diverse patient populations. The present report demonstrates the need for a more complete release of information in the future including patient clinical characteristics to determine appropriate utilization of services. Another important limitation is that reimbursement does not equate directly with profit. Services with high reimbursement are usually costly, and the payment may not even fully cover

the actual cost of the procedure.^{5,19} Also, some providers listed in the PUF bill on behalf of other providers within the same group, inflating perceived earning by these individuals.⁶

Despite these limitations, public records such as PUF data and analyses such as ours have the potential to allow for objective assessment and identification of variability in practice patterns.¹⁶ There are significant implications to all the involved parties in health care. For Medicare beneficiaries, the analysis such as one herein may help them choose physicians based on their utilization pattern.⁸ For health care providers, the significant variability in utilization shown here may prompt them to carefully examine their own utilization patterns to practice high-value, cost-conscious health care.²⁰ For regulatory organizations and specialty boards, analyses like the present study represent a new methodology to identify performance deficiencies, analyze variation, and report analysis results.¹⁵

In 2012, the total payment to urologists accounted for <2% of the total Medicare payment to providers. In addition to the identification and elimination of low-value services,²¹ CMS may consider controlling rising health care cost by standard utilization of services based on well-defined clinical guidelines and/or recommendations. Our approach to the Medicare Payment and Utilization data can be applied to other medical and surgical specialties beyond urology to analyze and understand their providers' practice patterns. If a similar approach for standardized utilization were to be applied to the providers in other medical and surgical specialties, potential savings to Medicare as a whole will be substantial. The present report highlights the need for additional data on service-matched patient and disease characteristics to mitigate limitations identified in our analysis.

CONCLUSION

Overall Medicare payments to urologists correlated well with the number of patient visits. There was substantial variability in utilization of commonly performed services per patient visit. This type of analysis has the potential to lead to significant cost savings via appropriate standardized utilization of services. However, the current PUF data, as it stands, are inadequate to drive decision making. Thus, we advocate for the release of corresponding clinical information in the future versions of the PUF.

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EDITORIAL COMMENT



The authors¹ rely on data released in a massive Medicare data dump earlier in 2014, regarding Medicare utilization by urologists in 2012. The nature of the data has been widely criticized for a number of inaccuracies. The authors¹ acknowledge this severe shortcoming by referencing 2 newspaper articles (References 5 and 6 in Ko, et al.¹). This reviewer cites a letter written by James Madara, MD, Executive VP and CEO of the American Medical Association, written to Marilyn Tavenner, Administrator of Centers for Medicare and Medicaid Services (<http://thehill.com/blogs/congress-blog/healthcare/209039-cms-data-dump-tells-policy-makers-nothing>), pointing out a myriad of shortcomings from these data. The data are not stratified by

severity of illness or even diagnosis—it is simply impossible to ascertain based on billing data whether a service is medically appropriate or not. As the authors¹ point out, the data dump represents claims data information only based on individual practitioner National Provider Identifier number, it may incorrectly credit services to certain providers, particularly in subspecialty or group practices that perform particular services for a greater subset of providers—artificially increasing volume to some practitioners, whereas decreasing it for others.

Reliance on a flawed set of raw data in and of itself invalidates any conclusions that the authors¹ may draw. That said, I am troubled by the fundamental suggestion on which this article is based: that lower utilization is the appropriate utilization. There is simply no justification for this suggestion. Although the authors¹ have tried to balance their assertions by pointing out the “flaws and pitfalls of an analysis based off of the present PUF file (authors’ comments to the Editor) ...” many reading this article¹ may conclude that those providing services in the lowest quartile are providing better or more appropriate care than those in the highest quartile. This assumption would have been fallacious even if the raw data were incontrovertible, which in fact it is not.

Therefore I am particularly troubled by what appears to be an intrinsic bias in the article. The authors¹ review allegations regarding utilization of services, particularly in-office ancillaries, quoting articles that have been widely criticized as both methodologically flawed and politically motivated. “Some believe reimbursement has a significant effect on urologists’ practice patterns.” (11-14). The authors state: “In 2013, Mitchell published a study asserting ...” (14). Mitchell indeed asserted a great deal—and those allegations were based on questionable data and methodology. In fact, issues regarding costs and utilization of such services are far from settled.

There is no question that the Medicare data indicate that there is significant variation in the degree in which certain services are performed by members of the urologic community. Unfortunately, from within this data set, we are unable to answer the question as to why this is so. So this Editor joins the authors encouraging Centers for Medicare and Medicaid Services, if they are going to release data such as they have released in this data dump, to release more complete data that will allow all stakeholders in our health care system to arrive at more constructive conclusions to achieve what we all seek—the appropriate utilization of limited resources to provide appropriate health care to all our patients. We have taken an oath to do so.

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<http://dx.doi.org/10.1016/j.urology.2014.11.055>

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REPLY



Dineen¹ has insightfully voiced some concerns that we shared when setting out to draft this article. We agree that underutilization is not necessarily the appropriate utilization, however, neither is overutilization. As we stated in the article, appropriate utilization can only be determined with additional information regarding the clinical characteristics of beneficiaries. Unfortunately, such data are not currently available. Because of the limitations in the data, we can only point to the significant amount of variability in service utilization among urologists and its correlation with reimbursement.

Without the necessary patient data, we can only ask that urologists carefully examine their own utilization patterns to practice high-value, cost-conscious health care. We believe that it is our responsibility to present a fair evaluation of the Public Use File and hope that the limitations of our analysis will advocate for the release of balanced information in the future.

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