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Report from an Academic Medical Center**

B.B. Noveiry, F.N. Varzaneh and D.M. Yousem

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Revenue Increase following 2017 Multiple Procedures Payment Reduction Modification: Differential Impact on Neuroradiology—Report from an Academic Medical Center

 B.B. Noveiry,  F.N. Varzaneh, and  D.M. Yousem



ABSTRACT

BACKGROUND AND PURPOSE: The Centers for Medicare and Medicaid Services imposed a 25% professional component multiple procedure payment reduction for the professional component of advanced diagnostic imaging modalities in January 2012. In 2017, the Centers for Medicare and Medicaid Services rolled back the multiple procedure payment reduction to 5% for subsequent imaging. To evaluate the effect of this change, we analyzed 5 months of Centers for Medicare and Medicaid Services procedures at Johns Hopkins Medical Institution.

MATERIALS AND METHODS: We analyzed the procedure codes and reimbursement rate for studies performed between January 1 and May 31, 2017. Patients with Medicare insurance who had multiple diagnostic procedures in a day were selected. Per the Centers for Medicare and Medicaid Services guidelines, procedures with the highest price were considered fully reimbursed and subsequent studies were marked for differences between 25% (2013–2016) and 5% reduction (2017).

RESULTS: We included 8787 patients with 22,236 procedures (mean, 2.53 studies/day). CT, MR imaging, and ultrasound scans composed 75.9%, 21.5%, and 2.6% of all studies, with 61.2%, 54.9%, and 85.4% of the procedures of each technique subject to multiple procedure payment reduction, respectively. The projected reimbursement for these studies was \$1,666,437, which translated to a \$179,782 (12.1%) increase in revenue comparing 25%-versus-5% multiple procedure payment reduction rates for 5 months: \$128,542 for CT, \$47,802 for MR imaging, and \$3439 for ultrasound. The annual overall prorated increase in revenue would be \$431,476. The impact was maximal for neuroradiology.

CONCLUSIONS: With the recent favorable adjustment in multiple procedure payment reduction regulations, CT-heavy subspecialties like neuroradiology benefit the most with revenue increases. Different practice settings might experience revenue increases to a different extent, depending on the procedure and payer mix.

ABBREVIATIONS: ACR = American College of Radiology; ASNR = American Society of Neuroradiology; CMS = Centers for Medicare and Medicaid Services; CPT = Current Procedural Terminology; MPPR = multiple procedure payment reduction; PC = professional component; TC = technical component; US = ultrasound


The Centers for Medicare and Medicaid Services (CMS) imposed the multiple procedure payment reduction (MPPR) for certain advanced diagnostic imaging modalities (CT, MR imaging, and ultrasound [US]) in 2006 based on the Medicare Payment Advisory Commission recommendation. Initially, only the technical component (TC) of the service fee was subject to MPPR.

The TC of a service covers the cost of equipment, supplies, and nonphysician personnel. This reduction started out at 25% and applied to contiguous body parts, but in 2011, the TC MPPR was increased to 50% and became applicable to noncontiguous body parts.¹ Despite opposition by radiologist groups, including the American College of Radiology (ACR) and the American Society of Neuroradiology (ASNR), CMS imposed a 25% reduction in the professional component (PC) of multiple studies as part of the 2011 MPPR, which went into effect on January 1, 2012.^{2,3} While initially this applied to multiple diagnostic imaging services administered by the same physician to the same patient during a single office visit, it was further expanded in 2013 to include all physicians practicing in the same group, irrespective of the practice setting.⁴ In practice, this meant that if a patient underwent >1 imaging study on a single day, the highest priced procedure was reimbursed fully (100%), but any subsequent same-day imaging

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From the Departments of Medicine (B.B.N.) and Radiology (F.N.V.), Division of Body MRI, Johns Hopkins University, Baltimore, Maryland; and Department of Radiology (D.M.Y.), Division of Neuroradiology, Johns Hopkins Medical Institution, Baltimore, Maryland.

Please address correspondence to David M. Yousem, MD, MBA, Department of Radiology, Division of Neuroradiology, Johns Hopkins Medical Institution, 600 North Wolfe St, Phipps B100F, Baltimore, MD 21287; e-mail: dyousem1@jhu.edu

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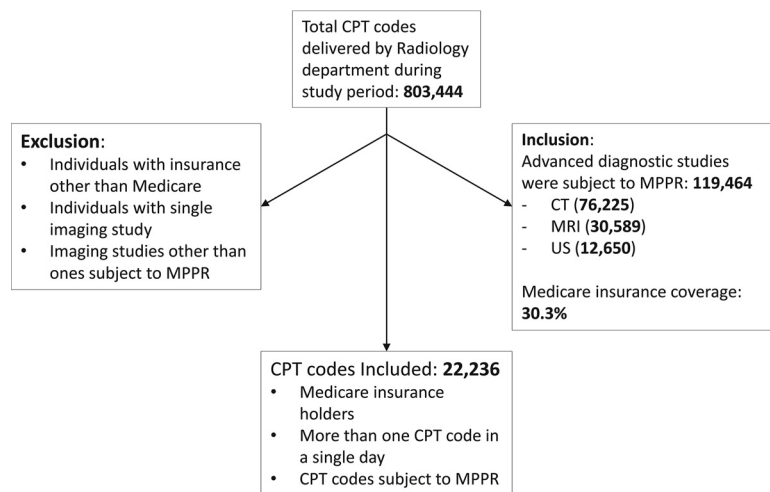


FIGURE. This chart illustrates the criteria for patient inclusion and exclusion.

studies would be paid at 75% of the original amount allocated by the CMS Current Procedural Terminology (CPT) codes for PC.

For example, if a patient had a brain CT, an ultrasound of the pelvis, and a cardiac MR imaging on the same day within a radiology group and 3 different radiologists reported each of those studies at 3 different office locations, Medicare would reimburse the PC of the highest priced procedure (cardiac MR imaging) fully and would only reimburse the brain CT and pelvic sonography at 75% of the full price of the subsequent studies from 2013 to 2016. This change had a large impact on neuroradiology, given the following frequent studies: 1) brain and spine CT studies in the emergency department for trauma, 2) brain and spine MRIs for multiple sclerosis, 3) CT/CTA and MR/MRA studies for strokes and aneurysms, and 4) screening cervical, thoracic, and lumbar spine studies in patients with cancer for cord compression and subarachnoid seeding.⁵

In 2016, the CMS was convinced to roll back the MPPR for the PC under growing pressure from the ACR, ASNR, and the American Medical Association after receiving extensive data supplied by these organizations.^{4,6} As of January 1, 2017, the MPPR was changed to a 95% level of reimbursement for subsequent multiple body part imaging.⁷ So, in the above instance, the brain CT and pelvic sonography PC would be paid at 95% of the full allowed reimbursement.

To evaluate the effect of this change, we analyzed the impact during 5 months of activity at Johns Hopkins Medical Institution (January to May 2017). Because our emergency department physicians often request imaging of multiple body parts for trauma and our oncologic practice uses chest, abdomen, and pelvic CT scanning to screen for and follow cancers, we hypothesized that we would see a large increase in revenue from the CMS decision.

MATERIALS AND METHODS

The CPT codes of the procedures performed by the department of radiology at our institution between January 1, 2017, and May 31, 2017, were retrieved via our radiology billing service. Patients with Medicare insurance who had multiple diagnostic procedures in a day were selected for analysis. Patients with a single imaging and patients holding health insurance other than Medicare were excluded.

The Healthcare Common Procedure Coding System CPT codes were extracted from the CMS Web site, and the diagnostic imaging family indicator 88 (subject to the reduction of the TC diagnostic imaging [effective for services January 1, 2011 and after]) was used to retrieve procedures for which MPPR would apply.^{8,9} TC and PC facility prices for selected imaging, for our local and national area, were extracted using modifier 26.^{8,9} We categorized CPT codes into 4 different groups of imaging: neuroradiologic, body, musculoskeletal, and breast. Per CMS guidelines, procedures with the highest price were considered fully reimbursed and subsequent studies were marked for further calculations, either a

25% reduction (2013–2016) or a 5% (2017) reduction.

We based the calculations on Medicare reimbursement rates, not actual payments. We sought to determine the theoretic increase in revenue that could be expected through the change in MPPR for PC reimbursement. Thus, we did not explore payments received. To estimate the MPPR impact on radiology practices nationwide, we used available reports of advanced diagnostic imaging numbers in the United States. Because this project did not analyze any personal information, it was considered an institutional review board–exempt study and was in full Health Insurance Portability and Accountability Act compliance. Descriptive statistical analysis was done using Excel 2013 (Microsoft, Redmond, Washington).

RESULTS

From January 1, 2017, to May 31, 2017, the radiology department performed 803,444 procedures. Advanced diagnostic studies subject to MPPR consisted of 14.9% of all procedures and 119,464 events (CT, $n = 76,225$; MR imaging, $n = 30,589$; and US, $n = 12,650$). Of all patients, 30.3% had Medicare insurance coverage at our institution. After we excluded patients as defined in the “Materials and Methods” section, 8787 patients with Medicare insurance and >1 CPT code in a single day were included, undergoing procedures with 22,236 CPT codes, representing an average of 2.53 studies per day (Figure and Table 1).

The CMS has defined 121 imaging CPT codes subject to MPPR. Procedure names as shown on the CMS Web site and our institution categorization are shown in the On-line Table. For all selected CPT codes, the facility price for the PC was equal to the listing for the nonfacility limiting charge of CMS. Our local regional PC nonfacility limiting charge is 5.04% higher than the national value, on average.

Projected reimbursement after implementation of MPPR relative to full reimbursement for PC, TC, and global fees were \$1,666,436 (97.4%), \$3,206,700 (73.8%), and \$4,873,137 (80.5%), respectively. These values reflect 100% reimbursement for the first study performed plus the 2017 MPPR reduction for the PC (5%) and TC (50%) calculations.

If one applies the 25% 2013–2016 MPPR on the PC and compares that with the 5% MPPR of 2017, one finds a revenue in-

Table 1: Advanced diagnostic imaging procedures subject to multiple procedure payment reduction performed from January to May 2017

Modality/Imaging Category	Count (%) of All Imaging	Proportion of Imaging Category Subject to MPPR within Modality	Proportion of Imaging Modality Subject to MPPR
CT	16,874 (75.9)		61.2%
Neuroradiologic		76.4%	
Musculoskeletal		82.8%	
Body		52.3%	
MRI	4780 (21.5)		54.9%
Neuroradiologic		55.0%	
Musculoskeletal		63.8%	
Body		49.4%	
Breast		53.3%	
US	582 (2.6)		85.4%
Body		85.4%	
Total	22,236 (100)		60.5%

crease of \$179,782 (12.1%) for the 8787 patients who had multiple studies performed; this includes \$128,542 (12.1%) for CT, \$47,802 (11.6%) for MR imaging, and \$3439 (21.2%) for US.

$$\begin{aligned}
 & [\text{Highest Price CPT code} + (\text{Lower price CPT codes} \\
 & \quad \times 95\%) - \text{Highest Price CPT code} \\
 & \quad + (\text{Lower price CPT codes} \times 75\%)]
 \end{aligned}$$

One can estimate the prorated annual (12-month) revenue increase by multiplying the calculated 5-month revenue increase by the 12/5-month ratio. The prorated annual revenue increase would become \$431,476 in total (Tables 1 and 2).

A general comparison of different imaging categories and modalities and relative MPPR impact is shown in Table 2. The US technique had the highest proportion of CPT codes affected by MPPR, of which 85.4% of studies were subject to MPPR, followed by CT (61.2%) and MR imaging (54.9%); however, the total number for ultrasound was small. When we compared the different categories of CPT codes, 71.7% of musculoskeletal studies were multiple, followed by 67.9% of neuroradiologic studies, and 53.8% of body imaging.

The neuroradiology division obtained the highest increase in revenue because of the following: 1) a high rate of MPPRs overall at 67.9%, 2) higher volume of both MR imaging and CT studies, 3) higher reimbursement for MR imaging compared with CT, 4) fewer MRIs performed in the body and musculoskeletal and breast imaging designations, and 5) far fewer ultrasounds, which are reimbursed at a lower rate. Thus, although the overall rate of MPPR for neuroradiology (67.9%) was lower than for musculoskeletal studies (71.9%), the higher volume of cases subject to MPPR favored the reimbursement of neuroradiology. At the same time, body imaging, by virtue of a higher volume of MPPR CT cases than neuroradiology nearly had the same benefit in revenue (\$88,000 in neuroradiology versus \$86,000 for body), despite a lower overall rate for MPPR (53.8%) (Table 2).

The number of patients with multiple imaging in a day, their respective number of imaging scans, monetary MPPR impact, and most common imaging combinations are shown in Tables 3 and 4. Most patients (70.9%) had only 2 studies. The most common combination was abdominopelvic and thoracic CT with contrast, followed by abdominopelvic and thoracic CT without

contrast, accounting for 22.9% and 6.7% of all procedures, respectively. After the abdominopelvic CT and thoracic CT combination, the most common 2 studies performed were brain and cervical spine CT scans, commonly ordered in our emergency department. The most common 3 studies performed together were brain, maxillofacial, and cervical spine examinations, presumed to be from trauma cases in the emergency setting. These examples maximally impacted neuroradiology.

It has been reported that the total number of CT scans performed annually in the United States is around 80 million

scans.¹⁰ Also, in 2016, there were 121 MRIs per 1000 inhabitants,¹¹ and considering ~321 million US population,¹² the annual number of MR imaging studies can be estimated to be around 38.8 million per year. We could not find a report of annual studies in the United States for US, but if we assume that the proportion of advanced diagnostic imaging modalities at our institution mirrors that in the nation, we can roughly estimate 3.2 million ultrasounds performed, for a total of 122 million advanced diagnostic imaging procedures per year. If we assume that the rate of multiple procedure codes is 10% across the country (a reduction from our rate by one-third because we have a heavy emergency department/oncology practice) and if the overall Medicare payer mix is like ours at 30%, then 3.66 million studies would be affected. If we apply our added revenue of \$179,782 for 22,236 CPT codes in this study, it would yield added revenue nationally to radiology as a whole of approximately \$29.6 million.

DISCUSSION

Our results show that depending on payer mix and procedure mix, some radiology practices may experience a major increase in reimbursement secondary to the rollback of the MPPR, with the neuroradiology portion of the practice receiving the most benefit. Those neuroradiology hospital-based practices with a higher rate of emergency department–combined trauma CT scans will likely receive a higher benefit than some outpatient imaging practices. However, neuroradiologists will also see improved revenue in MR imaging/MRA cases, complete spine MR imaging studies for metastatic disease, and neuroaxis (brain, cervical spine, thoracic spine MR) multiple sclerosis examinations.

The multiple procedures payment reduction of the CMS for the TC of certain advanced diagnostic imaging (CT, MR imaging, and ultrasound) had been justified on the basis of increased efficiency of simultaneous procedures in the same session.¹³ MPPR was basically saying that less work is done when multiple procedures are delivered to 1 patient at a single session. This concept was followed by adjusted reimbursement (ie, decreased payment).¹⁴

The MPPR has been one of the most challenging issues between radiology communities and the CMS. Since the early introduction of the TC of the MPPR in 2006, the concept was applied to other components of radiology reimbursement and was increased

Table 2: Different categories of advanced diagnostic imaging categories and modalities^a

	No. of Procedures	Proportion of Procedures Subject to MPPR	75% Reimbursement	95% Reimbursement	Presumed 100% Reimbursement	\$ Increase (%)	Prorated Annual Increase	\$ Deficit (%)	Prorated Annual Deficit
Imaging categories									
Neuro-radiologic	9952	67.9%	\$ 613,157	\$ 701,503	\$ 723,589	88,346 (14.4)	\$ 212,030	22,086 (3.1)	53,006
Body	11,778	53.8%	\$ 841,173	\$ 927,297	\$ 948,828	86,123 (10.2)	\$206,695	21,531 (2.3)	51,674
Musculoskeletal	491	71.7%	\$ 31,182	\$ 36,354	\$ 37,648	5172 (16.6)	\$ 12,412	1293 (3.4)	3103
Breast	15	53.3%	\$ 1142	\$ 1282	\$ 1318	141 (12.3)	\$ 338	35 (2.7)	84
Imaging modalities									
CT	16,874	61.2%	\$1,058,073	\$ 1,186,614	\$1,218,750	128,542 (12.1)	\$308,500	32,135 (2.6)	77,124
MRI	4780	54.9%	\$ 412,381	\$ 460,183	\$ 472,133	47,802 (11.6)	\$ 114,724	11,950 (2.5)	28,680
US	582	85.4%	\$ 16,200	\$ 19,639	\$ 20,499	3439 (21.2)	\$ 8253	860 (4.2)	2064
Total imaging	22,236	60.5%	\$1,486,654	\$1,666,437	\$ 1,711,382	179,782 (12.1)	\$ 431,476	44,946 (2.6)	107,870

^aNote the new MPPR policy impact on net revenue increase and the current deficit to the full reimbursement.

Table 3: Number of patients with multiple advanced diagnostic imaging per day, respective number of imaging procedures, and net revenue loss due to current 5% MPPR

Procedures Count in Single Day	No. (%) of Patients	No. (%) of Procedures	Net Revenue Loss (%) due to 5% MPPR
2	6226 (70.9)	12,452 (56.0)	\$20,415 (45.4)
3	1474 (16.8)	4422 (19.9)	\$9913 (22.1)
4	648 (7.4)	2592 (11.7)	\$6734 (15.0)
≥5	439 (5.0)	2770 (12.5)	\$7884 (17.5)
Total	8787 (100)	22,236 (100)	\$44,946 (100)

from 25% to 50% applied to the TC Medicare Physician Fee Schedule, including noncontiguous body parts across different modalities.¹⁵ Among different medical insurances, United Healthcare is the only major insurance company that implemented the MPPR besides the CMS.¹⁶

In 2011, the Medicare Payment Advisory Commission proposed a 50% PC MPPR inclusion in the Medicare Physician Fee Schedule, which caused stiff ACR and radiologist opposition. The Medicare Payment Advisory Commission justified this huge cut in revenue with the rationale that radiologists do not perform some reporting activities twice for multiple studies within 1 report, such as reviewing medical history, reviewing the final report, and following up with the ordering physician.¹⁵ While one might understand that a single injection of contrast to a person in a CT scanner that included chest, abdomen, and pelvis in 1 session should have some reduction in the TC, this amount of PC MPPR was undermining the independent interpretation of images by radiologists, particularly across subspecialties of radiology. The ACR and ASNR argued that sometimes 1 clinical history does not pertain to all body parts (eg, brain versus chest). If the radiology group had different subspecialized radiologists interpreting different imaging modalities that are not collocated, the rationale proposed by Medicare Payment Advisory Commission was lacking.

The idea that there were “efficiencies” to justify reducing the TC by 50% on an ultrasound study performed in one building from a CT scan performed in another site on the same day seemed unreasonable to most radiologists. The application of this logic to the professional component rather than restricting it to the technical component of a CPT code also rankled radiology and the ASNR leadership. The PC of the CPT code is supposed to reimburse physician work, practice expense, and professional liability insurance.¹⁷ It was unclear how multiple procedures in 1 day would have any effect on professional liability insurance costs and even on practice expenses.

However, the result was a 25% PC reduction as of January 1, 2012.^{1,14,18} In 2013, this was further expanded, so the 25% PC MPPR would apply to all radiologists in the same group practice interpreting multiple imaging studies from the same patient on the same day, irrespective of practice setting.^{1,4,18} The impact of this was not inconsequential. Chiao et al⁵ found that the PC MPPR unevenly affected different divisions of radiology, with thoracic imaging losing the most percentage and neuroradiology losing the most absolute revenue relative to other divisions.⁵

For >4 years the ACR and ASNR lobbied Congress and provided scientific data from well-performed peer-reviewed published studies regarding the impact of performing multiple studies on the same patient. Allen et al¹⁹ found that the maximum estimated percentage work reduction when multiple services were performed by the same physician in the same session was small, ranging from 4.3% to 8.2%, with a mean of 5.9% ± 1.5%, substantially less than the 25% PC MPPR that was in place at the time of the publication.

Duszak et al²⁰ found that the potential work reduction for same-session, same-technique services rendered by different physicians in the same group practice was even smaller, ranging from 1.4% to 2.7%, with a mean of 1.8% ± 0.6%.

Thus, after the initial series of unsuccessful negotiations in 2006 and 2011, the ACR, ASNR, and other radiology advocacy groups were able to convince the CMS in August 2016 to release a new decision, the MPPR rollback, which decreased the reduction in PC reimbursement from 25% to 5%.^{21,22} The TC MPPR remained at the previous 50% level.

The impact of the 25% reductions on the field of neuroradiology was noted by the leaders in the profession. These consequences for neuroradiologists in private and academic settings included not just reduced revenue but downstream effects. First, divisional self-sufficiency was harmed. By sharply decreasing the revenue of certain divisions, the PC MPPR unintentionally but ominously impaired the financial health of these divisions. The revenue needed to support clinical fellows dropped. In academic medical centers, this impairment could have resulted in fewer dollars available for hiring new faculty, fellow support, research initiatives, and discretionary funds. Second, interdivisional relationships could be impaired. If certain divisions are seen as being subsidized by others, they may be perceived as “weak” or a drain on resources. Finally, the perception of “profitable” and “unprofitable” divisions may reach radiology residents, who are sensitive to issues of financial stability and well-being as they consider job prospects. Although the PC MPPR is certainly a minor factor

Table 4: Most common combinations of diagnostic imaging

First Image	Second Image	Third Image	Fourth Image	Percentage of Study Imaging
CT abdomen & pelvis w/contrast	CT thorax w/dye			22.9
CT abdomen & pelvis w/o contrast	CT thorax w/o dye			6.7
CT neck spine w/o dye	CT head/brain w/o dye			4.6
CT angio abdomen & pelvis w/o & w/dye	CT angiography chest			2.5
MRI brain stem w/o & w/dye	MR angiography head w/o dye			1.7
MRI brain stem w/o & w/dye	MRI orbit/face/neck w/o & w/dye			1.5
CT maxillofacial w/o dye	CT head/brain w/o dye			1.4
CT neck spine w/o dye	CT maxillofacial w/o dye	CT head/brain w/o dye		1.2
CT abdomen & pelvis w/o contrast	CT thorax w/o dye	CT head/brain w/o dye		1.2
CT thorax w/o dye	CT head/brain w/o dye			1.2
CT head/brain w/o dye	CT head/brain w/o dye			1.1
CT abdomen & pelvis w/contrast	CT abdomen & pelvis w/contrast	CT thorax w/dye	CT thorax w/dye	1.1
CT thorax w/o dye	CT maxillofacial w/o dye			0.9
MRI brain stem w/o dye	MR angiography head w/o dye			0.8
CT angiography head	CT angiography neck			0.8
CT soft-tissue neck w/dye	CT thorax w/dye			0.8
CT abdomen & pelvis w/contrast	CT thorax w/dye	CT head/brain w/o dye		0.8
CT abdomen & pelvis w/contrast	CT soft-tissue neck w/dye	CT thorax w/dye		0.7
CT abdomen & pelvis w/contrast	CT thorax w/dye	CT neck spine w/o dye	CT head/brain w/o dye	0.7
CT abdomen & pelvis w/contrast	CT angiography chest			0.7
MRI brain stem w/o & w/dye	MR angiography neck w/o & w/dye	MR angiography head w/o dye		0.6

Note:—w/o indicates without; w/o & w/, without and with; w/, with; angio, angiography.

overall, particularly now at a 5% reduction, it could conceivably have influenced resident decision-making regarding subspecialty fellowship training, resulting in fewer residents choosing to pursue certain subspecialty fellowships. In summary, the PC MPPR could have substantial unintended consequences on neuroradiology that were not considered by the CMS before the policy was adopted but were apparent to the neuroradiology community.⁵

On the basis of our categorization and the change in rate from 25% to 5% of MPPR, the impact on different divisions of radiology has decreased substantially. However, we have found that the revenue of the neuroradiology division and CT scanning as a technique are most affected.

During the study, 30.3% of patients who received radiology services were covered by Medicare at our institution. This MPPR policy will affect centers accordingly with more or less of a Medicare payer mix. Private insurance companies, such as United Healthcare, might mirror the changes regulated by Medicare and further decrease practice revenue.

Although we could not find a report to compare our institution count of modalities with those of other institutions, our estimates indicate that MPPR might impact a considerable portion of advanced diagnostic imaging studies for radiology practices across the United States.

There are certain limitations in this report. First, the study took place in a tertiary care academic medical center with a primary trauma center. Our study reflects the effect on an academic setting, with a high number of patients and many emergent requests for advanced diagnostic imaging, often leading to multiple studies per day. Also, it is more common in our hospital-dominated practice setting to have multiple procedures in the same day for a patient than in an outpatient center-dominated practice.

Another limitation in our results is that our numbers reflect the projected reimbursement amount, not the actual amount because the collection rate varies across CMS geographic areas and copay deductions. We also admit that since United Healthcare is not disclosing its Physician Fee Schedule the way CMS does, we

could not analyze the revenue impact on United Healthcare patients.

CONCLUSIONS

Our results indicate that with recent favorable adjustments in MPPR regulations, the overall prorated increase in revenue at our academic medical center (\$431,476) will impact CT-heavy subspecialties the most, especially body imaging and neuroradiology. The CT volume, coupled with high MR imaging reimbursement rates, will lead to beneficial changes in neuroradiology practices. Large practices can expect increased revenue based on the analysis we have made and the number of cases affected. Depending on overall volume and payer mix, other practices may see more or less impact.

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