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An Empiric Medicare Claims-Based Utilization Approach to Mitigating the Iodinated Contrast Shortage

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DESCRIPTION OF THE PROBLEM

Recent coronavirus disease of 2019 (COVID-19)–related lockdowns in China resulted in the shutdown of the GE Healthcare factory responsible for production of most of the iodinated contrast used in the United States [1]. Given increased clinical reliance on CT, which often includes the need for intravenous contrast, for the diagnosis and follow-up of a variety of conditions and its associated dramatic utilization growth over recent decades [2], disruptions in patient care have already occurred and are anticipated to continue. The ACR recently released recommendations to help mitigate that impact [3], and individual centers are beginning to share their institutional approaches and experience [4,5].

Those early reports have largely been clinically focused, highlighting interdisciplinary collaboration, operational opportunities (eg, dosing and alternative contrast agents), and care pathways (eg, oncology versus other diseases). Given the daunting challenges associated with most effectively rationing of limited contrast resources, we believe that empiric utilization data could help prioritize and inform professional society guidelines and health system decision making by focusing mitigation strategies on areas in which contrast is most frequently used. Because institutional and enterprise data on local contrast agent utilization may be variable in availability, completeness, and quality, national benchmark information could prove useful. Using recent Medicare claims data, we thus detail CT services by body region and site of service in which iodinated contrast is used most frequently.

WHAT WE DID

In a manner similar to that previously described [6,7], we obtained and retrospectively analyzed an unredacted Medicare Physician/Supplier Procedure Summary Limited Data Set (https://www.cms.gov/research-statistics-data-systems/limited-data-set-lds-files/physiciansupplier-procedure-summary-psps-limited-data-set-lds) for 2019 (the most recent pre–COVID-19 pandemic year for which files were available). Because Physician/Supplier Procedure Summary data sets contain no private identifiable information, their use does not constitute human subjects research and thus exempt from institutional review board oversight. This data set contains 100% of 2019 Medicare Part B fee-for-service claims, aggregated by combinations of service and site of service.

Using the Neiman Imaging Types of Service coding system (http://www.neimanhpi.org/neiman-imaging-types-of-service-nitos/) in a manner similar to that previously described [2], and manually isolating all comport with terminology used elsewhere that involve iodinated contrast, we extracted national counts of allowable services for all contrast-enhanced CT services by body region and high-volume sites of service (inpatient and outpatient hospital, office, and emergency department), additionally separating these codes into angiographic (CT angiography [CTA]) versus nonangiographic CT services. To avoid double counting of services with separate technical and professional component billing, we focused only on global and professional service claims. Using Medicare enrollment data in a manner previously described [8], population-based utilization was calculated and reported per 100,000 Medicare beneficiaries and CTA to nonangiographic CT services by body region and site of service was reported as a ratio.

OUTCOMES AND LIMITATIONS

As detailed in Table 1, Medicare fee-for-service beneficiaries population-adjusted utilization of contrast-enhanced CT was highest in the outpatient hospital (10,728 per 100,000 beneficiaries) and emergency department (8,740 per 100,000 beneficiaries) settings. By

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Table 1. Medicare fee-for-service utilization (per 100,000 Medicare beneficiaries) of contrast-enhanced CT and CTA by Neiman Imaging Types of Service body region by site of service for year 2019

Body Region	Inpatient Hospital	Outpatient Hospital	Office	ED	All Other	Total
Brain	633.7	456.7	129.3	735.0	5.8	1,960.6
Head/neck	664.3	879.6	293.4	883.9	11.2	2,732.4
Spine	66.2	161.5	36.4	77.5	1.1	342.7
Cardiac	40.7	226.9	80.1	7.5	0.1	355.3
Chest	2,070.2	3,751.2	1,189.3	2,634.7	39.2	9,684.5
Abdomen/pelvis	2,345.4	5,163.3	2,055.4	4,321.5	65.9	13,951.5
Extremity	109.0	88.9	31.7	69.5	1.3	300.4
Total	5,929.4	10,728.1	3,815.7	8,739.5	124.5	29,327.2

CTA = CT angiography; ED = emergency department.

body region, overall population-adjusted utilization was highest for the abdomen/pelvis (13,952 per 100,000 beneficiaries) and chest (9,685 per 100,000 beneficiaries).

In both the outpatient hospital and emergency department settings, the most frequently rendered individual contrast-enhanced CT service by far was that of the abdomen/pelvis (comport with terminology used elsewhere 74177; 3,929 and 3,299 examinations per 100,000 beneficiaries, respectively). Individual contrast-enhanced CT services across all these and all other categorized sites of service are detailed in e-only Appendix A.

Relative utilization of CTA versus nonangiographic contrast-enhanced CT by body region and site of service is detailed in Table 2. The ratio of CTA to nonangiographic contrast-enhanced CT was greatest by far for the brain in the emergency department setting (14.94) followed by the inpatient hospital setting (7.67). Across all places of service, this ratio is highest for brain (26.16), head/neck (9.63), and chest (3.95) body regions. Across all body regions, this ratio is highest for the inpatient hospital (0.82) and emergency department (0.65).

Emerging published iodinated contrast reduction guidelines and institutional implementation strategies [3-5] largely focus on efficiently and robustly identifying scenarios in which contrast use may be minimized or avoided by using alternative imaging modalities, contrast agents, or protocols that reduce or minimize waste resulting from individual doses. In implementing these strategies, radiology practices and departments may find their greatest mitigation impact focusing on the most frequently used CT services outlined herein, and particularly abdominal/pelvic and chest CT in the emergency department and hospital outpatient settings as well as brain and head/neck

Table 2. Ratio of CTA to nonangiographic contrast-enhanced CT Medicare fee-for-service allowable services counts by body part and site of service for year 2019

Body Region	Inpatient Hospital	Outpatient Hospital	Office	ED	All Other	Total
Brain	7.67	1.73	0.77	14.94	1.05	26.16
Head/neck	4.79	0.65	0.38	3.46	0.36	9.63
Chest	1.32	0.28	0.17	1.97	0.22	3.95
Abdomen/pelvis	0.16	0.13	0.08	0.07	0.08	0.52
Extremity	0.29	0.27	0.18	0.43	0.12	1.30
Total	0.82	0.27	0.17	0.65	0.17	0.44

Spine CT is excluded from this list because no specific Current Procedural Terminology codes exist for spinal CTA. Cardiac CT is excluded because contrast-enhanced cardiac CT codes include angiographic reconstruction when performed. CTA = CT angiography; ED = emergency department.

CTA in the emergency department and hospital inpatient settings. Because optimal balancing of mitigation with clinical service needs will require multidisciplinary collaboration, we believe that the highlighted site of service and body region differences may help guide the creation of the most impactful specialty teams (particularly with emergency medicine, neurology/neurosurgery, and oncology). Finally, because clinical indications for Doppler ultrasound and MR angiography may overlap with those for CTA, identification of settings and scenarios in which CTA is most frequently used (eg, brain and neck in the emergency department and inpatient settings) may help guide alternative imaging care pathways and most effectively and safely reallocate resources to alternative modalities.

Our analysis is based on Medicare fee-for-service claims and therefore may not be generalizable to other patient populations (such as those with commercial insurance and those without insurance). We acknowledge that as a limitation but one that may help guide future research using institutional and other payer data sets.

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