Analysis of Radiologists' Imaging Workload Trends by Place of Service

David C. Levin, MD[a,b], Vijay M. Rao, MD[a], Laurence Parker, PhD[a], Andrea J. Frangos, MS[a]

Purpose: The aim of this study was to determine what proportion of noninvasive diagnostic imaging (NDI) work done by radiologists occurred in each of the 4 primary places of service where imaging is conducted.

Methods: Medicare's Physician/Supplier Procedure Summary Master Files for 2000 to 2011 were the data source. Specialty codes were used to identify radiologists, and place-of-service codes identified studies done in hospital outpatient facilities, hospital inpatient facilities, private offices, and emergency departments (EDs). The applicable total professional component relative value units (RVUs) were assigned to each NDI Current Procedural Terminology code, and RVU rates per 1,000 Medicare beneficiaries were calculated. RVU rates reflect workload and costs and are therefore a better metric than utilization rates based on volume.

Results: From 2000 to 2006, radiologists' RVU rates per 1,000 Medicare beneficiaries increased in each of the 4 primary venues. However, from 2006 to 2011, rates remained essentially flat in hospital outpatient and inpatient facilities and offices but continued to increase in EDs. Absolute RVU rate increases from 2000 through 2011 were 289 in hospital outpatient facilities, 218 in EDs, 194 in private offices, and 99 in inpatient facilities. In 2011, 19% of radiologists' workload occurred in offices; the remainder was conducted in the 3 hospital settings. Twice as much elective outpatient NDI work by radiologists was done in hospital outpatient facilities as in radiologists' private offices.

Conclusions: Radiologists' workload in hospital outpatient and inpatient facilities and offices grew from 2000 through 2006, but no further growth occurred thereafter. EDs were the only venue where growth continued. The vast proportion of radiology NDI RVUs (81% in 2011) are produced in hospital settings.

Key Words: Outpatient imaging, private office radiology, imaging utilization, imaging trends, radiology and radiologists, socioeconomic issues

J Am Coll Radiol 2013;10:760-763.

Imaging is conducted in 4 primary venues or places of service: hospital outpatient facilities, private offices (including imaging centers), inpatient facilities, and emergency departments (EDs). It is important for radiologists and hospital administrators to be aware of trends in imaging workload in these venues so that they can engage in strategic planning, resource allocation, and decision making with regard to hiring additional personnel. Previous work on this topic has generally been limited to the experience of a single hospital or a small group of hospitals or has assessed trends by modality [1-5]. Another earlier study did examine overall trends in the different venues, but its data were complete only through 2006, so it is now out of date [6].

Substantial changes have occurred in the medical imaging market since 2006, and our purpose in this study was to use a nationwide database to study the more recent trends in imaging by place of service among radiologists and compare them with those from the early years of the past decade.

METHODS

Our data source was the Medicare Part B Physician/Supplier Procedure Summary Master Files for 2000 through 2011. For each code in the *Current Procedural Terminology,® fourth rev, (CPT-4)* manual, the files provide nationwide data on procedure volume, specialties of the physicians filing the claims, places of service where the procedures were performed, and other administrative data. They cover all beneficiaries in the traditional fee-for-service Medicare population (36.3 million in 2011)

[a]Center for Research on Utilization of Imaging Services (CRUISE), Department of Radiology, Thomas Jefferson University Hospital and Jefferson Medical College, Philadelphia, Pennsylvania.

[b]HealthHelp, Inc, Houston, Texas.

Corresponding author and reprints: David C. Levin, MD, Thomas Jefferson University Hospital, Department of Radiology, Main 1090, Philadelphia, PA 19107; e-mail: david.levin@jeffersonhospital.org.

This study was supported in part by a grant from the ACR (Reston, Virginia).

0091-2182/13/$36.00 • http://dx.doi.org/10.1016/j.jacr.2013.02.016

but not those in Medicare Advantage plans (12.6 million in 2011). We selected all codes for noninvasive diagnostic imaging (NDI) in the 70000 series, as well as the echocardiography and vascular ultrasound sections of the 90000 series. We also selected the so-called level 3 codes pertaining to NDI. Codes for invasive procedures (including those for supervision and interpretation) and radiation therapy planning were not included.

Using Medicare's physician specialty codes, we identified all procedures performed by radiologists. Physicians using the self-designated specialty codes for diagnostic radiology, interventional radiology, and nuclear medicine were considered radiologists. All those with other specialty codes were considered nonradiologists. Medicare also uses place-of-service or location codes to determine where studies are carried out. There are place-of-service codes for each of the aforementioned 4 venues, which together encompass virtually all NDI. For each CPT-4 code, we calculated a relative value unit (RVU) rate per 1,000 Medicare fee-for-service beneficiaries. This was done each year by assigning the applicable total professional component RVUs to each code, multiplying that value by the procedure volume for that code that year, and dividing by the number of thousands of beneficiaries in traditional Medicare that year. We chose to use the RVU rate because it is an approximation of work intensity and cost to the health care system. Using the pure utilization rate would not be appropriate because it does not accurately measure work; for example, it gives the same weight to a plain chest radiograph as to an MRI scan. We compared the NDI RVU rates and trends in the 4 principal venues for imaging. The use of rates controls for year-to-year fluctuations in Medicare population size.

In determining the RVU rates for radiologists, we tabulated global and professional component claims by radiologists in all 4 venues, but not technical component claims because that would have led to double counting. Global claims would capture radiologists' billing in any offices they own. Professional component–only claims would capture all their examinations in the 3 hospital settings and much (not all) of their reading under contract with nonradiologist physicians or companies that own imaging equipment in offices. Data analysis was performed using SAS, version 9.3 for Windows (SAS Institute Inc, Cary, North Carolina).

RESULTS

Table 1 shows the NDI RVU rates among radiologists in the 4 primary locations where imaging is performed. Radiologists' total RVU rate (all locations) for all NDI increased from 1,467 in 2000 to 2,243 in 2011, a 55% increase. During those years, their RVU rates increased in each of the 4 main venues where imaging is conducted: from 237 to 431 (+82%) in offices, from 576 to 865 (+50%) in hospital outpatient facilities, from 518 to 617 (+19%) in inpatient facilities, and from 131 to 349 (+166%) in EDs. The absolute numeric increases in RVU rates were 194 in offices, 289 in hospital outpatient facilities, 99 in inpatient facilities, and 218 in EDs.

Table 1. RVU rates per 1,000 Medicare beneficiaries for radiologists in the primary places of service where imaging is performed

Location	2000 RVU Rate (% Share of Total Rate)	2011 RVU Rate (% Share of Total Rate)	Absolute Increase, 2000 to 2011
Offices	237 (16.2)	431 (19.0)	194
Hospital OPDs	576 (39.3)	865 (38.1)	289
Hospital inpatient facilities	518 (35.3)	617 (27.2)	99
EDs	131 (8.9)	349 (15.4)	218
Other	5 (0.3)	7 (0.3)	2
Total	1,467 (100)	2,269 (100)	802

Note: ED = emergency department; OPD = outpatient department; other = other locations where imaging is occasionally performed, such as nursing homes; RVU = relative value unit.

Table 1 also shows the 2000 and 2011 shares for each place of service. Radiologists' share in offices changed relatively little, from 16.2% in 2000 to 19.0% in 2011. The large preponderance of NDI work, almost 81% in 2011, was done in the 3 hospital-based settings. Also, note that the hospital outpatient department share in 2011 was 38.1%. In other words, twice as much elective outpatient NDI work by radiologists was done in hospital outpatient facilities as in private offices.

Table 1 also indicates that although the shares of NDI work accruing to private offices and hospital outpatient facilities showed only minor changes from 2000 to 2011, larger changes in shares did occur in the hospital inpatient and ED settings. The NDI share accruing to inpatient examinations decreased from 35.3% in 2000 to 27.2% in 2011. The share accruing to EDs increased from 8.9% in 2000 to 15.4% in 2011.

Figure 1 shows the RVU rate trends for radiologists in the 4 primary locations where imaging is conducted. There was a steady upward progression of rates from 2000 to 2006 in hospital outpatient facilities, hospital inpatient facilities, and private offices. However, from 2006 to 2011, there was little change. By contrast, in EDs, there was a steady upward progression throughout the entire study period. It can be seen that there was a moderate drop in rates in hospital outpatient facilities, hospital inpatient facilities, and private offices in 2010. This was due in large part to bundling of the codes for radionuclide myocardial perfusion imaging that year. In the following year, 2011, there was a slight increase in radiologists' rates in both hospital outpatient facilities and private offices, while inpatient rates dropped slightly.

Figure 2 compares the NDI RVU rates in private offices for radiologists and nonradiologist physicians (the