Trends in Utilization Rates of the Various Imaging Modalities in Emergency Departments: Nationwide Medicare Data From 2000 to 2008

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Purpose: To study utilization trends in the various imaging modalities in emergency departments (EDs) over a recent multiyear period.

Methods: The nationwide Medicare Part B databases for 2000 to 2008 were queried. Medicare's location codes were used to identify imaging examinations done on ED patients. All diagnostic imaging Current Procedural Terminology® codes were grouped by modality. For each code, the database provides procedure volume; utilization rates per 1,000 beneficiaries were then calculated. Medicare's physician specialty codes were used to determine provider specialty. Utilization trends were studied between 2000 and 2008.

Results: The overall utilization rate per 1,000 beneficiaries for all imaging in EDs increased from 281.0 in 2000 to 450.4 in 2008 (+60%). The radiography utilization rate rose from 227.3 in 2000 to 294.3 in 2008 (+29%, 67 accrued new studies per 1,000). The CT rate rose from 40.0 in 2000 to 130.7 in 2008 (+227%, 90.7 accrued new studies per 1,000). The ultrasound rate rose from 9.6 in 2000 to 18.7 in 2008 (+95%, 9.1 accrued new studies per 1,000). Other modalities had much lower utilization. In 2000, CT constituted 14% of all ED imaging, but by 2008, it constituted 29%. In 2008, radiologists performed 96% of all ED imaging examinations.

Conclusions: The rate of utilization of imaging is increasing in EDs. Growth is by far the most pronounced in CT, in terms of both the growth rate itself and the actual number of accrued new studies per 1,000 beneficiaries. Radiologists strongly predominate as the physicians of record for all ED imaging.

Key Words: Medical economics, emergency department imaging, advanced imaging, Medicare physician services, radiology and radiologists, socioeconomic issues

J Am Coll Radiol 2011;8:706-709.

Between 2000 and 2007, imaging was the most rapidly growing of all physician services in the Medicare population [1]. This has led to concern among payers and policymakers and has made it incumbent upon radiologists to understand where most of the growth is occurring so that they can consider steps that might be taken to limit that growth. Virtually all diagnostic imaging occurs in 1 of 4 settings: hospital inpatient, hospital outpatient facilities, private offices, and emergency departments (EDs). A previous study showed that in the Medicare population between 1996 and 2006, the utilization rate of all noninvasive diagnostic imaging (NDI) grew more rapidly in EDs than in the other 3 settings [2]. This is likely due to an increase in the number of ED visits by patients [3] and more liberal use of NDI by ED physicians. More recently, studies have shown an increase in the rate of use of CT in EDs but have not compared this with changes in ED rates of use of other imaging modalities [4-6]. One study from the Centers for Disease Control and Prevention documented an increase in the use of "advanced" imaging in EDs, but the authors did not define what they meant by "advanced" [7].

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This study was supported in part by a grant from the American College of Radiology (Reston, Va).

0091-2182/11/$36.00 • DOI 10.1016/j.jacr.2011.04.004

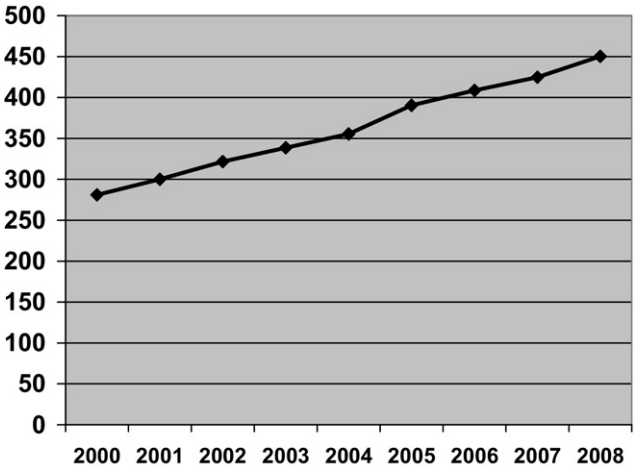

Fig 1. Trend in the overall use of imaging in emergency departments in the Medicare fee-for-service population, 2000 to 2008. The vertical axis shows total imaging examinations per 1,000 Medicare beneficiaries.

In this study, we used a nationwide database to evaluate trends in utilization rates of all NDI modalities in EDs in recent years. A secondary purpose was to ascertain what percentage of ED NDI examinations were interpreted by radiologists.

METHODS

The data source was the Medicare Part B Physician/Supplier Procedure Summary Master Files for 2000 through 2008. The files contain information on all medical services provided to the Medicare fee-for-service population (34.98 million in 2008). For each code in the fourth edition of the Current Procedural Terminology® (CPT®) manual, the files indicate the annual procedure volume, the specialties of the physician providers, and the locations (or places of service) where the procedures were performed. Place-of-service codes were used to identify all NDI examinations performed in EDs. We evaluated the NDI codes in the 70000 CPT series, as well as those codes in the 90000 series pertaining to echocardiography and vascular ultrasound. Codes relating to interventional procedures were excluded. Medicare's physician specialty codes were used to categorize those physicians interpreting the images as either radiologists or all other nonradiologist physicians as a group. The CPT codes for NDI were grouped into 4 modality categories: (1) radiography (including fluoroscopy); (2) CT, including CT angiography; (3) ultrasound, including body, vascular, and cardiac; (4) all others (including MRI and nuclear medicine). Utilization rates per 1,000 Medicare beneficiaries were calculated by dividing procedure volume each year for each CPT code by the number of thousands of Medicare beneficiaries that year. Trends from 2000 through 2008 were examined.

RESULTS

Figure 1 shows the trend in the overall utilization rate of NDI in EDs in the Medicare fee-for-service population from 2000 to 2008. The rate per 1,000 beneficiaries showed a steady upward progression from 281.0 in 2000 to 450.4 in 2008 (+60%), for a compound annual growth rate (CAGR) of 6.1%.

Figure 2 breaks down utilization data into the 3 major ED modality categories: radiography, CT, and ultrasound. Radiographic examinations were the most commonly performed, increasing from a rate of 227.3 in 2000 to 294.3 in 2008 (+29%, CAGR of 3.3%). CT examinations increased from a rate of 40.0 in 2000 to 130.7 in 2008 (+227%, CAGR of 16.0%). Ultrasound examinations (including body, vascular, and echocardiography) increased from a rate of 9.6 in 2000 to 18.7 in 2008 (+95%, CAGR of 8.7%). Of the 18.7 ultrasound examinations per 1,000 in 2008, 3.0 were echocardiographic studies and 15.7 were of other body areas. Radiography, CT, and ultrasound constituted 98.5% of all ED NDI in 2008. Other modalities, such as MRI and nuclear medicine, made up only 1.5% and are not shown in Figure 2 because their rates were so low. For example, the MRI rate was 0.98 in 2000, increasing to 3.4 in 2008. Although this rate change represents a CAGR of 16.8%, the baseline rate in 2000 was so low as to render it almost meaningless.

Figure 3 shows the incremental new examinations per

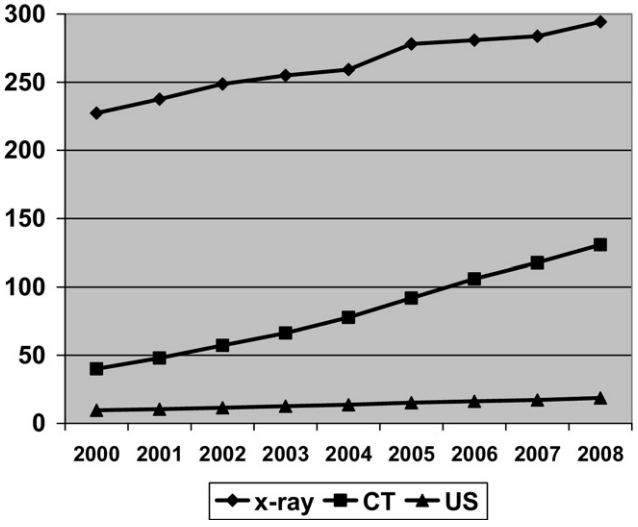

Fig 2. Trends in the use of different imaging modalities in emergency departments in the Medicare fee-for-service population, 2000 to 2008. The vertical axis shows imaging examinations per 1,000 Medicare beneficiaries. US = all ultrasound studies, including echocardiography; x-ray = all radiographic and fluoroscopic studies; CT = computed tomography. Other modalities, such as MRI and nuclear medicine, are not shown because their utilization rates in emergency departments were so low (the aggregate of these other modalities was 1.5% of the total in 2008).