ORIGINAL ARTICLE

National Trends in the Utilization of Skeletal Radiography From 2003 to 2015

Daniel J. Mizrahi, MD[a], Laurence Parker, PhD[a], Adam M. Zoga, MD[a,b], David C. Levin, MD[a,b]

Abstract

Purpose: Examine recent trends in the use of skeletal radiography and assess the roles of various nonradiologic specialties in the interpretations.

Methods: Medicare Part B fee-for-service claims data files from 2003 to 2015 were analyzed for all Current Procedural Terminology, version 4 (CPT-4) procedure codes related to skeletal radiography. The files provide examination volume, and we calculated utilization rates per 1,000 Medicare beneficiaries. Medicare's physician specialty codes were used to determine the specialties of the providers. Total utilization rate trends were analyzed, as well as those for radiologists and nonradiologists. We determined which nonradiologist specialties were the highest users of skeletal radiography. Medicare place-of-service codes were used to identify the locations where the services were provided.

Results: The total utilization rate per 1,000 of skeletal radiography within the Medicare population increased 9.5% from 2003 to 2015. The utilization rate for radiologists increased 5.5% from 2003 to 2015 versus 11.1% for nonradiologists as a group. Among nonradiologist specialties in all health care settings over the study period, orthopedic surgeons increased 10.6%, chiropractors and podiatrists together increased 14.4%, nonphysician providers (primarily nurse practitioners and physician assistants) increased 441%, and primary care physicians' rate decreased 33.5%. Although radiologists do almost all skeletal radiography interpretation in hospital settings, nonradiologists do the majority in private offices. There has been strong growth in skeletal radiography in emergency departments, but a substantial drop in inpatient settings.

Conclusions: The utilization of skeletal radiography has increased more rapidly among nonradiologists than among radiologists. This raises concerns about self-referral and quality.

Key Words: Skeletal radiography, image utilization, self-referral, outpatient imaging, socioeconomic issues, radiology and radiologists

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INTRODUCTION

Although conventional skeletal radiography is a basic, "low-tech" form of imaging, it is still a very important aspect of radiologic practice. For example, in 2015, it comprised 22.8% of all noninvasive diagnostic imaging volume performed in the Medicare population (unpublished data from the nationwide Medicare Part B database that we describe herein). Overall, more skeletal radiography is performed than chest radiography in the United States. In a study of Medicare utilization of skeletal radiography in 1993 [1], it was found that in hospital settings, over 99% of all skeletal radiographs were interpreted by radiologists. However, in private offices and freestanding imaging centers, only 21% of these examinations were interpreted by radiologists. This striking discrepancy indicated that there was considerable self-referral occurring outside of the more tightly controlled hospital environment.

The purposes of this study were to examine more recent trends in the use of skeletal radiography, to determine what kinds of changes may have occurred in recent years, and to assess the roles of various nonradiologic specialties in the interpretations.

METHODS

The data sources were the nationwide Medicare Part B Physician/Supplier Procedure Summary Master Files

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

[b]HealthHelp, Inc, Houston, Texas.

Corresponding author and reprints: Daniel J. Mizrahi, MD, Department of Radiology, Main 1090, Thomas Jefferson University Hospital, Philadelphia, PA 19107; e-mail: daniel.mizrahi@jefferson.edu.

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for 2003 through 2015. These files provide Medicare volume, reimbursements paid, and other administrative data for every code in the *Current Procedural Terminology, fourth rev* manual. They include all enrollees in traditional fee-for-service Medicare (37.5 million in 2015) but not those in Medicare Advantage plans (17.2 million in 2015). All noninvasive diagnostic codes pertaining to skeletal radiography were selected. We did not include radiographs of head structures because they are commonly considered to be within the domain of neuroradiology. We also did not include arthrography because this can be considered an interventional procedure. Volumes were determined by tabulating global and professional component claims. Technical component-only claims (which are much less commonly filed) were not included because that would have resulted in double counting.

Medicare place-of-service codes were used to identify skeletal radiographic examinations performed in hospital settings such as emergency departments (EDs), inpatient facilities, and hospital outpatient departments (HOPDs). These were distinguished from examinations using Medicare's code for private office settings. A few radiographs are done in other locations, primarily nursing homes. Medicare also uses 115 specialty codes, which enabled determination of whether the examinations were interpreted by radiologists or other specialists. One of the vagaries of the Medicare specialty code list is that it includes multispecialty groups and independent diagnostic testing facilities (IDTFs) as "specialties." The two were placed in a separate category because it is not possible from their claims to determine the specialty of the actual provider of the service.

The number of Medicare fee-for-service enrollees was ascertained each year and was used to calculate utilization rates per 1,000 Medicare enrollees. Utilization rates were calculated for radiologists and the four other specialties that were the top providers of skeletal radiography interpretations. Because of the way claims were tabulated (global plus professional component claims), the utilization rates for the various specialties refer to who provided the interpretations of the radiographs. Trends were examined over the entire period of study. Tables were constructed showing data on utilization rates per 1,000 in 2003, 2009 (the midpoint of the study), and 2015. Because the Medicare Physician/Supplier Procedure Summary Master Files are complete population counts, sample statistics and significance tests were not appropriate or required. Data analysis was performed using SAS version 9.3 for Windows (SAS Institute, Cary, North Carolina).

RESULTS

The total utilization rate per 1,000 of skeletal radiography within the entire Medicare fee-for-service population increased modestly from 730.0 in 2003 to 799.5 in 2015 (+9.5%). Among radiologists, the utilization rate increased from 411.8 in 2003 to 434.6 in 2015 (+5.5%). Among all nonradiologist providers as a group, the rate increased from 296.7 in 2003 to 329.6 in 2015 (+11.1%). A small number of additional examinations were done by IDTFs and multispecialty groups, in which provider specialty could not be determined. These two accounted for 4.4% of all skeletal radiography in 2015. Figure 1 depicts the modest increase in skeletal radiography for all years from 2003 to 2015 for the top utilizers (orthopedic surgery and radiology).

Table 1 compares the utilization rates per 1,000 in all places of service among radiologists and the top four nonradiologist provider groups: orthopedic surgeons, chiropractors and podiatrists together, primary care physicians (PCPs), and nonphysician providers (primarily nurse practitioners and physician assistants). As noted previously, from 2003 to 2015, radiologists' utilization rate increased by 5.5% to 434.6 in 2015. Orthopedic surgeons' rate increased by 10.6% to 209.3 in 2015. The rates among the other three groups were considerably lower, but nonphysician providers showed a sharp increase (+440.7%) and chiropractors and podiatrists together, a moderate increase (+14.4%). On the other hand, the rate among PCPs dropped 33.5%. Figure 2 shows the year-by-year utilization rates for these latter three groups. The data points in this figure are shown separately from Figure 1 because the scale is much lower for the three groups.

The vast bulk of skeletal radiography use by nonradiologist providers occurs in private offices. For example, in 2015, of the total orthopedic surgery rate of 209.3, a rate of 201.1 (96%) was provided in offices. Another rate of 7.7 was provided in hospital settings (ED + inpatient + HOPDs), and the small remainder was provided in other locations (eg, nursing homes). The 2015 total rate for chiropractors and podiatrists together was 38.9, of which a rate of 38.4 (99%) was provided in offices, 0.4 in hospital settings, and the remainder in other locations. Among PCPs, the 2015 total rate was 28.4, of which a rate of 24.9 (88%) was in offices, 1.1 in hospital settings, and the remainder in other locations.