

# Trends in the Utilization of CT Angiography and MR Angiography of the Head and Neck in the Medicare Population

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**Purpose:** The aim of this study was to analyze trends in the utilization of CT angiography (CTA) and MR angiography (MRA) of the head and neck in the Medicare population over a 6-year interval.

**Methods:** Nationwide Medicare Part B fee-for-service databases were reviewed. Current Procedural Terminology<sup>®</sup> codes for CTA and MRA of the head and neck were selected. MRA codes included studies without contrast, with contrast, and without and with contrast. Yearly and aggregate procedure volumes were compared for each Current Procedural Terminology code and modality. Data were also analyzed regarding contrast utilization and cost.

**Results:** From 2002 to 2007, the volume of head CTA increased by 827%, and the overall volume of head MRA increased by 39%. The year-to-year percentage increase in overall volume of head MRA declined throughout the study period; almost all of the increase in the overall volume of head MRA occurred from 2002 to 2005. The volume of neck CTA increased by 1,074%, and the overall volume of neck MRA increased by 31%. An 18% decrease in the volume of neck MRA without contrast was offset by a 104% increase in the volume of neck MRA using contrast. The year-to-year percentage increase in the overall volume of neck MRA declined from 2002 to 2005; there was a decrease in volume of 3% from 2005 to 2007. From 2002 to 2007, when considering all study types, procedure volume increased by 71%; aggregate allowable charges increased by \$181 million. Examinations using contrast increased by 235%. In 2002, 23% of examinations used contrast; in 2007, 46% of examinations used contrast.

**Conclusions:** The rate of growth for head and neck CTA was dramatically higher than for MRA. Neck MRA using contrast also showed substantial growth. The Medicare population is now receiving more contrast material and radiation to noninvasively assess the arterial vasculature of the head and neck.

**Key Words:** Utilization, CT angiography, MR angiography

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## INTRODUCTION

In the past 2 decades, there has been a steady increase in the utilization of high-cost, advanced imaging studies such as CT and MRI in the United States [1-4]. The reasons for increased utilization are multifactorial and include technologic advances, changes in best practice guidelines, self-referral, the aging population, patient ex-

pectations, and medicolegal concerns. The escalating cost of diagnostic imaging has made national headlines, as has concern related to increasing radiation exposure to the general population of the United States [5-7]. Exposure of the population to ionizing medical radiation grew more than 7-fold between the early 1980s and 2006, an increase attributable largely to the dramatic growth in the diagnostic capabilities and use of CT [8-10].

In this study, we analyzed trends in the utilization of CT angiography (CTA) and MR angiography (MRA) of the head and neck in the Medicare population over a 6-year interval. To provide further perspective regarding these trends, procedure volumes for duplex ultrasound of the carotid arteries, as well as conventional craniocervical

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**Table 1.** Yearly procedure volumes of head CTA and MRA from 2002 to 2007

Study Type	Year						% Change 2002-2007
	2002	2003	2004	2005	2006	2007	
Head CTA	8,987	16,037	29,880	47,757	66,717	83,297	827%
Head MRA without contrast	255,643	290,443	327,277	350,328	355,355	355,406	39%
Head MRA with contrast	6,653	6,666	6,568	6,489	6,766	6,200	-7%
Head MRA without and with contrast	10,091	11,693	14,374	15,842	16,457	16,214	61%
All head MRA	272,387	308,802	348,219	372,659	378,578	377,820	39%

carotid and vertebral angiography, were also analyzed. By restricting the study to a particular patient population and a small number of procedures evaluating the same vascular anatomy, we hoped to gain a better understanding of trends in the utilization of these procedures. For example, does the growth in volume of one procedure result in a corresponding decline in another procedure evaluating the same anatomy? Is the population of interest receiving more or less contrast material? More or less radiation? What impact do these factors have on overall costs?

## METHODS

Using the Physician Supplier Procedure Summary Master Files, nationwide Medicare Part B fee-for-service databases from 2002 to 2007 were reviewed. All studies performed by radiologists, nonradiologists, multispecialty groups, and independent diagnostic testing facilities on fixed, fee-for-service Medicare beneficiaries in both inpatient and outpatient settings were included.

The Current Procedural Terminology<sup>®</sup> (CPT<sup>®</sup>) codes for CTA and MRA of the head and neck were selected; a total of 8 codes were evaluated. The CT angiographic codes included head CTA (70496) and neck CTA (70498). The MR angiographic codes included studies without contrast (head, 70544; neck, 70547), studies with contrast (head, 70545; neck, 70548), and studies without and with contrast (head, 70546; neck, 70549). Yearly and aggregate procedure volumes were compared for each CPT code, as well as each modality (CTA vs MRA). The data were also analyzed regarding contrast utilization and cost.

Aggregate procedure volumes for duplex ultrasound of the carotid arteries (bilateral, 93880; unilateral or limited study, 93882), cranial carotid angiography (unilateral, 75665; bilateral, 75671), cervical carotid angiography (unilateral, 75676; bilateral, 75680), and vertebral angiography (cervical or intracranial, 75685) were also compared (2002 vs 2007).

## RESULTS

In 2002, there were 34,997,612 fixed, fee-for-service Medicare beneficiaries; this number increased to 35,434,519 in 2007 (+1%). Because of the minimal change in the number of fee-for-service beneficiaries during the study period, percentage changes in procedure volumes almost exactly parallel percentage changes in the rate of procedures per 100,000 beneficiaries.

Comparing 2002 with 2007, the volume of head CTA increased steadily from 8,987 to 83,297 (+827%); the rate per 100,000 beneficiaries increased from 26 to 235. During this time, the overall volume of head MRA (without contrast, with contrast, and without and with contrast) increased from 272,387 to 377,820 (+39%). However, the year-to-year percentage increase in the overall volume of head MRA declined throughout the study period, and almost all of the increase in the overall volume of head MRA occurred from 2002 to 2005. From 2002 to 2007, the overall volume of all head examinations (both modalities) increased from 281,374 to 461,117 (+64%). These data are summarized in Table 1.

Comparing 2002 with 2007, the volume of neck CTA increased from 9,796 to 115,021 (+1,074%); the rate per 100,000 beneficiaries increased from 28 to 325. During this time, the overall volume of neck MRA (without contrast, with contrast, and without and with contrast) increased from 192,653 to 253,170 (+31%). An 18% decrease in the volume of neck MRA without contrast was more than offset by a 104% increase in volume of neck MRA using contrast (CPT codes 70548 and 70549). The year-to-year percentage change in the overall volume of neck MRA declined from 2002 to 2005, and the overall volume of neck MRA actually decreased by 3% from 2005 to 2007. From 2002 to 2007, the overall volume of all neck examinations (both modalities) increased from 202,449 to 368,191 (+82%). These data are summarized in Table 2.

Comparing 2002 with 2007, the volume of duplex ultrasound of the carotid arteries (two CPT codes) in-

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