

Inferior Vena Cava Filter Placement and Retrieval Rates among Radiologists and Nonradiologists

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ABSTRACT

Purpose: To evaluate inferior vena cava (IVC) filter placement and retrieval rates among radiologists, vascular surgeons, cardiologists, other surgeons, and all other health care providers for Medicare fee-for-service beneficiaries in the years 2012–2015.

Materials and Methods: The nationwide Medicare Physician/Supplier Procedure Summary Master Files were used to determine the volume and utilization rate of IVC filter placement, IVC filter repositioning, and IVC filter retrieval, which correspond to procedure codes 37191, 37192, and 37193, respectively. Procedural code 37193 was not available before 2012, so data were reviewed for the years 2012–2015.

Results: The total volume of Medicare IVC filter placement decreased from 57,785 in 2012 to 44,378 in 2015, with radiologists responsible for 60% of all filter placements. Volume of IVC filter placement declined across all specialties, including radiologists, who placed 33,744 in 2012 and 27,957 in 2015. In contrast, total retrieval of IVC filters increased from 4,060 removals in 2012 to 6,166 in 2015. Retrieval rate per 100,000 Medicare beneficiaries increased from 11 in 2012 to 16 in 2015. Radiologists removed the bulk of the filters: 64% in both 2012 and 2015. Vascular surgeons, cardiologists, and other surgeons retrieved, respectively, 20%, 10%, and 5% of all IVC filters in 2012 and 22%, 9%, and 5% in 2015.

Conclusions: From 2012 to 2015, IVC filter placement steadily decreased across all specialties. Retrieval rate of IVC filters continued to rise over the same period. Radiologists were responsible for the majority of IVC filter placements and retrievals.

ABBREVIATIONS

FDA = US Food and Drug Administration, IVC = inferior vena cava, PE = pulmonary embolism

Pulmonary embolism (PE) is a major cause of morbidity and mortality, with an estimated incidence of more than 200,000 deaths per year in the United States (1). In patients with proximal deep venous thrombosis or PE, anticoagulant therapy continues to be the recommended first-line treatment (2). When anticoagulant therapy is contraindicated, interruption of the inferior vena cava (IVC) with a filter

device may need to be considered to protect the patient from a PE. This is frequently performed with the intention of ultimately removing the IVC filter.

In 2003, the US Food and Drug Administration (FDA) approved retrievable filters for market use (3). At that time, retrieval rates were low. Duszak et al found that within the entire Medicare population, more than 65,000 filters were placed in 2008 and ~1.2%–5.1% removed (4). Complications related to filters left in for longer than the recommended time period have been reported, including IVC thrombosis, visceral penetration, filter fracture, filter migration, and filter embolization (5). In response to 921 adverse event reports from 2005 to 2010, the FDA published a safety communication recommending that “implanting physicians and clinicians responsible for the ongoing care of patients with retrievable IVC filters consider removing the filter as soon as protection from pulmonary embolism is no longer needed” (6). In 2014, the recommendation was amended, stating that if the patient’s

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transient risk for PE has passed, the risk/benefit profile begins to favor removal of the IVC filter 29–54 days after implantation (7). Although some manufacturer literature states that it is safe for up to 300 days (1), dwell times >90 days have been demonstrated to be a significant predictor of retrieval failure (8).

In light of the repeated FDA advisory statements, there have been efforts to improve filter retrieval through creation of a dedicated IVC filter clinic (9), assignment of clinical teams to maintain an institution-specific database for aggressive follow up (10), and systematic “design-of-experiment” projects that compare various follow-up formats by different departments (11). The purpose of the present study was to evaluate national trends among radiologists and other specialty groups in IVC filter placement, repositioning, and retrieval rates from 2012 to 2015 within the Medicare population.

MATERIALS AND METHODS

The data source used was the nationwide Medicare Physician/Supplier Procedure Summary Master Files. They include more than 100 specialty codes identifying providers and the procedures they performed. The database covers 37.5 million fee-for-service beneficiaries, but not those in Medicare Advantage plans. Current Procedural Terminology, 4th Edition (CPT-4) codes 37191, 37192, and 37193 were queried, corresponding to IVC filter placement, IVC filter repositioning, and IVC filter retrieval, respectively. Data were reviewed for all years that procedural code 37193 was available, ie, 2012–2015, because this code was not available before 2012. The 2016 data were not yet available. For each CPT-4 code queried, yearly volume and rate (per 100,000 Medicare beneficiaries) were calculated with the use of the Medicare Advantage State-County market penetration files and then further delineated to determine if the procedures were performed by radiologists, cardiologists, vascular surgeons, or other surgeons (which encompasses all other surgeons besides vascular surgeons). Trends in performance of these procedures were compared among these specialties and within these conditions; 95% confidence intervals (CIs) for rates of filter placement and retrieval were calculated. In addition, a Cochran-Armitage nonparametric test of trend was calculated for the 4-year trends in filter placement, retrieval, and repositioning. Analyses were conducted with the use of SAS version 9.4 for Windows (SAS Institute, Cary, North Carolina).

The Medicare Physician/Supplier Procedure Summary Master Files are government-published, anonymized, aggregated data sets that do not follow individual patients or outcomes; they are therefore exempt from the requirement for Institutional Review Board approval.

RESULTS

The total volume of IVC filter insertion procedures within the Medicare population, across all specialties, decreased

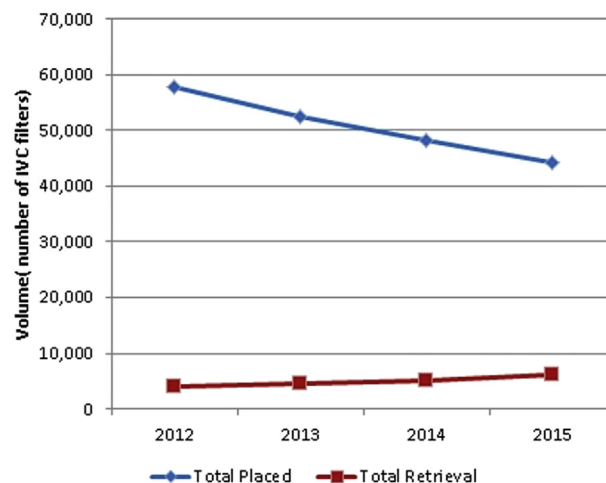


Figure 1. Total volume of IVC filters placed and retrieved from 2012 to 2015.

each year from 57,785 in 2012 to 44,378 in 2015, whereas retrieval procedures increased from 4,060 in 2012 to 6,166 in 2015 (Fig 1). Total volume of IVC filter repositioning was substantially lower than IVC filter placement or retrieval. In 2012, there were 122 IVC filters repositioned within the Medicare fee-for-service population. This number steadily decreased year to year, with 73 repositioning procedures performed in 2013, 57 in 2014, and 38 in 2015. The volume of IVC filter repositioning was so small that no further analysis was done.

IVC filter placement rate decreased from 156 procedures per 100,000 Medicare beneficiaries in 2012 (95% CI 154.7–157.3) to 141 in 2013 (95% CI 139.8–142.2), 129 in 2014 (95% CI 127.8–130.2), and 118 in 2015 (95% CI 116.9–119.1). IVC filter retrieval rate increased from 11 in 2012 (95% CI 10.7–11.3) to 12 in 2013 (95% CI 11.6–12.4), 14 in 2014 (95% CI 13.6–14.4), and 16 in 2015 (95% CI 15.6–16.4; Fig 2). In addition, Cochran-Armitage nonparametric tests of trend for rate over years were computed, and were significant for both values ($z = 2.8283$; $P < .0047$).

The volume of filter insertion procedures decreased each year within each specialty. Radiologists dropped from a volume of 33,744 placements to 27,957, cardiologists from 4,943 to 3,621, vascular surgeons from 11,040 to 7,915, and other surgeons from 7,197 to 4,299 (Fig 3).

Each specialty increased filter retrieval procedures performed from 2012 to 2015, except for other surgeons, in which filter retrievals decreased from 237 in 2013 to 221 in 2014 (Fig 4).

Radiologists were responsible for the majority of IVC filter removal procedures: 64% in both 2012 and 2015. Vascular surgeons performed 20% of all filter removal procedures in 2012, increasing to 22% in 2015, cardiologists decreased from 10% in 2012 to 9% in 2015, and other surgeons remained steady at 5% in 2012 and 2015. During the 4 years queried, radiologists were responsible for 60% (122,321 out of 202,900) of the total number of IVC filter placement procedures performed within the Medicare

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