LITERATURE HIGHLIGHTS

SAFE-IVC Study Finds Declining Use of IVC Filters But Need for Improved Rates of Timely Retrieval

With Enrico G. Ferro, MD, and Eric A. Secemsky, MD, MSc, RPVI, FACC, FAHA, FSCAI, FSVM

In a large, real-world analysis of United States Medicare fee-for-service patients, Ferro et al found that inferior vena cava filter (IVC) use declined over the study period, but the cumulative rate of retrieval was low, suggesting a need for strategies to achieve timely retrieval. The results were published in *JAMA*.[1]

The SAFE-IVC study was designed in collaboration with the FDA in an effort to better understand contemporary IVC filter use and outcomes. A 100% sample of inpatient and outpatient claims data of patients who received an IVC filter between January 1, 2013, and December 31, 2021, was used for analysis.

The primary safety outcome was a composite of all-cause mortality, IVC filter–related complications, operating room visits following IVC filter–related procedures, or new deep vein thrombosis (DVT) diagnosis. Safety events were considered periprocedural if they occurred within 30 days of filter insertion or retrieval and long term if they occurred > 30 days after insertion or retrieval.

A total of 270,866 patients received an IVC filter during the study period (mean age, 75.1 years; 52.8% female; 14% Black; 20.2% dual enrolled in Medicare; 21.6% living in distressed communities). During this time, IVC filter insertions decreased from 44,680 annually in 2013 to 19,501 in 2021. The cumulative incidence of IVC filter retrievals was 15.3% (95% CI, 15.1%-15.4%; median follow-up, 1.2 years), with most retrievals occurring within the first year after insertion (cumulative incidence at 1 year, 14.8%; 95% CI, 14.7%-14.9%).

Most patients (64.9%) received IVC filters for first-time venous thromboembolism (VTE), 26.3% for recurrent VTE, and 8.8% for VTE prophylaxis. Older age, major contraindications to anticoagulation, major comorbidities, self-reported Black race, dual enrollment, and residing in distressed communities were associated with a decreased likelihood of IVC filter retrieval. IVC filter placement in a teaching or larger hospital was associated with an increased likelihood of retrieval.

The cumulative incidence of the 30-day composite safety outcome of those undergoing IVC filter insertion was 27.3% (95% CI, 27.1%-27.5%), with a 0.3% rate (95% CI, 0.3%-0.4%) of IVC filter–related complications during insertion. Most (93.5%) of retrievals were successful, and the cumulative incidence of the 30-day composite safety outcome was 3.9% (95% CI, 3.7%-4.1%).

In a subgroup analysis, Black patients were statistically significantly more likely to receive IVC filters at large

KEY FINDINGS

- During the study period, IVC filter use declined and retrievals remained steady.
- The cumulative incidence of IVC filter retrieval was approximately 15%, with most retrievals occurring within the first year postinsertion.
- Older age, more comorbidities, Black race, and low income were associated with a lower likelihood of retrieval.
- IVC filter placement at large teaching hospitals was associated with a higher likelihood of retrieval.
- The success rate of IVC filter retrieval was 93.5% with a 3.9% cumulative incidence of 30-day complications.

teaching hospitals (76.5% vs 68.5%; standardized mean difference, 18.1%) but also more likely to experience safety events such as filter-related complications (2.2% vs 1.3%; adjusted hazard ratio, 1.40; 95% CI, 1.26-1.56; $P < .001$).

According to the investigators, this study had limitations related to use of claims-based data sets and codes, including the inability to differentiate timing of VTE events, specific IVC filter manufacturers and whether IVC filters were retrievable or nonretrievable, the potential for misclassification of IVC filter retrievals, and potential residual treatment selection bias.

The SAFE-IVC study demonstrated decreased use of IVC filters over the 8-year study period. Still, recurrent DVTs and IVC filter–related complications did occur, and the rate of IVC filter retrieval was low despite recommendations for routine retrieval, noted the investigators.

ENDOVASCULAR TODAY ASKS…

We asked study investigators Enrico G. Ferro, MD, and Eric A. Secemsky, MD, with Beth Israel Deaconess Medical Center in Boston, Massachusetts, about what prompted this research and potential strategies for increasing IVC filter retrieval rates.

What prompted your group to initiate this research? How did you go about designing a study to answer this question?

It was really a perfect storm of overlapping between the clinical interest and the regulatory gap, realizing that IVC filters are commonly used (1 in every 6 Medicare patients with a pulmonary embolism [PE], > 40,000 per year) and regularly prescribed and managed across all specialties. The consensus is that we can do better in terms of retrieving IVC filters when it's indicated.

Medicare becomes a very powerful tool because IVC filters are primarily used in an older population, and we anchored our analysis on the availability of CPT codes, which are incredibly specific in describing the procedure of interest. The codes have not changed from 2013 to 2021, so utilization patterns can be accurately tracked and hospitals have the incentive to bill for procedures they perform.

How would you summarize the main reasons for the lack of routine IVC filter retrieval?

The study does not really shed light on why retrieval rates are low because we don't have that type of data available, but it supports that the retrieval rate remains as low as about 15% to 20%, and it has not increased over the years. Since 2010, the FDA has issued two safety recommendations on IVC filters, and society guidelines recommend the use of filters if there is an active risk of DVT/PE and an active contraindication to anticoagulation, but use should be temporary. Of course, there is also the exception where the indication for an IVC filter could be permanent, in which case it wouldn't be retrieved, but in the majority of patients, it would be retrieved.

There are several reasons why IVC filters are not retrieved. One we found through this study is that about 30% of patients have their filter implanted and then retrieved in different facilities, so there's a fractionation of care that doesn't help when it comes to care coordination. In addition, the physician performing the procedure and determining the indication for IVC filter implantation may be different than the physician who sees the patient in follow-up. In our study, > 65% of patients had a major bleed or trauma at the time of IVC filter insertion, so this would be determined on the surgical ward or posttrauma ward, and then those patients would be discharged and transitioned to the care of their primary care physician, who may not be in communication with the physician who inserted the IVC filter. This is something we can explore in the future.

Then, the lack of routine reminders embedded in the electronic medical record may also be a factor, where physicians or other health care providers may not proceed with retrieval. Certainly, patients may not know that the IVC filter needs to be retrieved, so patient education could be something to explore in the future.

Why have retrieval rates not risen despite efforts and endorsements from the FDA to increase awareness? What further steps do you think are needed to promote the importance of timely retrieval?

In terms of further steps, one aspect that we have been looking into is the use of artificial intelligence (AI). For patients who undergo CT for other reasons, AI could be used as an opportunistic method to determine if an IVC filter is in place. However, adding yet another bucket to the radiology list may become overwhelming.

In addition, aligning the incentives is also important. In our study, we noted that Medicare's merit-based incentive payment program is being used to try and align the incentives and quality considerations with the percentage of filter retrieval. These are additional steps that could be applied more broadly to increase timely filter retrieval.

This study showed health disparities among Black patients and those residing in distressed areas. What strategies can be employed to close the disparity gap and achieve equitable clinical outcomes related to IVC filter use?

We looked at a broader model in terms of predictors of retrieval, and certain characteristics are the usual suspects: Older age and more comorbidities predicted lower retrieval. We also found that certain nonclinical characteristics, such as Black race, were also predictors of lower retrieval. One thing I would note is that the proportion of Black patients who received an IVC filter was balanced (14% Black patients, about 20% dual-enrolled patients). That is similar to the overall broader breakdown of the Medicare population, so there was not a disproportionate use or underuse, but the retrievals were lower in the population of Black patients.

This is where I believe our observational database is good at generating gaps and aspects that we need to better understand. I don't think we have an answer from the data yet. Certainly, future studies may look at whether Black patients have other characteristics that may be predictive of lower retrieval. For example, we may want to look at the rate of chronic kidney disease in Black patients, and procedures requiring contrast (like IVC filter retrieval) could lead to a differential IVC filter retrieval rate. However, right now this is only speculatory.

What role can digital health tools like automated reminders and AI play in improving outcomes related to IVC filter use and retrieval?

AI very practically would be used for opportunistic screening. When patients undergo CT for completely different reasons, there is the opportunity to look for IVC filters, but of course, this also requires a plan for retrieval. This is where automated reminders could come in.

A previous study by Dr. Secemsky and colleagues looked at about 1,000 patients with IVC filters and the effect of reminders embedded within the electronic medical records. They found a significant increase in retrieval rates from about 30% without retrieval to 50% once you add retrieval reminders, so I think practically automated reminders work. I think it's complementary to what we found in our study, namely that retrievals tend to be safe overall in terms of complication rates; therefore, there should be less hesitancy from providers once they receive a reminder to go ahead and get the patient started on the retrieval path.

IVC filters are placed quite often in non-Medicare patients for a variety of reasons, as PE can happen in people aged ≤ 65 years. Are any of your study findings applicable in a broader context?

What do you think needs to be further added to literature on the non-Medicare population?

I think these require a dedicated analysis. There is some literature about the use of IVC filters around obesity-related surgeries and in patients with trauma who cannot be on anticoagulation (this study was negative). Practice patterns may be different in younger patients, so we cannot extrapolate or generalize these findings to that population.

Where I think we can probably make some extrapolation is around the procedural safety of the procedures. If anything, you would probably guess that older patients with more comorbidities may have a higher risk of procedural complications, and so the fact that the 0.3% rate of IVC filter–related complications is reassuring and could be a reasonable extrapolation, looking at younger patients as long as the procedure is performed around the same time frame. We know that the longer the time to extraction, the higher the risk of endothelialization and the more complicated the extraction itself, and I also think this might be applied to patients we have not studied here. ■

1. Ferro EG, Mackel JB, Kramer RD, et al. Postmarketing surveillance of inferior vena cava filters among US Medicare beneficiaries. JAMA. 2024;332:2091–2100. doi: 10.1001/jama.2024.19553

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