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# Institutional protocols can improve IVC filter retrieval rates

Madeline Ross

*Wayne State University School of Medicine, mross@med.wayne.edu*

Gong He

*Wayne State University School of Medicine, ghe@med.wayne.edu*

Veronica Santana-Ufret

*Wayne State University School of Medicine, gf7777@wayne.edu*

Anjali Sundar

*Wayne State University School of Medicine, ansundar@med.wayne.edu*

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# Institutional protocols can improve IVC filter retrieval rates

MADLINE ROSS, Wayne State University School of Medicine, [mross@med.wayne.edu](mailto:mross@med.wayne.edu)  
GONG HE, Wayne State University School of Medicine, [ghe@med.wayne.edu](mailto:ghe@med.wayne.edu)  
VERONICA SANTANA-UFRET, Wayne State University School of Medicine, [gf7777@wayne.edu](mailto:gf7777@wayne.edu)  
ANJALI SUNDAR, Wayne State University School of Medicine, [ansundar@med.wayne.edu](mailto:ansundar@med.wayne.edu)

**ABSTRACT** A critical appraisal and clinical application of Lynch FC. A method for following patients with retrievable inferior vena cava filters: results and lessons learned from the first 1100 patients. *J Vasc Interv Radiol.* 2011;22:1507–1512. doi: [10.1016/j.jvir.2011.07.019](https://doi.org/10.1016/j.jvir.2011.07.019).

**Keywords:** IVC filter, deep vein thrombosis, quality improvement

## Clinical Context

Our patient is a 29-year-old African American man who presented to the emergency department (ED) of an urban hospital with a chief complaint of significant pain in his right lower extremity. His pain was attributed to deep venous thromboses (DVT's), a likely complication of previous inferior vena cava (IVC) filter insertion. The patient had presented to the ED three months prior and had been found to have multiple DVT's in his lower extremity along with bilateral pulmonary embolisms (PE's). Both the DVT's and PE's were treated with catheter-directed thrombolysis. Additionally, the patient was given anticoagulation therapy and a retrievable IVC filter. The patient was advised to schedule an appointment for IVC filter retrieval within a few weeks. However, he was lost to follow-up. Though he initially seemed uninterested in removing the IVC filter, he expressed an urgent desire to remove it upon learning that the filter was likely the source of his pain.

## Clinical Question

Can institutional protocols improve IVC filter retrieval rates?

## Research Article

Lynch FC. A method for following patients with retrievable inferior vena cava filters: results and lessons learned from the first 1100 patients. *J Vasc Interv Radiol.* 2011;22:1507–1512. doi: [10.1016/j.jvir.2011.07.019](https://doi.org/10.1016/j.jvir.2011.07.019)

## Related Literature

Searching the term, "IVC filter retrieval rate" produced 83 articles on Pubmed. After reviewing title and abstract, seven articles were deemed relevant to the clinical question and were selected for further analysis.<sup>1-7</sup> An additional five articles were found by reviewing

MADLINE ROSS, GONG HE, VERONICA SANTANA-UFRET, and ANJALI SUNDAR are MD candidates at Wayne State University School of Medicine.



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the references in the articles chosen from Pubmed.<sup>8-12</sup> Lastly, one article was found by reviewing the references on the “Placement of vena cava filters and their complications” page on UpToDate.<sup>13</sup>

Several studies demonstrated the effectiveness of multidisciplinary filter retrieval protocols, which utilize the input of a number of different specialists to provide care.<sup>1-4</sup> One such study found that IVC filter retrieval tripled over the course of five years after implementation of post-procedure care and patient education, maintenance of an IVC filter database, post-discharge patient outreach, and intervention by a thrombosis specialist to assess the ongoing need for the filter and to coordinate retrieval.<sup>4</sup> Similarly, other academic medical centers independently enacted multidisciplinary approaches that improved their retrieval rates by augmenting patient education, standardizing post-procedure care, and designating coordinators for post-procedure follow-up and filter retrieval.<sup>1,3,10</sup> The University of Pittsburgh Medical Center utilized a multidisciplinary approach that emphasized educating trauma providers, rather than patients, on the indications for retrievable IVC filter insertion and retrieval. This study addressed issues including clinician oversight and patient noncompliance.<sup>12</sup> Unfortunately, most of these studies had small sample sizes with cohorts of fewer than 150 patients. Consequently, they may be underpowered for conclusive generalizations.<sup>1,3,10,12</sup>

Though many institutions have undertaken similar approaches to improving filter retrieval, others have set themselves apart by implementing unique strategies. In addition to developing an IVC filter database, Northwestern University’s Department of Radiology established a dedicated IVC filter clinic.<sup>7</sup> The clinic was staffed by a dedicated nurse coordinator and an interventional radiologist, who readily communicated and supported the clinic as an added responsibility, resulting in an increase in filter retrieval from 29% to 60%.<sup>7</sup> A collection of Kaiser Permanente Northern California facilities chose to incorporate physician education to both decrease the placement of unnecessary IVC filters and to improve IVC filter retrieval. Physician education entailed fourteen in-hospital grand rounds with an evidence-based review of the literature on IVC filter efficacy, patient-centered outcomes, guidelines for IVC filter indications, and complications.<sup>13</sup> In an effort to better standardize care and improve retrieval rates, the University of Arizona College of Medicine divided trauma and non-trauma patients with IVC filters and observed improved retrieval rates in patients that were monitored using chart stickers, arm bracelets and dedicated follow-up policies with the help of nurse practitioners.<sup>11</sup>

Some institutions chose to implement smaller scale strategies. For example, Christiana Care Health System, a network hospital system that serves several states in the Northeastern United States, doubled its retrieval rate by simply creating and maintaining an IVC filter registry.<sup>5</sup> A hospital in New Zealand found that they were able to achieve a 100% 12-month rate of filter retrieval by implementing a review of individual cases by a venous thromboembolism specialist as well as maintaining a vena caval filter database.<sup>2</sup> North Memorial Medical Center in Minnesota also chose to review individual cases. By reviewing the medical records of trauma patients to obtain details regarding their injury, filter placement, and ultimate retrieval, retrieval rates were improved.<sup>8</sup> Another American medical institution saw non-statistically significant increases in IVC filter retrieval after implementing single department improvements to follow-up and documentation.<sup>6</sup> Different strategies produced varying levels of success, but in all cases suggest that institution-wide protocols dedicated to improving IVC filter retrieval are beneficial.

While many high quality articles have been published on this topic, a study by Lynch was selected for critical appraisal because of its relevance to our patient, easily reproducible protocol, and combined retrospective and prospective cohort design. Additionally, the sample size of 1,127 was markedly higher than any of the other studies.

## Critical Appraisal

As a hybrid retrospective and prospective cohort study, the article meets the criteria for the Oxford Center for Evidence-Based Medicine Levels of Evidence 2b. The study compared rates of IVC filter retrieval before and after the 2005 implementation of a follow-up protocol by the Departments of Radiology, Surgery and Medicine at a large university medical center. One interventional radiologist was given the responsibility of following up with IVC filter patients. Patients were managed via a database and assessed every few months for retrieval eligibility. Patients also received letters that encouraged follow-up and provided information on the rationale for filter retrieval as well as possible complications. Retrieval rates from patients who received an IVC filter between 2005 and 2010 were retrospectively measured. A strength of this study is its sample size of 1,127 patients. However, the sample was not split evenly between the control group (154) and the experimental (973) group.



The retrieval rate of the experimental group was compared to a control group that received filters between 2002 and the start of the intervention. An increase in retrieval from 24% to 59% was found to be statistically significant ( $p < 0.001$ ). The number needed to treat was calculated to be 3, suggesting that this protocol was effective. The assignment of patients to the experimental group versus the control group was not fully randomized. Ideally, the study would have prospectively and randomly allocated patients into the control or the intervention group during the same time period and analyzed the retrieval rates of the two groups. Of note, a fully randomized study of rigorous retrieval protocols compared to current standard of care would probably run up against ethical challenges, given the likely benefits of filter retrieval.

However, the intervention did not seem to have a large effect on follow-up rates. Patients who did not return the clinic after filter placement or who did not return after IVC removal were considered lost to follow-up. 18.2% of patients were lost to follow up in the pre intervention group compared to 16.2% in the post. Additionally, filters in both groups were “declared permanent” if the patient continued to have an indication for an IVC filter. Declaring a filter as permanent is still considered to be high-quality care. When comparing rates of replacement or declaration of permanence, the pre intervention group actually had a higher rate at 79.8% compared to 70.9% in the post intervention group. The differences in both follow-up and replacement or declaration of permanence were not assessed for statistical significance.

All patients were treated equally for this study, and there is no appreciable procedure bias. Patients were recruited for this study based on whether or not they had received an IVC filter at the Pennsylvania State University between 2002 and 2010. Since recruitment was not based on volunteerism, participation bias is unlikely. All patients, even those whose devices were deemed permanent or who were lost to follow-up, were included in this study, meaning attrition bias is not present. Since the authors of this article did not say if the study was blinded, it is unclear if healthcare employees were aware that their efforts to execute the follow-up method would be used to determine retrieval rates. Due to this oversight, performance bias cannot be discounted. This study was not sponsored, and the author reports no conflict of interest, eliminating any funding bias.

Our patient met the study’s inclusion criteria, having received a retrievable IVC filter. The cohort included individuals similar to our patient in regards to age, sex, and indication for filter placement. However, the patients recruited for this study all received their medical care from a single institution, which serves a relatively affluent and rural population. This limits the application of the study results to our patient, who lives in an urban setting where many people face financial and social barriers to healthcare.

## Clinical Application

The results of this study suggest that institutional protocols can improve IVC retrieval rates, which is further supported by the body of related literature. The study demonstrated a statistically significant increase in retrieval rates after implementing protocols for patient follow-up and education. However, it is difficult to determine if our patient specifically would have benefitted from this intervention. It is possible that being better informed of the complications of a retained IVC and receiving reminder letters would have prompted him to return for filter removal, but this is speculative. The study did not adequately investigate what percentage of patients dealt with complications from their IVC filter, like our patient. Also, the data from this study did not show a clinically significant increase in follow-up, so implementing a similar protocol at our institution may not have increased our patient’s likelihood of returning to the clinic before the complications began. Furthermore, he was not asked about his literacy level or housing situation. Low literacy and/or transient housing would limit our patient’s ability to benefit from this particular protocol. Since most studies that assessed the effects of IVC filter protocol changes focused on a single institution, it is difficult to generalize findings across institutions. Similarly, measures other than IVC filter retrieval rates, such as declaring a filter as permanent, can indicate quality follow-up care. Nevertheless, the protocol assessed by this study showed an increase in filter retrieval rates and there is a strong body of evidence with similar findings. Thus, the implementation of institutional protocols is still a worthwhile pursuit to improve IVC filter retrieval rates. Protocols should be based off of previous successful studies, but should undergo monitoring and adaptation to best meet the needs of individual institutions.

Learning points:



1. When IVC filters are no longer indicated for therapy they should be removed promptly in order to avoid damaging complications.
2. Simple and inexpensive protocols can be implemented within the healthcare system to improve patient follow-up and filter retrieval.
3. Patient and physician education can play a role in improving IVC filter removal.

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