CLINICAL STUDY

Impact of Physician Education and a Dedicated Inferior Vena Cava Filter Tracking System on Inferior Vena Cava Filter Use and Retrieval Rates Across a Large US Health Care Region

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ABSTRACT

Purpose: To evaluate the effects of physician familiarity with current evidence and guidelines on inferior vena cava (IVC) filter use and the availability of IVC filter tracking infrastructure on retrieval rates.

Materials and Methods: Fourteen continuing medical education–approved in-hospital grand rounds covering evidence-based review of the literature on IVC filter efficacy, patient-centered outcomes, guidelines for IVC filter indications, and complications were performed across a large United States (US) health care region serving more than 3.5 million members. A computer-based IVC filter tracking system was deployed simultaneously. IVC filter use, rates of attempted retrieval, and fulfillment of guidelines for IVC filter indications were retrospectively evaluated at each facility for 12 months before intervention (n = 427) and for 12 months after intervention (n = 347).

Results: After education, IVC filter use decreased 18.7%, with a member enrollment–adjusted decrease of 22.2%, despite an increasing IVC filter use trend for 4 years. Reduction in IVC filter use at each facility strongly correlated with physician attendance at grand rounds ($r = -0.69$; $P = .007$). Rates of attempted retrieval increased from 38.9% to 54.0% ($P = .0006$), with similar rates of successful retrieval (82.3% before education and 85.8% after education on first attempt). Improvement in IVC filter retrieval attempts correlated with physician attendance at grand rounds ($r = 0.51$; $P = .051$). IVC filter dwell times at first retrieval attempt were similar (10.2 wk before and 10.8 wk after).

Conclusions: Physician education dramatically reduced IVC filter use across a large US health care region, and represents a learning opportunity for physicians who request and place them. Education and a novel tracking system improved rates of retrieval for IVC filter devices.

ABBREVIATIONS

ACCP = American College of Chest Physicians, CME = continuing medical education, DVT = deep vein thrombosis, FDA = Food and Drug Administration, IVC = inferior vena cava, PE = pulmonary embolism

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Despite the lack of survival benefit supported by level I data (1–3), inferior vena cava (IVC) filter use has seen a sharp increase during the past 30 years. A superlinear increase was seen from 2003 to 2006 (4), which correlated with US Food and Drug Administration (FDA) approval of retrievable IVC filter devices and a rapid increase in prophylactic indications for patients without pulmonary embolism (PE) or deep vein thrombosis (DVT). In 2009, more than half of all IVC filter use in the United States was for prophylactic indications (5). Despite their retrievable design, IVC filter retrieval rates are low, and fewer than 5% of retrievable filters deployed in the Medicare population are removed (6). Physicians in the United States were projected to deploy 25 times more IVC filters in 2012 than physicians in Europe's "Big Five" nations (United Kingdom, France, Germany, Italy, and Spain), which have a comparable combined population size, despite similar rates of venous thromboembolism–related deaths (7). Physicians on the east coast of the United States place more than double the number of IVC filters than physicians on the west coast (8). This discrepancy in use is often ascribed to variability in guidelines.

Beginning in 2010, several publications described high rates of retrievable IVC filter complications, including fracture and cardiac embolization (9–11). Consequently, the FDA issued an advisory in 2010 stating, "FDA recommends 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 PE is no longer needed" (12). In addition, the American College of Chest Physicians (ACCP) evidence-based guidelines (13) became more stringent regarding indications for IVC filter use in 2012 (**Table 1**) (13,14).

Given the high variation in IVC filter use, the authors hypothesized that physician education and awareness of IVC filter evidence-based medicine may play a role in filter use patterns, and the lack of an organized system for IVC filter tracking likely contributes to poor filter retrieval rates. A retrospective evaluation was conducted to assess the impact of physician education with evidence-based review of IVC filters and the deployment of a computer-based IVC filter tracking system on filter use and rates of retrieval across a large US health care region serving more than 3.5 million members.

MATERIALS AND METHODS

This study was approved on a regional level by the Kaiser Permanente Northern California Institutional Review Board. Informed consent of study participants was waived. All chart review was performed retrospectively.

Patients who had an IVC filter placed in a Kaiser Permanente Northern California facility (inpatients and outpatients) were identified by the Kaiser Permanente National IVC Filter Registry by using an algorithm of Current Procedural Terminology codes, electronic medical record data, and inventory tracking data (SpaceTrax; Stanley Healthcare, Waltham, Massachusetts). An IVC filter grand rounds (as described later) was held at each participating facility in the region, and two groups of patients were included in the study: a preintervention group seen in the 364 days before the date (inclusive) of the grand rounds for each respective facility and a postintervention group of patients seen beginning 2 months after the grand rounds, allowing for the IVC filter tracking system/clinic model to be fully deployed at each facility and span 365 days (**Table 2**).

For purposes of IVC filter retrieval statistics, patients were excluded from the study if a permanent-type filter device was placed. Patients who died within 12 weeks of

Table 1. Summary of ACR/SIR 2011 and 2012 ACCP Guidelines for IVC Filter Indications (13,14)

Clinical Scenario	ACR/SIR 2011 Guidelines (14)	2012 ACCP Guidelines (13)
PE or VTE during systemic anticoagulation	Recommend IVC filter under certain conditions*	Recommend against IVC filter (grade 1B)
Proximal DVT or PE and contraindication for anticoagulation	Recommend IVC filter†	Recommend IVC filter (grade 1B)†
Recurrent VTE or PE despite adequate anticoagulation	Recommend IVC filter	No recommendation for/against IVC filter
Trauma (for prophylaxis with no PE or DVT)	Consider IVC filter	Recommend against IVC filter (grade 2C)
Bariatric surgery (for prophylaxis with no PE or DVT)	No recommendation for/ against IVC filter	Recommend against IVC filter (grade 2C)
Spinal cord injury (for prophylaxis with no PE or DVT)	Recommend IVC filter	Recommend against IVC filter (grade 2C)

ACCP = American College of Chest Physicians; ACR = American College of Radiology; DVT = deep vein thrombosis; IVC = inferior vena cava; PE = pulmonary embolism; VTE = venous thromboembolism.
*The listed conditions are recurrent PE or progression of DVT despite adequate anticoagulation, massive PE with residual DVT and risk of another PE, free-floating proximal DVT, and severe cardiopulmonary disease with DVT.
†Agreement among ACR/SIR 2011 and 2012 ACCP guidelines.