

Continuing Use of Inferior Vena Cava Filters Despite Data and Recommendations Against Their Use in Patients With Deep Venous Thrombosis



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The purpose of the present investigation is to determine the response to the evidence and recommendations against the use of inferior vena cava (IVC) filters in patients with deep venous thrombosis (DVT). This was a retrospective cohort study based on administrative data from the National Hospital Discharge Survey 1979 to 2006 and from the National (Nationwide) Inpatient Sample 2007 to 2014. The number of IVC filters inserted in patients with lone DVT peaked in 2009 and then decreased from 2009 to 2014. The proportion of patients with lone DVT who received an IVC filter peaked in 2010 and then decreased from 2010 to 2014. Both the number of IVC filters inserted yearly and the proportion of patients who received an IVC filter remained higher than in 1998 when a randomized controlled trial showed no reduced mortality with permanent IVC filters in patients with DVT. In conclusion, large numbers of patients with lone DVT continue to receive IVC filters despite a randomized controlled trial that showed no reduced mortality with IVC filters in patients with DVT and despite clinical guideline recommendations against the use of IVC filters in such patients. © 2019 Published by Elsevier Inc. (Am J Cardiol 2019;124:1643–1645)

The Prévention du Risque d'Embolie Pulmonaire par Interruption Cave study, a randomized controlled trial of permanent inferior vena cava (IVC) filters in patients with proximal deep venous thrombosis (DVT) in 1998, showed no reduction of mortality with filters compared with anticoagulants alone.¹ A vena cava filter was inserted in 200 patients, no filter in 200 patients, and all received enoxaparin or unfractionated heparin. Fewer occurrences of pulmonary embolism (PE) occurred in those with an IVC filter, but this was counterbalanced by an increased incidence of DVT.¹

In 2004, the Seventh ACCP Antithrombotic Conference recommended against IVC filters in patients with DVT who were able to receive anticoagulants,² and this recommendation was continued through the eighth and ninth ACCP recommendations published in 2008 and 2012.^{3,4} The use of IVC filters was recommended only if there was a contraindication to anticoagulant therapy^{2–4} or, in 2004, if there was recurrent venous thromboembolism despite adequate anticoagulant therapy.²

Many years may be required for evidence to be incorporated into clinical practice.⁵ The purpose of the present investigation is to determine the response to the evidence

and recommendations against the use of IVC filters in patients with DVT. A large portion of the data is from the era of retrievable IVC filters, introduced in 2000.⁶

Methods

This was a retrospective cohort study based on administrative data from the National Hospital Discharge Survey⁷ 1979 to 2006 and from the National (Nationwide) Inpatient Sample⁸ 2007 to 2014. Both are from the Healthcare Cost and Utilization Project, Agency for Healthcare Research and Quality. The National Hospital Discharge Survey consists of data obtained annually from approximately 270,000 sampled inpatient records from about 500 nonfederal short-stay hospitals in 50 states and the District of Columbia.⁷ It samples about 8% of short-stay nonfederal hospitals and about 1% of discharges.⁷ The NIS before 2012 was designed to approximate a 20% sample of United States nonfederal, short-term, general, and other specialty hospitals.⁸ Beginning with data from 2012, the NIS became a sample of discharge records from all Healthcare Cost and Utilization Project-participating hospitals.⁸ The database was renamed in 2012 from the “Nationwide Inpatient Sample” to the “National Inpatient Sample.”

This investigation was determined by the institutional review board not to meet the definition of “human subjects” because the database includes only deidentified patients. Included patients were adults (\geq aged 18 years) of both genders and all races hospitalized in short-stay hospitals from all regions of the United States with a discharge diagnosis of DVT not accompanied by PE. The International Classification of Diseases-9-Clinical Modification (ICD-9-CM) codes for DVT that we used were 451.1, 451.2, 453.2, and 453.4. The ICD-9-CM code used for PE was 415.1. The ICD-9-CM code used for insertion of an IVC filter was

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38.7. Patients who had a discharge code for PE in addition to DVT were excluded.

Continuous variables were expressed as means \pm standard deviation and were calculated using GraphPad Quick-Calcs (San Diego, California). Linear regression analyses were performed using InStat 3.0 (GraphPad Software).

Results

Among 8,523,098 patients with lone DVT, age was 65 ± 18 years. Among 705,162 patients with lone DVT who received an IVC filter, age was 70 ± 16 years. Demographic characteristics are shown in Table 1.

The number of IVC filters inserted in patients with lone DVT peaked in 2009 and then decreased from 2009 to 2014 (Table 2, Figure 1). The proportion of patients with lone DVT who received an IVC filter peaked in 2010 and then decreased from 2010 to 2014 (Table 2, Figure 2). Both the number of IVC filters inserted yearly and the proportion of patients who received an IVC filter remained higher than in 1998 when a randomized controlled trial showed no reduced mortality with permanent IVC filters in patients with DVT.¹

Discussion

The proportion of patients with lone DVT who received IVC filters increased from 1998 through 2010 despite a randomized controlled trial in 1998 that showed no reduction of mortality in patients with DVT treated with IVC filters,¹ and despite ACCP recommendations in 2004 and 2008 against their use in patients with DVT.^{2,3} Thousands of IVC filters have been inserted in patients with DVT since the randomized controlled trial in 1998 showed no reduced mortality with IVC filters.¹ The use of IVC filters in patients with DVT peaked in 2009 or 2010, but remained higher than in 1998. We previously showed that the proportion of patients hospitalized with lone DVT who received an IVC filter increased linearly from 1985 to 2006.⁹

The reason for the continuing use of IVC filters in patients with DVT despite evidence and recommendations against their use in such patients is speculative. The present data suggest that at least 10 years passed before there was a noticeable effect of a randomized controlled trial showing negative results. This is concordant with the observation

Table 1
Demographic characteristics

	Lone DVT n (%)	IVC filters in lone DVT n (%)
Females	5,701,089 (56.7%)	427,428 (55.4%)
White	6,881,967 (80.7%)	491,536 (69.7%)
Black	1,202,015 (14.1%)	109,031 (15.5%)
Hispanic	198,434 (2.3%)	33,459 (4.7%)
Asian American	73,770 (0.9%)	7,582 (1.1%)
Native American	27,307 (0.3%)	2,219 (0.3%)
Other	139,605 (1.6%)	61,335 (8.7%)

DVT = deep venous thrombosis; IVC = inferior vena cava.

Table 2
Lone DVT and IVC filters inserted according to year

Year	Lone DVT (number)	IVC filter (number)	IVC filter (%)
1979	215,143	352	0.2%
1980	221,975	137	0.1%
1981	208,677	394	0.2%
1982	228,787	315	0.1%
1983	237,246	617	0.3%
1984	243,885	1,876	0.8%
1985	233,656	2,165	0.9%
1986	221,075	2,020	0.9%
1987	217,766	2,795	1.3%
1988	203,282	2,680	1.3%
1989	199,470	4,597	2.3%
1990	214,979	6,171	2.9%
1991	205,022	5,473	2.7%
1992	223,958	8,278	3.7%
1993	244,204	9,901	4.1%
1994	257,401	11,513	4.5%
1995	288,573	17,558	6.1%
1996	307,443	16,452	5.4%
1997	294,524	18,125	6.2%
1998	315,505	19,207	6.1%
1999	310,848	21,345	6.9%
2000	294,210	23,013	7.8%
2001	302,823	27,568	9.1%
2002	327,644	26,938	8.2%
2003	347,700	31,316	9.0%
2004	355,720	31,880	9.0%
2005	164,247	33,620	12.7%
2006	144,909	34,550	14.1%
2007	295,365	45,075	15.3%
2008	304,041	50,283	16.5%
2009	300,236	51,288	17.1%
2010	284,772	49,079	17.2%
2011	283,441	46,788	16.5%
2012	262,525	43,130	16.4%
2013	248,795	38,705	15.6%
2014	240,690	36,960	15.4%

IVC = inferior vena cava.

that many years may be required for the uptake of evidence into clinical practice.⁵

Strengths of this investigation are the large number of years over which trends of use of IVC filters were shown and the large number of patients involved. A weakness is the use of 2 databases. The National Hospital Discharge Survey was used from 1979 to 2006 and the NIS was used from 2007 to 2014. The National Hospital Discharge Survey showed 35,550 patients with lone DVT received an IVC filter in 2006, whereas the NIS showed 42,781 patients with lone DVT received an IVC filter in 2006. The proportion of patients with lone DVT who received an IVC filter in 2006 was 14.1% with the National Hospital Discharge Survey and 15.0% with the NIS.

In conclusion, large numbers of patients with lone DVT continue to receive IVC filters despite a randomized controlled trial that showed no reduced mortality with IVC filters in patients with DVT and despite clinical guideline recommendations against the use of IVC filters in such patients.

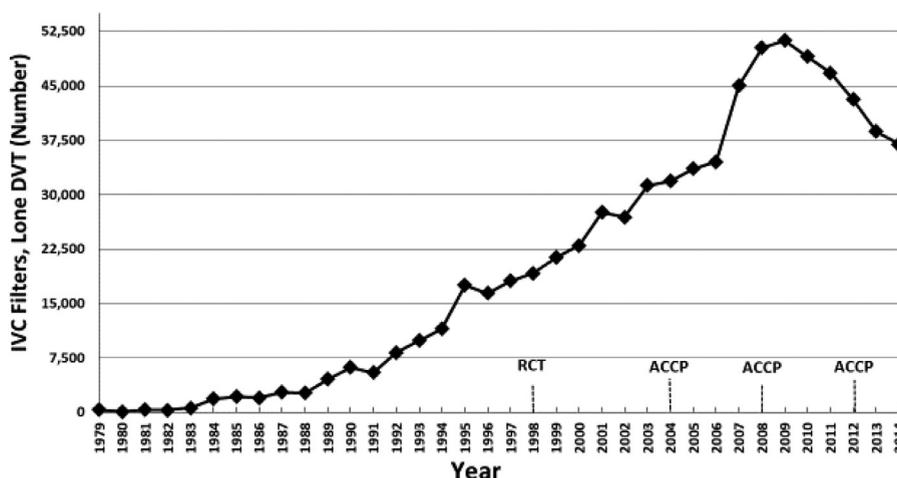


Figure 1. Number of patients with lone deep venous thrombosis (DVT) who received inferior vena cava (IVC) filters according to year. Date of a randomized controlled trial (RCT) that showed no reduced mortality with IVC filters and dates of American College of Chest Physicians (ACCP) recommendations against the use of IVC filters in patients with DVT are shown. The number of IVC filters inserted increased linearly from 1988 to 2009, correlation coefficient, $r = 0.98$, $p < 0.0001$.

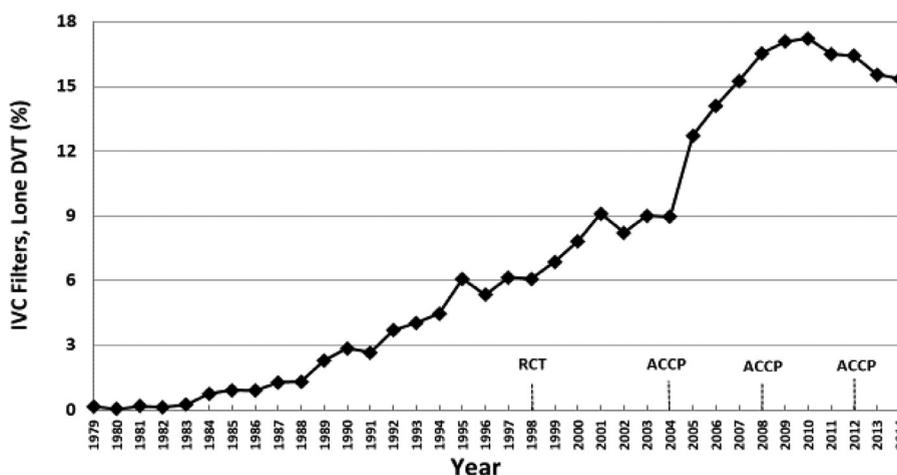


Figure 2. Proportion of patients with lone DVT who received IVC filters according to year. The proportion of patients who received IVC filters increased linearly from 1983 to 2010, $r = 0.96$, $p < 0.0001$. Abbreviations as in Figure 1.

Disclosures

The authors have no conflicts of interest to disclose.

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