

**Inferior Vena Cava (IVC) Filter Placement
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Alikhan R, Peters F, Wilmott R, Cohen AT. Fatal pulmonary embolism in hospitalised patients: a necropsy review. <i>J Clin Pathol</i> 2004; 57(12):1254-1257.	7	16,104 deaths 6,833 (42.4%) necropsies	Retrospective review. Number of deaths resulting from necropsy confirmed fatal pulmonary embolism (PE) in hospitalized patients was determined, and a limited analysis of the clinical characteristics of those patients who died was performed.	The outcome measure, fatal PE, was recorded as cause of death in 265 cases (3.9% of all necropsies; 5.2% of adult cases). No deaths from PE occurred in patients under 18 years of age; 80.0% occurred in patients older than 60 years of age. Of the fatal emboli, 214/265 (80.8%) occurred in patients who had not undergone recent surgery. Of these patients, 110 (51.4%) had suffered an acute medical illness in the 6 weeks before death, most often an acute infectious episode (26 cases).	3
2. Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. <i>Chest</i> 2004; 126(3 Suppl):338S-400S.	15	N/A	To review prevention of venous thromboembolism (VTE). Seventh American College of Chest Physicians Conference on Antithrombotic and Thrombolytic Therapy: Evidence-Based Guidelines.	N/A	N/A
3. Lindblad B, Sternby NH, Bergqvist D. Incidence of venous thromboembolism verified by necropsy over 30 years. <i>Bmj</i> 1991; 302(6778):709-711.	7	260 patients showing VTE	Review necropsy reports to determine the incidence of VTE in reports over 30 years.	The overall incidence of VTE has not changed over 30 years. During this period the proportion of the population over 65 years of age has doubled, and this may have masked the beneficial effects of prophylaxis and early mobilization.	3
4. Sandler DA, Martin JF. Autopsy proven pulmonary embolism in hospital patients: are we detecting enough deep vein thrombosis? <i>J R Soc Med</i> 1989; 82(4):203-205.	7	195	Retrospective study of autopsy reports and associated hospital records was done to examine the present status of PE as a cause of death in a general hospital patient population.	PE is still a major cause of death in hospital patients despite advances in diagnosis and treatment of this condition.	3
5. Cohen AT, Tapson VF, Bergmann JF, et al. Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): a multinational cross-sectional study. <i>Lancet</i> 2008; 371(9610):387-394.	3b	68,183	To assess hospital inpatients for risk of VTE and to determine proportion of at-risk patients receiving prophylaxis.	A large proportion of hospitalized patients are at risk for VTE, but there is a low rate of appropriate prophylaxis.	2
6. Tapson VF. Acute pulmonary embolism. <i>N Engl J Med</i> 2008; 358(10):1037-1052.	7	N/A	To review epidemiology and pathophysiology, acute PE of thrombotic origin.	Majority of patients with acute PE who receive adequate anticoagulant therapy survive. The 3-month overall mortality rate has been reported to be about 15%-18%.	4

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7. Girard TD, Philbrick JT, Fritz Angle J, Becker DM. Prophylactic vena cava filters for trauma patients: a systematic review of the literature. <i>Thromb Res</i> 2003; 112(5-6):261-267.	7 (Meta-analysis)	1,112	To describe the safety and efficacy of prophylactic IVC filter placement in patients at high-risk of PE after major trauma.	Evidence supporting use of prophylactic IVC filters in patients at high risk for VTE after traumatic injury is limited by multiple methodological shortcomings. While the descriptive data available suggest their use may be efficacious, lack of appropriate comparison groups, incomplete evaluation for adverse outcomes, and incomplete follow-up make it difficult, if not impossible, to account for possible confounders.	3
8. Streiff MB. Vena caval filters: a comprehensive review. <i>Blood</i> 2000; 95(12):3669-3677.	7	N/A	Comprehensive review of medical literature to assess evidence supporting the importance of vena caval filters in the treatment of venous thromboembolic disease (VTED).	Vena caval filters represent a potentially important but poorly evaluated therapeutic modality in the prevention of PE.	4
9. Streiff MB. Vena caval filters: a review for intensive care specialists. <i>J Intensive Care Med</i> 2003; 18(2):59-79.	7	N/A	Comprehensive review of medical literature to determine the safety and efficacy of vena caval filters in the treatment of VTE.	Vena caval filters should generally be restricted to patients with VTE who cannot receive anticoagulation.	4
10. Kinney TB. Update on inferior vena cava filters. <i>J Vasc Interv Radiol</i> 2003; 14(4):425-440.	7	N/A	To review attributes of the theoretical ideal IVC filter, recently introduced IVC filters, complications of use of IVC filters, and results of recent IVC filter studies. Also reviews alternative sites for filter placements, use of temporary and retrievable IVC filters and use of IVC filters for prophylactic situations.	Although it appears IVC filters do reduce long-term PE rates, there may be a higher associated incidence of IVC thrombosis and lower-extremity deep venous thrombosis (DVT) than with anticoagulation alone.	4

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11. Athanasoulis CA, Kaufman JA, Halpern EF, Waltman AC, Geller SC, Fan CM. Inferior vena caval filters: review of a 26-year single-center clinical experience. <i>Radiology</i> 2000; 216(1):54-66.	7	1,731	Retrospective study. To review a 26-year single center clinical experience with IVC filters.	<ul style="list-style-type: none"> The prevalence of observed post-filter PE was 5.6%. It was fatal in 3.7% of patients. In most patients, fatal PE occurred soon after filter insertion (median, 4.0 days; 95% CI: 2.2, 5.8 days). Major complications occurred in 0.3% of procedures. The prevalence of observed post-filter caval thrombosis was 2.7%. The 30-day mortality rate was 17.0% overall, higher among patients with neoplasms (19.5%) as compared with those without neoplasms (14.3%; P=.004). Filter efficacy and associated morbidity were not different in 46 patients with suprarenal filters. The rate of filters placed for prophylaxis was 4.7% overall and increased to 16.4% in 1998. From 1980 to 1996, there was a five fold increase in the number of caval filter implants. 	3
12. Stein PD, Kayali F, Olson RE. Twenty-one-year trends in the use of inferior vena cava filters. <i>Arch Intern Med</i> 2004; 164(14):1541-1545.	7	N/A	To analyze the National Hospital Discharge Survey (NHDS) database for trends in the use of IVC filters.	The use of IVC filters increased markedly during the last two decades in patients with PE, patients with DVT alone, and patients at risk who had neither PE nor DVT.	3
13. Girard P, Stern JB, Parent F. Medical literature and vena cava filters: so far so weak. <i>Chest</i> 2002; 122(3):963-967.	7	N/A	Systematic literature review to clarify use of vena cava filters in patients with or at risk for VTE.	Until more relevant data become available, literature reviews about vena cava filters will remain narrative, and many if not most indications for filter placement will remain a matter of opinion.	3
14. Kaufman JA, Kinney TB, Streiff MB, et al. Guidelines for the use of retrievable and convertible vena cava filters: report from the Society of Interventional Radiology multidisciplinary consensus conference. <i>J Vasc Interv Radiol</i> 2006; 17(3):449-459.	15	N/A	To provide suggestions for the clinical application of nonpermanent vena cava filters.	N/A	N/A
15. Crowther MA. Inferior vena cava filters in the management of venous thromboembolism. <i>Am J Med</i> 2007; 120(10 Suppl 2):S13-17.	7	N/A	To review role of IVC filters in the management of VTE.	Current evidence-based guidelines recommend IVC filter insertion only in patients with proven VTE and an absolute contraindication for anticoagulation.	4

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16. Hann CL, Streiff MB. The role of vena caval filters in the management of venous thromboembolism. <i>Blood Rev</i> 2005; 19(4):179-202.	7	N/A	To review currently available IVC filters, data on their efficacy and safety and assess appropriate indications for their use.	Patients with contraindications to anticoagulation will remain a challenge for medical and surgical practitioners. For these patients, IVC filters will remain an important therapeutic alternative.	4
17. Kinasewitz GT. Thrombophlebitis and pulmonary embolism in the elderly patient. <i>Clin Chest Med</i> 1993; 14(3):523-536.	7	N/A	To review DVT and PE in elderly patients.	Treatment with heparin followed by long-term anticoagulation with warfarin is the preferred course of therapy for most patients. Awareness of their increased risk and emphasis on prevention of venous thrombosis may be the most effective means of dealing with this clinical problem in the elderly.	4
18. Merli GJ. Management of deep vein thrombosis in spinal cord injury. <i>Chest</i> 1992; 102(6 Suppl):652S-657S.	7	N/A	To review heparin and thrombolytic therapy for acute DVT, the use of mechanical modalities for the prevention of PE, and the long-term regimens to prevent the recurrence of DVT and PE.	Continuous infusion heparin either by the traditional regimen, the Hull et al, dosing method of high and low risk patients, or the Cruickshank et al, nomogram, have all been shown to be safe and efficacious in the treatment of DVT.	3
19. Pengo V, Lensing AW, Prins MH, et al. Incidence of chronic thromboembolic pulmonary hypertension after pulmonary embolism. <i>N Engl J Med</i> 2004; 350(22):2257-2264.	3a	314	Prospective, long-term, follow-up study to assess the incidence of symptomatic chronic thromboembolic pulmonary hypertension (CTEPH) in consecutive patients with an acute episode of PE but without prior VTE.	<ul style="list-style-type: none"> The cumulative incidence of symptomatic CTPH was 1.0% (95% confidence interval, 0.0 to 2.4) at 6 months, 3.1% (95% confidence interval, 0.7 to 5.5) at 1 year, and 3.8% (95% confidence interval, 1.1 to 6.5) at 2 years. The following increased the risk of CTPH: a previous PE (odds ratio 19.0), younger age (odds ratio, 1.79/decade), a larger perfusion defect (odds ratio, 2.22/decile decrement in perfusion), and idiopathic PE at presentation (odds ratio, 5.70). 	2

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20. Auger WR, Kim NH, Kerr KM, Test VJ, Fedullo PF. Chronic thromboembolic pulmonary hypertension. <i>Clin Chest Med</i> 2007; 28(1):255-269, x.	7	N/A	To review epidemiology and risk factors, pathogenesis, diagnosis, and therapeutic management of CTEPH.	<ul style="list-style-type: none"> • Thromboendarterectomy can dramatically improve pulmonary hemodynamic status, functional outcome, and long-term survival. • For patients who have suspected CTEPH, pulmonary angiography represents the gold standard and, when properly performed, remains a safe and reliable way to define the extent and proximal location of organized thromboemboli. • Given the greater perioperative mortality rates seen in patients who have operable chronic thromboembolic disease with severe pulmonary hypertension, experts hypothesize that using pulmonary vasodilator therapy preoperatively may have beneficial effects on early postoperative survival. 	4
21. Carlbom DJ, Davidson BL. Pulmonary embolism in the critically ill. <i>Chest</i> 2007; 132(1):313-324.	7	N/A	To review management of PE in critically ill patients.	<ul style="list-style-type: none"> • Measurements of chamber size by echocardiography and CT and of circulating biomarkers identify higher-risk patients with moderate accuracy and may aid determination of patient acuity. • Preserving right ventricular function requires judicious use of volume administration, vasopressor, and perhaps vasodilator therapies. • Obstructing thrombus can be treated with fibrinolytic drugs, percutaneous instrumentation, or surgically, but these treatments may not be equally effective or safe. • Anticoagulant therapy in critically ill patients is likely best administered IV. 	4

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22. Pacouret G, Alison D, Pottier JM, Bertrand P, Charbonnier B. Free-floating thrombus and embolic risk in patients with angiographically confirmed proximal deep venous thrombosis. A prospective study. <i>Arch Intern Med</i> 1997; 157(3):305-308.	3c	95	Prospective study of free-floating thrombus (FFT) and embolic risk in patients with angiographically confirmed proximal DVT.	<ul style="list-style-type: none"> • PPV and NPV of color venous duplex scanning for the diagnosis of an FFT were 91% and 55%, respectively. • On admission, PE prevalence was 64% in the FFT group (40 of 62 patients) and 50% in the occlusive thrombus group (14 of 28 patients) (P=.19). • No higher risk for PE was observed in patients with free-floating proximal DVT; anticoagulant therapy should prevent recurrent PE in such patients. 	3
23. Prandoni P, Lensing AW, Piccioli A, et al. Recurrent venous thromboembolism and bleeding complications during anticoagulant treatment in patients with cancer and venous thrombosis. <i>Blood</i> 2002; 100(10):3484-3488.	3b	842	Prospective follow-up study to determine whether thrombosis patients with cancer have a higher risk for recurrent VTE or bleeding during anticoagulant treatment than those without cancer.	<ul style="list-style-type: none"> • The 12-month cumulative incidence of recurrent thromboembolism in cancer patients was 20.7% (95% CI, 15.6%-25.8%) vs 6.8% (95% CI, 3.9%-9.7%) in patients without cancer, for a hazard ratio of 3.2% (95% CI, 1.9-5.4). • The 12-month cumulative incidence of major bleeding was 12.4% (95% CI, 6.5%-18.2%) in patients with cancer and 4.9% (95% CI, 2.5%-7.4%) in patients without cancer, for a hazard ratio of 2.2% (95% CI, 1.2-4.1). • Recurrence and bleeding were both related to cancer severity and occurred predominantly during the first month of anticoagulant therapy but could not be explained by sub- or over-anticoagulation. 	3
24. Streiff MB. Long-term therapy of venous thromboembolism in cancer patients. <i>J Natl Compr Canc Netw</i> 2006; 4(9):903-910.	7	N/A	To review long term treatment of VTE in cancer patients.	<ul style="list-style-type: none"> • Cancer patients have a two- to fourfold higher risk for experiencing recurrent VTE and major bleeding during chronic vitamin K antagonists (VKA) therapy than patients without malignancies. • IVC filters should generally be reserved for patients at high risk for recurrent VTE who have contraindications to anticoagulation. 	4
25. Segal JB, Streiff MB, Hofmann LV, Thornton K, Bass EB. Management of venous thromboembolism: a systematic review for a practice guideline. <i>Ann Intern Med</i> 2007; 146(3):211-222.	7	N/A	To review the evidence on the efficacy of interventions for treatment of DVT and PE.	The strength of evidence varies across the study questions but generally is strong.	3

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26. Krivak TC, Zorn KK. Venous thromboembolism in obstetrics and gynecology. <i>Obstet Gynecol</i> 2007; 109(3):761-777.	7	N/A	To review diagnosis, prevention and treatment of VTE in obstetrics and gynecology.	<ul style="list-style-type: none"> The use of D-dimer testing and spiral or helical CT scans has simplified the diagnosis of VTE. The use of low molecular weight heparin has become widely accepted in the prevention and treatment of VTE. 	4
27. Stone SE, Morris TA. Pulmonary embolism during and after pregnancy. <i>Crit Care Med</i> 2005; 33(10 Suppl):S294-300.	7	N/A	To review VTED during and after pregnancy.	VTED is a significant cause of morbidity and mortality during pregnancy and the puerperal period. Objective testing is critical to establish the diagnosis and can be safely performed during pregnancy. Anticoagulation with heparin is the mainstay of therapy during the pregnancy, but patients may be transitioned to warfarin after delivery.	4
28. Johns JS, Nguyen C, Sing RF. Vena cava filters in spinal cord injuries: evolving technology. <i>J Spinal Cord Med</i> 2006; 29(3):183-190.	7	N/A	To clarify the use of vena cava filters in patients with spinal cord injury (SCI) based on results from a literature review.	Retrievable vena cava filters are a safe, feasible option for secondary prophylaxis of VTE in patients with SCI. Objective criteria for temporary and permanent placement need to be defined.	4
29. Rogers FB, Cipolle MD, Velmahos G, Rozycki G, Luchette FA. Practice management guidelines for the prevention of venous thromboembolism in trauma patients: the EAST practice management guidelines work group. <i>J Trauma</i> 2002; 53(1):142-164.	15	N/A	Practice guidelines.	N/A	N/A
30. Geerts WH. Prevention of venous thromboembolism in high-risk patients. <i>Hematology Am Soc Hematol Educ Program</i> 2006:462-466.	7	N/A	To review the risks and prevention of VTE in patients recovering from major trauma, SCI, or other critical illness.	Routine thromboprophylaxis should be provided to major trauma, SCI and critical care patients based on an individual assessment of their thrombosis and bleeding risks.	3
31. Giannoudis PV, Pountos I, Pape HC, Patel JV. Safety and efficacy of vena cava filters in trauma patients. <i>Injury</i> 2007; 38(1):7-18.	7	N/A	To review all the available data on IVC filter placement in trauma patients and the potential complications of IVC filters in order to understand better the risk/benefit ratio of their use.	No results stated.	4
32. Sarani B, Chun A, Venbrux A. Role of optional (retrievable) IVC filters in surgical patients at risk for venous thromboembolic disease. <i>J Am Coll Surg</i> 2005; 201(6):957-964.	7	N/A	To review risk factors for VTED, review efficacy and complications of IVC filters, and examine the role of new "optional" IVC filters in surgical patients at risk for VTED.	Recommends that surgical patients who cannot be pharmacologically protected against VTED receive an optional IVC filter and that this filter is removed when appropriate medical therapy has been instituted or the risk of VTED has passed.	4

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33. Still J, Friedman B, Furman S, et al. Experience with the insertion of vena caval filters in acutely burned patients. <i>Am Surg</i> 2000; 66(3):277-279.	4	20 IVC filters	To report experience of insertion of vena caval filters in acutely burned patients.	There were no complications due to filter insertion. No post-insertion emboli were recognized. There were no cases of post-insertion thrombophlebitis. The procedure appears to be effective and safe in this small series.	3
34. Wu EC, Barba CA. Current practices in the prophylaxis of venous thromboembolism in bariatric surgery. <i>Obes Surg</i> 2000; 10(1):7-13; discussion 14.	15	N/A	To report survey results on current practices in the prophylaxis of VTE in bariatric surgery.	<ul style="list-style-type: none"> Gastric bypass was the most commonly performed procedure at 61.7%, followed by vertical banded gastroplasty at 23.3%, biliary pancreatic diversion at 9.3%, laparoscopic gastroplasty at 4.0%, laparoscopic gastric bypass at 1.6%, and horizontal banded gastroplasty at 0.1%. The prevailing opinion of members of the American Society for Bariatric Surgery is that morbidly obese patients are at high risk for developing perioperative VTE. A vast majority routinely use prophylaxis. 	3
35. Timsit JF, Farkas JC, Boyer JM, et al. Central vein catheter-related thrombosis in intensive care patients: incidence, risks factors, and relationship with catheter-related sepsis. <i>Chest</i> 1998; 114(1):207-213.	3a	265 subclavian catheters	Observational prospective multicenter study. To evaluate the incidence and risk factors for catheter-related central vein thrombosis in ICU patients.	Catheter-related central vein thrombosis is a frequent complication of central venous catheterization in ICU patients and is closely associated with catheter-related sepsis.	2
36. Meda MS, Lopez AJ, Guyot A. Candida inferior vena cava filter infection and septic thrombophlebitis. <i>Br J Radiol</i> 2007; 80(950):e48-49.	5	N/A	To report a case of IVC filter infection with <i>Candida glabrata</i> following septic thrombophlebitis of the femoral veins and discuss its management.	No results stated.	4
37. Berczi V, Bottomley JR, Thomas SM, Taneja S, Gaines PA, Cleveland TJ. Long-term retrievability of IVC filters: should we abandon permanent devices? <i>Cardiovasc Intervent Radiol</i> 2007; 30(5):820-827.	7	N/A	To review the safety and effectiveness of permanent and retrievable filters and to determine whether the use of permanent IVC filters can be abandoned in favor of retrievable filters.	If long-term follow-up data on larger numbers of cases confirm the initial data that retrievable filters are as safe and effective as permanent filters, the use of the retrievable filters is likely to expand.	4
38. Stavropoulos SW. Inferior vena cava filters. <i>Tech Vasc Interv Radiol</i> 2004; 7(2):91-95.	7	N/A	To review indications for IVC filter placement and different types of filters.	The published long-term results indicate that all of the approved IVC filters are quite effective in preventing symptomatic recurrent PE. In DVT patients without filters the rates of asymptomatic PE ranges from 35%-51%.	4

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39. Weichman K, Ansell JE. Inferior vena cava filters in venous thromboembolism. <i>Prog Cardiovasc Dis</i> 2006; 49(2):98-105.	7	N/A	To review the role of IVC filters in patients with VTE.	Recently available optional retrievable filters have made it possible for physicians to have another valuable tool to use for the treatment of VTE in patients who are not candidates for systemic anticoagulation or, have only a temporary indication for filtration.	4
40. Dentali F, Ageno W, Imberti D. Retrievable vena cava filters: clinical experience. <i>Curr Opin Pulm Med</i> 2006; 12(5):304-309.	7	N/A	To summarize currently available literature regarding indications for IVC filters, potential problems associated with the different filters available, and the efficacy and safety of retrievable IVC filters.	Retrievable filters are a very attractive alternative to either permanent or temporary filters when IVC interruption becomes necessary.	4
41. Imberti D, Bianchi M, Farina A, Siragusa S, Silingardi M, Ageno W. Clinical experience with retrievable vena cava filters: results of a prospective observational multicenter study. <i>J Thromb Haemost</i> 2005; 3(7):1370-1375.	3a	30	Prospective observational multicenter study. To evaluate the efficacy and the likelihood to remove the retrievable IVC filter ALN.	<ul style="list-style-type: none"> The filter was successfully placed in all patients. After a median follow-up of 18.2 months, there were 3 cases (10%) of trapped emboli within the filter, one case (3%) of asymptomatic migration of the filter toward the heart and 2 patients (7%) had DVT recurrences. ALN retrieval was attempted through transjugular approach in 18 patients (60%) and the maneuver was successful in 14 of them (78%); when the decision of removal was taken more than 3 months after the implantation, the retrieval was possible only in 4 of 8 patients (50%). 	3
42. Lorch H, Welger D, Wagner V, et al. Current practice of temporary vena cava filter insertion: a multicenter registry. <i>J Vasc Interv Radiol</i> 2000; 11(1):83-88.	15	188	To evaluate the current practice of temporary vena cava filter placement and its complications.	<ul style="list-style-type: none"> DVT was proven in 95.2% of the patients. Main filter indication was thrombolysis therapy (53.1%). Average filter time was 5.4 days. An Antheor filter was inserted in 56.4%, a Guenther filter in 26.6%, and a Prolyser filter in 17%. Transfemoral filter implantation was slightly preferred (54.8%). Four died of PE during filter protection. Major filter problems were filter thrombosis (16%) and filter dislocation (4.8%). Results of this multicenter registry support the need for innovative filter design, as well as a randomized, prospective study. 	3

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43. Seshadri T, Tran H, Lau KK, Tan B, Gan TE. Ins and outs of inferior vena cava filters in patients with venous thromboembolism: the experience at Monash Medical Centre and review of the published reports. <i>Intern Med J</i> 2008; 38(1):38-43.	7	125	Retrospective study to evaluate an institution's practice of permanent Vena Tech (VT) and retrievable Gunther Tulip (GT) IVC filters and to review the available published reports.	Both the permanent and retrievable filters are efficacious at preventing PE and are associated with a low complication rate. Planned removal of the GT filter may not be possible in a significant proportion of cases.	3
44. Stein PD, Alnas M, Skaf E, et al. Outcome and complications of retrievable inferior vena cava filters. <i>Am J Cardiol</i> 2004; 94(8):1090-1093.	7	284	To review the results and risks of retrievable IVC filters.	Among patients in whom percutaneous removal of the filter was attempted, the filter was successfully removed in 144 of 159 (91%). Surgery was necessary to remove the filter from 1 patient (1%), and filters could not be removed because of large trapped thrombi in 14 patients (9%).	3
45. Sing RF, Rogers FB, Novitsky YW, Heniford BT. Optional vena cava filters for patients with high thromboembolic risk: questions to be answered. <i>Surg Innov</i> 2005; 12(3):195-202.	7	N/A	To review the use of optional vena cava filters in patients with high thromboembolic risk.	Three filters are approved for removal in the United States, the GT, the OptEase filter (OF), and the recovery. Recent reports have demonstrated the safety and feasibility of these devices in appropriate patients, but a number of questions have arisen regarding their use.	4
46. Young T, Tang H, Aukes J, Hughes R. Vena caval filters for the prevention of pulmonary embolism. <i>Cochrane Database Syst Rev</i> 2007; (4):CD006212.	7	N/A	To examine evidence for the effectiveness of vena caval filters in preventing PE.	One randomized controlled trial: Prévention du Risque d'Embolie Pulmonaire par Interruption Cave (PREPIC), was included in data analysis. PREPIC trial demonstrated that permanent caval filters were associated with an increased risk of long term lower limb DVT. Further trials are needed to assess vena caval filter safety and effectiveness.	3
47. Greenfield LJ. The PREPIC Study Group. Eight-year follow-up of patients with permanent vena cava filters in the prevention of pulmonary embolism: the PREPIC (Prevention du Risque d'Embolie Pulmonaire par Interruption Cave) Randomized Study. <i>Perspect Vasc Surg Endovasc Ther</i> 2006; 18(2):187-188.	1	400	In a randomized trial in patients with proximal DVT, permanent vena cava filters reduced the incidence of PE but increased that of DVT at 2 years. An 8-year follow-up was performed to assess their very long-term effect.	At 8 years, vena cava filters reduced the risk of PE but increased that of DVT and had no effect on survival. Although their use may be beneficial in patients at high risk of PE, systematic use in the general population with VTE is not recommended.	1

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48. Decousus H, Leizorovicz A, Parent F, et al. A clinical trial of vena caval filters in the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis. Prevention du Risque d'Embolie Pulmonaire par Interruption Cave Study Group. <i>N Engl J Med</i> 1998; 338(7):409-415.	1	400	To determine the efficacy and safety of vena caval filters in the prevention of PE in patients with proximal DVT.	In high-risk patients with proximal DVT, the initial beneficial effect of vena caval filters for the prevention of PE was counterbalanced by an excess of recurrent DVT, without any difference in mortality. The data also confirmed that low-molecular-weight heparin was as effective and safe as unfractionated heparin for the prevention of PE.	1
49. White RH, Zhou H, Kim J, Romano PS. A population-based study of the effectiveness of inferior vena cava filter use among patients with venous thromboembolism. <i>Arch Intern Med</i> 2000; 160(13):2033-2041.	3c	3,632 patients treated with a filter 64,333 controls	Population based retrospective analysis to determine the 1-year cumulative incidence of rehospitalization for venous thrombosis or PE among patients with thromboembolism treated with a vena cava filter compared with the incidence in a control population with thromboembolism.	Insertion of a vena cava filter was not associated with a significant reduction in the 1-year incidence of rehospitalization for PE. Use of a filter was associated with a higher incidence of rehospitalization for venous thrombosis, but only among patients who initially manifested PE.	2
50. Anderson RC, Bussey HI. Retrievable and permanent inferior vena cava filters: selected considerations. <i>Pharmacotherapy</i> 2006; 26(11):1595-1600.	7	N/A	To review the risks and benefits of retrievable and permanent IVC filters.	The increasing use of IVC filters increases the need for clinicians to be aware of the potential limitations and risks of these devices.	4
51. Ray CE, Jr., Prochazka A. The need for anticoagulation following inferior vena cava filter placement: systematic review. <i>Cardiovasc Intervent Radiol</i> 2008; 31(2):316-324.	7	1369	Systematic review to determine the effect of anticoagulation on the rates of VTE following IVC filter placement.	Summary odds ratio for the effect of anticoagulation on VTE rates following filter deployment was 0.639 (95% CI 0.351 to 1.159, p = 0.141). Trend towards decreased VTE rates in patients with post-filter anticoagulation (12.3% vs. 15.8%). IVC filters are recommended in patients who cannot receive concomitant anticoagulation.	1
52. Millward SF. Vena cava filters: continuing the search for an ideal device. <i>J Vasc Interv Radiol</i> 2005; 16(11):1423-1425.	7	27	To determine the ideal filter by reviewing data on a series of patients treated with the OF.	More data regarding the 3 approved devices: recovery filter (RF), the GT filter and the OF are needed, particularly to confirm their efficacy and safety as permanent filters, as patients receiving "retrievable" filters may end up with a permanent implant.	3

**Inferior Vena Cava (IVC) Filter Placement
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
53. Becker DM, Philbrick JT, Selby JB. Inferior vena cava filters. Indications, safety, effectiveness. <i>Arch Intern Med</i> 1992; 152(10):1985-1994.	7	24 case series 16 cases (1,632 patients), and 8 cases (925 patients)	Systematic review of studies to clarify what is known about the indications, safety, and effectiveness of IVC filters.	<ul style="list-style-type: none"> • Recurrent clinical PE was rare after filter placement, and 8 deaths from PE were reported. • Filter complications were common but rarely life threatening; 4 deaths (0.16%) from filter complications were noted among the reviewed studies. • Thrombotic complications following filter placement included insertion-site deep vein thrombosis and IVC obstruction. These events were rare, but they occurred with all filter types. 	3
54. Greenfield LJ, Proctor MC. Twenty-year clinical experience with the Greenfield filter. <i>Cardiovasc Surg</i> 1995; 3(2):199-205.	3a	N/A	To characterize the long-term safety and efficacy of the stainless-steel Greenfield filter.	The rate of recurrent PE was 4% and the caval patency rate was 96%. Some filter movement of no clinical significance was seen in 8% of cases. There was no procedural mortality and morbidity was minimal. Greenfield filter insertion provides long-term protection from PE while preserving caval patency.	3
55. Joels CS, Sing RF, Heniford BT. Complications of inferior vena cava filters. <i>Am Surg</i> 2003; 69(8):654-659.	7	N/A	To review complications of IVC filters.	Overall, the benefits of preventing PE far exceed the risks related to filter placement in properly selected patients.	4
56. Cina A, Masselli G, Di Stasi C, et al. Computed tomography imaging of vena cava filter complications: a pictorial review. <i>Acta Radiol</i> 2006; 47(2):135-144.	13	N/A	To describe the normal CT aspect of cava filters, the classification of complications and their CT findings. Technical considerations for adequate CT imaging are also highlighted.	CT provides a complete evaluation of the filter, including both caval and extracaval complications.	4
57. Buller HR, Agnelli G, Hull RD, Hyers TM, Prins MH, Raskob GE. Antithrombotic therapy for venous thromboembolic disease: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. <i>Chest</i> 2004; 126(3 Suppl):401S-428S.	15	N/A	Guideline.	N/A	N/A
58. Millward SF, Grassi CJ, Kinney TB, et al. Reporting standards for inferior vena caval filter placement and patient follow-up: supplement for temporary and retrievable/optional filters. <i>J Vasc Interv Radiol</i> 2005; 16(4):441-443.	15	N/A	Guideline.	N/A	N/A

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
 - a. Cohort
 - b. Cross-sectional
 - c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews

8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.