

6-8-2012

Assessment of venous thromboembolism risk and adequacy of prophylaxis in selected acute care medical centres in Arabian Gulf States: results from the ENDORSE study


Faisal Alsayegh
Kuwait University

Hassan Kamaliddin
Rashid Hospital

Eman Sheshah
Prince Salman Hospital

See next page for additional authors

Follow this and additional works at: https://escholarship.umassmed.edu/cor_endorse

 Part of the [Cardiovascular Diseases Commons](#), [Clinical Epidemiology Commons](#), [Epidemiology Commons](#), [Health Services Research Commons](#), [Survival Analysis Commons](#), and the [Vital and Health Statistics Commons](#)

Repository Citation

Alsayegh, Faisal; Kamaliddin, Hassan; Sheshah, Eman; Bukhamseen, Nasir; Alkhuwaitir, Tarig; and Elhoufi, Ashraf, "Assessment of venous thromboembolism risk and adequacy of prophylaxis in selected acute care medical centres in Arabian Gulf States: results from the ENDORSE study" (2012). *ENDORSE Publications*. 16.

https://escholarship.umassmed.edu/cor_endorse/16

Assessment of venous thromboembolism risk and adequacy of prophylaxis in selected acute care medical centres in Arabian Gulf States: results from the ENDORSE study

Authors

Faisal Alsayegh, Hassan Kamaliddin, Eman Sheshah, Nasir Bukhamseen, Tarig Alkhuwaitir, and Ashraf Elhoufi

Keywords

Arabian Gulf, Thromboembolism, Prophylaxis, ENDORSE study, Kuwait, Saudi Arabia, United Arab Emirates

Creative Commons License



This work is licensed under a [Creative Commons Attribution-Noncommercial 3.0 License](https://creativecommons.org/licenses/by-nc/3.0/)

Assessment of Venous Thromboembolism Risk and Adequacy of Prophylaxis in Selected Acute Care Medical Centres in Arabian Gulf States: Results from the ENDORSE Study

Faisal Alsayegh^a Hassan Kamaliddin^b Eman Sheshah^d Nasir Bukhamseen^d
Tarig Alkhuwaitir^e Ashraf Elhoufi^c

^aDepartment of Medicine, Faculty of Medicine, Kuwait University, Jabriya, Kuwait; ^bTrauma ICU, Rashid Hospital, and ^cMedical ICU, Dubai Hospital, Dubai, United Arab Emirates; ^dPrince Salman Hospital and ^eRiyadh Medical Complex, Riyadh, Saudi Arabia

Key Words

Arabian Gulf · Thromboembolism · Prophylaxis · ENDORSE study · Kuwait · Saudi Arabia · United Arab Emirates

Abstract

Objectives: To assess the prevalence of venous thromboembolism (VTE) risk in acutely ill surgical and medical patients in selected acute care centres in the Arabian Gulf States, and to determine the proportion of at-risk patients who received effective prophylaxis in accordance with 2004 American College of Chest Physicians (ACCP) guidelines. **Materials and Methods:** Eight hospitals from 3 countries (Kuwait, Kingdom of Saudi Arabia, and United Arab Emirates) contributed to the global ENDORSE (Epidemiological International Day for the Evaluation of Patients at Risk for Venous Thromboembolism in the Acute Hospital Care Setting) study. Medical records were reviewed for all the in-patients aged ≥ 40 years admitted to medical wards, and in patients aged ≥ 18 admitted to surgical wards. The VTE risk and recommended prophylaxis were assessed according to the 2004 ACCP guidelines. **Results:** Of 1,291 evaluable patients, 801 were considered at risk of VTE; 391 (48.8%) surgical patients and 410 (51.2%) medical patients. Of the 801 patients, 322 (40.2%) received ACCP-recommended VTE prophylaxis; 159 (40.7%) of

surgical patients and 163 (39.8%) of medical patients. **Conclusions:** The data showed that VTE prophylaxis was underutilized in high-risk hospitalized patients. We recommend that active measures should be implemented in acute care centres in these Arabian Gulf countries to ensure identification of patients at risk of VTE and institute the appropriate prophylaxis.

Copyright © 2012 S. Karger AG, Basel

Introduction

Venous thromboembolism (VTE) prophylaxis in acute care medical centres has been proven to be effective in reducing the rate of VTE in high-risk patients [1, 2]. Several post-mortem studies have shown a significant hospital VTE-related mortality up to 10%, thereby making VTE one of the main causes of death in hospitalized patients [3–5]. Awareness of potential risk factors that put hospitalized patients at risk of VTE and implementation of evidence-based thromboprophylactic measures in these patients have been published in several guidelines [6–10]. Despite the publication of these guidelines, some of them updated annually, a large number of practicing physicians and surgeons still underestimate VTE risk and

thus implement inadequate VTE prophylaxis practices [11–13].

The ENDORSE (Epidemiologic International Day for the Evaluation of Patients at Risk of Venous Thrombosis in the Acute Hospital Care Setting) study was the first published global multicentre cross-sectional study that explored the percentage of acute care hospitalized patients at risk of VTE at any given time. It also looked into adherence to strict VTE prophylaxis practices according to risk stratification in surgical and medical patients as published in the American College of Chest Physicians (ACCP) guidelines [14].

The need to explore VTE risk estimation and adequacy of VTE prophylactic strategies in Arabian Gulf countries is of great importance since data in this area are rare. There is only one such study [15], which explored VTE risk factors, its rate in surgical and medical wards and the appropriateness of using pharmacologic anticoagulation. This study showed a significant VTE rate in both surgical and medical patients. In addition, there was inappropriate utilization of pharmacologic anticoagulants in patients with established VTE [15].

The objectives of this study were to use the global ENDORSE study to determine the prevalence of patients at VTE risk in selected acute care hospital settings in the Arabian Gulf region; to find the proportion of patients at VTE risk that received thromboprophylaxis in accordance with ACCP 2004 guidelines [7].

Materials and Methods

The methodology of the study has been described in the global ENDORSE publication [14]. Briefly, hospital selection was done randomly from authoritative lists of acute care centres in 3 Arabian Gulf countries: Kuwait, Kingdom of Saudi Arabia (KSA) and United Arab Emirates (UAE). Hospitals with more than 50 beds that admit patients with acute and chronic medical disorders as well as scheduling routine surgical procedures were considered eligible for inclusion in the study. Approval of the local hospital authorities was obtained before collecting the data. Signed patient consent was not required.

Patients' data, including demographics, diagnosis on admission, VTE risk factors, factors associated with risk of bleeding, duration of hospital stay and VTE prophylaxis used including the dosage (in accordance with ACCP guidelines), were extracted from the patients' medical records. Standardized case report forms were used by trained medical personnel to extract the data.

The survey included patients who were hospitalized in an eligible ward at the time of data collection. One day was considered adequate for each eligible ward to complete the data collection forms. The eligibility criteria included those patients who are ≥ 40 years of age in eligible medical wards and patients aged ≥ 18 in eligible surgical wards based on ENDORSE recommendation

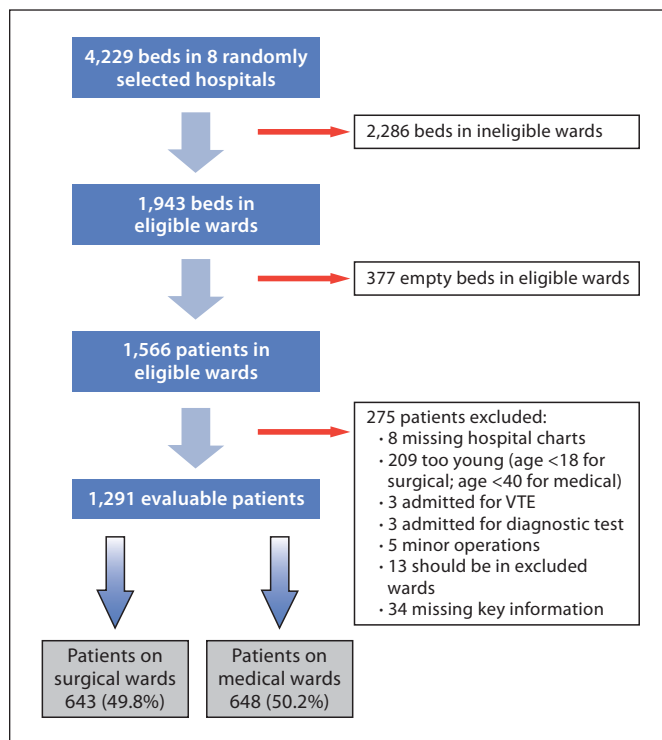


Fig. 1. Selection of the study population.

[14]. In addition, patients assessed for VTE risk included acutely ill medical patients, patients hospitalized for major trauma or undergoing a major surgical procedure requiring general or epidural anaesthesia for at least 45 min. VTE risk assessment in surgical patients was classified as being at highest, high, moderate or low risk for VTE. Data on VTE thromboprophylaxis that had been collected were only those that followed ACCP 2004 guidelines. However, thromboprophylaxis duration could not be assessed due to the cross-sectional nature of the study.

Patients were considered ineligible for VTE thromboprophylaxis if they presented or were at risk of the following: intracranial haemorrhage, liver impairment, bleeding at hospital admission, an active peptic ulcer, and known bleeding disorder. The selection algorithm of eligible patients and the number of the evaluable patients in surgical and medical wards are shown in figure 1.

Statistical analyses of the global ENDORSE report were used in this study [14].

Results

Of the 1,291 evaluable patients in the 3 countries, 801 (62%) were considered to be at risk of VTE. Patient characteristics and indications of admission in surgical and medical wards are listed in table 1.

Table 1. Characteristics and reasons for hospitalization of eligible patients

	Kuwait, n (%)	KSA, n (%)	UAE, n (%)	Total, n (%)
Patients characteristics				
Number of eligible patients	271 (33.8)	284 (35.5)	246 (30.7)	801 (100)
Surgical	74 (27.3)	192 (67.6)	125 (50.8)	391 (48.8)
Medical	197 (72.7)	92 (32.4)	121 (49.2)	410 (51.2)
Male	153 (56.5)	209 (73.6)	171 (69.5)	533 (66.5)
Age (median), years	61	50	52	
Body mass index (median)	26.6	25.5	25.5	
Hospital admission to survey (median), days	7	14	5	
Medical reasons for hospitalization				
Acute heart failure (NYHA class III or IV)	37 (13.7)	26 (9.2)	37 (15.0)	100 (12.5)
Ischaemic stroke	19 (7.0)	20 (7.0)	20 (8.1)	59 (7.3)
Haemorrhagic stroke	9 (3.3)	4 (1.4)	6 (2.4)	19 (2.4)
Other cardiovascular disease	46 (17.0)	55 (19.4)	97 (39.4)	198 (24.7)
Haematologic disease	4 (1.5)	5 (1.8)	3 (1.2)	12 (1.5)
Acute noninfectious respiratory disease	38 (14.0)	12 (4.2)	6 (2.4)	56 (7.0)
Pulmonary infection	102 (37.6)	22 (7.7)	41 (16.7)	165 (20.6)
Malignancy (active)	3 (1.1)	5 (1.8)	7 (2.8)	15 (2.3)
Infection (non-respiratory)	45 (16.6)	32 (11.3)	11 (4.5)	88 (11.0)
Rheumatologic or inflammatory	2 (0.7)	0	13 (5.3)	15 (2.3)
Neurologic	12 (4.4)	21 (7.4)	18 (7.3)	51 (6.4)
Renal	20 (7.4)	18 (6.3)	29 (11.8)	67 (8.4)
Endocrine/metabolic	16 (5.9)	48 (16.9)	76 (30.9)	140 (17.5)
GI/hepatobiliary	16 (5.9)	12 (4.2)	9 (3.7)	37 (4.6)
Other medical condition	23 (8.5)	7 (2.5)	45 (18.3)	75 (9.4)
Surgical reasons for hospitalization				
Hip replacement	0	5 (2.6)	1 (0.8)	6 (1.5)
Knee replacement	0	0	7 (5.6)	7 (1.8)
Hip fracture	0	8 (4.2)	5 (4.0)	13 (3.3)
Curative arthroscopy	0	0	1 (0.8)	1 (0.3)
Other orthopaedic trauma	16 (21.6)	40 (20.8)	36 (28.8)	92 (23.5)
Colon/small bowel	8 (10.8)	12 (6.3)	9 (7.2)	29 (7.4)
Rectosigmoid	0	0	0	0 (0)
Gastric	2 (2.7)	2 (1.0)	4 (3.2)	8 (2)
Hepatobiliary	11 (14.9)	1 (0.5)	3 (2.4)	15 (3.8)
Urologic	1 (1.4)	7 (3.6)	3 (2.4)	11 (2.8)
Vascular	3	3 (1.6)	0	6 (1.5)
Thoracic	1 (1.4)	1 (0.5)	0	2 (0.5)
Gynaecologic	0	0	8 (6.4)	8 (2)
Other major surgery	12 (16.2)	36 (18.8)	27 (21.6)	75 (19.2)
Admitted with major trauma but surgery not done	20 (27.0)	77 (40.1)	21 (16.8)	118 (30.2)

Several VTE risk factors were identified that were present prior to hospital admission, and those acquired during hospitalization. Immobility, cardiac failure and chronic lung disease were the most common risk factors prior to admission, whereas immobilization, intensive care unit/coronary care unit admission and mechanical ventilation were among the common acquired factors during hospitalization (table 2).

The most common contraindication for pharmacological prophylaxis in surgical patients was non-steroidal anti-inflammatory drugs, while in medical patients, it was the use of aspirin and renal impairment. There were also differences in the use of aspirin and non-steroidal anti-inflammatory drugs among the countries. In Kuwait, aspirin was more commonly used in all admitted patients as compared to the KSA and UAE, whereas non-

Table 2. Risk factors for VTE prior to and during hospital admission

	Kuwait n (%) (n = 271)	KSA n (%) (n = 284)	UAE n (%) (n = 246)	Total n (%) (n = 801)
Conditions present prior to hospital admission				
Previous VTE	5 (1.8)	2 (0.7)	3 (1.2)	10 (1.2)
Thrombophilia (laboratory documented)	0	0	0	0 (0)
Varicose veins or venous insufficiency	8 (3.0)	0	0	8 (1)
Postmenopausal hormone replacement therapy	1 (0.4)	0	0	1 (0.1)
Chronic pulmonary disease	47 (17.3)	17 (6.0)	10 (4.1)	74 (9.2)
Long-term immobility	46 (17.0)	16 (5.6)	21 (8.5)	83 (10.3)
Pregnancy (within 3 months)	0	0	9 (3.7)	9 (1.1)
Obesity (based on physician's note)	42 (15.5)	10 (3.5)	14 (5.7)	66 (8.2)
Contraceptives	3 (1.1)	0	0	3 (0.3)
Chronic heart failure	27 (10.0)	22 (7.7)	30 (12.2)	79 (9.8)
Additional risk factors for VTE during hospital admission				
Admitted to ICU/CCU	123 (45.4)	83 (29.2)	70 (28.5)	276 (34.5)
Central venous catheter	67 (24.7)	28 (9.9)	42 (17.1)	137 (17.1)
Mechanical ventilation	54 (19.9)	42 (14.8)	67 (27.2)	163 (20.3)
Immobile with bathroom privileges	63 (23.2)	23 (8.1)	72 (29.3)	158 (19.7)
Complete immobilization	122 (45.0)	145 (51.1)	145 (58.9)	412 (51.4)
Cancer therapy	1 (0.4)	1 (0.4)	1 (0.4)	3 (0.4)
Heparin-induced thrombocytopenia	1 (0.4)	1 (0.4)	1 (0.4)	3 (0.4)

ICU = Intensive care unit; CCU = coronary care unit.

steroidal anti-inflammatory drugs were more commonly used in the KSA as compared to Kuwait and the UAE (table 3).

Pharmacological prophylaxis was the most frequently used method of prophylaxis in surgical and medical patients. Mechanical prophylaxis was a less commonly used method. Graduated compression stockings were the preferred method of mechanical prophylaxis especially in surgical wards (table 4).

Of the 801 patients at risk of VTE, only 322 (40.2%) received ACCP-recommended prophylaxis. The overall use of VTE prophylaxis in high-risk patients in each country and in surgical and medical departments is given in table 5.

Discussion

Because only 40.2% of high-risk patients received ACCP-recommended VTE prophylaxis, VTE prophylaxis was underutilized in the participating centres in the Arabian Gulf region. This finding is lower than approximately 50% reported in the worldwide utilization of VTE prophylaxis in the ENDORSE study [14]. In addition,

there was no significant difference between surgical and medical patients in utilizing VTE prophylaxis because 39.8% surgical patients and 40.7% medical patients at high risk received ACCP-recommended prophylaxis in contrast to the global ENDORSE findings reporting that more surgical than medical patients received VTE prophylaxis [14].

When we examine the data more closely by country, the utilization of VTE prophylaxis in the KSA in high-risk medical patients was 62%, higher than in Kuwait (33.5%) and the UAE (33.1%). In fact, it is higher than the average global result in medical patients, which was reported as 40% [14]. On the other hand, more surgical patients at risk of VTE received ACCP-recommended prophylaxis in Kuwait (58.1%) as compared to the KSA (32.30%) and UAE (43.2%). These results seem to indicate that a large proportion of practicing physicians and surgeons in the Arabian Gulf area lack the awareness and knowledge of already published evidence-based guidelines on everyday practice of VTE prophylaxis. It may also indicate the existence of a significant number of patients with contraindications to pharmacologic prophylaxis in this series that lead to hesitancy of health care providers in initiating pharmacologic prophylaxis (ta-

Table 3. Contraindications to anticoagulation

	Kuwait, n (%) (n = 271)	KSA, n (%) (n = 284)	UAE, n (%) (n = 246)	All surgical wards, n (%) (n = 391)	All medical wards, n (%) (n = 410)	Total, n (%) (n = 801)
Significant renal impairment	43 (15.9)	18 (6.3)	34 (13.8)	17 (4.3)	78 (19)	95 (11.9)
Intracranial haemorrhage	14 (5.2)	15 (5.3)	10 (4.1)	31 (7.9)	8 (2)	39 (4.9)
Low platelet count (<100,000/ μ l)	9 (3.3)	3 (1.1)	3 (1.2)	6 (1.5)	9 (2.2)	15 (2.3)
Known bleeding disorder ¹	0	0	3 (1.2)	1 (0.3)	2 (0.5)	3 (0.3)
Hepatic impairment (clinically relevant)	13 (4.8)	4 (1.4)	4 (1.6)	5 (1.3)	16 (3.9)	21 (2.6)
Bleeding at hospital admission	7 (2.6)	8 (2.8)	7 (2.8)	12 (3)	10 (2.4)	22 (2.7)
Active gastroduodenal ulcer	4 (1.5)	3 (1.1)	2 (0.8)	3 (0.8)	6 (1.5)	9 (1.1)
Aspirin on admission	116 (42.8)	47 (16.5)	73 (29.7)	29 (7.4)	207 (50.5)	236 (29.5)
NSAID on admission (excluding aspirin)	24 (8.9)	57 (20.1)	24 (9.8)	80 (20.4)	25 (6.1)	105 (13.1)

NSAID = Nonsteroidal anti-inflammatory drug. ¹ Congenital or acquired.

Table 4. VTE prophylaxis ordered during hospital admission

	Kuwait, n (%) (n = 271)	KSA, n (%) (n = 284)	UAE, n (%) (n = 246)	All surgical wards, n (%) (n = 391)	All medical wards, n (%) (n = 410)	Total, n (%) (n = 801)
LMWH	61 (22.5)	62 (21.8)	82 (33.3)	124 (31.7)	81 (19.8)	205 (25.6)
UH	43 (15.9)	130 (45.8)	9 (3.6)	104 (26.6)	78 (19)	182 (22.7)
VKA	5 (1.8)	2 (0.7)	5 (2)	4 (1)	8 (2)	12 (1.5)
Fondaparinux	0	0	0	0	0	0
Others	0	0	0	0	0	0
Mechanical prophylaxis						
IPC	9 (3.3)	0	10 (4.1)	11 (2.8)	8 (2)	19 (2.4)
Foot pump	0	0	0	0	0	0
GCS	25 (9.2)	11 (3.9)	9 (3.7)	32 (8.2)	13 (3.2)	45 (5.6)

The IPC, foot pump and GCS were used separately in patients who had contraindications to anticoagulant based on the treating physician's decision. LMWH = Low-molecular-weight heparin; UH = unfractionated heparin; VKA = vitamin K antagonists; IPC = intermittent pneumatic compression; GCS = graduated compression stocking.

Table 5. Proportion of high-risk patients who received VTE prophylaxis according to ACCP guidelines by country and department

	Kuwait, n (%)	KSA, n (%)	UAE, n (%)	Total, n (%)
Prophylaxis according to ACCP	109 (40.2)	119 (41.9)	94 (38.2)	322 (40.2)
Surgical	43 (58.1)	62 (32.3)	54 (43.2)	159 (40.7)
Medical	66 (33.5)	57 (62.0)	40 (33.1)	163 (39.8)

ble 3). Equally important, there was also a lack of unified VTE risk assessment guidelines in the medical centres in the 3 participating Arabian Gulf countries. Thus, regional efforts should be carefully planned to raise awareness among health care professionals through implementation of educational programmes and adoption of mandatory VTE risk stratification charts in the wards.

Unfractionated heparin and low-molecular-weight heparin were the commonest forms of pharmacologic prophylaxis that were used in the Arabian Gulf States (table 4). There was a preference towards unfractionated heparin over low-molecular-weight heparin in KSA hospitals. In addition, unfractionated heparin was the commonly used pharmacologic prophylaxis in the UAE. The preferable use of unfractionated heparin has many possible explanations that include drug availability because of its cheap price, longer experience, and availability of a specific antidote to unfractionated heparin. Graduated compression stocking was used more often than intermittent pneumatic compression because of the limited availability of intermittent pneumatic compression machines on the wards. In addition, foot pumps were never reported to be utilized in the region. The effectiveness of mechanical VTE prophylaxis alone or in combination with pharmacologic prophylaxis has been shown in many studies to be the recommended method in high-risk patients as published in guidelines [12, 16–18]. Mechanical prophylaxis was rarely used in high-risk patients in this study. This underutilization of mechanical prophylaxis supports the notion that more is needed toward raising

the awareness of using different forms of VTE prophylaxis when a contraindication to anticoagulants is indicated [17–19].

There are several limitations to this ENDORSE study. Only 8 centres participated in the study and this may not be representative of thromboprophylaxis practices in the other medical centres. The data were obtained from the medical records rather than from direct interview with the patients. Since the ENDORSE study was a cross-sectional study, hence, long-term follow-up on adherence of health care providers to published VTE prophylaxis guidelines was not assessed.

Conclusion

The findings of the ENDORSE study in the 3 Arabian Gulf States showed that VTE prophylaxis was underutilized in surgical and medical patients at risk of VTE. We therefore recommend that regional efforts should be initiated to raise awareness of VTE risk and ensure that at-risk patients receive appropriate prophylaxis through mandatory hospital-based strategies, and implementation of evidence-based guidelines.

Acknowledgment

The ENDORSE study was supported through an educational grant by Sanofi (Paris, France).

References

- 1 Samama MM, Cohen AT, Darmon JY, Desjardins L, Eldor A, Janbon C, Leizorovicz A, Nguyen H, Olsson CG, Turpie AG, et al: A comparison of enoxaparin with placebo for the prevention of venous thromboembolism in acutely ill medical patients. *N Engl J Med* 1999;341:793–800.
- 2 Alikhan R, Spyropoulos AC: Epidemiology of venous thromboembolism in cardiorespiratory and infectious disease. *Am J Med* 2008;121:935–942.
- 3 Alikhan R, Peters F, Wilmott R, Cohen AT: Fatal pulmonary embolism in hospitalised patients: a necropsy review. *J Clin Pathol* 2004;57:1254–1257.
- 4 Cohen AT, Agnelli G, Anderson FA, Arcelus JI, Bergqvist D, Brecht JG, Greer IA, Heit JA, Hutchinson JL, Kakkar AK, et al: Venous thromboembolism (VTE) in Europe – The number of VTE events and associated morbidity and mortality. *Thromb Haemostasis* 2007;98:756–764.
- 5 Lindblad B, Sternby NH, Bergqvist D: Incidence of venous thromboembolism verified by necropsy over 30 years. *BMJ* 1991;302:709–711.
- 6 Abdel-Razeq H, Qari M, Kristensen J, Alizeidah H, Al-Sayegh F, Marashi M, Alzeer A, Al-Amoudi O, Qutub H, Al-Humiadi AA, et al: Guidelines for diagnosis and treatment of deep venous thrombosis and pulmonary embolism. *Methods Mol Med* 2004;93:267–292.
- 7 Geerts WH, Pineo GF, Heit JA, Bergqvist D, Lassen MR, Colwell CW, Ray JG: Prevention of venous thromboembolism: in The Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 2004;126:338S–400S.
- 8 Nicolaides AN, Fareed J, Kakkar AK, Bredin HK, Goldhaber SZ, Hull R, Kakkar VV, Michiels JJ, Myers K, Samama M, et al: Prevention and treatment of venous thromboembolism. International Consensus Statement (guidelines according to scientific evidence). *Int Angiol* 2006;25:101–161.
- 9 Fanikos J: Guidelines and performance measures for the prevention and treatment of venous thromboembolism. *J Manag Care Pharm* 2008;14:14S–23S.
- 10 Hassouna HI: Thrombophilia and hypercoagulability. *Med Princ Pract* 2009;18:429–440.
- 11 Eikelboom JW, Mazzarol A, Quinlan DJ, Beaver R, Williamson J, Yi Q, Hankey GJ: Thromboprophylaxis practice patterns in two Western Australian teaching hospitals. *Haematologica* 2004;89:586–593.

- 12 Kahn SR, Panju A, Geerts W, Pineo GF, Desjardins L, Turpie AGG, Glezer S, Thabane L, Sebaldt RJ: Multicenter evaluation of the use of venous thromboembolism prophylaxis in acutely ill medical patients in Canada. *Thromb Res* 2007;119:145–155.
- 13 Otero R, Uresandi F, Cayuela A, Blanquer J, Cabezudo MA, De Gregorio MA, Lobo JL, Nauffal D, Oribe M: Use of venous thromboembolism prophylaxis for surgical patients: a multicentre analysis of practice in Spain. *Eur J Surg* 2001;167:163–167.
- 14 Cohen AT, Tapson VF, Bergmann JF, Goldhaber SZ, Kakkar AK, Deslandes B, Huang W, Zayaruzny M, Emery L, Anderson FA Jr: Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): a multinational cross-sectional study. *Lancet* 2008;371:387–394.
- 15 Al Sayegh F, Almahmeed W, Al Humood S, Marashi M, Bahr A, Al Mahdi H, Bakir S, Al Farhan M: Global Risk Profile Verification in Patients with Venous Thromboembolism (GRIP VTE) in 5 Gulf countries. *Clin Appl Thromb Hemost* 2009;15:289–296.
- 16 Struijk-Mulder MC, Ettema HB, Verheyen CC, Buller HR: Comparing consensus guidelines on thromboprophylaxis in orthopaedic surgery. *J Thromb Haemost* 2010;8:678–683.
- 17 Eppsteiner RW, Shin JJ, Johnson J, van Dam RM: Mechanical compression versus subcutaneous heparin therapy in postoperative and posttrauma patients: a systematic review and meta-analysis. *World J Surg* 2010;34:10–19.
- 18 Caprini JA: Mechanical methods for thrombosis prophylaxis. *Clin Appl Thromb Hemost* 2010;16:668–673.
- 19 Zubkov AY, Wijidicks EF: Deep venous thrombosis prophylaxis in cerebral hemorrhage. *Rev Neurol Dis* 2009;6:21–25.