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Swiss results from a global observational study of venous thromboembolism risk and prophylaxis use in the acute care hospital setting: analysis from the ENDORSE study

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Summary

Background: The aim of the present analysis from the epidemiologic international day for the evaluation of patients at risk for venous thromboembolism (VTE) in the acute hospital care setting (ENDORSE) study was to evaluate the prevalence of VTE risk in acute care hospitals and the proportion of at-risk medical and surgical patients who receive recommended prophylaxis in Switzerland.

Methods: All patients (age ≥40 years) admitted to a medical ward or those (age ≥18 years) admitted to a surgical ward in ten randomly selected Swiss hospitals were assessed for risk of VTE. The 2004 American College of Chest Physicians (ACCP) evidence-based consensus guidelines were used to assess VTE risk and to determine whether patients were receiving recommended thromboprophylaxis.

Results: 2000 patients were eligible; of these 1153 (58%) were in surgical wards, and 847 (42%) in medical wards. According to the ACCP criteria, the proportion of surgical patients at VTE risk was similar in Switzerland (68%, between hospital range 48–86%) in comparison to the global ENDORSE study (64%) (p = 0.296). The rate of at-risk medical patients was lower in Switzerland (21%, range 3–44%) than in the global study (42%) (p <0.001). The proportion of at-risk surgical patients with ACCP-recommended VTE prophylaxis was higher in Switzerland (81%, between-hospital range 76–93%) than in the global study (59%) (p <0.001). Among medical patients at risk, the use of recommended thromboprophylaxis was higher in Switzerland (61%, between-hospital range 0–84%) than in the global ENDORSE (40%) (p <0.001). However 56% of the patients with cancer, 41% with major trauma, and 29% undergoing vascular surgery did not receive any recommended prophylaxis. Among surgical patients at risk, the use of ACCP-recommended prophylaxis was lower in academic (77%) vs. non-academic (86%) institutions (p = 0.0025).

Conclusions: In Switzerland, although the rate of recommended thromboprophylaxis is higher than in many countries, it is still improvable in medical patients at risk according to the ACCP guidelines. Consequently, hospital wide strategies for systematic risk factor assessment and implementation of practical tools to ensure appropriate use of prophylaxis in patients at VTE risk are required.

Key words: venous thromboembolism; thromboprophylaxis; hospitalised medical and surgical patients

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Introduction

Venous thromboembolism (VTE) accounts for more than 500 000 deaths in Europe and over 200 thousand fatalities in the United States annually [1–2]. Among hospitalised patients, 5–10% of all deaths are due to pulmonary embolism (PE) [3]. In addition to the acute risk of mortality, VTE

is associated with long-term risks of post-thrombotic syndrome and chronic thromboembolic pulmonary hypertension [4–5]. These complications contribute substantially to patient morbidity and the cost of management. Pharmacological and mechanical types of prophylaxis can prevent VTE effectively [6–7].

The American College of Chest Physicians (ACCP) evidence-based consensus guidelines for VTE prophylaxis released in 2004 [8] were adapted to local practice by the Swiss Expert Group [9]. Previously, an observational study conducted in 2003 in eight large hospitals across Switzerland showed that 59% of hospitalised medical patients were at risk for VTE and reported a 50% underuse of thromboprophylaxis [10]. The proportion of at-risk surgical patients who receive prophylaxis in Switzerland is unknown.

The present analysis from the multinational, observational, cross-sectional epidemiologic international day for the evaluation of patients at risk for venous thromboembolism in the acute hospital care setting (ENDORSE) study [11], aims to assess the prevalence of risk for VTE in hospitalised medical and surgical patients in Switzerland, determine the proportion of at-risk patients who received the ACCP recommended prophylaxis, and relate the Swiss and global results of this survey.

Methods and patients

Swiss hospitals with more than 50 beds were eligible for participation in the ENDORSE study if they provided acute medical care and major surgery. Ten participating hospitals were randomly chosen from the official list of Swiss acute health care providers. Ethics committee approval was received for each participating hospital according to national and local regulations.

All patients ≥18 years in eligible surgical wards or ≥40 years in eligible medical wards were screened. Patients were included if they were hospitalised on the pre-specified day of the cross-sectional survey. Patient demographics, admission and post-admission diagnoses, VTE risk factors, bleeding risk factors, duration of stay, and initiation, duration and type of VTE prophylaxis were collected on that pre-specified day from a review of hospital charts in all eligible wards at each hospital. The data collection was performed by trained external data abstractors using standard case report forms and covered the period from the day of hospital admission to the pre-specified day of chart review. Patients with unavailable charts or those who were admitted for the treatment of acute VTE were excluded.

The 2004 ACCP guidelines were used to assess the risk for VTE, proportion of at-risk patients receiving recommended thromboprophylaxis, and risk for bleeding presenting a contraindication to pharmacological prophylaxis, as specified in the methodology section of the global ENDORSE study publication [11].

Statistical analysis

Categorical data are presented as numbers and percentages of the population, and quantitative data as medians and interquartile ranges (IQR). Hospital rates were calculated from individual patient data. A minimum of 369 patients was needed to assess the occurrence of VTE risk at 60% with an error margin of 5%. Group comparisons were performed using the Fisher exact test, and all reported p-values are two-tailed. SAS version 9.1 was used for statistical analyses.

Role of the funding source

The study protocol was written by an independent scientific steering committee. Data collection was co-ordinated by the Center for Outcomes Research (University of Massachusetts Medical School, Worcester, MA, USA). All statistical analyses were performed by the Center for Outcomes Research.

Results

The present analysis was performed on the ENDORSE study patients recruited in Switzerland. In October 2006, all eligible patients from ten randomly selected Swiss hospitals were enrolled. Two (20%) hospitals were categorised as academic, two (20%) as private, and three (30%) were localised in the French speaking part of Switzerland. The median number of beds per hospital was 200 (range across participating hospitals 58–494 beds). The number of beds assessed, reasons for exclusion from assessment and the number of assessable hospitalised patients are shown in figure 1.

2000 Swiss patients were eligible; of these 1153 (58%) were in surgical, and 847 (42%) in medical wards. Patient characteristics are summarised in table 1. According to the ACCP criteria, the proportion of surgical patients at VTE risk was similar in Switzerland (68%, between-hospital range 48–86%) in comparison to the

Table 1

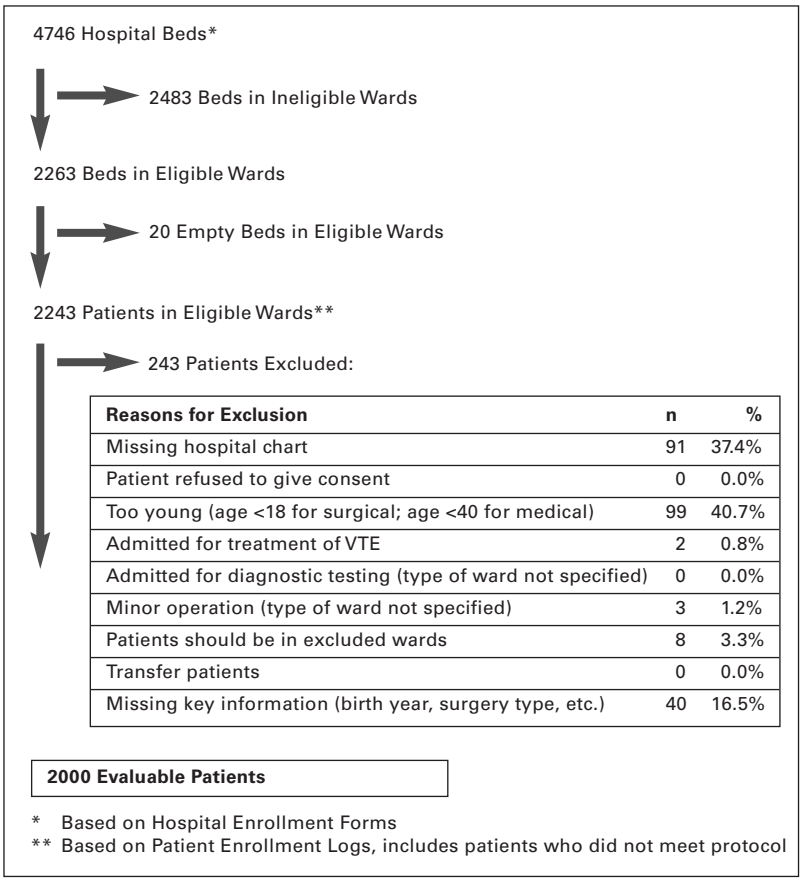
Patient characteristics.

Patients	all N = 2000	surgical N = 1153	medical N = 847
Female sex, n (%)	930 (47)	513 (44)	417 (49)
Age (years), median (IQR)	68 (55–78)	66 (60–76)	70 (59–79)
Body mass index (kg/m^2), median (IQR)	26 (23–29)	26 (23–29)	25 (22–29)
Length of hospital stay up to survey date (days), median (IQR)	6 (2–11)	5 (2–11)	6 (2–12)

IQR: Interquartile range.

Figure 1

Patient sample.



Reasons for Exclusion	n	%
Missing hospital chart	91	37.4%
Patient refused to give consent	0	0.0%
Too young (age <18 for surgical; age <40 for medical)	99	40.7%
Admitted for treatment of VTE	2	0.8%
Admitted for diagnostic testing (type of ward not specified)	0	0.0%
Minor operation (type of ward not specified)	3	1.2%
Patients should be in excluded wards	8	3.3%
Transfer patients	0	0.0%
Missing key information (birth year, surgery type, etc.)	40	16.5%

global ENDORSE study (64%) (p = 0.296). The rate of at-risk medical patients was lower in Switzerland (21%, range 3–44%) than in the global study (42%) (p <0.001). Among the patients with risk factors for VTE, median age was 68 (IQR 54–77) years, 45% were women and median BMI was 26 (IQR 23–29) kg/m^2. Before hospitalisation, the most common VTE risk factors were chronic heart failure (31%) and chronic pulmonary disease (25%) in medical patients, and obesity (15%) and chronic heart failure (11%) in surgical patients (table 2). The most common post admission risk factors for VTE in both patient populations were either complete immobilisation or immobilisation with bathroom privileges (28%) and admission to an intensive or critical care unit (21%).

The proportion of at-risk surgical patients with ACCP-recommended VTE prophylaxis was higher in Switzerland (81%, between-hospital range 76–93%) than in the global study (59%) (p <0.001). Among medical patients at risk, the use of recommended thromboprophylaxis was higher in Switzerland (61%, between-hospital range 0–84%) than in the global ENDORSE (40%) (p <0.001). The proportion of patients receiving ACCP recommended prophylaxis varied between different types of surgery, ranging from 71% of patients undergoing vascular operations to 100% of patients undergoing curative arthroscopy (table 3). 59% of patients with major trauma not undergoing any surgery received prophylaxis. The proportion of at-risk medical patients receiving prophylaxis ranged from 40% in patients with endocrine/metabolic disease to 88% of patients with ischaemic stroke (table 3). An additional 19% of the medical patients received non-recommended prophylaxis, mainly due to the high prevalence of patients (16%) with ongoing use of vitamin K antagonists.

Anticoagulants were the most frequently used form of VTE prophylaxis in the at-risk population, low-molecular-weight heparin being the most commonly prescribed anticoagulant (table 4). Graduated compression stockings were used more frequently in surgical patients than in medical patients (p <0.001).

Of the population at VTE risk, 13 (7%) medical and 50 (6%) surgical patients were considered to have a contraindication to pharmacological

Table 2

Risk factors for venous thromboembolism.

Patients at VTE risk	all		surgical		medical	
	CH N = 959	global N = 33 797	CH N = 780	global N = 18 544	CH N = 179	global N = 15 253
Risk factors prior to hospital admission						
Chronic heart failure, n (%)	137 (15)	5.334 (16)	82 (11)	1.585 (9)	55 (31)	3.749 (25)
Obesity, n (%)	134 (15)	3.619 (11)	111 (15)	1.875 (10)	23 (13)	1.744 (11)
Chronic pulmonary disease, n (%)	111 (12)	5.642 (17)	66 (9)	1.555 (8)	45 (25)	4.087 (27)
Varicose veins or venous insufficiency, n (%)	72 (8)	2.318 (7)	58 (8)	1.308 (7)	14 (8)	1.010 (7)
Previous venous thromboembolism, n (%)	57 (6)	1.216 (4)	45 (6)	466 (3)	12 (7)	750 (5)
Thrombophilia, n (%)	16 (2)	121 (0.4)	15 (2)	48 (0.3)	1 (0.6)	73 (0.5)
Risk factors during hospitalization						
Admitted to ICU/CCU, n (%)	204 (21)	8.984 (25)	162 (21)	4.595 (23)	42 (24)	4.389 (28)
Central venous catheter, n (%)	141 (15)	4.861 (14)	130 (17)	3.110 (16)	11 (6)	1.751 (11)
Immobile with bathroom privileges, n (%)	137 (14)	8.924 (25)	107 (14)	4.621 (23)	30 (17)	4.303 (28)
Complete immobilisation, n (%)	131 (14)	12.929 (37)	105 (14)	7.797 (39)	26 (15)	5.132 (33)
Mechanical ventilation, n (%)	101 (11)	3.726 (11)	86 (11)	2.448 (12)	15 (8)	1.278 (8)
Cancer therapy, n (%)	9 (0.9)	385 (1)	4 (0.5)	108 (0.5)	5 (3)	277 (2)
Heparin induced thrombocytopenia, n (%)	1 (0.1)	54 (0.2)	0 (0.0)	25 (0.1)	1 (0.6)	29 (0.2)

More than one condition was allowed per patient. CH: Switzerland.

Table 3
Use of ACCP recommended prophylaxis in medical and surgical patients at VTE risk.

	medical patients at VTE risk	patients at VTE risk receiving prophylaxis
Medical condition during hospitalisation	N	n (%)
Ischaemic stroke	8	7 (88)
Other medical condition	10	8 (80)
Renal disease	22	15 (68)
Non-respiratory infection	26	17 (65)
Other cardiovascular disease	56	36 (64)
Acute non-infectious respiratory disease	50	31 (62)
Acute heart failure (NYHA Class III or IV)	38	23 (61)
Haematological disease	10	6 (60)
Neurological disease	17	10 (59)
Pulmonary infection	54	31 (57)
Rheumatological or inflammatory disease	4	2 (50)
Gastrointestinal or hepatobiliary disease	20	10 (50)
Active malignancy	16	7 (44)
Endocrine or metabolic disease	20	8 (40)
	surgical patients at VTE risk	**patients at VTE risk receiving prophylaxis**
Performed type of surgery	N	n (%)
Curative arthroscopy	4	4 (100)
Hip replacement	54	50 (93)
Urological surgery	66	60 (91)
Gastric surgery	28	25 (89)
Hip fracture	21	18 (86)
Colon or small bowel surgery	59	50 (85)
Knee replacement	19	16 (84)
Thoracic surgery	43	36 (84)
Other orthopaedic trauma	122	102 (84)
Hepatobiliary surgery	49	40 (82)
Gynaecological surgery	5	4 (80)
Rectosigmoid surgery	28	22 (79)
Other major surgery	168	132 (79)
Vascular surgery	41	29 (71)
Major trauma but surgery not performed	73	43 (59)

Table 4
Prophylactic modalities in patients at VTE risk.

Patients at VTE risk	**all N = 959**	**surgical N = 780**	**medical N = 179**
Pharmacological prophylaxis			
Low-molecular-weight heparin, n (%)	644 (67)	555 (71)	89 (50)
Unfractionated heparin, n (%)	146 (15)	119 (15)	27 (15)
Other anticoagulants, n (%)	88 (9)	36 (5)	52 (29)
Vitamin K antagonist, n (%)	67 (7)	38 (5)	29 (16)
Fondaparinux, n (%)	1 (0.1)	0 (0.0)	1 (0.6)
Mechanical prophylaxis			
Graduated compression stockings, n (%)	123 (13)	120 (15)	3 (2)
Intermittent pneumatic compression, n (%)	16 (2)	13 (2)	3 (2)
Foot pump, n (%)	3 (0.3)	3 (0.4)	0 (0.0)

More than one condition was allowed per patient.

prophylaxis. The most common contraindications were clinically relevant hepatic impairment and active gastroduodenal ulcer in medical patients, and bleeding on admission and clinically relevant hepatic impairment in surgical patients (table 5). Of those considered to have a contraindication to pharmacological prophylaxis, 8 (62%) medical and 12 (24%) surgical patients received mechanical prophylaxis alone.

Across Switzerland, the proportion of patients at VTE risk ranged among hospitals from 48% to 86% for surgical patients and from 3% to 44% for medical patients. The proportion of at-risk patients receiving the ACCP-recommended prophylaxis varied from 77% to 93% for surgical patients and from 0% to 84% for medical patients (table 6). Despite this high between-hospital variability, no differences in the proportions of patients at VTE risk were found between academic and non-academic, public and private and German and French speaking hospitals. In contrast, among surgical patients at risk, the use of ACCP-recommended prophylaxis was lower in academic (77%) vs non-academic (86%) institutions (p = 0.0025) (fig. 2), and among medical patients at risk, prophylaxis use was higher in hospitals located in the German (66%) vs French (48%) speaking part of Switzerland (p = 0.0297).

Discussion

The presented analysis from the ENDORSE survey shows that in Switzerland, almost half of all hospitalised patients are at-risk for VTE, and that surgical patients seem to be more frequently at-risk than medical patients. Three quarters of at-risk patients received an ACCP-recommended method of prophylaxis which compares favourably with other countries participating in the global ENDORSE study [11].

In comparison to global ENDORSE study results [11], the proportion of surgical patients at-risk for VTE did not largely differ, whereas the proportion of at-risk medical patients was very low in Switzerland. Moreover, a previous survey on hospitalised medical patients in eight large Swiss hospitals [10] reported rate of VTE risk more than twice as high compared to our current observation. A potential explanation for the low rate of medical patients at VTE risk in our cohort is the low proportion of patients with immobilisation, an important risk factor that might have been underestimated during the data collection process. In Swiss hospitals, the relevant information on patient mobility is usually not recorded in patient charts but in a separate piece of documentation used mainly by the nursing staff. A clear trend towards early patient mobilisation may also explain the observed low rate of at-risk medical patients in our analysis.

Table 5
Bleeding risk and contraindications to pharmacological prophylaxis in patients at VTE risk.

Patients at VTE risk	all N = 959	surgical N = 780	medical N = 179
Bleeding risk / contraindication to pharmacologic prophylaxis			
Aspirin on admission, n (%)	211 (22)	142 (18)	69 (39)
NSAID on admission (excluding aspirin), n (%)	88 (9)	82 (11)	6 (3)
Significant renal impairment, n (%)	71 (7)	42 (5)	29 (16)
Bleeding at hospital admission, n (%)	26 (3)	23 (3)	3 (2)
Hepatic impairment (clinically relevant), n (%)	24 (3)	16 (2)	8 (5)
Low platelet count (<100 000) per µl), n (%)	20 (2)	13 (2)	7 (4)
Intracranial haemorrhage, n (%)	11 (1)	11 (1)	0 (0.0)
Active gastroduodenal ulcer, n (%)	10 (1)	5 (0.6)	5 (3)
Known bleeding disorder, n (%)	3 (0.3)	2 (0.3)	1 (0.6)

More than one condition was allowed per patient.
NSAID: Non-steroidal anti-inflammatory drug.

In the context of the global ENDORSE study [11], Switzerland ranked second worldwide in the use of thromboprophylaxis confirming the high quality and standard of the national health system. Additionally, assuming similar methodology and not taking into account potential differences in patient populations included in the present analysis and the previous Swiss survey [10], the proportion of medical patients at risk for VTE receiving appropriate prophylaxis improved from 50% to 61% between 2003 and 2006. However, there were remarkable differences between hospitals in the frequency of administration of ACCP-recommended types of prophylaxis, particularly among at-risk medical patients, which could be due to differences in patient characteristics, duration of hospital stay, physician awareness, availability and practicality of local screening tools (e.g. scoring system [12]), education factors, and reimbursement systems. The use of recommended VTE prophylaxis was lower in medical patients; only 44% of patients with active malignancy, a well-recognized risk factor for VTE, received prophylaxis. These findings are consistent with results of the Swiss venous thromboembolism registry (SWIVTER) [13], a recently published prospective observational study in hospitalised Swiss patients with acute venous thromboembolism, which showed a lower use of thromboprophylaxis in at-risk medical patients (52%), particularly in patients with cancer, acute heart or respiratory failure and in the elderly. Possible reasons for the observed low rate of prophylaxis among patients with active malignancy in the Swiss ENDORSE include non-prescription of prophylaxis in patients with end-stage cancer and short life expectancy, lack of awareness of VTE risk, awareness of increased risk of bleeding in patients with ongoing chemotherapy, presence of chemotherapy-induced thrombocytopenia, involvement of multiple medical teams, reduced quality of life by daily injections [14], or cost-benefit concerns. In our present analysis, prophylaxis rates were generally higher among surgical patients, although the proportion of patients receiving recommended prophylaxis varied with type of surgery, leaving almost 30% of patients requiring vascular procedures at VTE risk. Surprisingly, only 59% of patients with major trauma who did not undergo any kind of surgery, another well known condition with a high risk for VTE, received thromboprophylaxis.

Among patients at-risk for VTE, 7% were classified as having a contraindication for pharmacological prophylaxis. However, these patients could have received any form of the ACCP recommended mechanical prophylaxis, and therefore do not compromise the observed lack in overall thromboprophylaxis use.

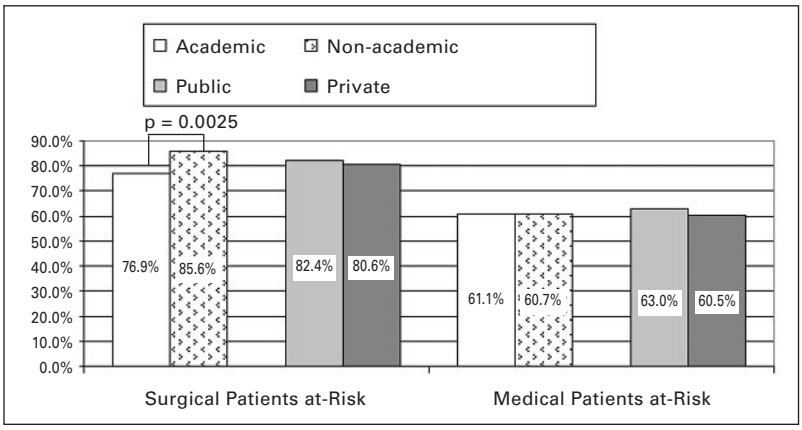
The methodological strengths and limitations of the survey were extensively discussed in the global ENDORSE publication [11]. From the local Swiss perspective, four comments should additionally be mentioned. Firstly, the 2004 ACCP guidelines were adapted to local practice by the Swiss expert group and therefore represent the most widely-accepted standard for VTE prophylaxis in Switzerland. Secondly, in Switzerland, physicians certainly have different opinions about the need and benefit of prophylaxis in patient groups that are not defined as being at VTE risk

Table 6
Use of ACCP recommended prophylaxis in patients at VTE risk by participating hospitals.

hospital	surgical patients	surgical patients at risk	surgical patients at risk receiving prophylaxis	medical patients	medical patients at risk	medical patients at risk receiving prophylaxis
	N	n (%)	n (%)	N	n (%)	n (%)
1	112	72 (64)	67 (93)	98	29 (30)	22 (76)
2	56	31 (55)	28 (90)	47	19 (40)	16 (84)
3	36	31 (86)	27 (87)	22	9 (41)	6 (67)
4	56	48 (86)	41 (85)	113	3 (3)	0 (0.0)
5	126	92 (73)	74 (80)	63	17 (27)	13 (77)
6	295	219 (74)	170 (78)	197	31 (16)	22 (71)
7	69	33 (48)	29 (88)	43	10 (23)	4 (40)
8	314	201 (64)	153 (76)	180	41 (23)	22 (54)
9	25	18 (72)	14 (78)	48	4 (8)	1 (25)
10	64	35 (55)	28 (80)	36	16 (44)	3 (19)
Total	1153	780 (68)	631 (81)	847	179 (21)	109 (61)

Figure 2

Use of ACCP-recommended prophylaxis in surgical and medical patients at VTE risk by groups of participating hospitals.



in the ACCP guidelines. Thirdly, the low rate of immobilisation in the Swiss patients could have changed the results and hamper the comparability to the global population. Fourthly, the Swiss ENDORSE data might not be representative for non-participating hospitals. Only two of the ten participating hospitals fulfilled the minimal patient requirement criterion limiting the interpretation of the results. In addition, there was a wide between-hospital range of patients at-risk. However, our analysis included ten academic and non-academic, public and private hospitals across Switzerland.

In conclusion, the present analysis from the ENDORSE study shows that a large proportion of hospitalised Swiss patients are at-risk for VTE. Although the overall rate of prophylaxis use in Switzerland appeared to improve over the course of three years [10], and compares favourably with many other countries [11], the rate of recommended thromboprophylaxis is still improvable in medical and major trauma patients not undergoing surgery. Consequently, hospital-wide strategies for systematic risk factor assessment and implementation of practical tools (e.g. simple scoring system [12]) to ensure appropriate use of prophylaxis in patients at VTE risk are required. Moreover, the impact of implementation of various strategies and tools on quality of prophylaxis use should be assessed periodically.

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