Original Article

JHSMR Journal of Health Science and Medical Research

Characteristics of the Wells Score and Associated Factors of Pulmonary Embolisms in Inpatients with Deep Venous Thrombosis

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Received 27 April 2021 ● Revised 15 October 2021 ● Accepted 19 October 2021 ● Published online 18 November 2021

Abstract:

Objective: To evaluate the characteristics of the Wells score and associated factors of acute pulmonary embolisms (PE) in surgical-based inpatients' with acute deep venous thrombosis (DVT), at Songklanagarind Hospital.

Material and Methods: Acute DVT inpatients in the departments of surgery, obstetrics-gynecology and orthopedics; from 2010 to 2016, were extracted from medical records, and retrospectively reviewed. The Wells score was calculated for risk stratification in terms of low, moderate, and high probability. Finally, the associated factors of acute PE were assessed.

Results: There were 278 inpatients diagnosed with acute DVT in the surgery (n=142), obstetrics-gynecology (n=101, and orthopedics (n=35) wards. The numbers of low, moderate and high risk probability were 4 (1.0%), 141 (51.0%) and 133 (48.0%), respectively. We identified four factors that were significantly different between the three specialties comprising of: "paralysis, paresis, or recent plaster immobilization of the lower extremities", "recently bedridden or underwent a major surgical procedure", "leg edema" and "active cancer". Regarding the surgery service, patients with acute PE experienced a higher rate of bilateral DVT than those who did not—28.0% and 8.0%, respectively.

Conclusion: The low-risk probability determined by Wells score had low incidence of acute DVT in in-patient department settings. Acute bilateral DVT was more significantly associated with acute PE in the surgery service.

Keywords: deep vein thrombosis, pulmonary embolism, venous thromboembolism

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J Health Sci Med Res 2022;40(4):411-418
doi: 10.31584/jhsmr.2021851
www.jhsmr.org

Introduction

Venous thromboembolism (VTE) is a common cause of morbidity and mortality in the United States of America.[1] Acute deep venous thrombosis (DVT) is one of the most important causes of acute pulmonary embolism (PE)[2], so many predictive scores for DVT[3-7] were created to help in diagnosis.

The Wells score is popular, effective, and simple for real practices[3,4,8]; especially in outpatient departments (OPD).[9,10] It could be used to exclude acute DVT in trauma patients.[11] However, some studies showed that the Wells score was not suitable for inpatient departments (IPD), because of uncertain accuracy[9] coupled with a narrow prevalence range compared to the OPD.[12] Since it is applicable, Wells score is an interesting predictive score for inpatients; especially, for surgical-based hospitalized patients who have more prevalence of immobilization, surgical procedures, active cancer which have an increased risk of DVT.[13,14]

The aim of this study was to evaluate the characteristics of Wells score and associated factors of acute PE in acute DVT inpatients, by assessing the department of surgery, obstetric-gynecology, and orthopedics. We hypothesized that no patient would be placed into a low risk group, if the Wells score worked for this setting.

Material and Methods

Data from the medical records of Songklanagarind Hospital were obtained, after ethics committee approval (Faculty of Medicine, Prince of Songkla University, Thailand) according to the Declaration of Helsinki and the International Conference on Harmonization in Good Clinical Practice. All patient data was processed confidentially.

There were 3,115 inpatients, aged 18 years and above, whom obtained surgical, obstetric-gynecological and orthopedic services, and underwent ultrasound for deep vein or computer tomography scanning; from January 1, 2010 to December 31, 2016. These surgical services included: trauma, cardiovascular-thoracic, vascular, plastic, neurological, urological and general surgery. The patients who were admitted due to acute DVT, diagnosed with acute DVT at the date of admission or previously had persistent DVT, were excluded. In this study, if DVT had been identified and already resolved (imaging-confirmed), the patient was regarded as a new case.

The primary outcome was the quantity of acute DVT inpatients, stratified by risk probability according to the Wells score in terms of a low (score<1), moderate (score=1-2) and high (score>2). Therefore, the quantity was defined as number of patients with each risk probability, and the proportion between them and all three categories.

The secondary outcome was the associated factors of acute PE in these acute DVT patients. If the patients had acute DVT and acute PE in the same admission, they would be evaluated by the number of cases and the clinical factors; including, age, gender, laterality, clinical symptoms, upper limit of DVT, and active cancer. The incidence was defined as a proportion of acute PE and all interested acute DVT patients.

The calculated sample size was 260 patients, according to infinite population proportion. This number had an alpha value (α) of 0.05, proportion (p) of 0.27, and 20.0% acceptable error (d) of 0.054, for the primary outcome (secondary outcome; n=2,305, α=0.05, p=0.04, d=0.008).[9,15-17] All medical records were retrospectively reviewed and analyzed by a single researcher. Nine items of the Wells score and its points are shown in Table 1. Due to the lack of data on "collateral superficial vein (non varicose)" in medical records, we gave 0 points for this item for all patients in regards to this item.

Continuous results from the Wells score were reported as median and interquartile range (IQR), then their difference was assessed by Kruskal-Wallis test; before the difference between PE or without PE group was

Table 1 Clinical factors and point stratification of the Wells sco

Clinical factors	Point of presence	Point of absence
1. Paralysis, paresis, or recent plaster immobilization of the lower extremities	1	0
2. Recently bedridden for more than 3 d or major surgical procedures within 4 wk	1	0
3. Localized tenderness along the distribution of the deep venous system	1	0
4. Entire leg swollen	1	0
5. Calf swelling by 3 cm or more when compared with the asymptomatic leg	1	0
6. Pitting edema (greater in the symptomatic leg)	1	0
7. Collateral superficial veins (non varicose)	1	0
8. Active cancer	1	0
9. Alternative diagnosis as likely or greater than that of deep vein thrombosis	−2	0
Total		**−2 to 8**

d=day, wk=week, cm=centimetre

assessed by Wilcoxon rank-sum test. Age was reported as mean±standard deviation (S.D.), then compared by student Analysis of Variance F-test among the three services, and Student t-test between the PE and without PE groups. Discrete results comprised of gender, clinical findings, and risk stratification, and were reported as count and percentage. Differences in categorical parameters were compared using Pearson's chi-squared test or Fisher's exact test depending on the number of events. A p-value of <0.05 was considered significant.

Results

The 278 (8.9%) acute DVT inpatients comprised of: surgery 142 (7.0%) of 2,036, obstetrics-gynecology 101 (13.0%) of 791, and orthopedics 35 (12.2%) of 288. The overall mean age was 58.0±14.7 years, and the majority were female (68.0%). We identified four clinical factors that were significantly different among the three specialties according to the Wells score stratification, which were recent immobilization of lower extremities, recent bed ridden, pitting edema, and active cancer. Patients who were admitted in surgery and orthopedic surgery had a higher proportion of immobilization and were bed ridden, while patients who were admitted in gynecology had a higher proportion of active cancer. The details of the characteristics are summarized in Table 2. Most patients (67.0%) had active cancer; especially, in obstetric-gynecological and surgical services: 94.0% and 54.0%. The second most common clinical factor was "calf swelling by 3 centimetre or more when compared with asymptomatic leg" (50.0%), which was not significantly different among the three hospital services. The third most prevalent was "recently bedridden for more than 3 days or major surgical procedures within 4 weeks" (47.0%), this was mainly found in orthopedics (74.0%) and surgery 59.0%. "Pitting edema" was found to be more common in obstetric-gynecology (50.0%) compared to the others; however, "paralysis, paresis, or recent plaster immobilization of the lower extremities" were found to be more common in orthopedics (54.0%) and surgery (40.0%) services.

The mean IQR of overall Wells score was 2 (2, 3), and not significantly different among the three specialties. The number of acute DVT patients with a low risk probability in surgery, obstetric-gynecology and orthopedics were 3 (2.1%), 1 (1.0%) and 0, respectively. The number of those with a moderate risk were 70 (49.3%), 53 (52.5%) and 18 (51.4%), respectively. Numbers of high risk patients were 69 (48.6%), 47 (46.5%) and 17 (48.6%), respectively

Table 2 Characteristic of acute deep venous thrombosis inpatients of three hospital services

Characteristic	Surgery (n=142)	Gynecology (n=101)	Orthopedics (n=35)	Total (n=278)	p-value
Age, mean (S.D.)	60.1 (15.8)	54.5 (12.0)	61.3 (15.8)	58.2 (14.7)	0.006*
Female sex (n, %)	68 (47.9)	101 (100.0)	21 (60.0)	190 (68.3)	<0.001*
Wells clinical factors (n, %)					
Paralysis, paresis, or recent plaster immobilization of the lower extremities	57 (40.1)	8 (7.9)	19 (54.3)	84 (30.2)	<0.001*
Recently bedridden for more than 3 d or major surgical procedure within 4 wk	83 (58.5)	22 (21.8)	26 (74.3)	131 (47.1)	<0.001*
Localized tenderness along the distribution of the deep venous system	11 (7.7)	8 (7.9)	2 (5.7)	21 (7.6)	0.906
Entire leg swollen	22 (15.5)	20 (19.8)	5 (14.3)	47 (16.9)	0.614
Calf swelling by 3 cm or more when compared with the asymptomatic leg	72 (50.7)	46 (45.5)	22 (62.9)	140 (50.4)	0.209
Pitting edema (greater in the symptomatic leg)	42 (29.6)	50 (49.5)	5 (14.3)	97 (34.9)	<0.001*
Collateral superficial veins (non varicose)	NA	NA	NA	NA	–
Active cancer	78 (54.9)	95 (94.1)	12 (34.3)	185 (66.5)	<0.001*
Alternative diagnosis as likely or greater than that of deep vein thrombosis	7 (4.9)	3 (3.0)	0 (0.0)	10 (3.6)	0.434
Wells score, median (IQR)	2 (2, 3)	2 (2, 3)	2 (2, 3)	2 (2, 3)	0.631
Risk stratification (n, %)					0.952
Low	3 (2.1)	1 (1.0)	0 (0.0)	4 (1.4)	0.792
Moderate	70 (49.3)	53 (52.5)	18 (51.4)	141 (50.7)	0.884
High	69 (48.6)	47 (46.5)	17 (48.6)	133 (47.8)	0.947

*statistical significant

NA=not available, S.D.=standard deviation, d=day, wk=week, cm=centimetre

The characteristics of 278 acute DVT inpatients, with or without PE, are summarized in Table 3. The overall incidence of acute PE was 42 (15.1%), of which 18 of 142 (12.6%), 19 of 101 (18.8%), and 5 of 35 (14.3%) were found in surgery, obstetric-gynecology, and orthopedics wards, respectively. In regard to symptoms, patients with and without PE had leg edema 47.6% versus 67.4%, leg pain 7.1% versus 3.4%, and dyspnea 23.8% versus 0%, respectively. In contrast, no significant differences were found concerning presence of overall symptoms, upper limit of DVT, laterality, malignancy, and calculated Wells score. We found lower proportions of low risk probability, both symptomatic 1 (0.5%) of 191 and asymptomatic 3 (3.5%), of 87 patients (Figure 1).

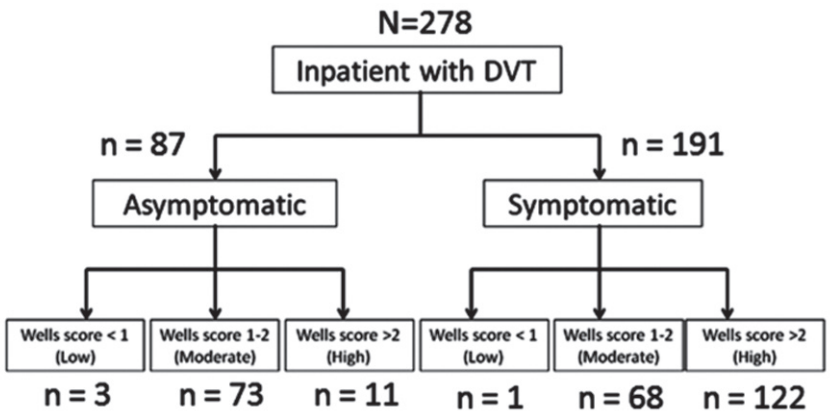
In the surgery group, seventy one percent had DVT at the femoral vein and 62.7% were symptomatic (Table 4). Patients with acute PE significantly had larger numbers of bilateral DVT than those without (27.8% vs 8.1%, p-value=0.025). There were no significant differences in presence of overall symptoms, upper limit of DVT, malignancy, and calculated Wells score. There were no interesting, significantly asso-ciated factors in obstetric-gynecological and orthopedic services.

Table 3 Characteristic of inpatients with and without acute pulmonary embolism

Characteristic	With PE (n=42)	Without PE (n=236)	Total (n=278)	p-value
Age, mean (S.D.)	61 (12.0)	57.7 (15.2)	58.2 (14.7)	0.185
Female sex (n, %)	29 (69.0)	161 (68.2)	190 (68.3)	>0.999
Upper limit (n, %)				0.453
Iliac	3 (7.1)	35 (14.8)	38 (13.7)	0.275
Femoral	35 (83.3)	184 (78.0)	219 (78.8)	0.563
Popliteal	3 (7.1)	13 (5.5)	16 (5.8)	0.717
Calf	1 (2.4)	4 (1.7)	5 (1.8)	0.562
Bilateral (n, %)	9 (21.4)	25 (10.6)	34 (12.2)	0.086
Symptomatics (n, %)	30 (71.4)	161 (68.2)	191 (68.7)	0.816
Leg edema	20 (47.6)	159 (67.4)	179 (64.4)	0.022*
Leg pain	3 (7.1)	8 (3.4)	11 (4.0)	0.222
dyspnea	10 (23.8)	0 (0.0)	10 (3.6)	<0.001*
Malignancy (n, %)				0.297
No CA	18 (42.9)	77 (32.6)	95 (34.2)	0.416
Non-metastatic CA	14 (33.3)	108 (45.8)	122 (43.9)	0.185
Metastatic CA	10 (23.8)	51 (21.6)	61 (21.9)	0.908
Wells score, median (IQR)	2.5 (2, 3)	2 (2, 3)	2 (2, 3)	0.663

*statistical significant

CA=cancer, PE=pulmonary embolism, S.D.=standard deviation, IQR=interquartile range



DVT=deep venous thrombosis, n=number of patient

Figure 1 Wells score risk stratification in asymptomatic and symptomatic deep venous thrombosis

Table 4 Characteristic of 142 inpatients with and without acute pulmonary embolisms in surgical services

Characteristic	With PE (n=18)	Without PE (n=124)	Total (n=142)	p-value
Age, mean (S.D.)	62.8(12.6)	59.7 (16.2)	60.1 (15.8)	0.442
Female sex (n, %)	7 (38.9)	61 (49.2)	68 (47.9)	0.572
Upper limit (n, %)				0.761
Iliac	2 (11.1)	19 (15.3)	21 (14.8)	1.000
Femoral	14 (77.8)	94 (75.8)	108 (76.1)	1.000
Popliteal	1 (5.6)	8 (6.5)	9 (6.3)	1.000
Calf	1 (5.6)	3 (2.4)	4 (2.8)	0.422
Bilateral (n, %)	5 (27.8)	10 (8.1)	15 (10.6)	0.025*
Symptomatics (n, %)	15 (83.3)	74 (59.7)	89 (62.7)	0.093
Leg edema	11 (61.1)	74 (59.7)	85 (59.9)	1.000
Leg pain	2 (11.1)	5 (4.0)	7 (4.9)	0.217
dyspnea	4 (22.2)	0 (0.0)	4 (2.8)	<0.001*
Malignancy (n, %)				0.138
No CA	12 (66.7)	53 (42.7)	65 (45.8)	0.226
Non-metastatic CA	3 (16.7)	46 (37.1)	49 (34.5)	0.150
Metastatic CA	3 (16.7)	25 (20.2)	28 (19.7)	1.000
Wells score, median (IQR)	3 (2, 3.8)	2 (2, 3)	2 (2, 3)	0.238

*statistical significant

CA=cancer, PE=pulmonary embolism, S.D.=standard deviation, IQR=interquartile range

Discussion

Our data showed 8.9% acute DVT, which was quite low compared with 21.0-24.0% of suspected DVT inpatients in other studies.[9,15] This might be influenced by differences in race[18,19], diseases, environment, medical/mechanical prophylaxis[20,21] or selection bias. Proximal and isolated distal DVT were 92.0% and 18.0%, respectively, compared to other studies with 55.0-57.0% and 43.0-45.0%, respectively.[9,15] This might be due to operator dependent ultrasounding that poorly detected distal DVT. Furthermore, late detection might cause proximal propagation of blood clots before imaging.

In contrast to the low risk, the moderate or high risk inpatients were convinced to undergo a deep vein ultrasound [22,23] to ensure that low risk patients were not missed. Generally, when patients were stratified into a low risk probability, their serum D-dimer would be tested. Even with a combination of the low risk score and negative D-dimer, about 1.6-2.9% of DVT were missed; especially in cancer patients.[10] Additionally, more acute DVTs were missed and low risk patients received improper treatment.

Active cancer patients had two-fold pretest probability of DVT[10], as we found it was the most common clinical factor in our patients; especially, in glynecology for which cancer patients were the largest proportion. Furthermore, 92.0% of them had proximal DVT, with 31.0% being asymptomatic. Therefore, the Wells score assessment should be aware regardless of asymptomatic patients, because sudden, fatal PE might occur.[1]

The Wells score may not suitable for all patients with suspected acute DVT, because of its uncertain accuracy (77.0% for OPD, 52.0-60.0% for inpatient departments (IPD)). Some prospective studies showed a high failure rate (5.9%) in order to exclude acute DVT in IPD due to its narrow prevalence range of low, moderate and high risk stratification 6.0-14.0%, 9.0-10.0% and 16.0-17.0%, respectively.[9,15] However, inpatients had higher risk of acute DVT[24]; according to Virchow's triad. Previous studies initially

included in-patients with suspected DVT, but all patients in our study had confirmed diagnoses. Although, prophylactic anticoagulant may reduce the incidence of acute DVT[25], this might not have an effect on our population; because of certain diagnostic DVT. We expected that most patients would be stratified into high and moderate risk probability. Ideally, all DVT inpatients would not be found within the low risk group. Our data showed patients with low, moderate, and high risk probability as being 1.4%, 50.7% and 47.8%, respectively, when using similar subgroup analysis among the three specialties. Therefore, we expected that acute DVT inpatients in our setting with a low risk probability combined with negative D-dimer would be missed in less than 1.4% of cases. However, with a high proportion of cancer patients, compared to other studies; 65.8% versus 24.0-39.0%, this may have caused a lower number of patients in the low risk group: 1.4% versus 3.0-35.0%.[3,9,12] We implied that the Wells score might have the ability to exclude acute DVT in low risk patients, but could not properly differentiate between moderate and high-risk patients.

Surgical services, 142 inpatients, had the four most common clinical factors, which were: "Recently bedridden for more than 3 days or major surgical procedures within 4 weeks (58.5%)", "active cancer" (54.9%), "Calf swelling by 3 centimetre or more when compared with the asymptomatic leg" (50.7%), and "Paralysis, paresis, or recent plaster immobilization of the lower extremities" (40.1%). We had higher prevalence in three of these four factors compared to another prospective studies conducted in the USA; in which, the 439 surgical inpatients suspected of DVT had 87.0%, 32.0%, 29.0%, 20.0%, respectively.[15] Furthermore, we found that surgical patients with acute PE had more bilateral DVT than those without PE. This might correspond with a higher proportion of cancers and immobilization in our situation.

This study included several limitations. The first limitation, was that this was a retrospective study. Second, our study populations were all acute DVT, which may have lead to selection bias. Third, there were not enough patients to conclude significant difference of secondary outcomes. In our opinion, the Wells score is still useful for inpatients. It may help to lower the rate of missed diagnosis, excessive negative imaging, and to adhere to international guidelines. In future studies, these studies should collect the Wells score and outcomes prospectively, so as to be able to compare the Wells score in patients who have DVT against patients who do not have DVT.

Conclusion

this study assessed the characteristics of the Wells score and associated factors of acute PE in-surgical-based in-patients with DVT, at Songklanagarind Hospital. The low-risk probability determined by the Wells score may be used to differentiate the presence of acute DVT in an IPD. In our institution, acute bilateral DVT was more significantly associated with acute PE within surgical services.

Conflict of interest

The authors have no conflict of interest to declare.

References

1. Beckman MG, Hooper WC, Critchley SE, Ortel TL. Venous thromboembolism: a public health concern. Am J Prev Med 2010;38(4 Suppl):S495–501.
2. Galanaud JP, Sevestre-Pietri MA, Bosson JL, Laroche JP, Righini M, Brisot D, et al. Comparative study on risk factors and early outcome of symptomatic distal versus proximal deep vein thrombosis: results from the OPTIMEV study. Thromb Haemost 2009;102:493–500.
3. Wells PS, Anderson DR, Bormanis J, Guy F, Mitchell M, Gray L, et al. Value of assessment of pretest probability of deep-vein thrombosis in clinical management. Lancet 1997;350:1795–8.
4. Wells PS, Anderson DR, Rodger M, Forgie M, Kearon C, Dreyer J, et al. Evaluation of D-dimer in the diagnosis of suspected deep-vein thrombosis. N Engl J Med 2003;349: 1227–35.
5. Subramaniam RM, Snyder B, Heath R, Tawse F, Sleigh J. Diagnosis of lower limb deep venous thrombosis in

emergency department patients: performance of Hamilton and modified Wells scores. Ann Emerg Med 2006;48:678–85.
6. Lustig DB, Rodriguez R, Wells PS. Implementation and validation of a risk stratification method at The Ottawa Hospital to guide thromboprophylaxis in ambulatory cancer patients at intermediate-high risk for venous thrombosis. Thromb Res 2015; 136:1099–102.
7. Dronkers CEA, Tan M, Mol GC, Iglesias Del Sol A, van de Ree MA, Huisman MV, et al. Evaluation of the new simple and objective clinical decision rule "I-DVT" in patients with clinically suspected acute deep vein thrombosis. Thromb Res 2016;141: 112–8.
8. Gaitini D, Khoury R, Israelit S, Beck-Razi N. Sparing ultrasound in emergency department patients with suspected deep vein thrombosis by using clinical scores and D-dimer testing. J Clin Ultrasound 2016;44:231–9.
9. Engelberger RP, Aujesky D, Calanca L, Staeger P, Hugli O, Mazzolai L. Comparison of the diagnostic performance of the original and modified Wells score in inpatients and outpatients with suspected deep vein thrombosis. Thromb Res 2011;127: 535–9.
10. Geersing GJ, Zuithoff NPA, Kearon C, Anderson DR, Ten Cate-Hoek AJ, Elf JL, et al. Exclusion of deep vein thrombosis using the Wells rule in clinically important subgroups: individual patient data meta-analysis. BMJ 2014;348: g1340.
11. Modi S, Deisler R, Gozel K, Reicks P, Irwin E, Brunsvold M, et al. Wells criteria for DVT is a reliable clinical tool to assess the risk of deep venous thrombosis in trauma patients. World J Emerg Surg 2016;11:24.
12. Silveira PC, Ip IK, Goldhaber SZ, Piazza G, Benson CB, Khorasani R. Performance of Wells score for deep vein thrombosis in the inpatient setting. JAMA Intern Med 2015; 175:1112–7.
13. Bastos M de, Barreto SM, Caiafa JS, Rezende SM. Thromboprophylaxis: medical recommendations and hospital programs. Rev Assoc Med Bras (1992) 2011;57:88–99.
14. Collins R, Scrimgeour A, Yusuf S, Peto R. Reduction in fatal pulmonary embolism and venous thrombosis by perioperative administration of subcutaneous heparin. Overview of results of randomized trials in general, orthopedic, and urologic surgery. N Engl J Med 1988;318:1162–73.
15. Wayne WD. Biostatistics: a foundation of analysis in the health sciences. 6th ed. New York: Wiley & Sons; 1995.
16. Ngamjarus C, Chongsuvivatwong V. n4Studies: sample size and power calculations for android. Bangkok: The Royal Golden Jubilee Ph.D. Program, The Thailand Research Fund & Prince of Songkla University; 2014.
17. Girard P, Decousus M, Laporte S, Buchmuller A, Herve P, Lamer C, et al. Diagnosis of pulmonary embolism in patients with proximal deep vein thrombosis: specificity of symptoms and perfusion defects at baseline and during anticoagulant therapy. Am J Respir Crit Care Med 2001;164:1033–7.
18. Sullivan LT 2nd, Jackson LR 2nd, Thomas KL. Review of venous thromboembolism and race: the generalizability of treatment guidelines for high-risk populations. J Thromb Thrombolysis 2016;42:167–71.
19. Huang SS, Liu Y, Jing ZC, Wang XJ, Mao YM. Common genetic risk factors of venous thromboembolism in Western and Asian populations. Genet Mol Res 2016;15:15017644.
20. Feng JP, Xiong YT, Fan ZQ, Yan LJ, Wang JY, Gu ZJ. Efficacy of intermittent pneumatic compression for venous thromboembolism prophylaxis in patients undergoing gynecologic surgery: a systematic review and meta-analysis. Oncotarget 2017;8:20371–9.
21. Kakkos SK, Caprini JA, Geroulakos G, Nicolaides AN, Stansby G, Reddy DJ, et al. Combined intermittent pneumatic leg compression and pharmacological prophylaxis for prevention of venous thromboembolism. Cochrane Database Syst Rev 2016;9:CD005258.
22. BMJ Best Practice. Deep vein thrombosis – approach [homepage on the Internet]. London: BMJ Best Practice [cited 2018 Mar 17]. Available from: http://bestpractice.bmj.com/topics/en-gb/70/diagnosis-approach
23. Streiff MB, Agnelli G, Connors JM, Crowther M, Eichinger S, Lopes R, et al. Guidance for the treatment of deep vein thrombosis and pulmonary embolism. J Thromb Thrombolysis 2016;41:32–67.
24. Hill J, Treasure T. Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in inpatients having surgery: summary of NICE guidance. BMJ 2007;334: 1053–4.
25. Kearon C, Akl EA, Ornelas J, Blaivas A, Jimenez D, Bounameaux H, et al. Antithrombotic therapy for VTE disease: CHEST guideline and expert panel report. Chest 2016;149: 315–52.