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Compliance with venous thromboembolism guideline after delivery at Maternity Teaching Hospital, Erbil city, Iraq

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Abstract

Background and objective: Venous thromboembolism is a leading cause of maternal morbidity and mortality. Few published articles have evaluated obstetricians' compliance with thromboprophylaxis guidelines, especially after vaginal delivery. This study aimed to assess obstetricians' adherence to postpartum thromboprophylaxis guidelines and correlate adherence with the risk factors for venous thromboembolism after vaginal and cesarean delivery.

Methods: A cross-sectional study involving 981 women delivered at the Maternity Teaching Hospital, Erbil city, Kurdistan Region, Iraq, was conducted. Obstetricians' compliance with the thromboprophylaxis guideline regarding dose, duration, and indications were recorded. We assessed the risk factors for thromboembolism using the 2015 Royal College of Obstetricians and Gynecologists guideline.

Results: Medical thromboprophylaxis was required but not given to 93.2% of the women who delivered vaginally compared with 6.7% of the women who delivered by cesarean section. Women who delivered vaginally had a higher rate of age > 36 years, parity of 3 and more, varicose vein, and current infection (P <0.001). The rates of preeclampsia, preterm labor, and prolonged labor were highest in the emergency cesarean section group (P <0.001). Factors associated with making a wrong decision were having no preeclampsia (odds ratio=15.4; 95% confidence interval=3.4–68.6), post-partum hemorrhage (odds ratio=15.3; 95% confidence interval=2.0–114.2), and vaginal delivery (odds ratio=250.2; 95% confidence interval=110.6–566.0).

Conclusion: Obstetricians' compliance with postpartum thromboprophylaxis in the hospital was low, especially after vaginal delivery.

Keywords: Thromboprophylaxis; Postpartum; Compliance; Venous thromboembolism; Guideline.

Introduction

Venous thromboembolism (VTE) is a serious medical condition encompassing pulmonary embolism and deep vein thrombosis. VTE is a leading cause of maternal morbidity and mortality[1] and is the third leading cause of direct maternal death in Europe and the United Kingdom.[2] The relative risk of VTE during pregnancy and the postpartum period is 20 times more than for non-pregnant women.[3] A large prospective primary care database from the UK revealed that the first six weeks postpartum was associated with a 22 fold increase in VTE risk.[4] Additionally, the risk of VTE is estimated to be 4-fold greater after cesarean section than after vaginal delivery. It depends on additional risk factors for thrombus formation and the type of cesarean section (elective or emergency).[5] VTE is a preventable cause of maternal mortality; careful assessment of the risk factors and using appropriate thromboprophylaxis may play roles in preventing this critical condition.[6]

Recent guidance from the Royal College of Obstetricians and Gynecologists (RCOG 2015) and the National Institute for Health

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and Clinical Excellence encourages the use of low-molecular-weight heparin (LMWH) thromboprophylaxis in high- and intermediate-risk pregnancies and postpartum, according to a decision model that was constructed to evaluate the risk factors in each parturient.[7] Many published guidelines facilitate risk assessment and using thromboprophylaxis after cesarean section and vaginal delivery.[7-9] However, prophylaxis strategies after cesarean section vary widely.[10] There are also wide differences among health care providers after delivery regarding the dose and duration of heparin prescriptions in response to patients' VTE risk profiles, indicating that there is little awareness and adherence to the guidelines' recommendations.[10] Few published articles have evaluated physicians' compliance with thromboprophylaxis guidelines, especially after vaginal delivery, as most studies were conducted following cesarean section, and data were collected from patients' records retrospectively.[11-13]

Attempts to prevent VTE using thromboprophylaxis depend on applying the recommended method correctly; otherwise, achieving prevention will be suboptimal. To evaluate compliance and application of the recommended thromboprophylaxis guidelines, we conducted this study to assess the risk factors for VTE after vaginal and cesarean delivery, using the 2015 RCOG guideline, and correlate the risk factors with the obstetrician's compliance with the guideline.

Methods

Study design and setting

This was a cross-sectional descriptive study involving 981 parturients who delivered at the Maternity Teaching Hospital, Erbil city, Kurdistan Region, Iraq, from June to September 2019.

Sample size and sampling

All delivered women within the period of the study were included having the inclusion criteria and accepted to participate.

Data collection

The inclusion criteria were women aged ≥ 18 years who delivered at our hospital within the study period and who agreed to participate in the study. We excluded women in unstable clinical conditions and those who refused to participate.

A hospital policy regarding thromboprophylaxis was prepared and set by the scientific committee of our hospital according to the 2015 RCOG guideline for assessing the risk factors for VTE in labor and postpartum, including emergency and elective cesarean sections. The local guideline was incorporated into a patient health tracking sheet that was included in eachparturient medical file. The sheet includes all risk factors related to VTE prophylaxis in the postpartum period. Medical thromboprophylaxis (low molecular weight heparin) is prescribed according to the guideline for the intermediate- and high-risk groups.

Data for patients' clinical status and examination findings were collected before, during, and after deliveries in women who underwent vaginal delivery, emergency, and elective cesarean section. We identified and assessed the women's VTE risk factors to evaluate the adequacy of the thromboprophylaxis prescription and classify women into low-, intermediate-, and high-risk groups for VTE. Intermediate- and high-risk women required thromboprophylaxis with LMWH in doses appropriate for their weight. For women in the high-risk group, prophylactic LMWH is advised antenatally and should be continued for six weeks postpartum, regardless of the mode of delivery. For the intermediate-risk group, LMWH prophylaxis should be continued for ten days postpartum. If additional persistent risk factors are present, extending LMWH prophylaxis is considered until the additional risks are no longer present (RCOG 2015).

We interviewed the participating women upon admission to the labor ward, during admission for preparation for elective

cesarean section, from postpartum until discharge from the ward, and after cesarean section for both emergency and elective cesarean sections.

Compliance with the thromboprophylaxis guideline was defined as the correct LMWH dose, the correct duration according to the intermediate- and high-risk group prophylaxis guideline, and the correct indications. If the parturient was in the low-risk group, she should not be prescribed LMWH.

We also evaluated the appropriateness of the obstetricians' decisions to administer prophylaxis regarding the decisions in correspondence with the RCOG guideline. Delivered women were followed until discharge from the hospital to evaluate the prescribed dose and duration of the medical thromboprophylaxis (LMWH). Obstetrician compliance with the thromboprophylaxis regimen for each woman was defined as "correct" when LMWH prescription was at the proper dose and duration, while it was defined as "not correct" when the LMWH prescription dose and duration were incorrect. We defined "overdose" as excessive prescription of VTE prophylaxis above what is necessary to be effective. "Unrequired" was used when women receive prophylaxis without indications for this treatment. Finally, we defined thromboprophylaxis as "Required" when there were absolute indications with no proper prophylaxis administration.

We assessed compliance with the thromboprophylaxis guideline by comparing the parturient's risk factors and the proper indications for receiving thromboprophylaxis with the regimens used.

All interviews, including assessments of the women regarding VTE risk factors and obstetrician compliance, were conducted by a single author.

Ethical approval

This study was approved by the Kurdistan Board of Medical Specialties (KBMS) ethics and scientific committee (approval No. 4573 on January 6, 2019). Informed written consent was obtained from all women in labor or during preparation for cesarean section.

Statistical analysis

Data were analyzed using the statistical package for the social sciences (SPSS version 25; IBM Corp., Armonk, NY, USA). We used the Chi-square test of association to compare proportions and Fisher's exact test when the expected count of more than 20% of the cells of the table was <5. Factors significantly (by the Chi square test) associated with the decision to prescribe LMWH were entered into the binary logistic regression model. A *P* value of ≤0.05 was considered statistically significant.

Results

We interviewed 1000 women for eligibility in this study; 19 women were excluded (10 who were clinically unstable and nine who refused to participate). The total number of included women was 981, and their mean ± standard deviation (SD) age was 29.07 ± 6.20 years (range: 15–45 years; median: 30 years). The numbers of women in each of the three risk groups were: low-risk: 403 women, intermediate-risk: 461 women, and high-risk: 117 women.

Table 1 shows that 24% of the women who delivered vaginally were older than 30 years, compared with 10.1% and 10.9% of the women who delivered by emergency and elective cesarean section, respectively (*P* <0.001). The rate of high parity (>3) was also higher in the vaginal group (43.5%) than in the emergency cesarean section (32.9%) and elective cesarean section groups (28.1%) (*P* <0.001). The rate of varicose veins in the vaginal group (5.4%) was significantly (*P* = 0.013) higher than the rate in the emergency cesarean section group (1.7%) and the elective cesarean section group (2.3%). The rate of current infection after delivery was significantly higher in the vaginal group (*P* = 0.373). The rates of preeclampsia and prolonged labor were highest (8.4% and 4.7%,

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respectively) in the emergency cesarean section group (*P* <0.001). Regarding stillbirth, the rate was 2.4% in the vaginal group, while none of the women in the other groups had this history (*P* = 0.002). Having a history of preterm labor was significantly high (7.7%) in the emergency cesarean section group (*P* <0.001). No significant associations were detected for the rates of the other risk factors between the groups regarding the mode of delivery.

Table 1 Prevalence of risk factors for VTE by type of delivery

Risk factors	Vaginal [N = 462]	Emergency cesarean section [N = 298]	Elective cesarean section [N = 221]	Total [N = 981]	*P* value
	No. (%)	No. (%)	No. (%)	No. (%)	
Age (> 35)	111(24.0)	30(10.1)	24(10.9)	165(16.8)	< 0.001
BMI (≥30)	119(25.8)	61(20.5)	47(21.3)	227(23.1)	0.182
Parity (≥3)	201(43.5)	98(32.9)	62(28.1)	361(36.8)	< 0.001
Previous-venous thromboembolism	1(0.2)	0(0.0)	0(0.0)	1(0.1)	>0.999*
Antiphospholipid syndrome	1(0.2)	0(0.0)	0(0.0)	1(0.1)	>0.999*
Varicose vein	25(5.4)	5(1.7)	5(2.3)	35(3.6)	0.013
Heart disease	2(0.4)	0(0.0)	0(0.0)	2(0.2)	0.714*
Surgery	8(1.7)	10(3.4)	13(5.9)	31(3.2)	0.014
Dehydration	0(0.0)	0(0.0)	0(0.0)	0(0.0)	NA
Current infection	27(5.8)	11(3.7)	13(5.9)	51(5.2)	0.373
Preeclampsia	9(1.9)	25(8.4)	3(1.4)	37(3.8)	<0.001
Prolonged labor	2(0.4)	14(4.7)	0(0.0)	16(1.6)	<0.001*
Smoking	4(0.9)	2(0.7)	0(0.0)	6(0.6)	0.492*
Twin	13(2.8)	7(2.3)	1(0.5)	21(2.1)	0.131
Postpartum hemorrhage	4(0.9)	4(1.3)	0(0.0)	8(0.8)	0.266*
Stillbirth	11(2.4)	0(0.0)	0(0.0)	11(1.1)	0.002*
Preterm labor	22(4.8)	23(7.7)	0(0.0)	45(4.6)	<0.001
Bed rest >3 days	0(0.0)	3(1.0)	1(0.5)	4(0.4)	0.071*

*By Fisher's exact test. The other *P* values were calculated using the Chi-square test.

BMI: Body Mass Index; VTE: venous thromboembolism; Current infection: infection requiring hospital admission with intravenous antibiotic (including pyelonephritis and postpartum wound infection) during and after delivery, preeclampsia: high blood pressure in pregnancy associated with proteinuria

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Table 2 shows that LMWH was prescribed for 69.4% of the women in the intermediate -risk group compared with 47% in the high-risk group (*P* <0.001). The dose was sufficient in 85.5% of the high-risk women who took LMWH, compared with 64.4% of the intermediate-risk women (*P* <0.001). Only 10.9% of the high-risk women took the drug for a proper duration compared with 1.6% of the intermediate-risk women (*P* = 0.002). Table 2 also shows that only 5.1% of the high-risk women and 0.9% of the intermediate-risk women took the drug at a correct dose and duration. In comparison, 41.9% of the high-risk women and 68.5% of the intermediate-risk women took the drug, but the dose and/or duration was insufficient. LMWH was not prescribed for a considerable proportion of the high-risk women (53%) and 30.6% of the intermediate-risk women, even though this treatment was required.

Table 2 Patterns of management in women with intermediate and high VTE risk

Pattern	Intermediate risk		High risk		Total		*P* value
	No.	(%)	No.	(%)	No.	(%)	
Prescription of LMWH							
No	141	(30.6)	62	(53.0)	203	(35.1)	
Yes	320	(69.4)	55	(47.0)	375	(64.9)	<0.001*
Total	461	(100.0)	117	(100.0)	578	(100.0)	
Sufficiency of dose							
Insufficient dose	35	(10.9)	8	(14.5)	43	(11.5)	
Sufficient dose	206	(64.4)	47	(85.5)	253	(67.5)	
Over-dose	79	(24.7)	0	(0.0)	79	(21.1)	<0.001*
Total	320	(100.0)	55	(100.0)	375	(100.0)	
Duration of treatment							
Not correct	315	(98.4)	49	(89.1)	364	(97.1)	
Correct	5	(1.6)	6	(10.9)	11	(2.9)	0.002†
Total	320	(100.0)	55	(100.0)	375	(100.0)	
Decision							
Correct way	4	(0.9)	6	(5.1)	10	(1.7)	
Insufficient dose/duration	316	(68.5)	49	(41.9)	365	(63.1)	
Required but not treated	141	(30.6)	62	(53.0)	203	(35.1)	<0.001*
Total	461	(100.0)	117	(100.0)	578	(100.0)	

*By Chi square test. †By Fisher's exact test.
VTE: venous thromboprophylaxis; LMWH: low-molecular-weight heparin

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The most prominent finding in Table 3 is that LMWH was required but not given to 93.2% of the women who delivered vaginally compared with 6.7% of the women who delivered by cesarean section (*P* <0.001). Notably, the majority (92.8%) of the women who delivered by cesarean section were prescribed LMWH, but the dose or duration was insufficient.

Table 4 shows that the factors that were associated with significantly high rates of a wrong decision (treatment required but not given) were: presence of varicose veins (*P* <0.001), current infection (0.135), no preeclampsia (*P* = 0.004), twin birth (*P* = 0.031), post-partum hemorrhage (*P* = 0.025), stillbirth (*P* = 0.001) and vaginal delivery (*P* <0.001)

Table 3 Decisions regarding prescribing LMWH for women who delivered vaginally or by cesarean section

Decision	Vaginal		Cesarean section		Total		*P* value
	No.	(%)	No.	(%)	No.	(%)	
Correct	8	(4.2)	2	(0.5)	10	(1.7)	
Insufficient dose/duration	5	(2.6)	360	(92.8)	365	(63.1)	
Required but not treated	177	(93.2)	26	(6.7)	203	(35.1)	< 0.001
Total	190	(100.0)	388	(100.0)	578	(100.0)	

LMWH: low-molecular-weight heparin

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Table 4 Factors associated with the decision to prescribe LMWH.

Factor	Treatment given		Treatment required but not given		Total		
	No.	(%)	No.	(%)	No.	(%)	*P* value
Previous venous thrombo-embolism							
No	375	(64.9)	203	(35.1)	578	(100.0)	
Yes	0	(0.0)	0	(0.0)	0	(0.0)	NA
Antiphospholipid syndrome							
No	375	(65.0)	202	(35.0)	577	(100.0)	
Yes	0	(0.0)	1	(100.0)	1	(100.0)	0.351*
Varicose veins							
No	363	(66.9)	180	(33.1)	543	(100.0)	
Yes	12	(34.3)	23	(65.7)	35	(100.0)	< 0.001
Heart disease							
No	374	(64.9)	202	(35.1)	576	(100.0)	
Yes	1	(50.0)	1	(50.0)	2	(100.0)	>0.999*
Surgery							
No	354	(64.6)	194	(35.4)	548	(100.0)	
Yes	21	(70.0)	9	(30.0)	30	(100.0)	0.546
Dehydration							
No	375	(64.9)	203	(35.1)	578	(100.0)	
Yes	0	(0.0)	0	(0.0)	0	(0.0	NA
Current infection							
No	354	(65.7)	185	(34.3)	539	(100.0)	
Yes	21	(53.8)	18	(46.2)	39	(100.0)	0.135
Preeclampsia							
No	343	(63.4)	198	(36.6)	541	(100.0)	
Yes	32	(86.5)	5	(13.5)	37	(100.0)	0.004
Prolonged labor							
No	361	(64.2)	201	(35.8)	562	(100.0)	
Yes	14	(87.5)	2	(12.5)	16	(100.0)	0.055
Smoking							
No	373	(65.2)	199	(34.8)	572	(100.0)	
Yes	2	(33.3)	4	(66.7)	6	(100.0)	0.191*
Twin							
No	366	(65.7)	191	(34.3)	557	(100.0)	
Yes	9	(42.9)	12	(57.1)	21	(100.0)	0.031
Postpartum hemorrhage							
No	373	(65.4)	197	(34.4)	570	(100.0)	
Yes	2	(25.0)	6	(75.0)	8	(100.0)	0.025*
Stillbirth							
No	375	(65.7)	196	(34.3)	571	(100.0)	
Yes	0	(0.0)	7	(100.0)	7	(100.0)	0.001*
Preterm labor							
No	352	(65.4)	186	(34.6)	538	(100.0)	
Yes	23	(57.5)	17	(42.5)	40	(100.0)	0.311
Bed rest > 3 day							
No	371	(64.6)	203	(35.4)	574	(100.0)	
Yes	4	(100.0)	0	(0.0)	4	(100.0)	0.303*
Mode of delivery							
Vaginal	13	(6.8)	177	(93.2)	190	(100.0)	
Cesarean	362	(93.3)	26	(6.7)	388	(100.0)	< 0.001
Total	375	(64.9)	203	(35.1)	578	(100.0)	

LMWH: low-molecular-weight heparin

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Table 5 presents the factors associated with a wrong decision (the drug is needed but not prescribed). The significant associated factors were: no preeclampsia (odds ratio (OR) = 15.46), post-partum hemorrhage (OR = 15.38), and vaginal mode of delivery (OR = 250.28).

Discussion

This study revealed very poor obstetricians' compliance with a regional policy on thromboprophylaxis following cesarean section and vaginal delivery regarding the correct dose, duration, and indications, at our hospital.

The most prominent result was that LMWH was required but not given to 93.2% of the women who delivered vaginally compared with 6.7% of the women delivered by cesarean section. The high adherence rate with thromboprophylaxis after the cesarean section of 93.3% vs. approximately 50% reported by Goecke et al.[10] and Donnelly et al.,[14] can be explained by the fact that obstetricians use surgery (including cesarean section) as the only VTE risk factor. Surgery is a well-known VTE risk factor and the leading risk factor.[5,15] this knowledge may lead the majority of obstetricians relaying on cesarean section for the use of thromboprophylaxis.[9]

Although the dose and duration were often insufficient, it appeared that the obstetricians in our study were well-aware of cesarean section as a risk factor for VTE.

Very few obstetricians in our locality prescribed LMWH in accordance with the RCOG recommendations for all clinical scenarios evaluated in this study. LMWH was commonly recommended by obstetricians, even when the guidelines did not recommend its use, including after elective cesarean section. This finding was similar to the results of Seeho et al., who revealed that very few obstetricians prescribed LMWH in accordance with either the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) or RCOG recommendations for all clinical scenarios presented in their survey. LMWH was commonly recommended even when guidelines did not recommend its use, and conversely, LMWH was frequently not recommended in clinical circumstances where guidelines advised that its use was appropriate.[9]

In contrast, our study showed only a 6.8% compliance with thromboprophylaxis after vaginal delivery. Poor communication

Table 5 SPSS output for the binary logistic regression analysis of "wrong treatment decisions" as a dependent variable with several covariates

Factor	B	*P*	OR	95% CI for OR	
				Lower	Upper
Varicose veins	0.131	0.853	1.140	0.284	4.582
Current infection	0.593	0.455	1.809	0.383	8.547
No preeclampsia	2.738	< 0.001	15.463	3.483	68.645
Twin	-0.320	0.719	0.726	0.127	4.138
Postpartum hemorrhage	2.733	0.008	15.384	2.072	114.236
Mode of delivery (Vaginal)	5.523	< 0.001	250.280	110.659	566.060
Cesarean (reference)					
Constant	-5.523	0.000	0.004		

SPSS (IBM Corp., Armonk, NY, USA); OR: odds ratio; CI: confidence interval

between the nurses, obstetricians, delivery and postpartum ward staff regarding implementing thromboprophylaxis may have a role. Additionally, the risk factor and risk group categorization (low-, intermediate-, and high-risk) checklist was a new document in parturients' medical records.

Our data indicated that obstetricians in our hospital are less likely to use anticoagulants as postpartum thromboprophylaxis after vaginal delivery. This finding is similar to an audit conducted at a district general hospital with a maternity unit serving southwest Scotland. The authors developed guidelines for thromboprophylaxis after vaginal birth, and the audit assessed compliance with these guidelines within the maternity unit. The audit showed that only 31% of the women delivering via spontaneous vaginal birth for whom thromboprophylaxis was indicated did indeed receive the required treatment. The authors concluded that failure to respond to VTE risk factors was common, and measures to increase the awareness of maternity staff to these factors were suggested.[16] Of our 981 parturients, 41% were categorized into the low-risk group, and 59% constituted the combined intermediate and high-risk groups. Our percentages were higher than those in a study by Grill et al.[17] in which 38.4% of all hospitalized women (high- and intermediate-risk group) were considered at risk of developing VTE, and similar to proportions reported by Hayes-Ryan and Byrne where 51% of delivered women were deemed to be at intermediate- or high-risk of developing VTE.[18]

In the current study, the most frequent risk factors regarding the mode of delivery were age ≥ 36 years, parity > 3, varicose veins, and current infection, which were significantly high in the vaginal delivery group. The opposite pattern was seen regarding the history of surgery, preeclampsia, prolonged labor rate, current infection, and preterm labor, which occurred significantly more often in the cesarean section group. The level of risk associated with many of these VTE risk factors is unclear. Individual patients should be assessed for thrombotic risk, ideally before pregnancy or in early pregnancy.[19]

Risk factors varied in different studies, depending on the sample size and research methodology. Jacobsen et al. revealed that postnatal risk factors were cesarean section, preeclampsia, assisted reproduction, abruption placenta, and placenta previa.[20] Greer concluded in his study of the risk factors for VTE that age >35 years, operative vaginal delivery, cesarean section, high body mass index, previous VTE, and a family history of thrombosis suggestive of an underlying thrombophilia were risk factors for VTE.[21] Studies by Jacobsen et al. and Lindqvist et al., revealed a higher prevalence of venous thrombosis in the postnatal period in patients with preeclampsia.[20,22,23] Another study found that during the puerperium, postpartum infection increased the risk of thrombosis 4-fold.[24]

A strength of this study is that our hospital uses the RCOG guideline exclusively for risk stratification for recommending thromboprophylaxis following cesarean section and vaginal delivery. We recommend depending on one set of guidelines rather than using several guidelines. As additional strengths, our sample size was large, and we conducted our study in the only public hospital in Erbil City, where most high-risk pregnancies are delivered. Another strength is that all data were collected prospectively by one author who followed each patient from admission to the labor room and until discharge from the hospital. This author also assessed each parturient risk factor according to the RCOG checklist in the patient's medical records. Therefore, the information and risk assessment was not dependent on the delivered woman's records or retrospectively assessed, making the data more dependable and accurate.

Finally, we assessed all of the risk factors

for VTE documented in the latest RCOG guideline for thromboprophylaxis after delivery, starting with age and ending with wound infection.

A limitation of the study is that it assessed obstetricians' compliance to the medical thromboprophylaxis and ignored other health care providers' adherence as this issue requires all to be involved starting from admission to the hospital till discharge home.

Conclusion

In this study, we found poor awareness of VTE risk and compliance to LMWH prescription for thromboprophylaxis following cesarean section and vaginal delivery. Physician and health care provider training and regular evaluation of adherence to thromboprophylaxis could help our obstetricians to improve their daily clinical practice.

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Competing interests

None declared.

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