# ICM VTE General

1 - Are certain patients identified to be at greater risk for venous thromboembolism than others?

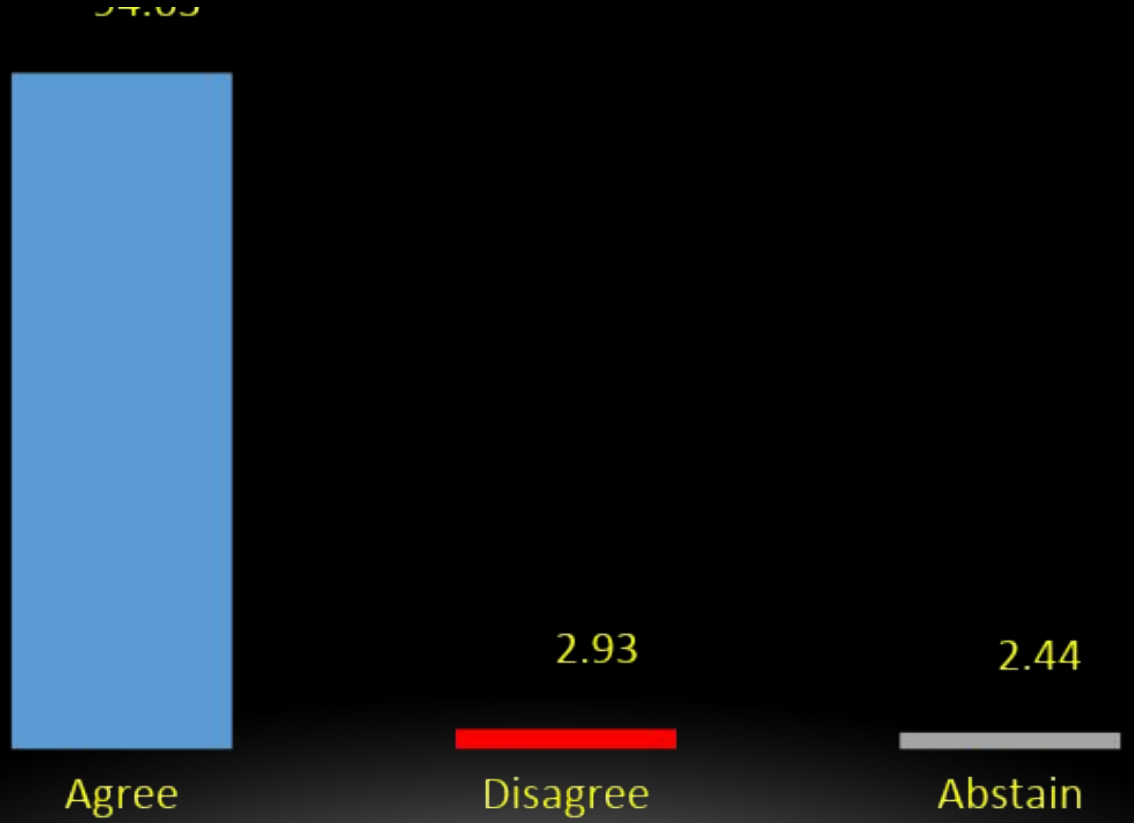
Response/Recommendation: Certain patient populations have been identified to be at greater risk for venous thromboembolism (VTE).

Strength of Recommendation: Limited.

*Jeremiah Taylor, William Jiranek, Jerzy Bialecki, Ronald Navarro*

# ICM VTE General

1 - Are certain patients identified to be at greater risk for venous thromboembolism than others?




(Strong Consensus)

# ICM VTE General

## 2 - Are there genetic predisposing factors for VTE?

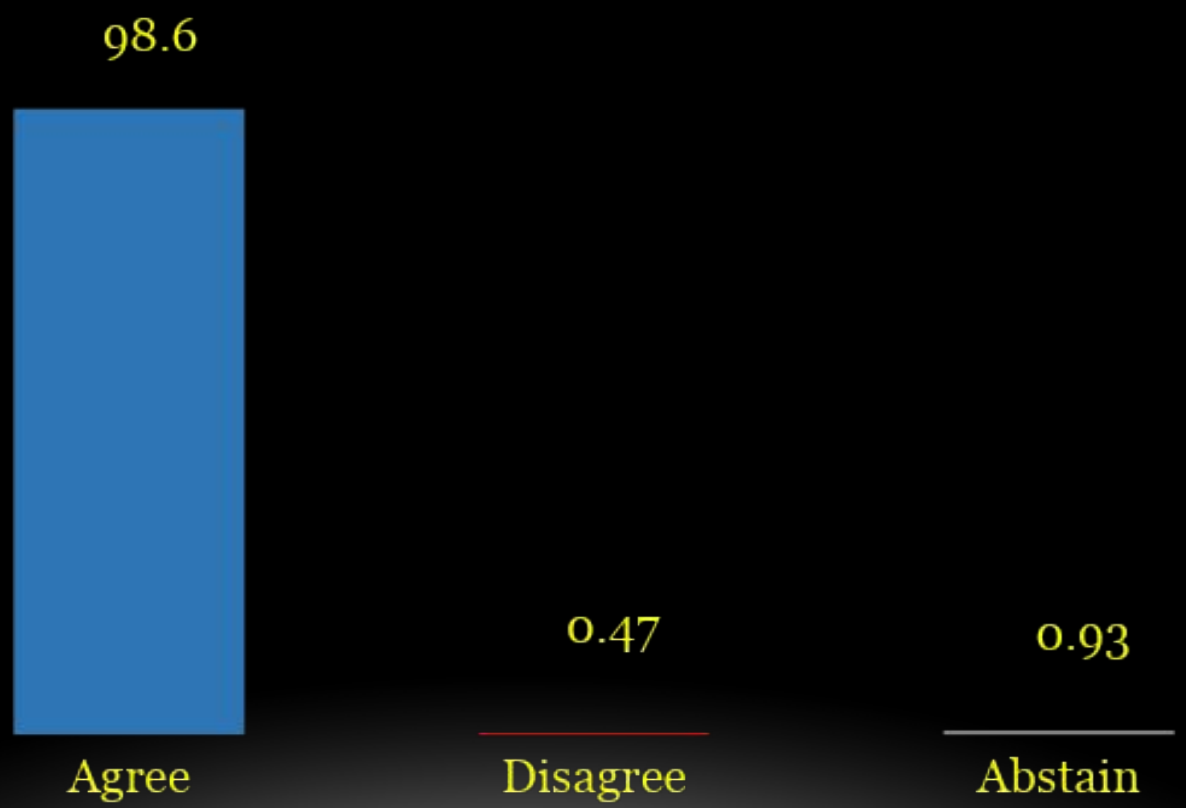
Response/Recommendation: There are 5 classic thrombophilias that have a genetic predisposition for venous thromboembolism (VTE). A large proportion of the inherited risk factors for VTE remain undiscovered and many new loci associated with VTE risk continue to be identified.

Strength of Recommendation: Strong.

*Jennifer A. Bell, Michael H. Huo, Jay R. Lieberman*

# ICM VTE General

## 2 - Are there genetic predisposing factors for VTE?




(Strong Consensus)

# ICM VTE General

3 - Is there a correlation between age and the risk of VTE in patients undergoing orthopaedic procedures?

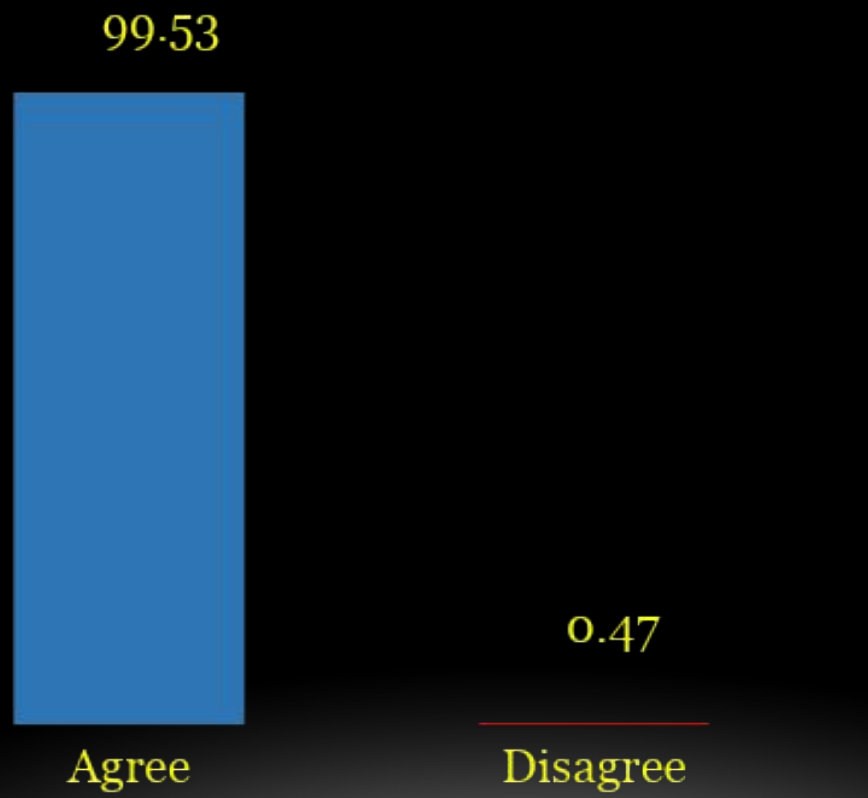
Response/Recommendation: Increasing age is associated with an increased risk of postoperative venous thromboembolism (VTE) in patients undergoing orthopaedic procedures.

Strength of Recommendation: Strong.

*Karsten Keller, Lukas M.A. Hobohm*

# ICM VTE General

3 - Is there a correlation between age and the risk of VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

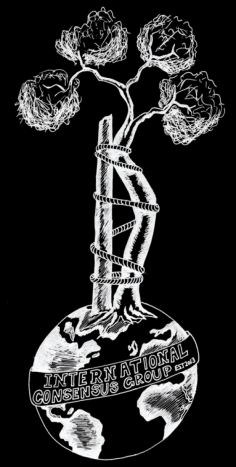
# ICM VTE General

4 - Is the risk of VTE following orthopaedic procedures related to ethnicity or race? If yes, should VTE prophylaxis be altered or changed based on race and/or ethnicity?

Response/Recommendation: At this time, evidence is insufficient to suggest that venous thromboembolism (VTE) prophylaxis should be altered based on race/ethnicity.

Strength of Recommendation: Limited.

*David O. Alfaro, John Callaghan, Ronald Navarro*



# ICM VTE General

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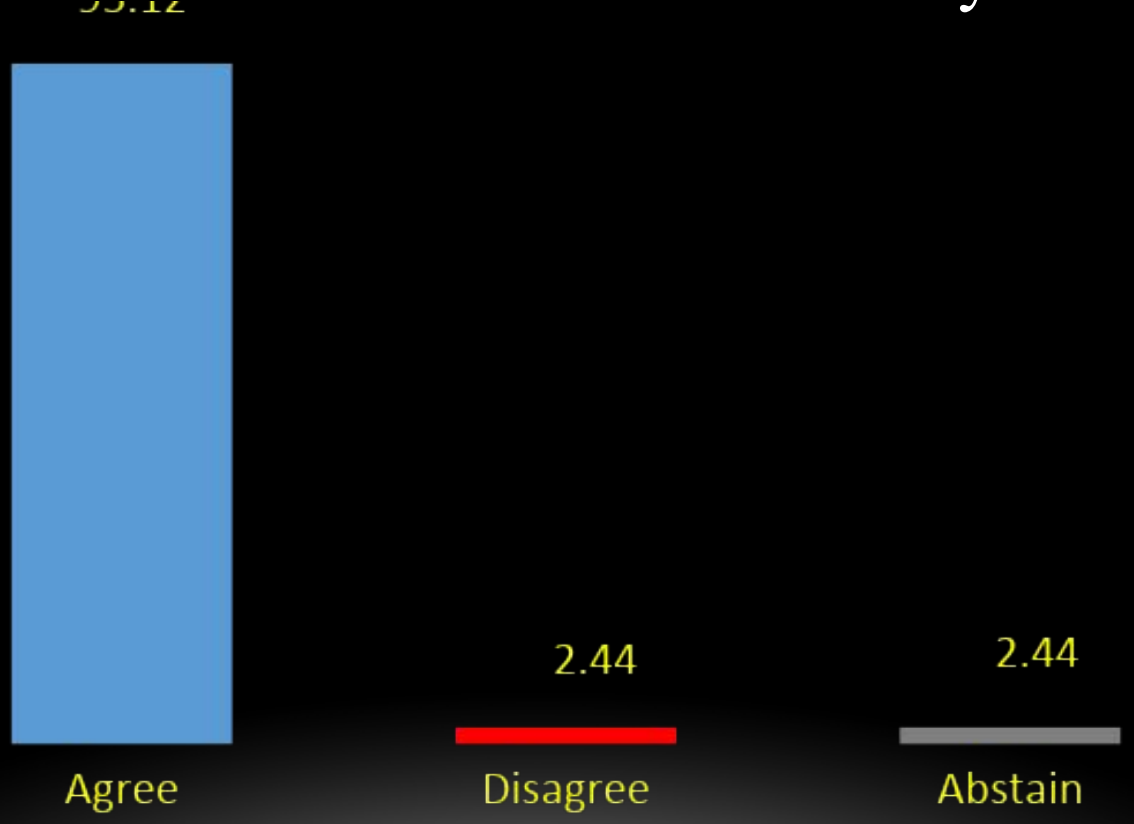



(Strong Consensus)

# ICM VTE General

## 5 - Is there a definite association between BMI and VTE?

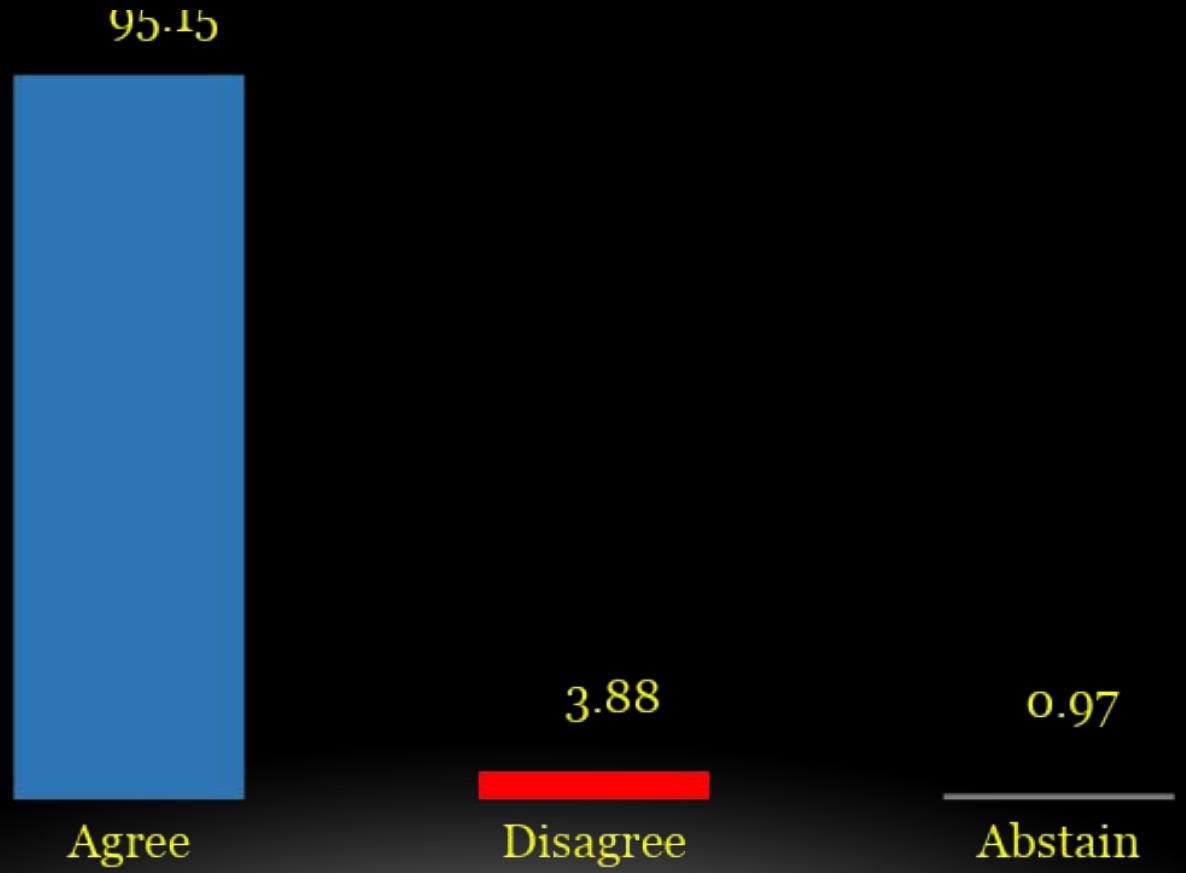
Response/Recommendation: Extensive evidence confirms a definite association between unprovoked venous thromboembolism (VTE) and increasing body mass index (BMI). However, the evidence linking BMI to postoperative VTE is more equivocal.

Strength of Recommendation: Moderate.

*Ana Torres, Emanuele Chisari, Jessica Morton, Emilio Romanini, Vitali Goriainov, Nicola Gallagher, Rajiv Kaila, Antonio J. Andrade, David Beverland*

# ICM VTE General

5 - Is there a definite association between BMI and VTE?




(Strong Consensus)

# ICM VTE General

6 - Does a history of prior VTE influence the rate of subsequent VTE in patients undergoing orthopaedic procedures?

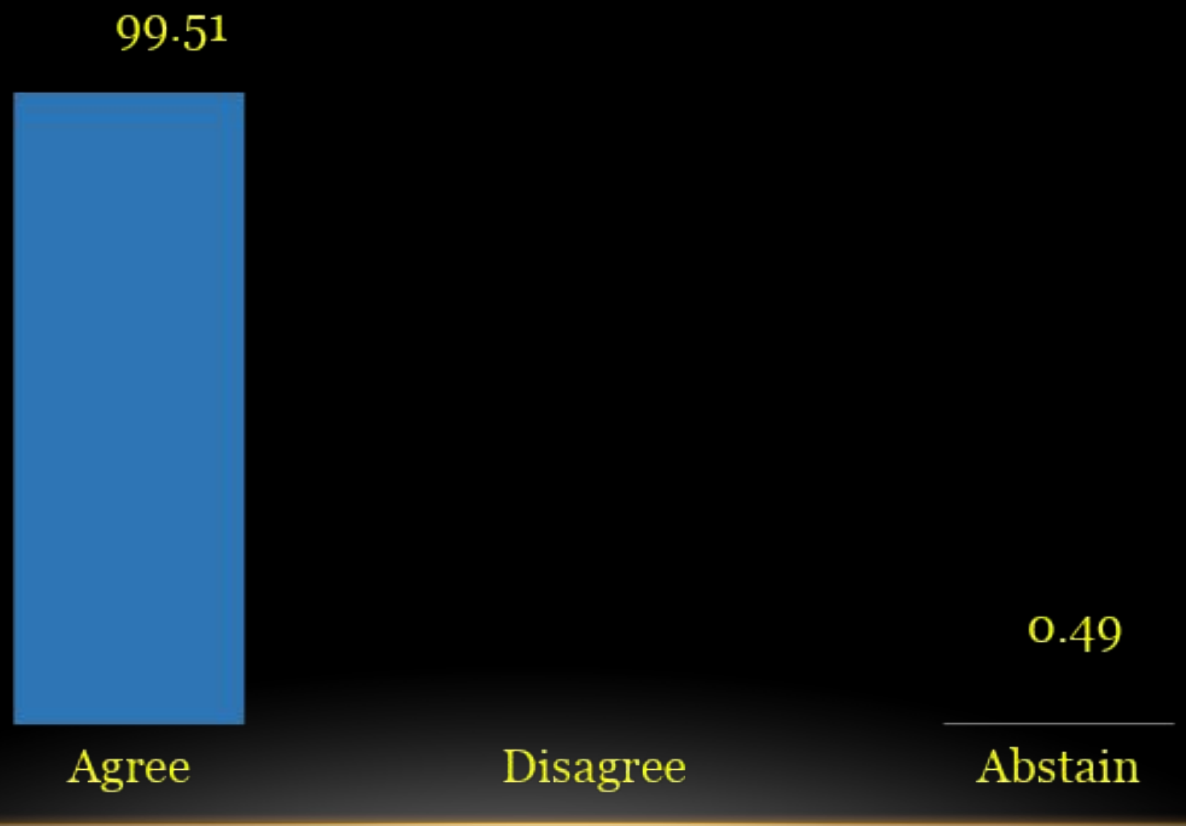
Response/Recommendation: Patients with a previous history of venous thromboembolism (VTE), including both deep venous thrombosis (DVT) and pulmonary embolism (PE), are at a higher risk of developing VTE following orthopaedic procedures.

Strength of Recommendation: Strong.

*Leanne Ludwick, Noam Shohat*

# ICM VTE General

6 - Does a history of prior VTE influence the rate of subsequent VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

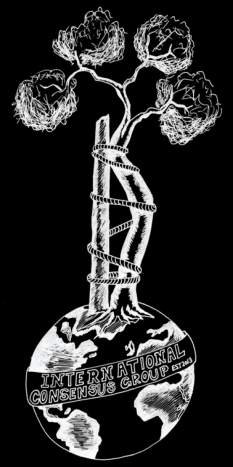
# ICM VTE General

7 - Does the type (DVT vs. PE) or timing (remote vs. recent) of prior VTE influence the risk of subsequent VTE following orthopaedic procedures?

Response/Recommendation: While it seems a reasonable assumption that patients with a history of venous thromboembolism (VTE) are at higher risk of post-operative VTE, there is little high-quality literature available regarding the effect of type or timing of prior VTE on subsequent VTE risk.

Strength of Recommendation: Limited.

*Brendan Gleason, Camilo Restrepo, William J. Hozack*



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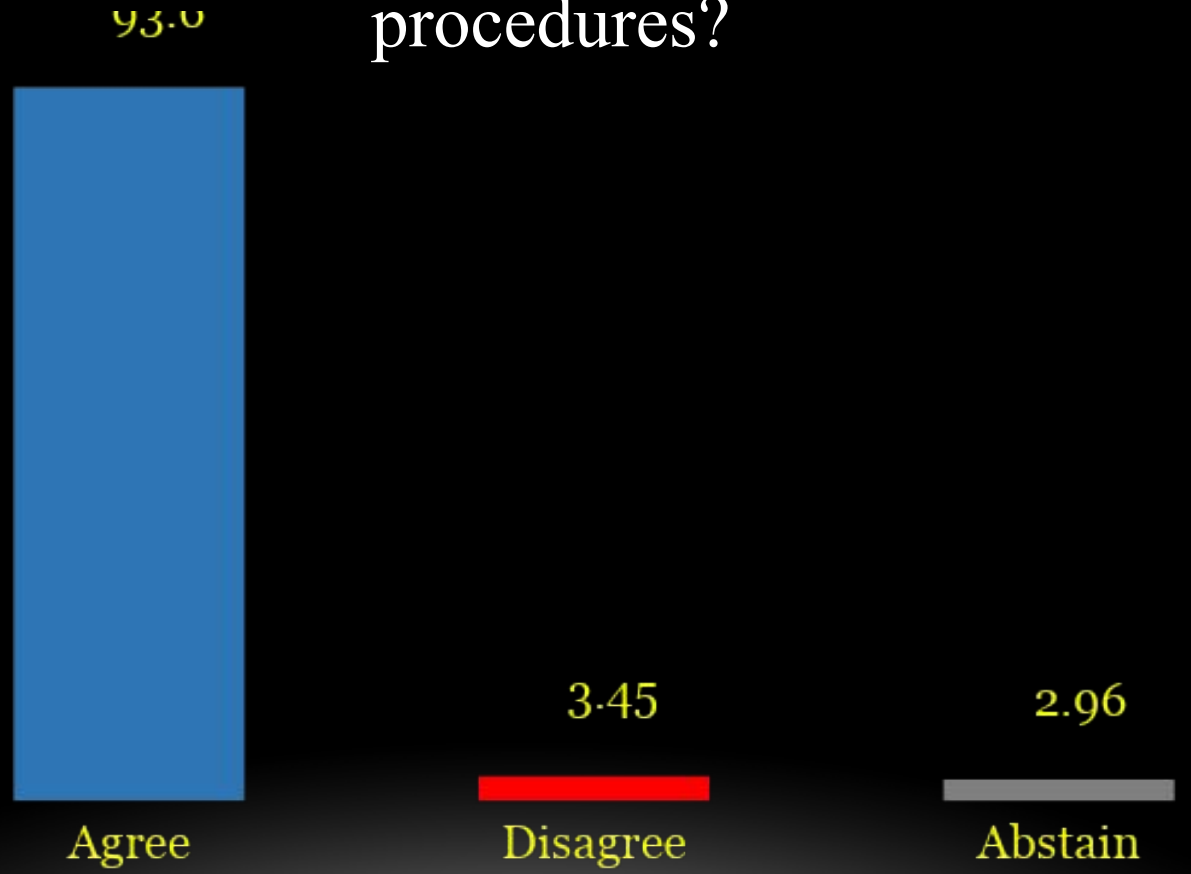



(Strong Consensus)

# ICM VTE General

8 - Do patients with an underlying diagnosis of infection (local or systemic) undergoing orthopaedic procedures have an elevated risk for subsequent VTE?

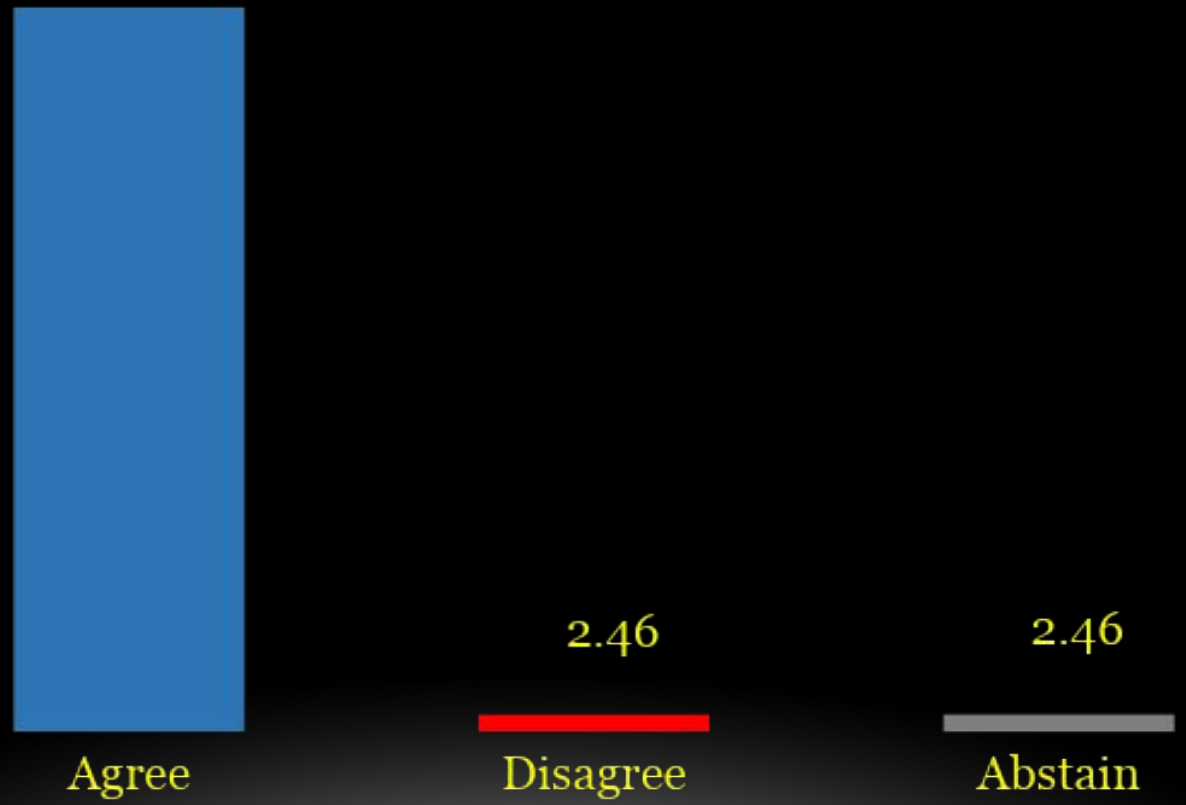
Response/Recommendation: Patients with a systemic infection undergoing orthopaedic procedures have a higher risk of postoperative venous thromboembolism (VTE). This relationship for local infection is not proven.

Strength of Recommendation: Moderate.

*Mohammad T. Ghazavi, Asep Santoso, Francesco Zambianchi, Fabio Catani*

# ICM VTE General

8 - Do patients with an underlying diagnosis of infection (local or systemic) undergoing orthopaedic procedures have an elevated risk for subsequent VTE?




(Strong Consensus)

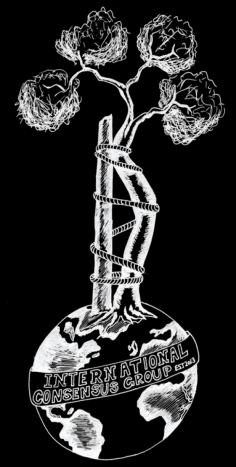
# ICM VTE General

9 - Does the presence of varicosities and/or superficial lower extremity thrombosis increase the risk of VTE in patients undergoing orthopaedic procedures?

Response/Recommendation: The presence of varicose veins increases the risk of postoperative venous thromboembolism (VTE) by approximately 3 times in patients undergoing major orthopaedic procedures (Strong). A history of superficial venous thrombosis (SVT) increases the risk of postoperative VTE by 5 - 10 times in patients undergoing lower limb orthopaedic surgery (Limited). Acute SVT further increases the risk of VTE, and elective orthopaedic procedures should be postponed for at least 3 months if possible (Limited).

Strength of Recommendation: Limited.

*David Campbell, Kirill Lobastov, Zbigniew Krasinski*



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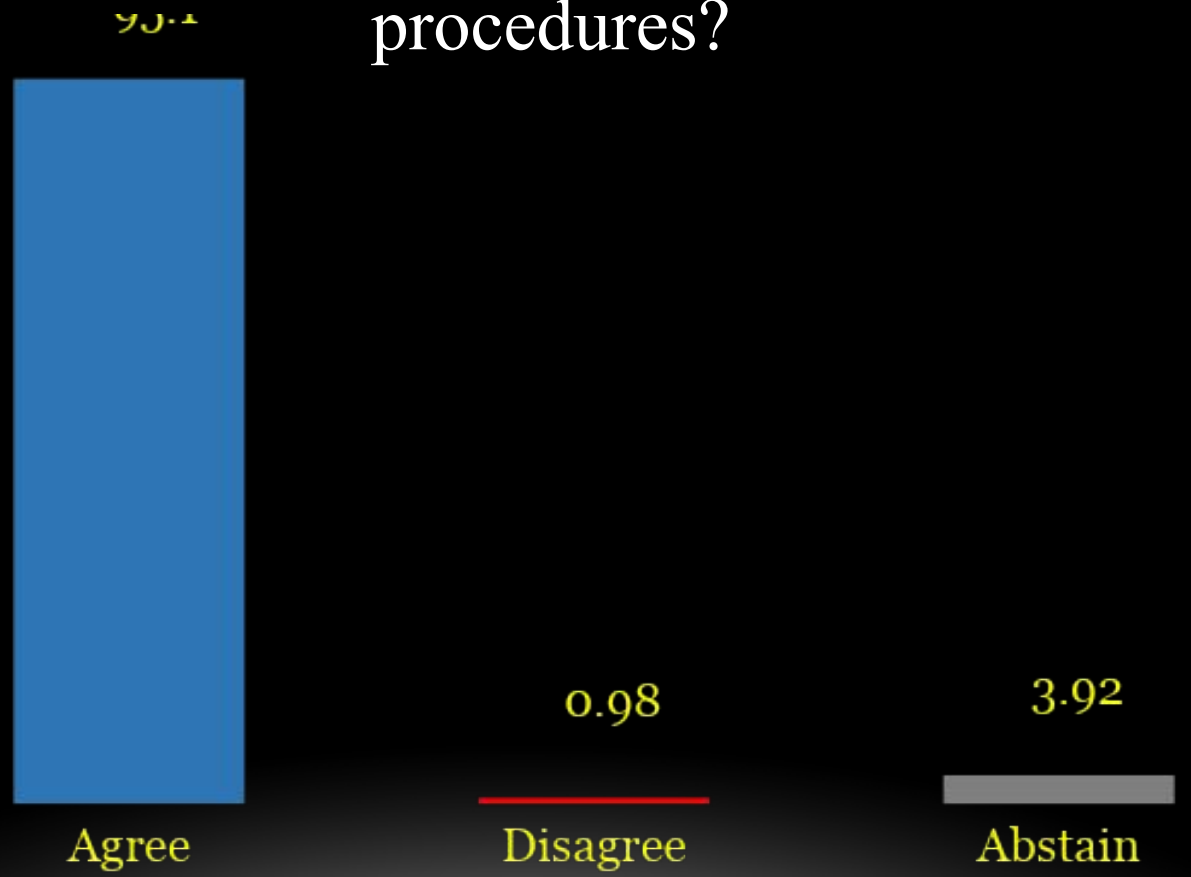



(Strong Consensus)

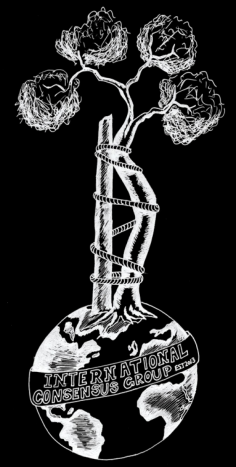
# ICM VTE General

10 - (A) Do oral contraceptive medications increase the risk of VTE?
(B) If so, should they be stopped prior to orthopaedic procedures?

Response/Recommendation: The incidence of postoperative venous thromboembolism (VTE) is increased in women who use oral contraceptives pills (OCP), as compared to women who do not. Cessation in all users is not recommended. However, OCP use should be taken into account when assessing the patient's and the procedure's estimated risk and hence, form a basis for decisions on thromboprophylaxis.

Strength of Recommendation: (A) Strong, (B) Limited.

*Pedro Dantas, Suzanne C. Cannegieter, Andre Grenho, Sergio Goncalves*



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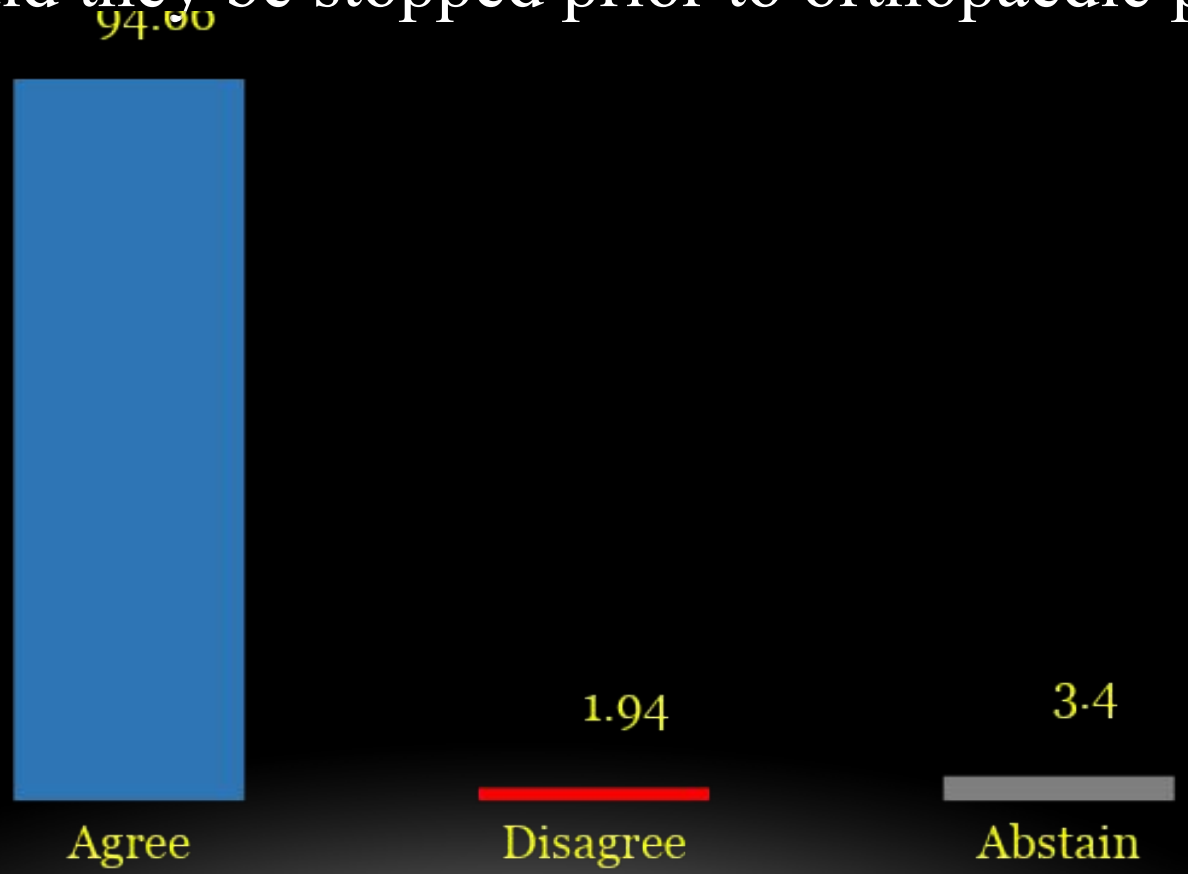


(Strong Consensus)

# ICM VTE General

11 - Do oral hormonal therapy, used for cancer management, increase the risk of post-operative VTE in patients undergoing orthopaedic procedures? If so, should they be stopped prior to surgery?

Response/Recommendation: Hormonal therapy used in cancer management, like tamoxifen, increases the risk of venous thromboembolism (VTE) in patients undergoing orthopaedic procedures. We suggest they should be suspended at least 7 days before surgery, a degree of individualization of approach is needed based on risk factors and clinical settling (type of cancer, etc.).

Strength of Recommendation: Weak.

*Salvador Oscar Rivero Boschert, Jose J. Aguilar Ramirez, Gregory Y.H. Lip*

# ICM VTE General

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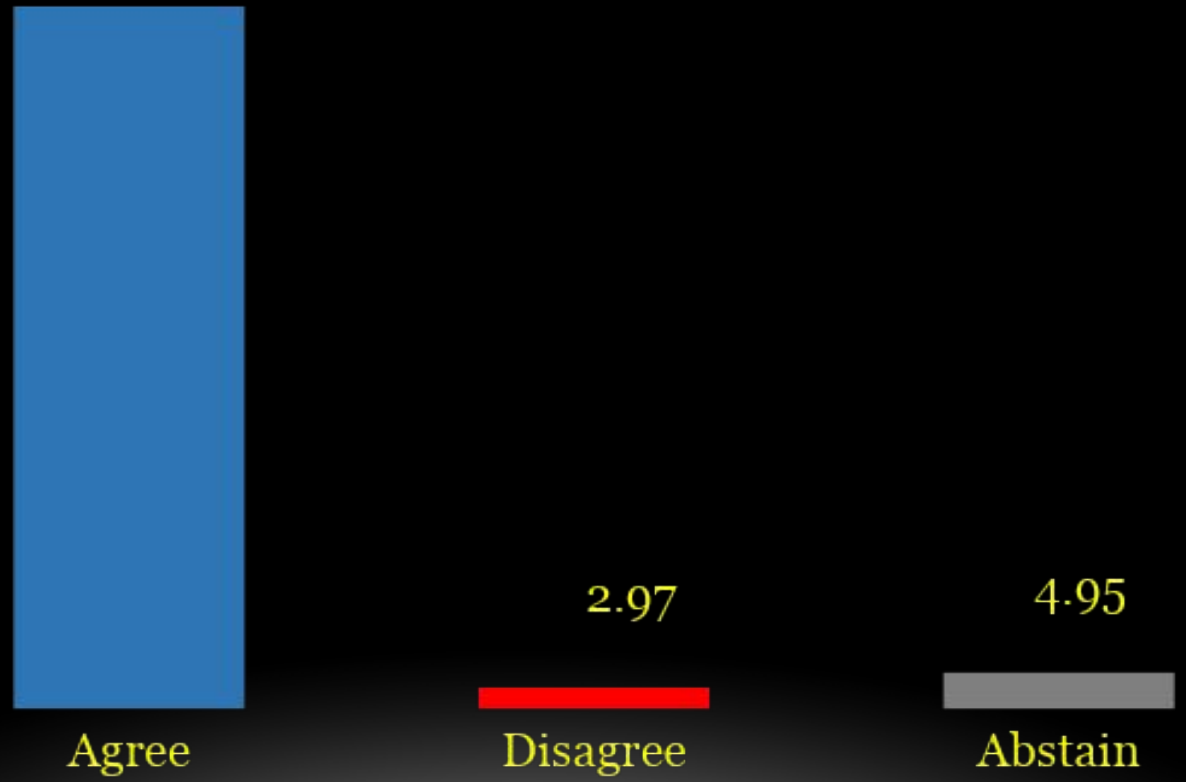


(Strong Consensus)

# ICM VTE General

## 12 - Are patients, who traveled on airplanes or had long car rides prior to surgery, at an increased risk of VTE? If so, what is the optimal interval between travel and surgery?

Response/Recommendation: It is well established that travel on airplanes, especially 'long-haul flights', is a major risk factor for development of venous thromboembolism (VTE). Individuals with preexisting risk factors for VTE appear to be at greatest risk. There is a paucity of literature examining the influence of long-distance travel prior to surgery on the risk of postoperative VTE. Similarly, while it is commonly accepted that airplane travel in the acute postoperative period should be avoided due to an increased risk of VTE, there is limited evidence supporting this notion. Lastly, due to limited literature on the optimal strategy for VTE risk mitigation in patients who engage in long-distance travel either pre- or post-operatively, the choice of prophylactic agent should be individualized, taking into account the relative risks and benefits of different pharmacological and non-pharmacological options for each patient.

Strength of Recommendation: Limited.

*Erik N. Hansen, David G. Nazarian*

# ICM VTE General

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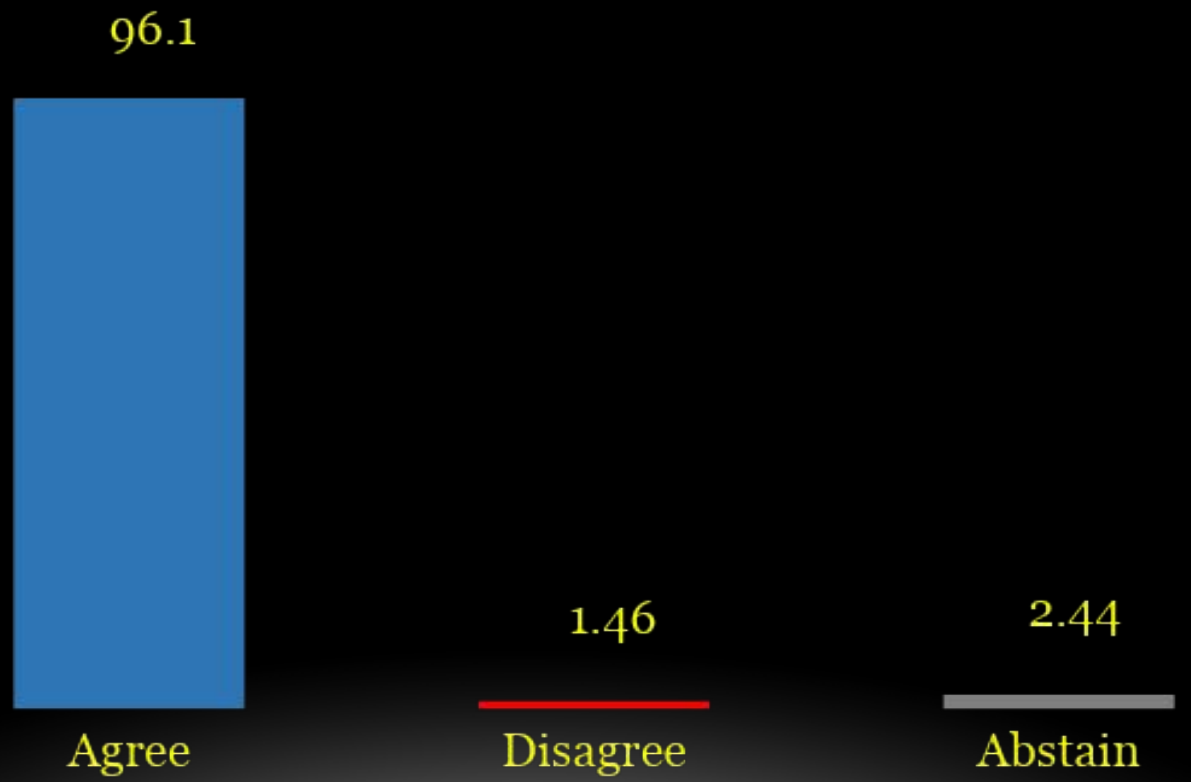



(Strong Consensus)

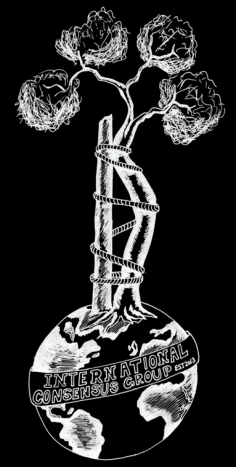
# ICM VTE General

## 13 - Do all orthopaedic procedures have the same risk profile for DVT?

Response/Recommendation: Orthopaedic procedures carry variable risk profiles for deep venous thrombosis (DVT). They have been classically stratified according to the incidence of venous thromboembolism (VTE) events, with total hip arthroplasty (THA) and total knee arthroplasty (TKA) being the highest risk alongside with hip fracture fixation.

Strength of Recommendation: Limited.

*Juan S. Sánchez-Osorio, Adolfo Llinás, Guillermo Bonilla, Cristina Suarez, Daniel Monsalvo, Ana Torres, Sudeep Shivakumar, Justin Magnuson, Chad A. Krueger*



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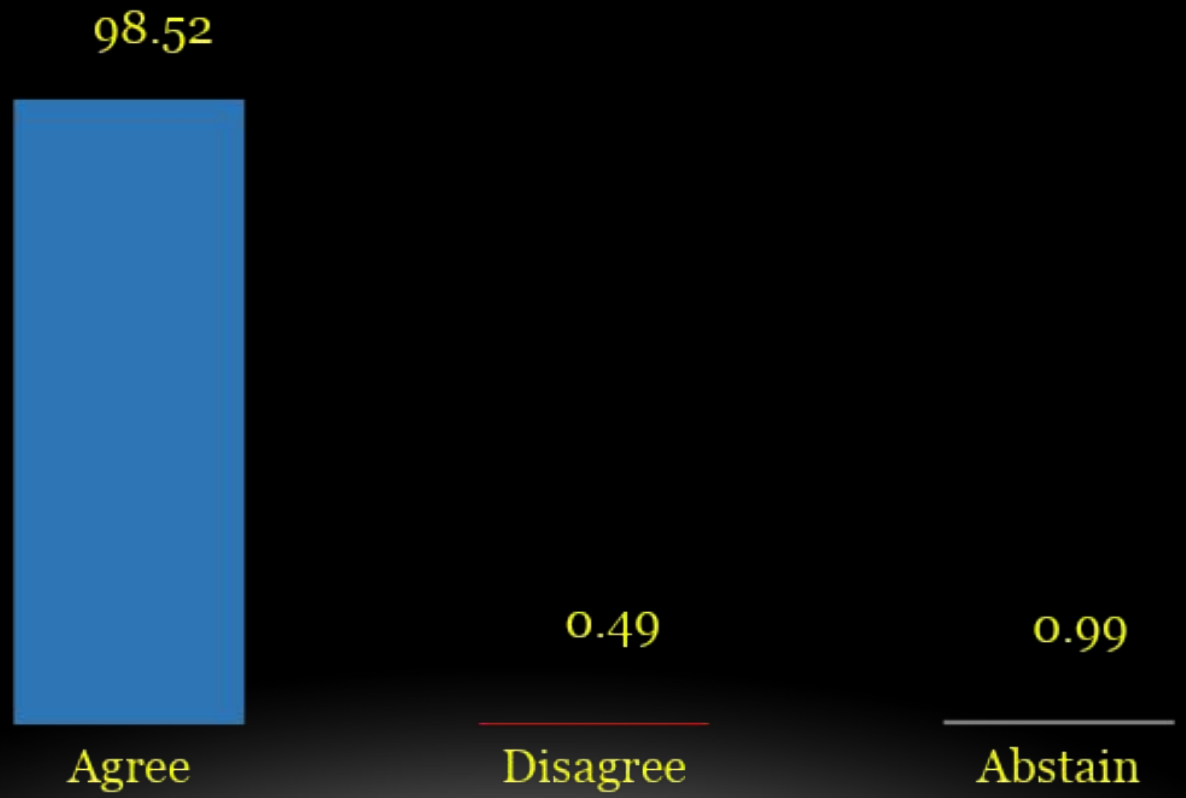



(Strong Consensus)

# ICM VTE General

14 - Does the duration of surgery influence the incidence of postoperative VTE?

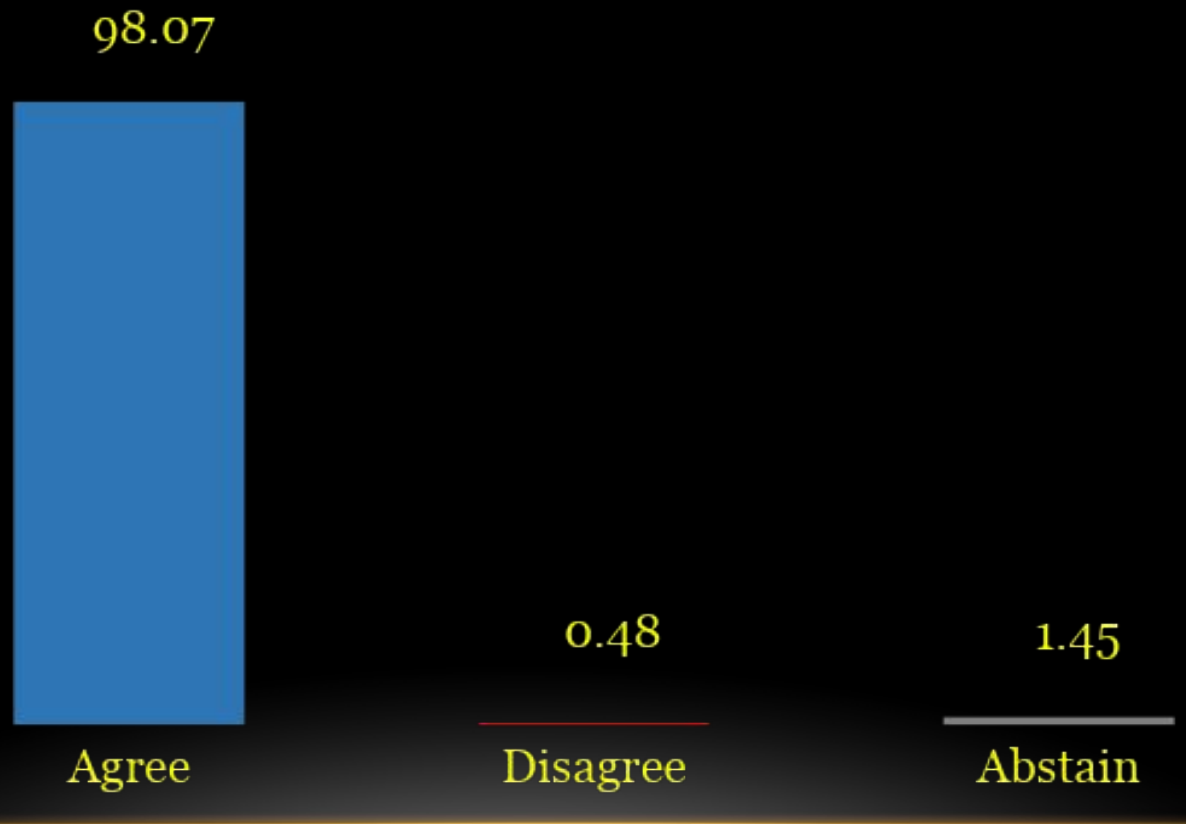
Response/Recommendation: Surgical duration is directly associated with an increased risk of venous thrombosis (VTE). When intraoperative complications or surgical complexity affect the length of surgery, VTE risk should be reevaluated.

Strength of Recommendation: Moderate.

*Emanuele Chisari, Graham S. Goh, Javad Parvizi*

# ICM VTE General

14 - Does the duration of surgery influence the incidence of postoperative VTE?




(Strong Consensus)

# ICM VTE General

15 - Does the volume of intraoperative blood loss influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?

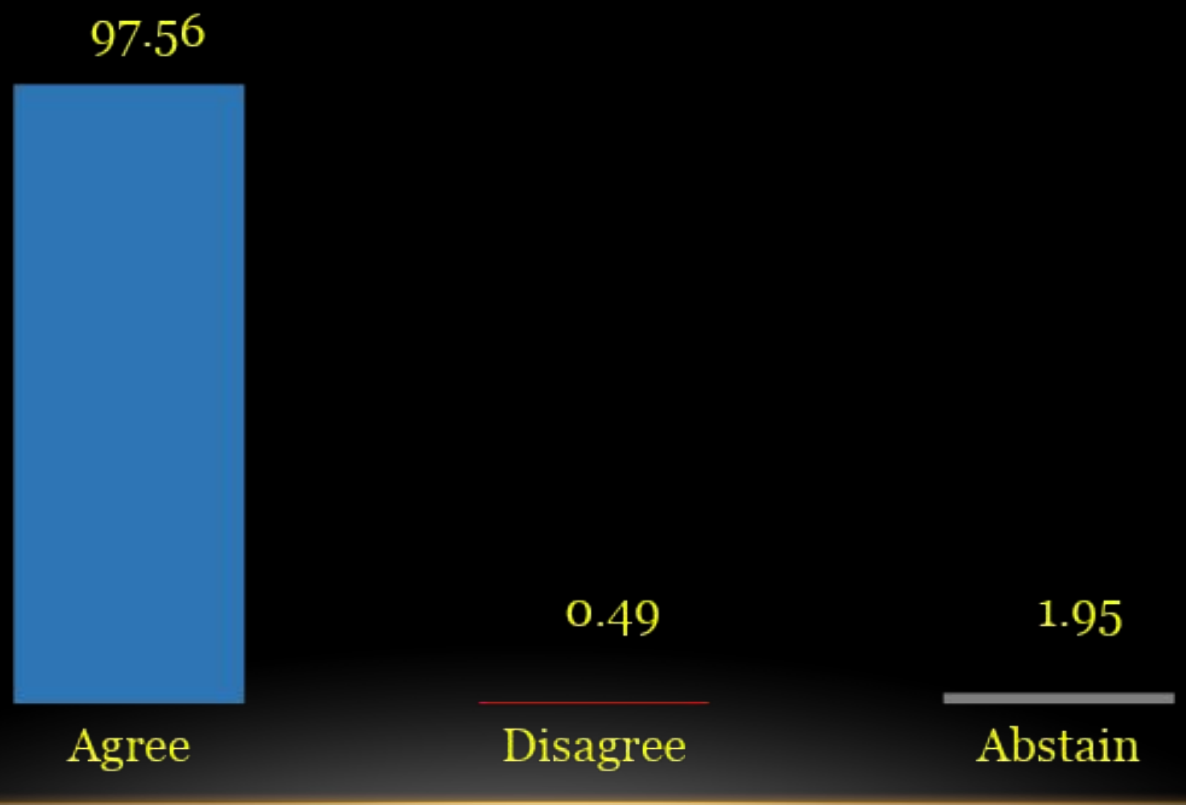
Response/Recommendation: There is no concrete data related to this issue. However, because of a potential association between allogeneic blood transfusion and postoperative venous thromboembolism (VTE), we recommend that strategies be in place to reduce intraoperative blood loss and the possible need for allogeneic blood transfusion.

Strength of Recommendation: Limited.

*Alexander J. Acuña, Andy Kuo, Giedrius Kvederas, Atul F. Kamath*

# ICM VTE General

15 - Does the volume of intraoperative blood loss influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 16 - Does administration of allogeneic blood transfusion influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?

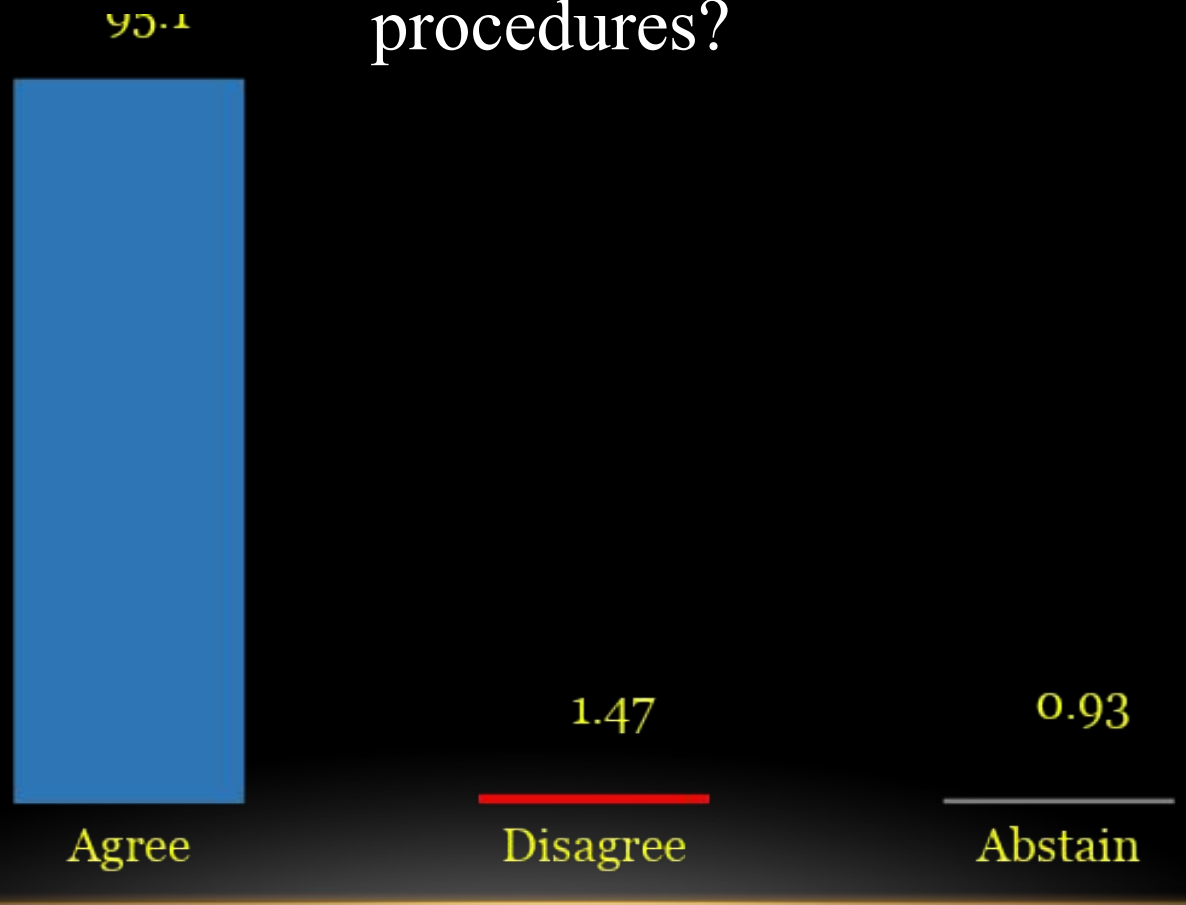
**Response/Recommendation:** The majority of the clinical studies, largely from total joint arthroplasty (TJA) literature, cite an association between allogeneic blood transfusions and venous thromboembolism (VTE) following orthopaedic surgery. Along with the scientific rationale, these associations are sufficient to urge surgeons to minimize the use of allogeneic blood transfusions in the peri-operative period.

**Strength of Recommendation:** Limited.

*Noam Shohat, Tony Tannoury, Giedrius Kvederas*

# ICM VTE General

16 - Does administration of allogeneic blood transfusion influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 17 - Does administration of tranexamic acid (TXA) to patients undergoing orthopaedic procedures increase the risk of subsequent VTE?

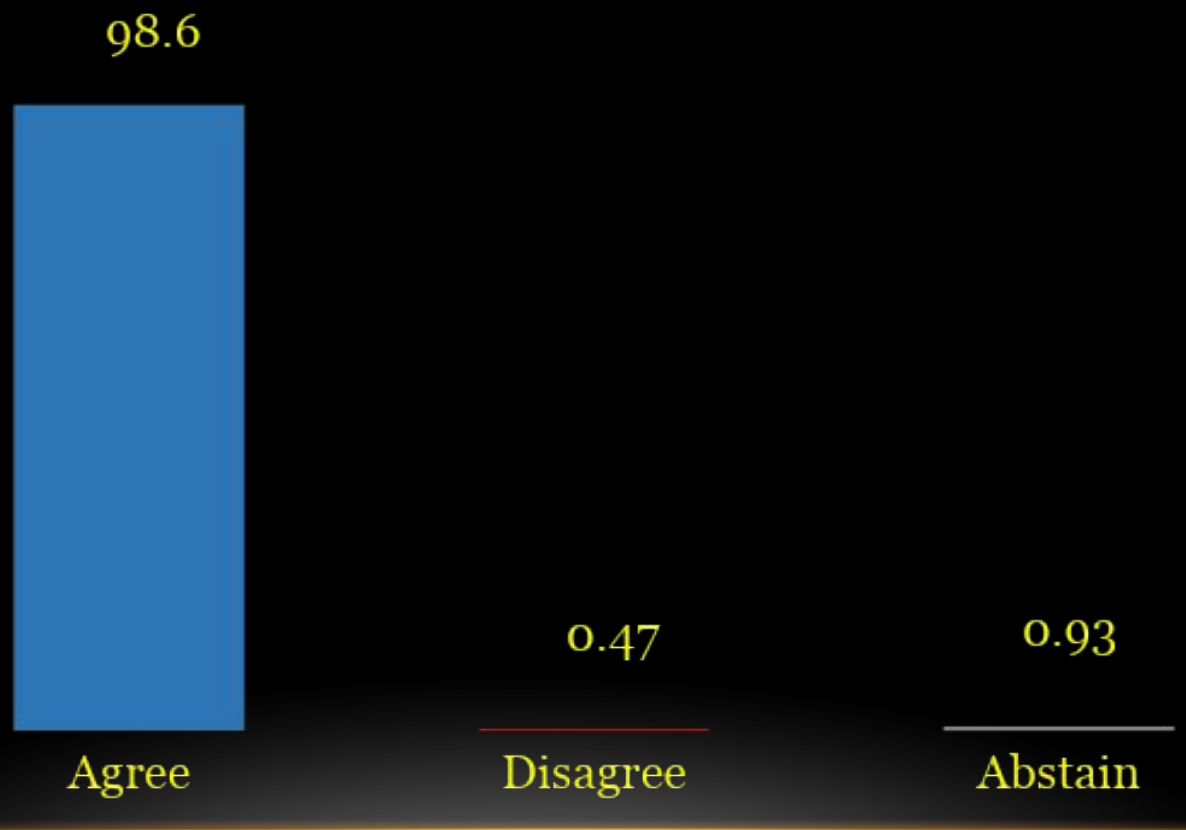
**Response/Recommendation:** (A) Administration of tranexamic acid (TXA) in patients undergoing orthopaedic procedures does not increase the risk of developing subsequent venous thromboembolism (VTE) in patients without prior VTE history. (B) Administration of TXA in patients undergoing orthopaedic procedures does not increase the risk of developing subsequent VTE in patients with prior VTE or equivalently elevated hypercoagulability risk.

**Strength of Recommendation:** (A) Strong, (B) Moderate.

*Armin Arish, Vasili Karas, George C. Babis, Jeffrey J. Mojica, Uzung Yoon, Yale A. Fillingham*

# ICM VTE General

17 - Does administration of tranexamic acid (TXA) to patients undergoing orthopaedic procedures increase the risk of subsequent VTE?




(Strong Consensus)

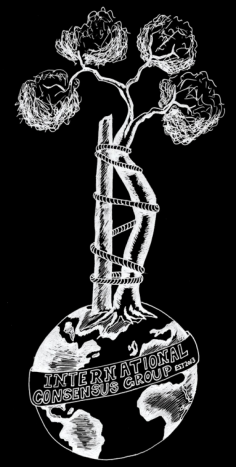
# ICM VTE General

18 - Does tourniquet applied to the lower extremity influence the incidence of post-operative VTE?

Response/Recommendation: There is inadequate evidence to link the use of lower extremity tourniquet during orthopaedic procedures and postoperative venous thromboembolism (VTE).

Strength of Recommendation: Limited.

*Paul Sousa, Mahmoud A. Hafez, Matthew S. Austin*



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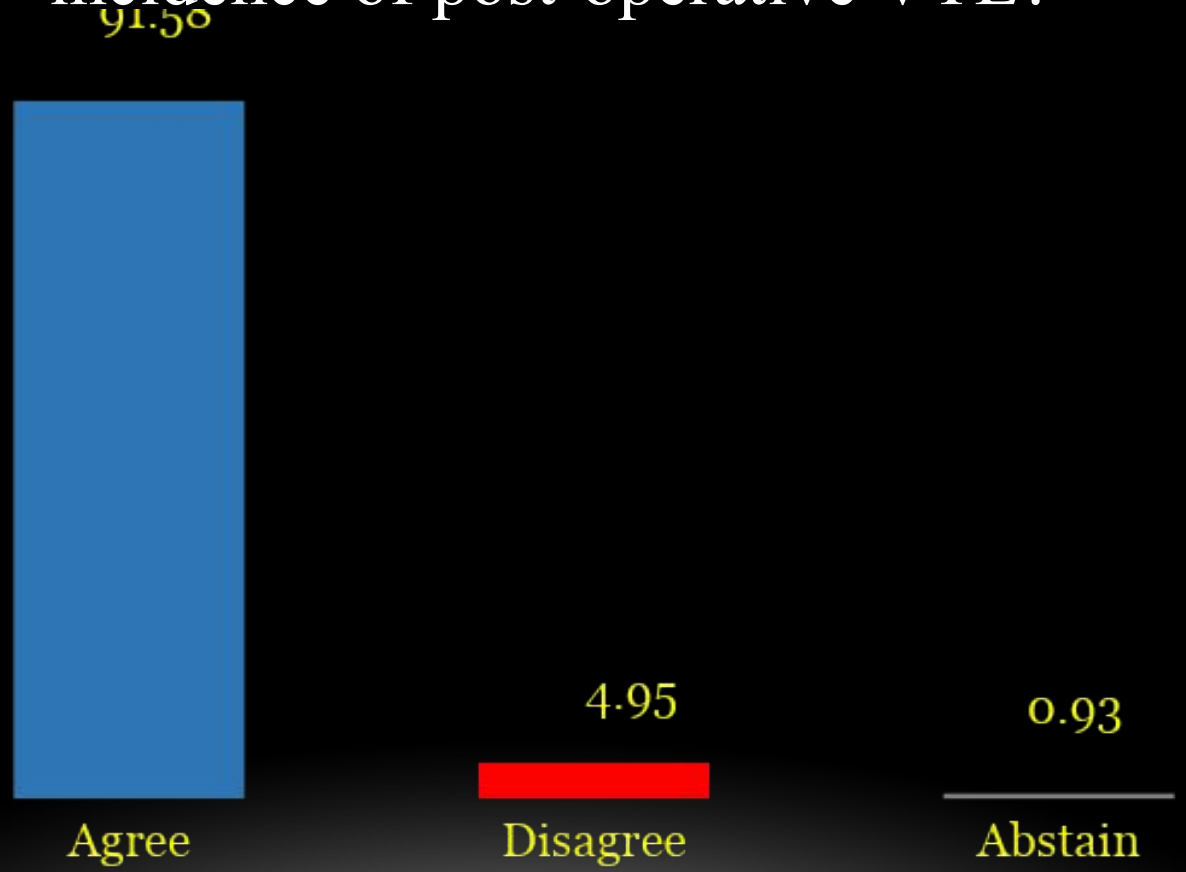



(Strong Consensus)

# ICM VTE General

19 - Does tourniquet applied to upper extremity influence the incidence of post-operative VTE?

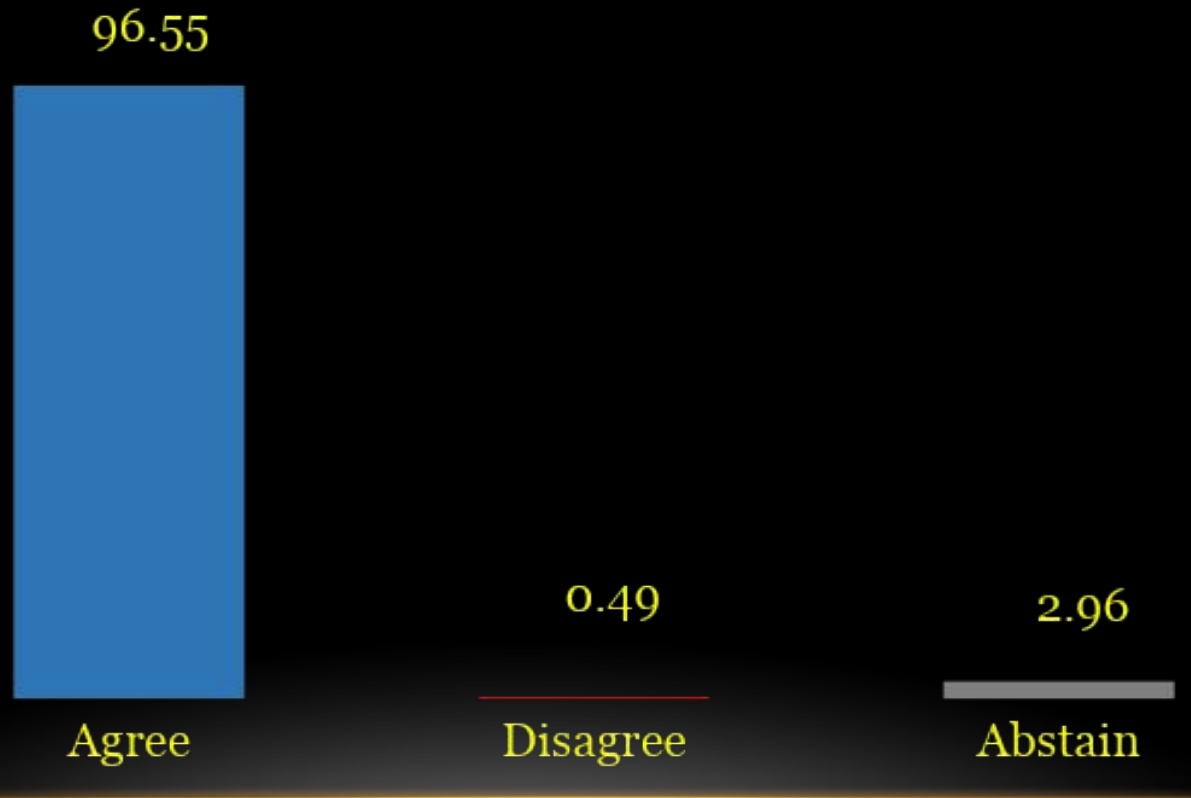
Response/Recommendation: There does not appear to be a high rate of venous thromboembolism (VTE) after the use of tourniquets for upper extremity surgery.

Strength of Recommendation: Limited.

*Surena Namdari, Samir Mehta*

# ICM VTE General

19 - Does tourniquet applied to upper extremity influence the incidence of post-operative VTE?




(Strong Consensus)

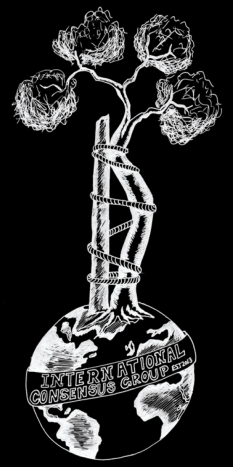
# ICM VTE General

20 - Is intraoperative heparin effective and safe to prevent postoperative VTE in patients undergoing orthopaedic procedures?

Response/Recommendation: Intravenous (IV) administration of intraoperative heparin to patients undergoing total hip arthroplasty (THA) has been investigated and found to be safe and effective in prevention of postoperative venous thromboembolism (VTE). Further studies are needed to evaluate the efficacy of this modality in other orthopaedic procedures.

Strength of Recommendation: Moderate.

*Sam Schulman, Alfredas Smailys, Nigel Sharrock*



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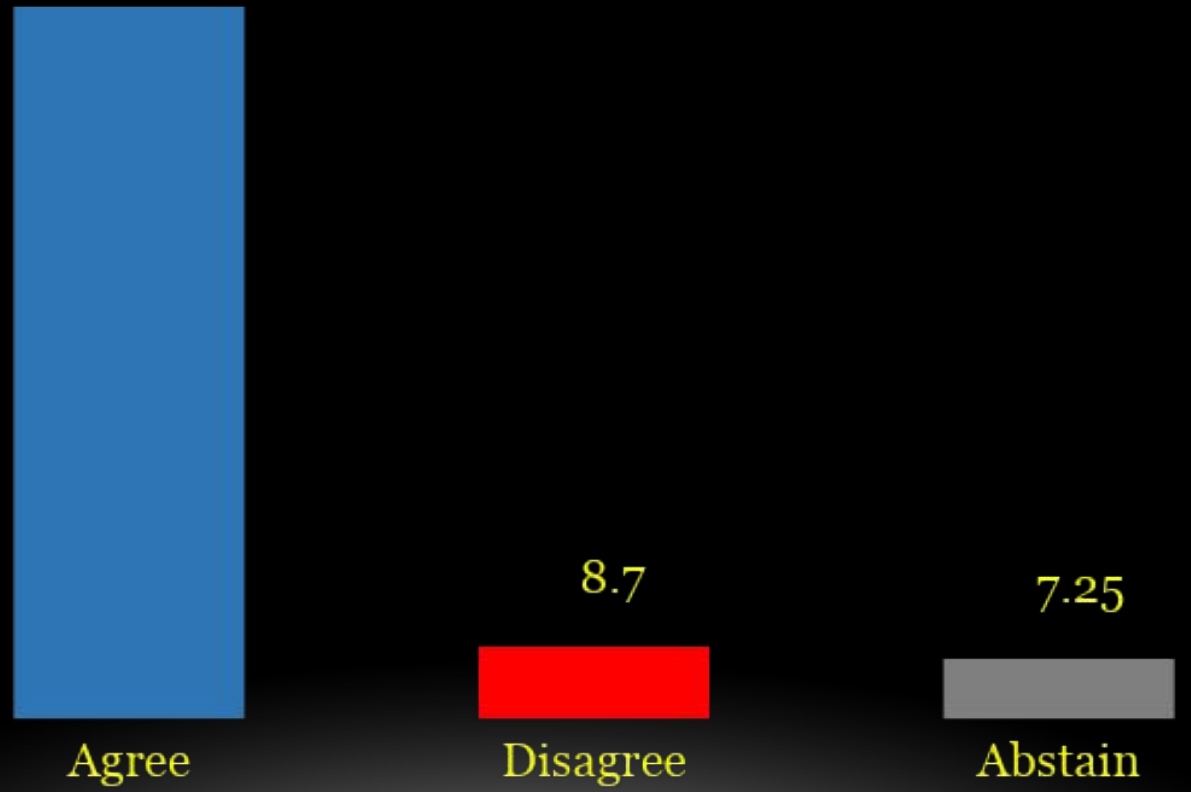



(Strong Consensus)

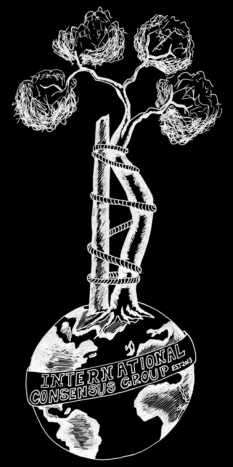
# ICM VTE General

21 - Does the type of anesthesia administered influence the risk of VTE in orthopaedic surgery?

Response/Recommendation: The use of neuraxial anes- thesia is associated with a reduced risk of venous thromboem- bolism (VTE) after lower extremity joint arthroplasty and should be considered as part of a multimodal prophylaxis regimen when feasible.

Strength of Recommendation: Moderate.

*Stavros G. Memtsoudis, Crispiana Cozowicz, Eugene R. Viscusi*



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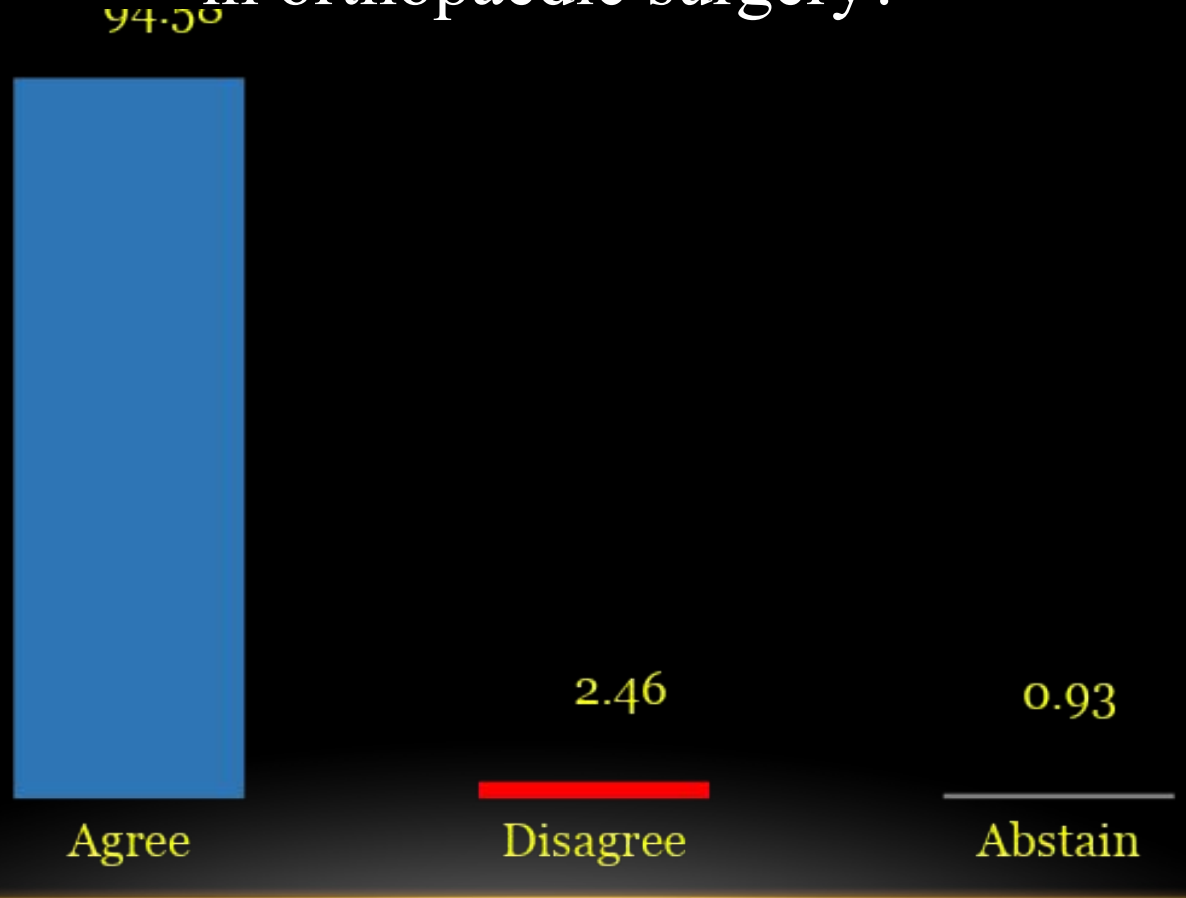



(Strong Consensus)

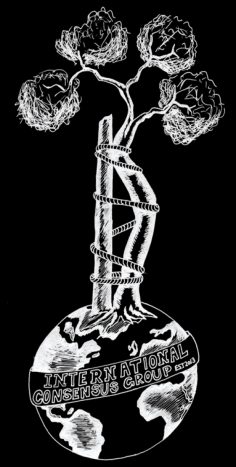
# ICM VTE General

## 22 - Does the use of PMMA cement during orthopaedic procedures influence the risk of subsequent VTE?

**Response/Recommendation:** Although polymethyl methacrylate (PMMA) cement and its component parts have not been demonstrated to be thrombogenic *in vitro*, the use of PMMA cement does influence the risk of subsequent embolization, some of which may be labeled as venous thromboembolism (VTE).

**Strength of Recommendation:** Moderate.

*Louis M. Kwong, Yoshi P. Djaja, Brett Levine*



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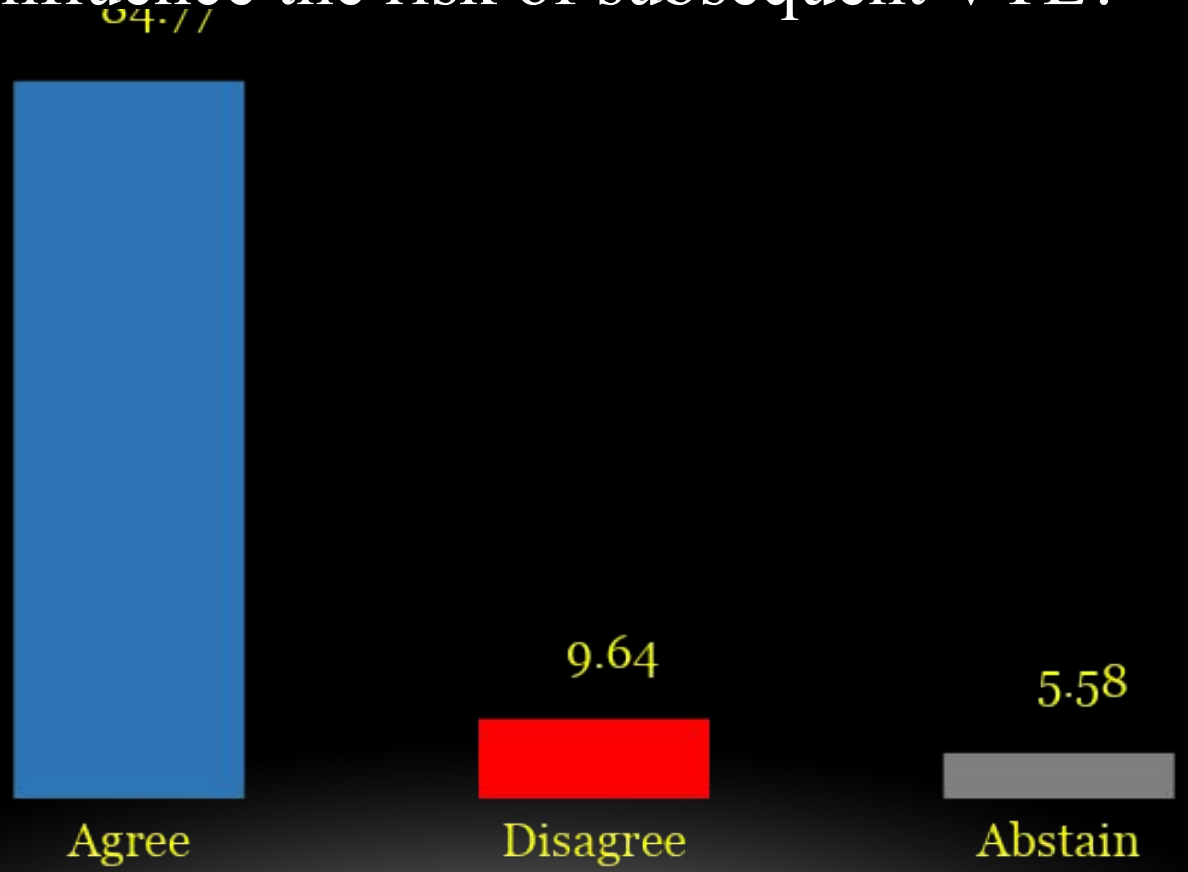



(Strong Consensus)

# ICM VTE General

## 23 - Does the intra-operative positioning of a patient undergoing orthopaedic surgery influence the risk of subsequent VTE?

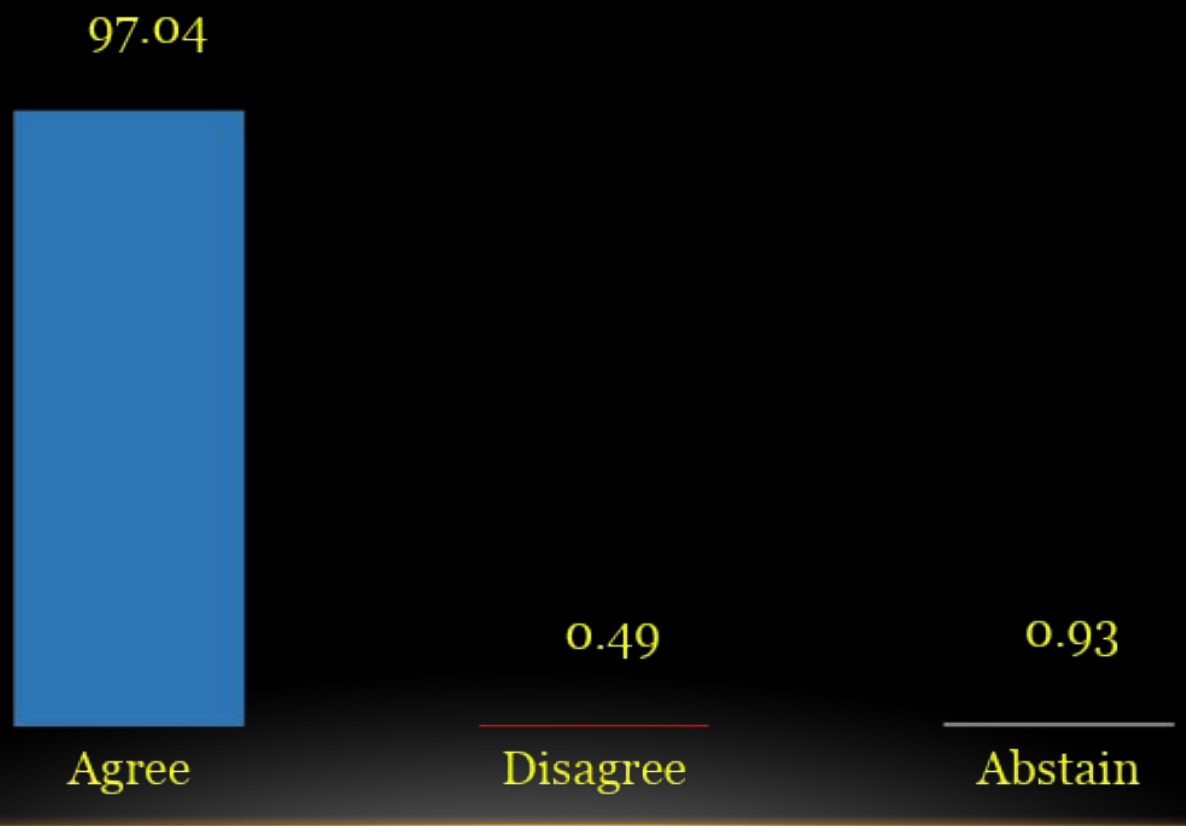
Response/Recommendation: While surgical positioning may influence the venous thromboembolism (VTE) risk after some orthopaedic surgical procedures, there are no high-quality studies addressing this issue. We recommend that surgeons base these decisions on optimal surgical site access/exposure as well as their technical expertise rather than as a strategy to reduce VTE risk.

Strength of Recommendation: Consensus.

*William H. Geerts, Nicholas M. Siegel, Jose A. Canseco*

# ICM VTE General

23 - Does the intra-operative positioning of a patient undergoing orthopaedic surgery influence the risk of subsequent VTE?




(Strong Consensus)

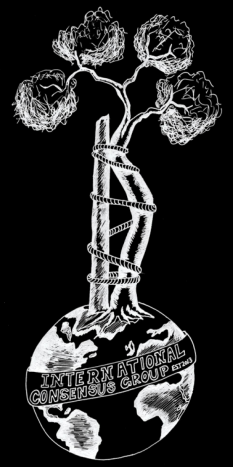
# ICM VTE General

## 24 - Is there a validated risk stratification scoring system that can be used for determining VTE risk of a patient undergoing orthopaedic procedures?

Response/Recommendation: There is currently no validated risk score that can be used across all orthopaedic sub- specialties. Most of the studies concerning risk scores have originated from joint replacement literature and generally use similar risk factors that classify patients as either high- or low- risk. Unfortunately, none of these scores have been properly externally validated. They also lack any assessment of major bleeding events. Furthermore, the impact of these risk scores on patient outcomes and decision-making remains unknown. Additional studies are required to address these major limitations.

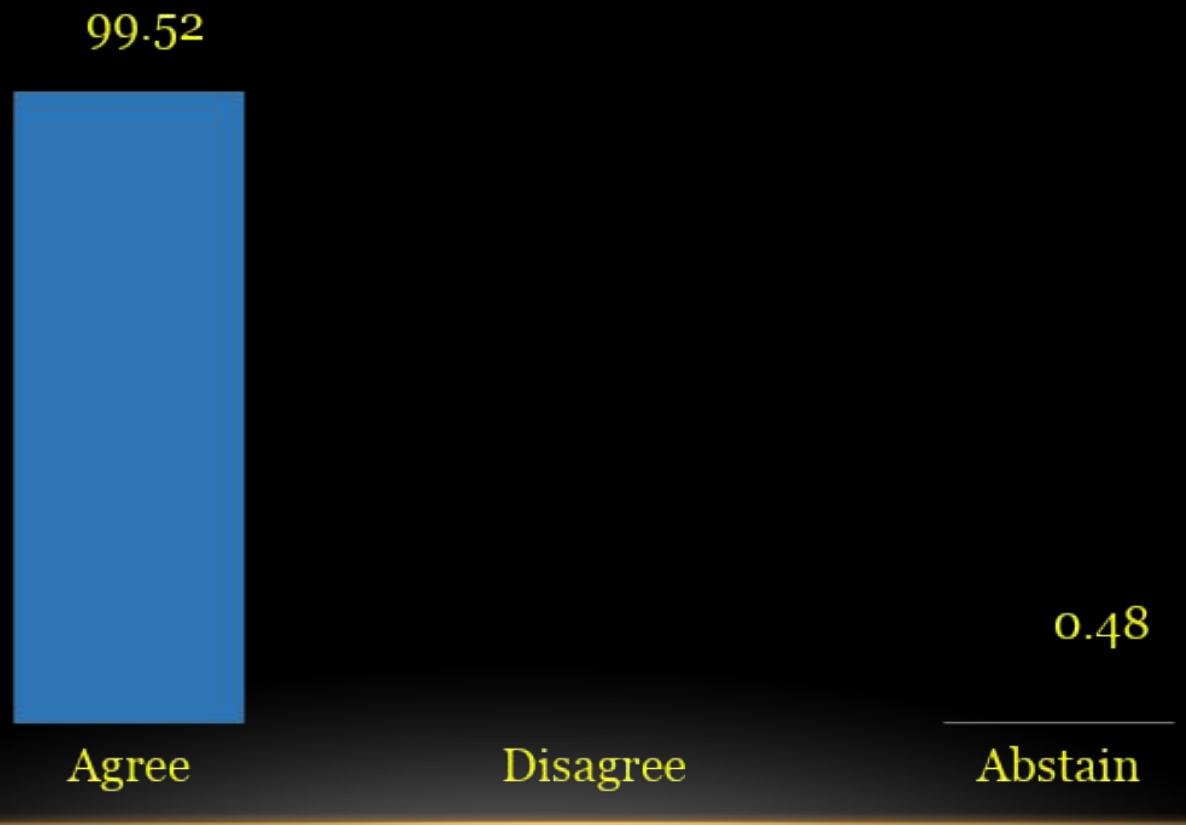
Strength of Recommendation: Moderate.

*Noam Shohat, Joseph A. Caprini, Pascal-Andre Vendittoli*



# ICM VTE General

24 - Is there a validated risk stratification scoring system that can be used for determining VTE risk of a patient undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 25 - Is there a risk stratification system for predicting major bleeding events following orthopaedic procedures?

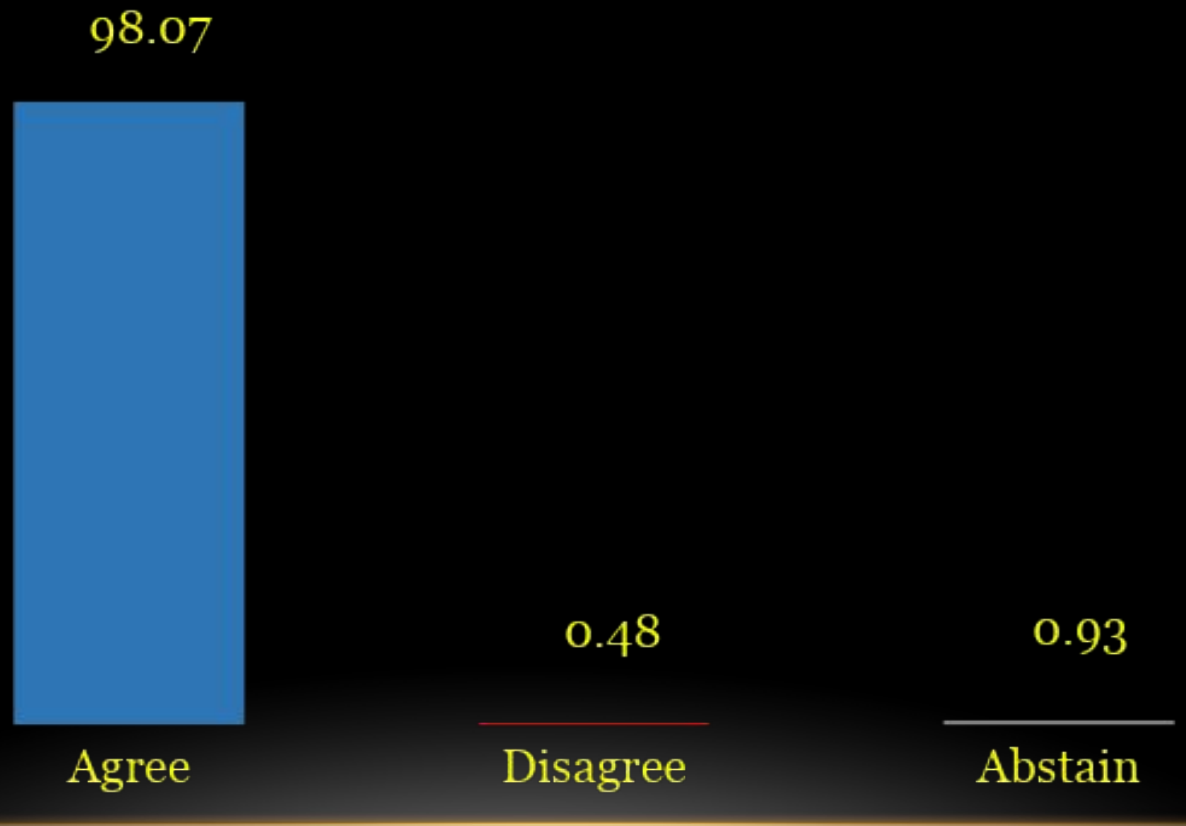
**Response/Recommendation:** There is no formal risk stratification system available for predicting major bleeding events following orthopaedic procedures. A recent consensus statement limited to patients on chronic oral anticoagulation undergoing specific surgical procedures does stratify the risk of bleeding events (high, low/moderate, and minimal).

**Strength of Recommendation:** Consensus.

*Gulraj S. Matharu, Michael R. Whitehouse*

# ICM VTE General

25 - Is there a risk stratification system for predicting major bleeding events following orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 26 - Is there a role for stratification of patients undergoing orthopaedic procedures for risk of bleeding? If so, should VTE prophylaxis be altered based on bleeding risk profile?

Response/Recommendation:

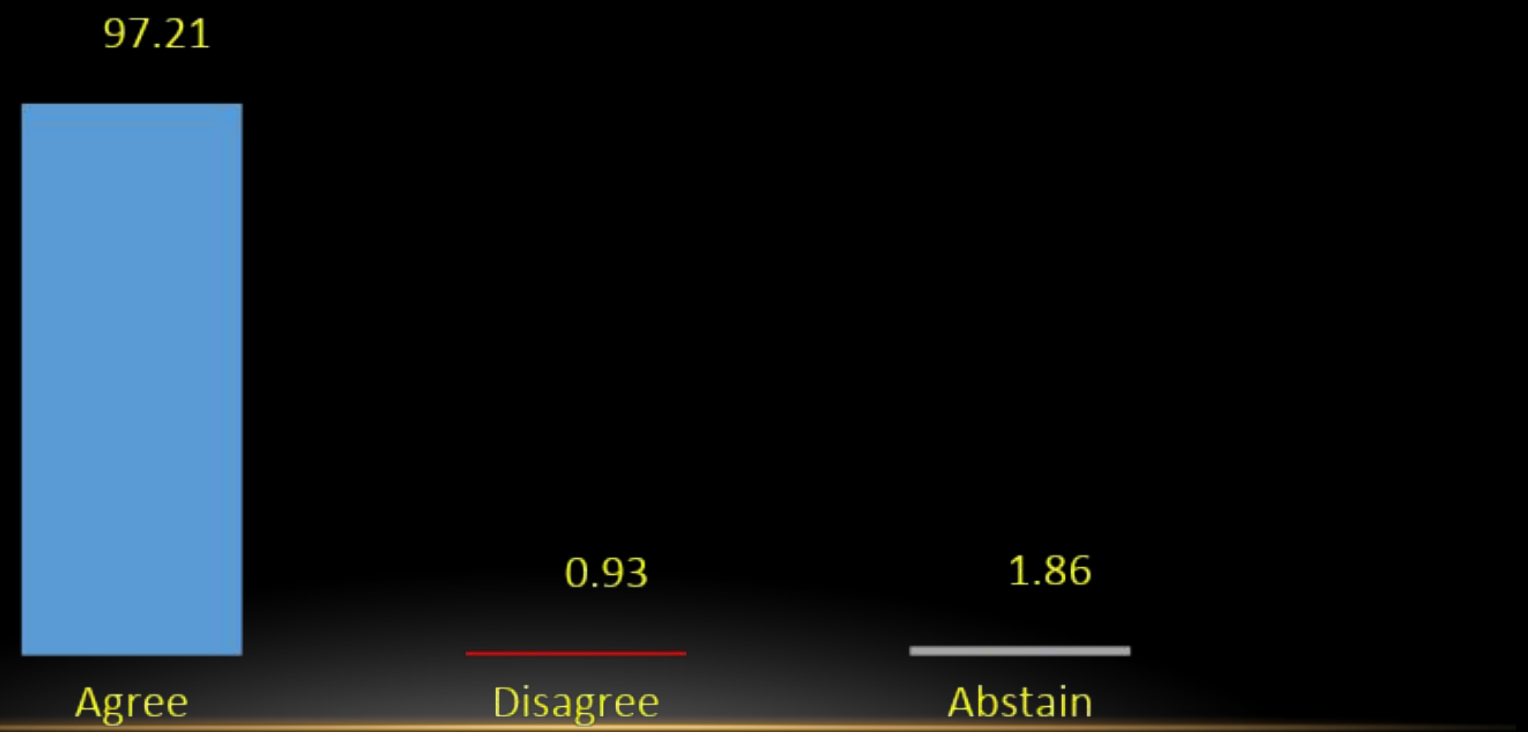
Given the incidence and severe outcomes of major bleeding events following orthopaedic procedures, there is definite need for risk stratification prior to surgery. While much attention has been put into identification of venous thromboembolism (VTE) risk factors and multiple guidelines exist attempting to mitigate this risk, major bleeding events (MBE) are serious complications that received less attention. Unjustifiably, MBE is often examined as a secondary outcome and therefore cohorts are too small to allow adequate statistical power for examining this issue.While current literature cannot support one chemoprophylaxis agent over the other in terms of MBE risk, it is important to consider that any potential benefit in terms of VTE risk reduction should be weighed against a potential increase in bleeding risk.

Strength of Recommendation: Limited.

*Omer Serdar Hakyemez, Ibrahim Azboy*

# ICM VTE General

26 - Is there a role for stratification of patients undergoing orthopaedic procedures for risk of bleeding? If so, should VTE prophylaxis be altered based on bleeding risk profile?




(Strong Consensus)

# ICM VTE General

27 - Is Thromboelastography (TEG) useful in predicting the risk of VTE in patients undergoing orthopaedic procedures?

Response/Recommendation:

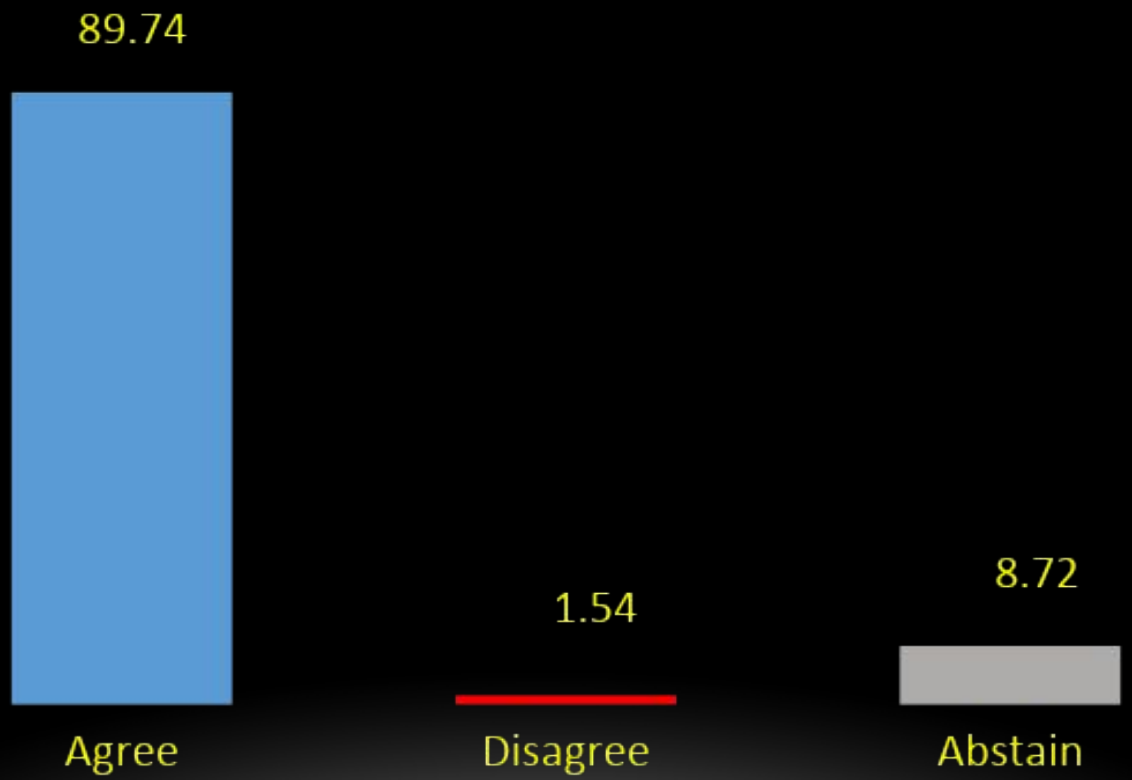
Although previously validated in other surgical subspecialties to predict venous thromboembolism (VTE), thromboelastography (TEG) has not been adequately trialed in patients undergoing orthopedic procedures. However, limited studies suggest that TEG is a useful adjunct for assessing orthopaedic hypercoagulopathy and VTE after traumatic injury and/or surgical intervention based upon a maximal amplitude (MA) > 65 mm.

Strength of Recommendation: Moderate.

*Christiaan N. Mamczak, Joshua L. Gary, Mark Walsh*

# ICM VTE General

27 - Is Thromboelastography (TEG) useful in predicting the risk of VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

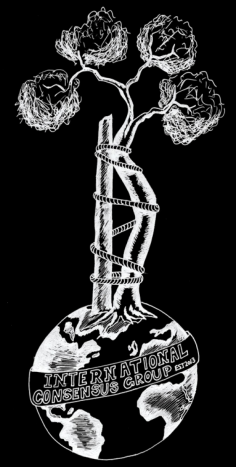
## 28 - Does lower extremity deep venous thrombosis arising after total joint arthroplasty propagate to cause pulmonary embolus?

Response/Recommendation:

Deep venous thrombosis (DVT) propagation, causing pulmonary embolus (PE), has been described in patients with unprovoked clots, and attributed to the prothrombotic phenotype of the individual. While it is recognized that a PE may arise from a DVT, a direct relationship between DVT propagation and a PE does not appear to exist for patients undergoing orthopedic procedures, in particular total joint arthroplasty (TJA).

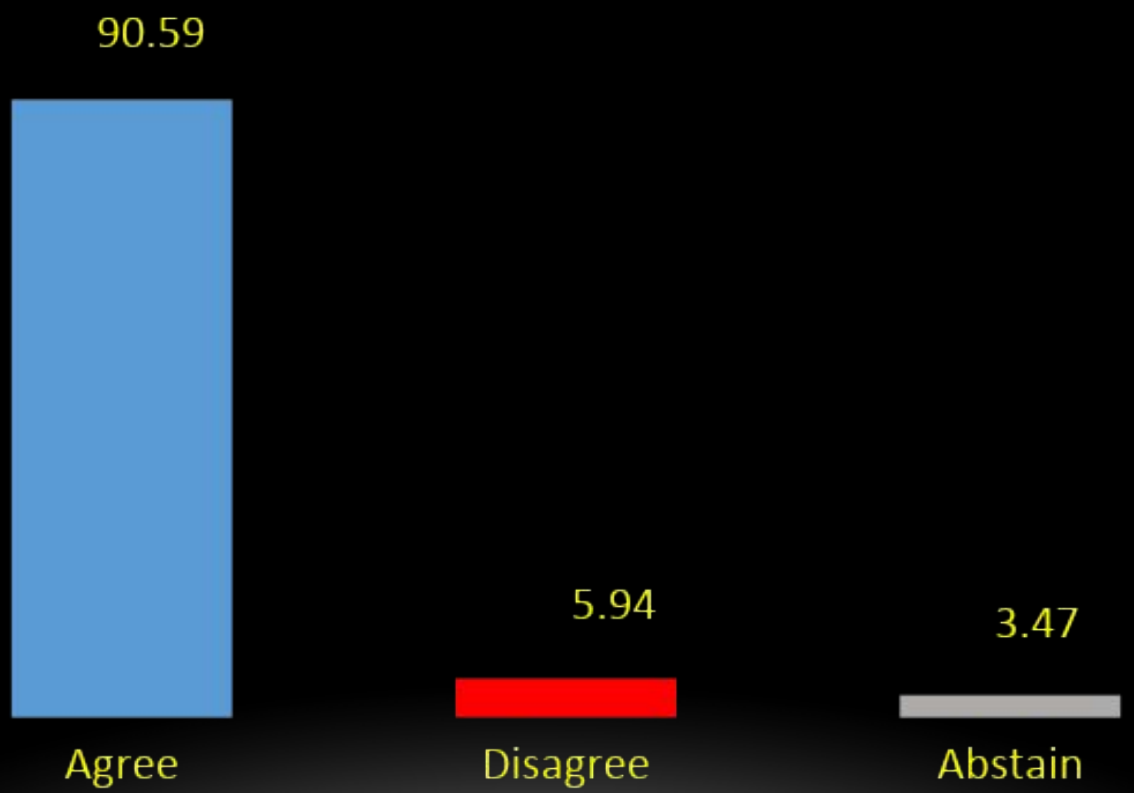
Strength of Recommendation: Moderate.

*Andrew J. Hughes, Emanuele Chisari, Javad Parvizi, Geoffrey Westrich, David Beverland*



# ICM VTE General

28 - Does lower extremity deep venous thrombosis arising after total joint arthroplasty propagate to cause pulmonary embolus?




(Strong Consensus)

# ICM VTE General

## 29 - How should patients with post-operative proximal (popliteal or supra-popliteal) DVT be managed?

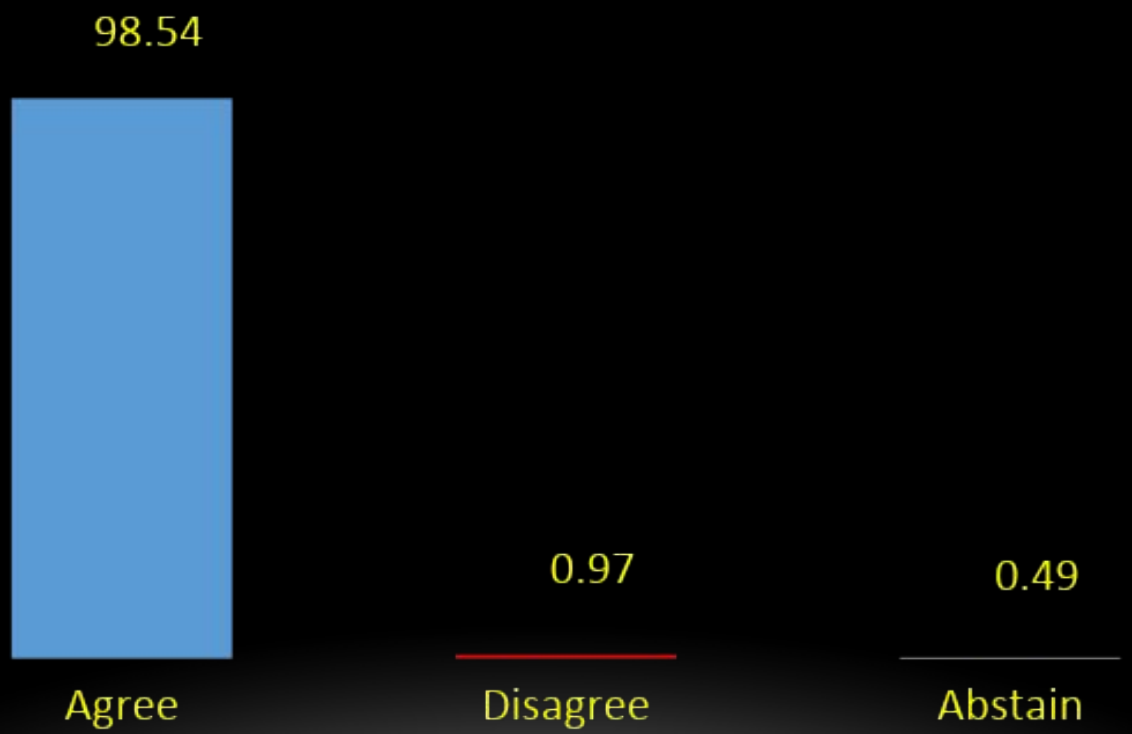
Response/Recommendation: In line with the current guidelines, we recommend that consideration should be given to treat proximal deep venous thrombosis (DVT), affecting popliteal or suprapopliteal vessels, arising acutely in patients undergoing orthopaedic procedures.

Strength of Recommendation: Moderate.

*Andrew J. Hughes, Emanuele Chisari, Javad Parvizi*

# ICM VTE General

29 - How should patients with post-operative proximal (popliteal or supra-popliteal) DVT be managed?




(Strong Consensus)

# ICM VTE General

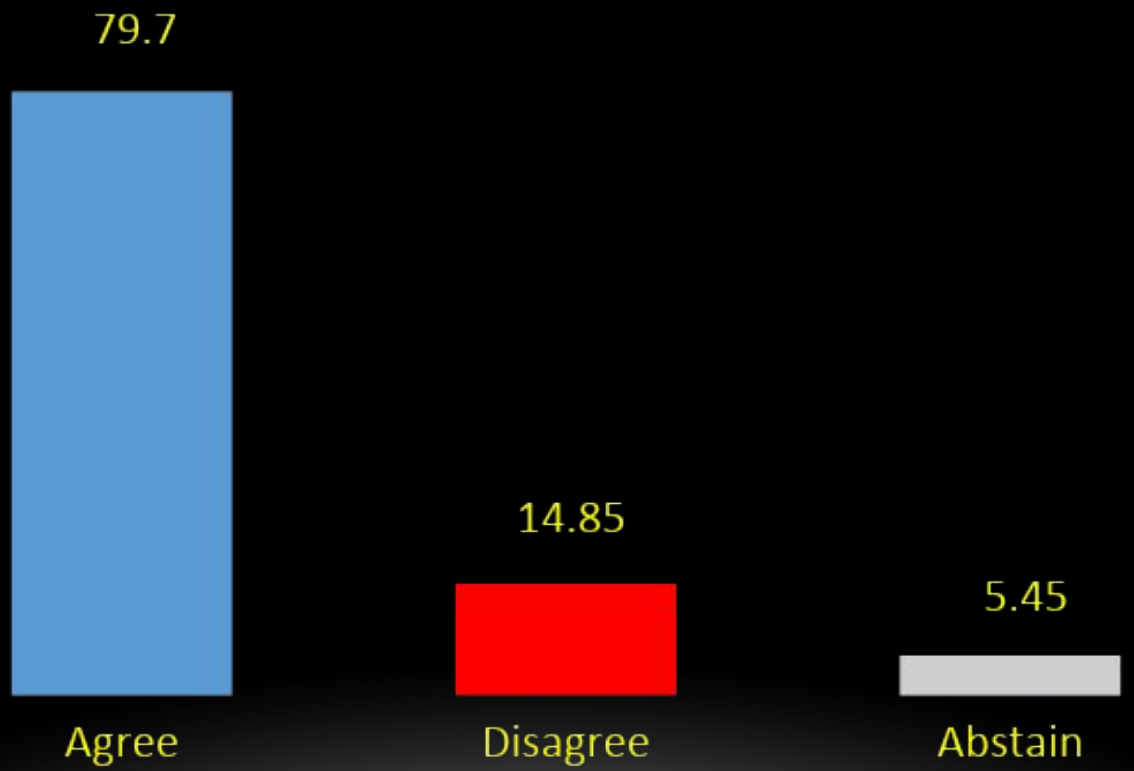
## 30 - How should patients with post-operative distal DVT be managed?

Response/Recommendation: In the absence of concrete evidence, the opinion of this workgroup is that patients with isolated distal deep venous thrombosis (DVT), can be monitored without treatment or treated by aspirin (ASA).
Strength of Recommendation: Limited.

*Karan Goswami, Brendan Gleason, Gregg R. Klein, William J. Hozack*

# ICM VTE General

30 - How should patients with post-operative distal DVT be managed?




(Strong Consensus)

# ICM VTE General

## 31 - How should a patient with a soleal vein thrombosis detected after an orthopaedic procedure be managed?

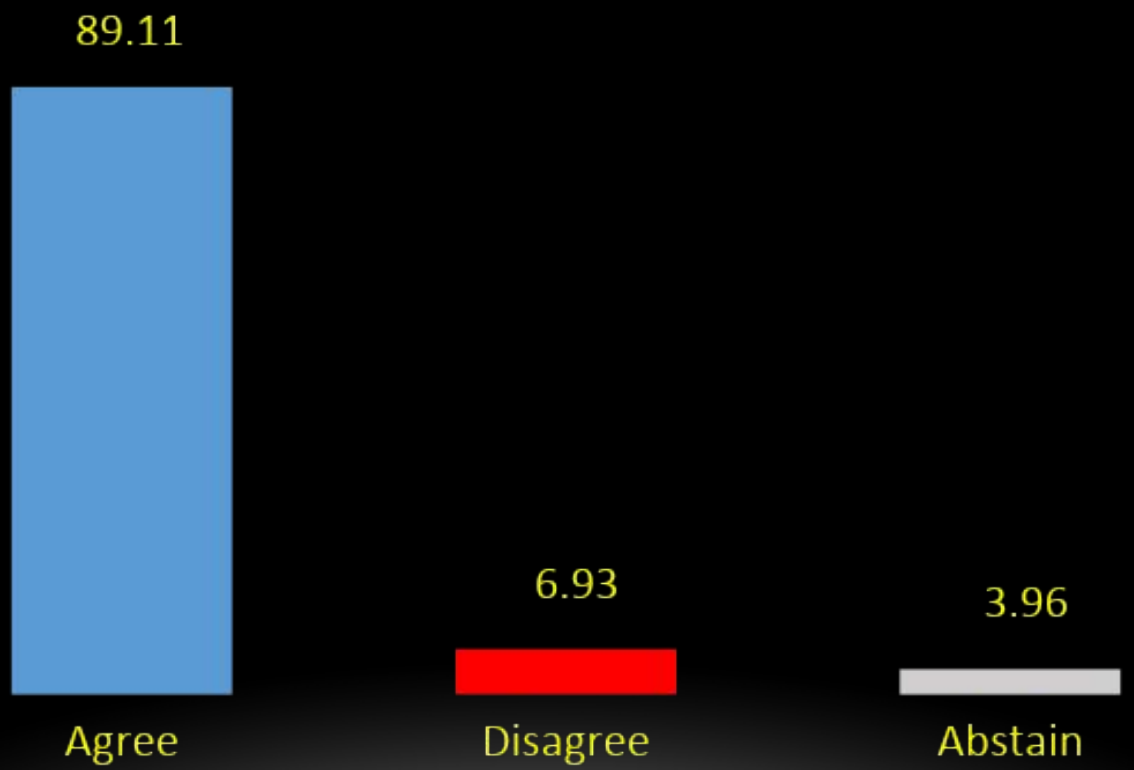
Response/Recommendation: There is little high-quality literature available regarding treatment of soleal vein thrombosis after orthopaedic surgery. The rate of propagation of soleal vein thrombosis to proximal veins is very low. Thus, these patients may be managed by close monitoring, which may include repeat imaging, and possible administration of aspirin (ASA).

Strength of Recommendation: Limited.

*William T. Li, Man Hong Cheung, Kenneth L. Urish*

# ICM VTE General

31 - How should a patient with a soleal vein thrombosis detected after an orthopaedic procedure be managed?




(Strong Consensus)

# ICM VTE General

## 32 - When do venous thromboembolism (VTE) episodes occur after orthopaedic procedures?

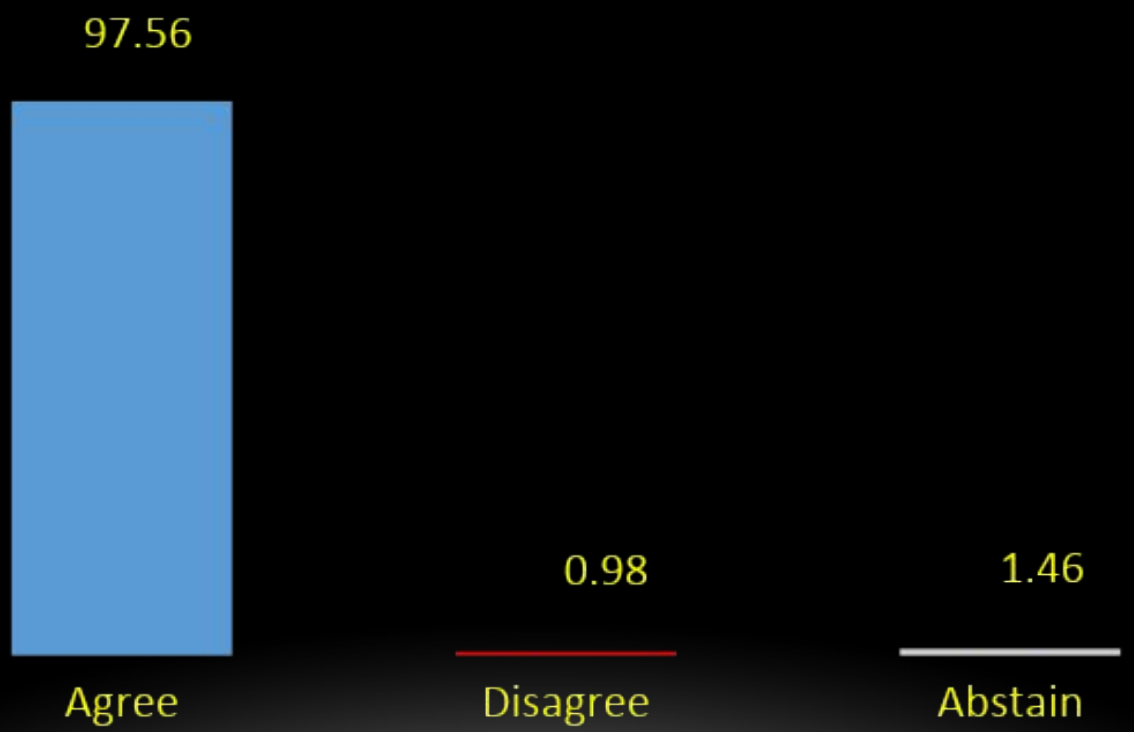
Response/Recommendation: The most critical period for venous thromboembolism (VTE) development is within the first month after orthopaedic surgery, but the risk of VTE may persist for longer.

Strength of Recommendation: Limited.

*Leanne Ludwick, Ibrahim Tuncay*

# ICM VTE General

32 - When do venous thromboembolism (VTE) episodes occur after orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 33 - Should a patient with active lower extremity DVT undergo an orthopaedic procedure?

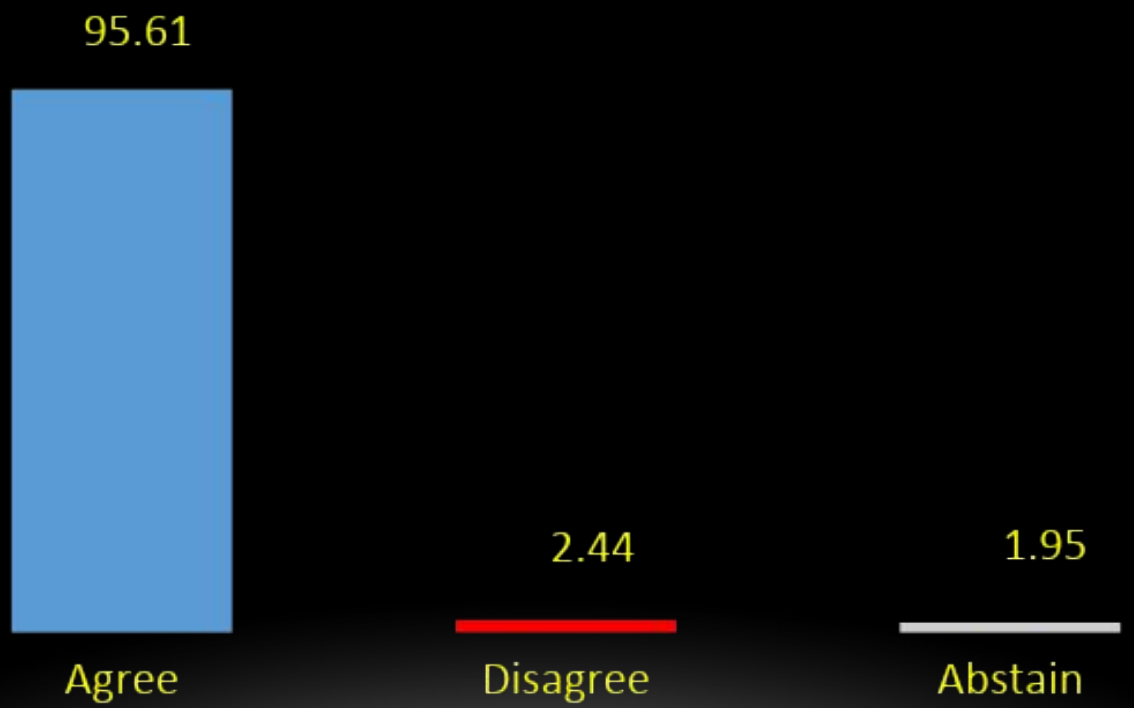
Response/Recommendation: There is limited scientific evidence to support the safety of orthopaedic surgery in a patient with an active deep venous thrombosis (DVT) or pulmonary embolism (PE). Thus, the management of these patients must be individualized based on the patient history, procedure, extent of the DVT/PE, physiologic parameters, and the risk of bleeding during and after surgery.

Strength of Recommendation: Limited.

*Michael Meghpara, James J. Purtill, Paul Tornetta III, Felix Vilchez*

# ICM VTE General

33 - Should a patient with active lower extremity DVT undergo an orthopaedic procedure?




(Strong Consensus)

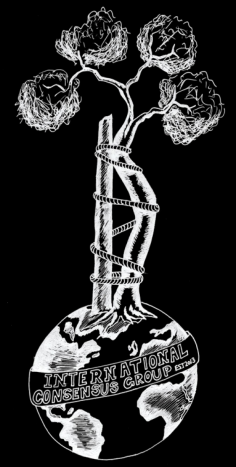
# ICM VTE General

## 34 - How long after a diagnosed DVT and/or PE can a patient undergo elective orthopaedic procedure?

Response/Recommendation: In the absence of definitive evidence, the opinion of this workgroup is that elective orthopaedic surgery should be delayed by 6 months in patients with a recently diagnosed deep venous thrombosis (DVT) and/ or pulmonary embolism (PE).

Strength of Recommendation: Consensus.

*Kristen Combs, Augustus C. Demanes, Eleni Moka, Mary K. Mulcahey, Ronald Navarro*



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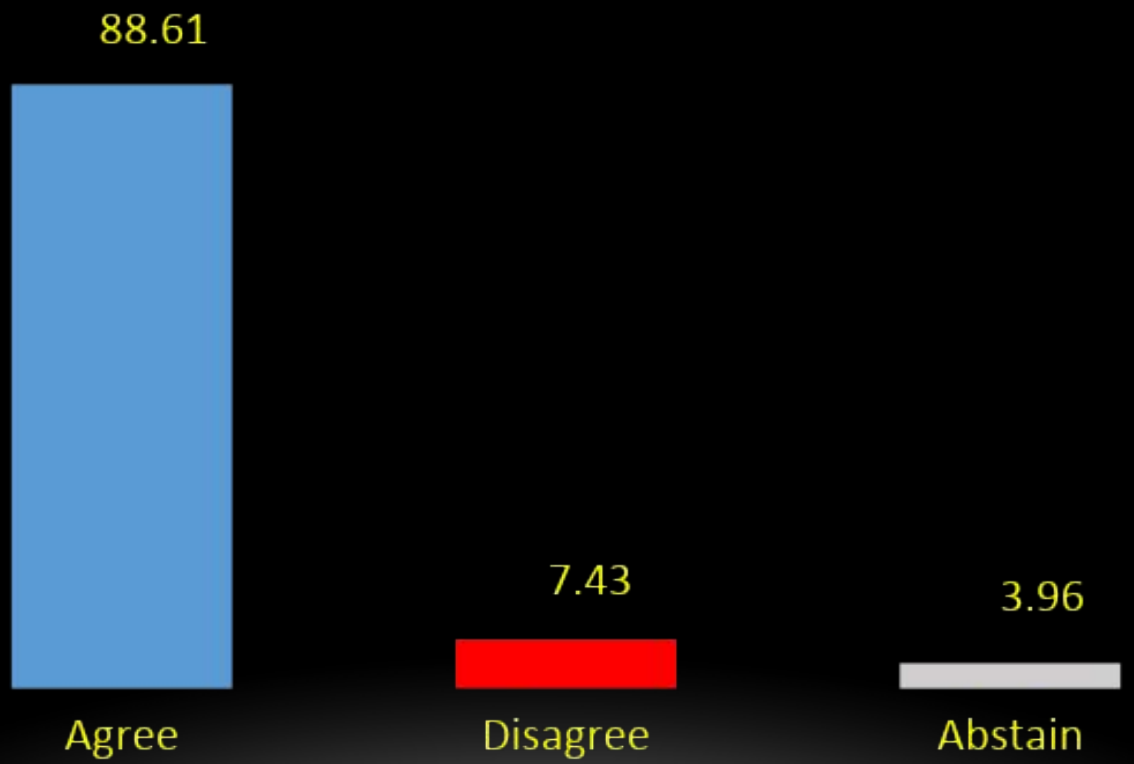



(Strong Consensus)

# ICM VTE General

35 - Are there adverse consequences of not treating acute lower extremity DVT in patients undergoing orthopaedic procedures?

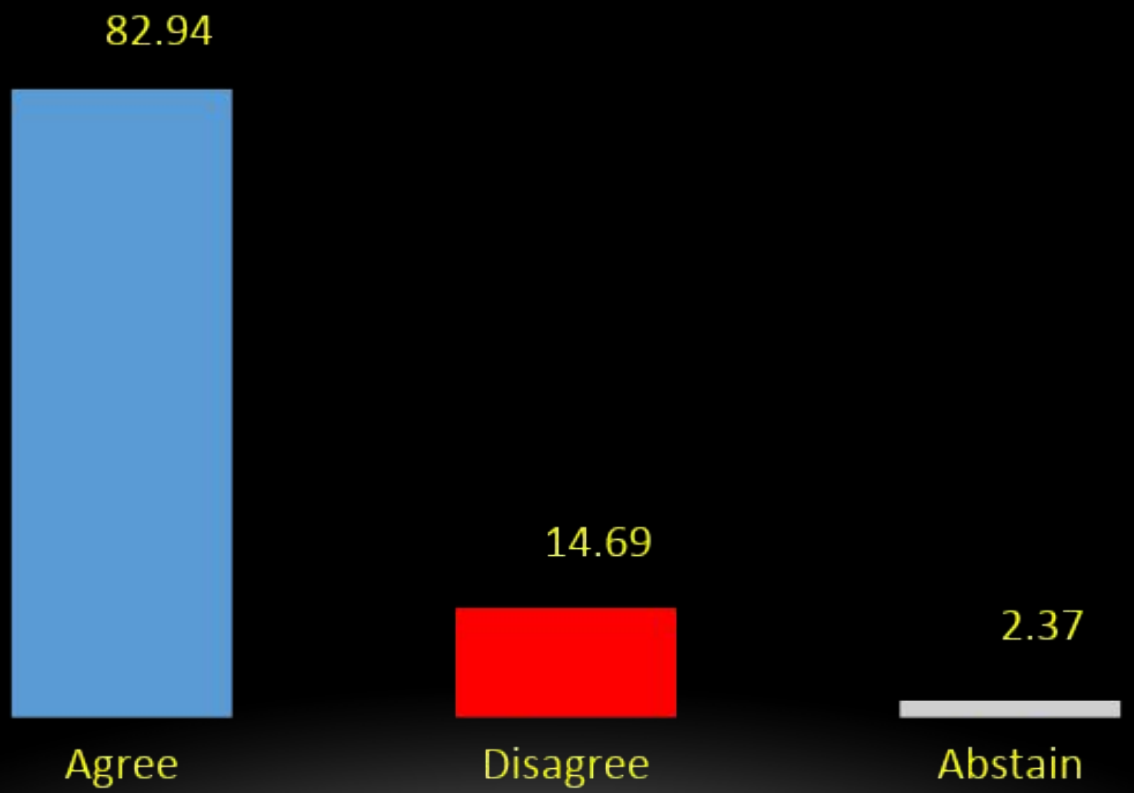
Response/Recommendation: Available data suggests that patients with proximal (above knee) lower extremity deep venous thrombosis (DVT) may be at higher risk of pulmonary embolism (PE). From the limited evidence, it appears that the majority of patients with distal DVTmay be left untreated with no adverse consequences.

Strength of Recommendation: Limited.

*Paul W. Ackermann, Mathias Granqvist, Gregg R. Klein*

# ICM VTE General

35 - Are there adverse consequences of not treating acute lower extremity DVT in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

36 - Should venous thromboembolism (VTE) screening be performed in asymptomatic patients undergoing orthopaedic surgery?

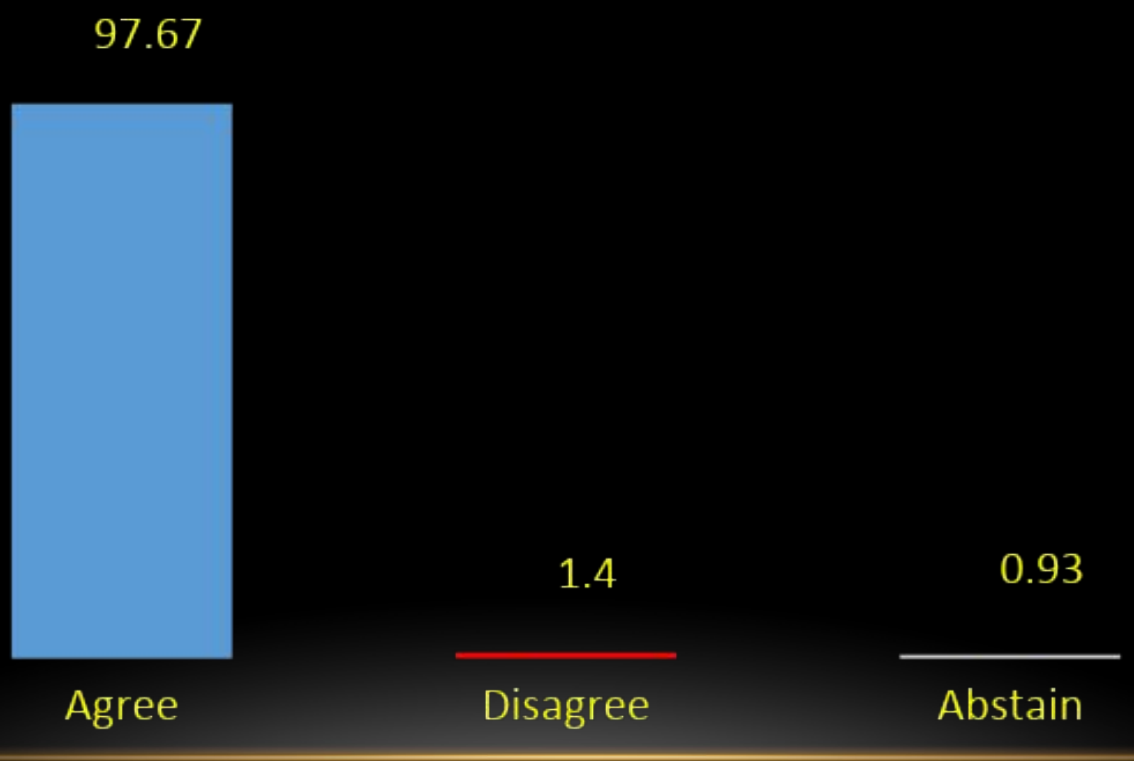
Response/Recommendation: Venous thromboembolism (VTE) screening with ultrasound is not recommended for asymptomatic patients before or after major orthopaedic surgery.

Strength of Recommendation: Moderate for postoperative screening and Limited for pre-operative screening.

*Daniel Caldeira, Aymard de Ladoucette, Taylor D'Amore*

# ICM VTE General

36 - Should venous thromboembolism (VTE) screening be performed in asymptomatic patients undergoing orthopaedic surgery?




(Strong Consensus)

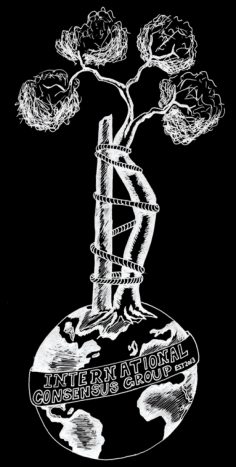
# ICM VTE General

## 37 - Are there specific clinical findings that are indicative of lower extremity DVT?

Response/Recommendation: The clinical diagnosis of lower extremity deep venous thrombosis (DVT) is nonspecific and individual clinical findings are of limited value in diagnosing DVT.

Strength of Recommendation: Moderate.

*Kazuki Yamada, Toshifumi Ozaki, Yutaka Inaba*



# ICM VTE General

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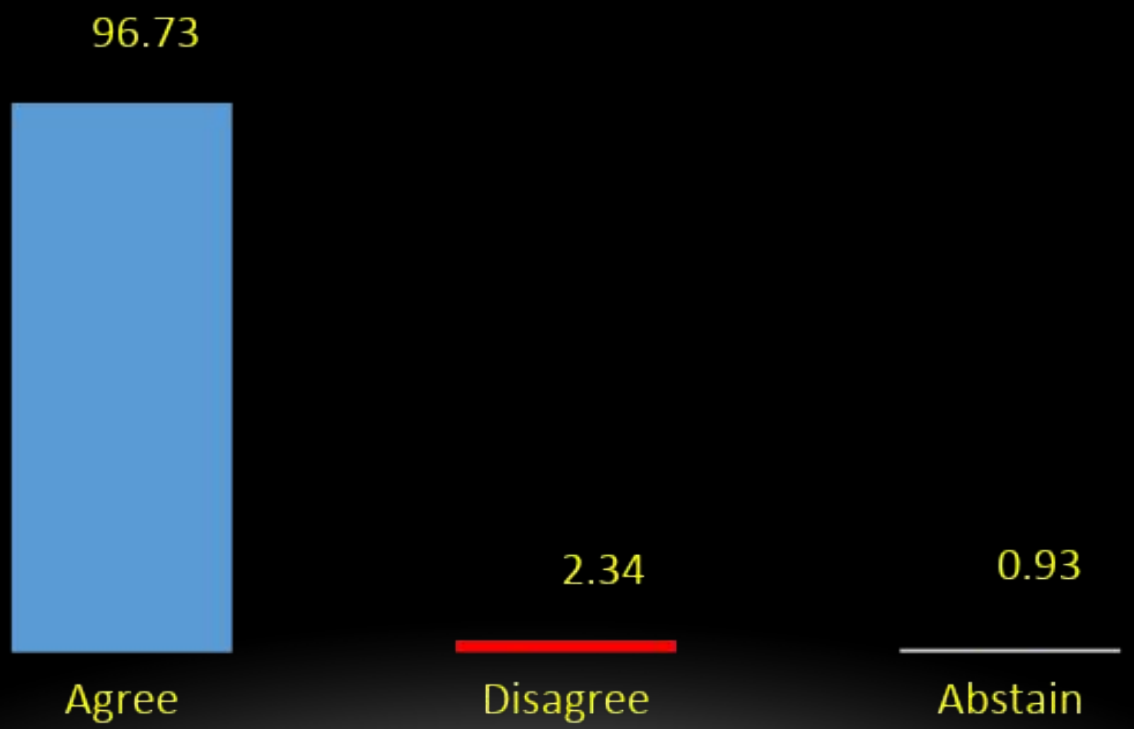



(Strong Consensus)

# ICM VTE General

## 38 - Are there any serological biomarkers for the diagnosis of DVT/PE?

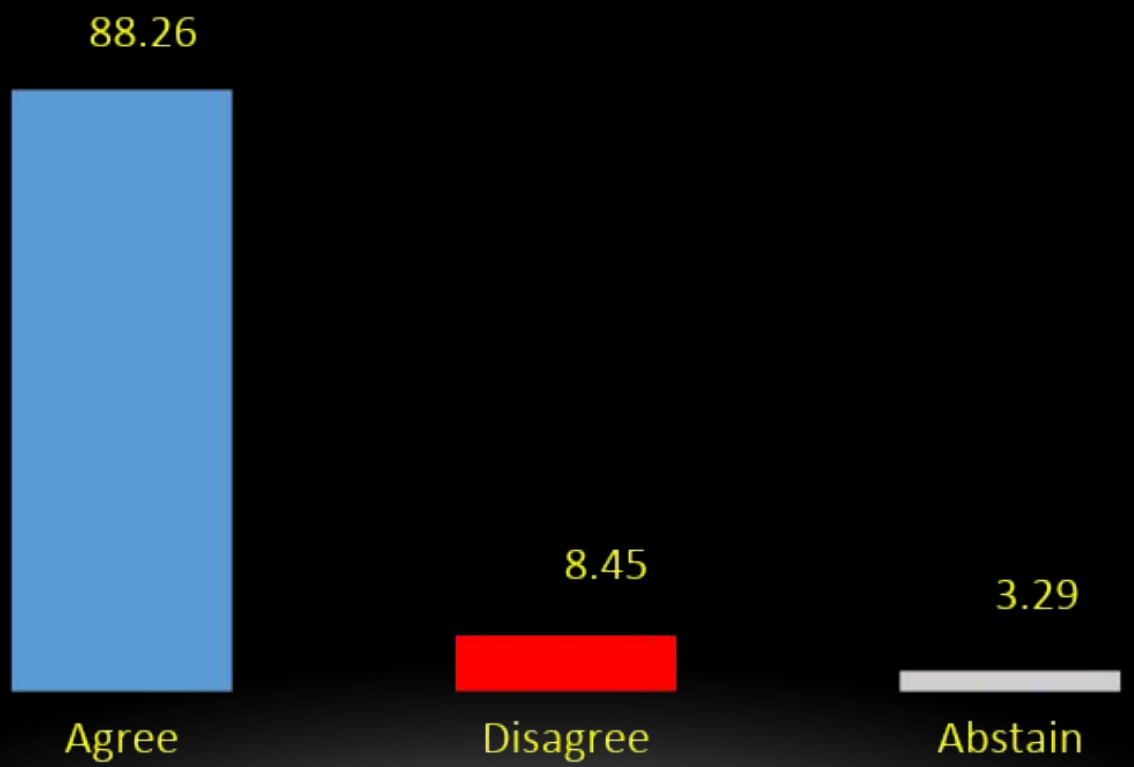
Response/Recommendation: There are makers that can be used for detecting the presence of deep venous thrombosis/ pulmonary embolism (DVT/PE). The most commonly used serological biomarker is the D-dimer. However, there are some other markers that are also available such as: PAI-1, SF, FDP, TAT and PF 1 1 2.

Strength of Recommendation: Grade-B. Fair evidence (Level II or III studies with consistent findings) for using serological markers.

*Sofiene Kallel, Meriem Souissi, Lalit Maini, Yasim Khan, Lokesh Goyal, Nishant Bhatia*

# ICM VTE General

38 - Are there any serological biomarkers for the diagnosis of DVT/PE?




(Strong Consensus)

# ICM VTE General

## 39 - What is the optimal imaging modality for detection of upper and lower extremity DVT for patients undergoing orthopaedic procedures?

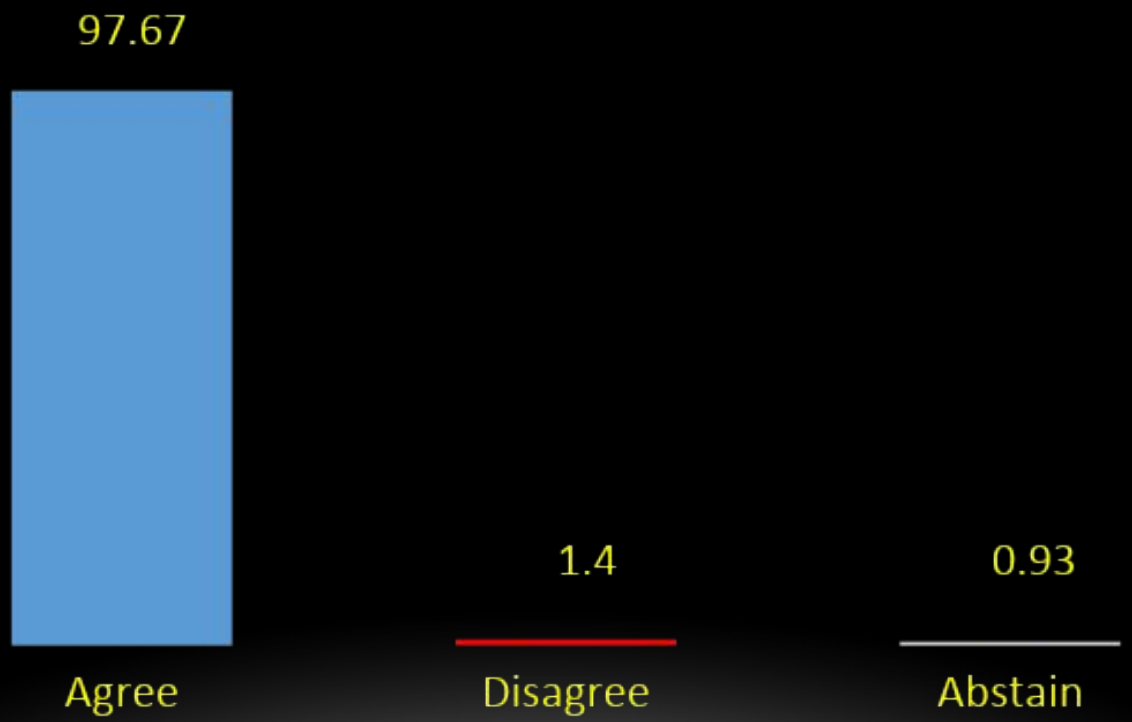
Response/Recommendation: The optimal imaging modality for the detection of upper and lower extremity deep venous thrombosis (DVT) is venous compression ultrasonography (CUS). The choice between proximal leg, whole-leg, and serial CUS should be guided by an assessment of clinical pretest probability.

Strength of Recommendation: Strong.

*Graham S. Goh, John J. Corvi, Sabine Eichinger*

# ICM VTE General

39 - What is the optimal imaging modality for detection of upper and lower extremity DVT for patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 40 - Is there a role for lower extremity venograms for the diagnosis of lower extremity DVT?

Response/Recommendation:

1- The use of lower extremity venograms for routine diagnosis of lower extremityeep venous thrombosis (DVT) is not recommended. For patients with suspicion of lower leg DVT requiring imaging, venous ultrasound (VUS) is recommended as the first diagnostic modality.

Strength of Recommendation: Strong.

2- In patients with suspicion of iliac or vena cava thrombosis, as well as inconclusive or impossible to perform VUS, computer tomography venography (CTV) or magnetic resonance venography (MRV) should be performed, based on availability and center experience.

Strength of Recommendation: Moderate.

3- In the patients withstrong suspicion for lower extremity DVT and inconclusive orimpossible to perform VUS, examination of the veins below the

inguinal ligament should be done with CTV, MRV or contrastphlebography.

Strength of Recommendation: Moderate.

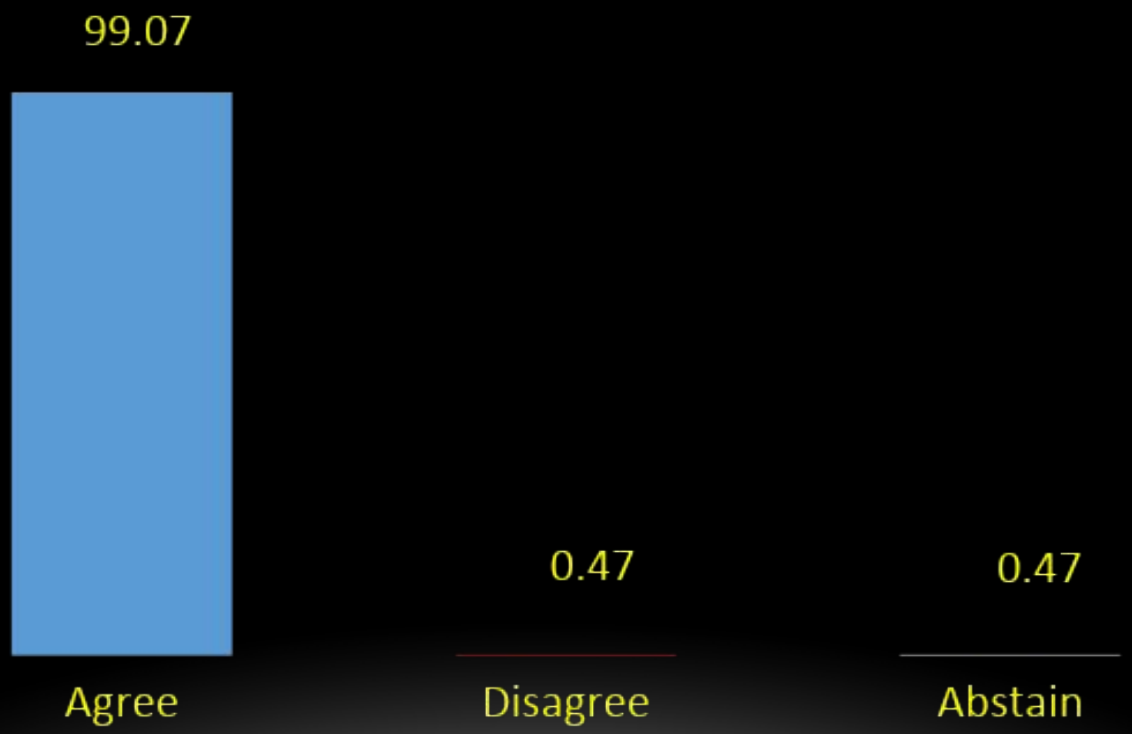
Response/Recommendation 4: In clinical trials with astudy endpoint including the presence of lower leg asymptomatic DVT, the use of contrast venography may be performedas these are required by the regulatory bodies.

Strength of Recommendation: Moderate.

*Tomasz Urbanek*

# ICM VTE General

40 - Is there a role for lower extremity venograms for the diagnosis of lower extremity DVT?




(Strong Consensus)

# ICM VTE General

## 41 - What is the most optimal imaging modality for diagnosis of pulmonary embolus (PE) following orthopaedic surgery?

Response/Recommendation: Advances in imaging have resulted in an increased ability to visualize emboli in the lungs, some of which may be clinically non-significant and may even not be a true pulmonary embolism (PE). The "gold standard" for diagnosis of PE is still the computer tomography pulmonary angiography (CTPA).

Strength of Recommendation: Strong.

*Saad Tarabichi, Eric B. Smith*

# ICM VTE General

41 - What is the most optimal imaging modality for diagnosis of pulmonary embolus (PE) following orthopaedic surgery?


(Strong Consensus)

# ICM VTE General

## 42 - Do pulmonary arterial filling defects seen on crosssectional imaging of the lung always represent a pulmonary embolism (PE)?

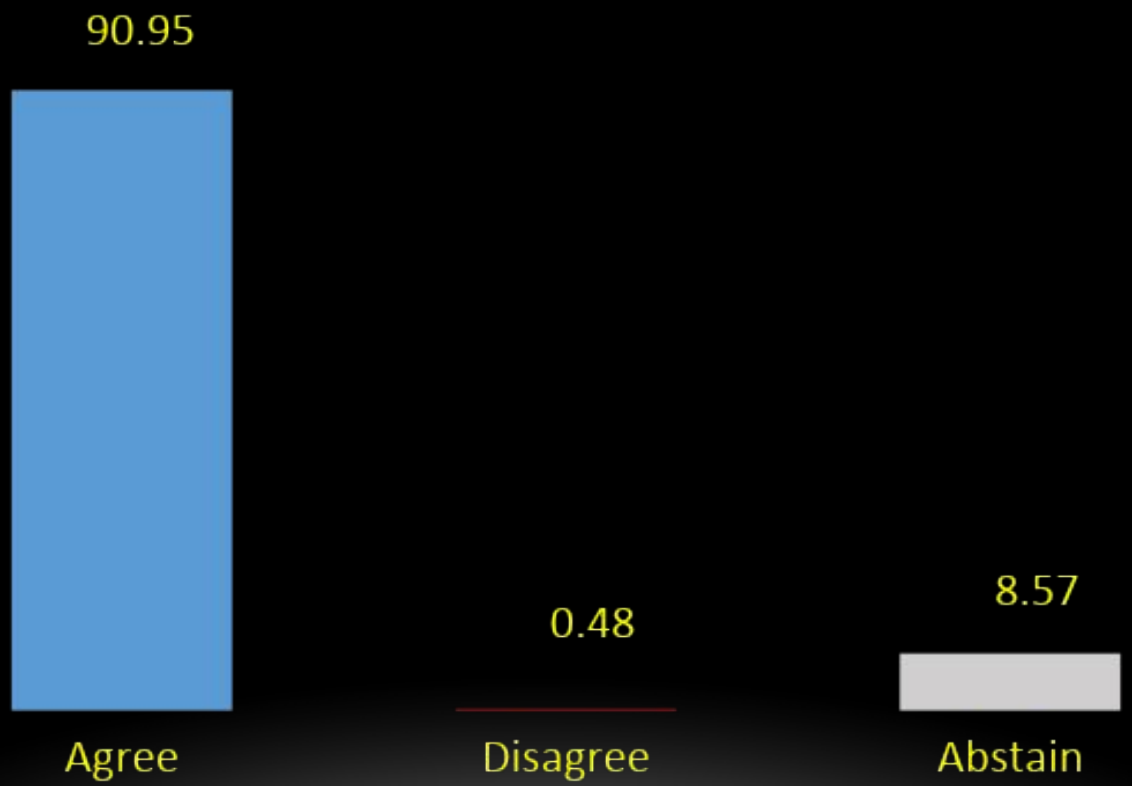
Response/Recommendation: Pulmonary arterial filling defects seen on cross-sectional imaging studies are not always indicative of pulmonary embolism (PE). There are several other conditions that can lead to arterial filling defects on crosssectional imaging studies such as primary pulmonary arterial (PA) neoplasm, pulmonary vascular involvement of IgG4- related disease (IgG4-RD), Behcet's disease, Takayasu's arteritis (TA), Hughes–Stovin syndrome (HSS), and pulmonary arterial streak artifact.

Strength of Recommendation: Strong.

*Alisina Shahi, Mary K. Mulcahey, Emmanuele Thienpont*

# ICM VTE General

42 - Do pulmonary arterial filling defects seen on crosssectional imaging of the lung always represent a pulmonary embolism (PE)?




(Strong Consensus)

# ICM VTE General

## 43 - Do all emboli detected on cross-sectional imaging of the lung lead to the same degree of oxygenation compromise (hypoxia)?

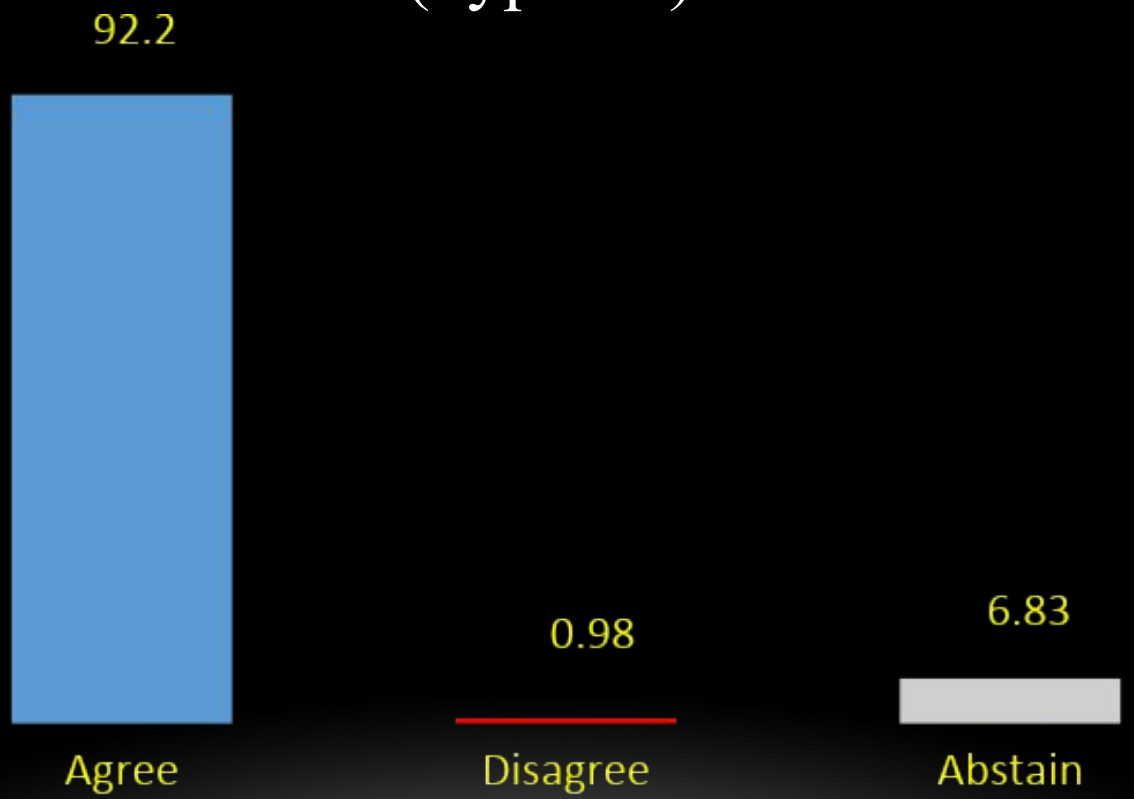
Response/Recommendation: While current evidence suggests that not all emboli detected on cross-sectional imaging of the lung result in the same degree of hypoxia, evidence is conflicting regarding the association between emboli size and location to the degree of patient hypoxia. Providers should continue to risk stratify patients with acute pulmonary embolism (PE) by hemodynamic status and right ventricular dysfunction in accordance with the European Society of Cardiology (ESC) 2019 and the American Society of Hematology (ASH) 2020 guidelines for management of venous thromboembolism (VTE).

Strength of Recommendation: Limited.

*Tyler J. Humphrey, Geno J. Merli, Stavros V. Konstantinides, Hany S. Bedair*

# ICM VTE General

43 - Do all emboli detected on cross-sectional imaging of the lung lead to the same degree of oxygenation compromise (hypoxia)?




(Strong Consensus)

# ICM VTE General

## 44 - Is there an association between pulmonary embolus and secondary pulmonary hypertension after major orthopaedic surgery?

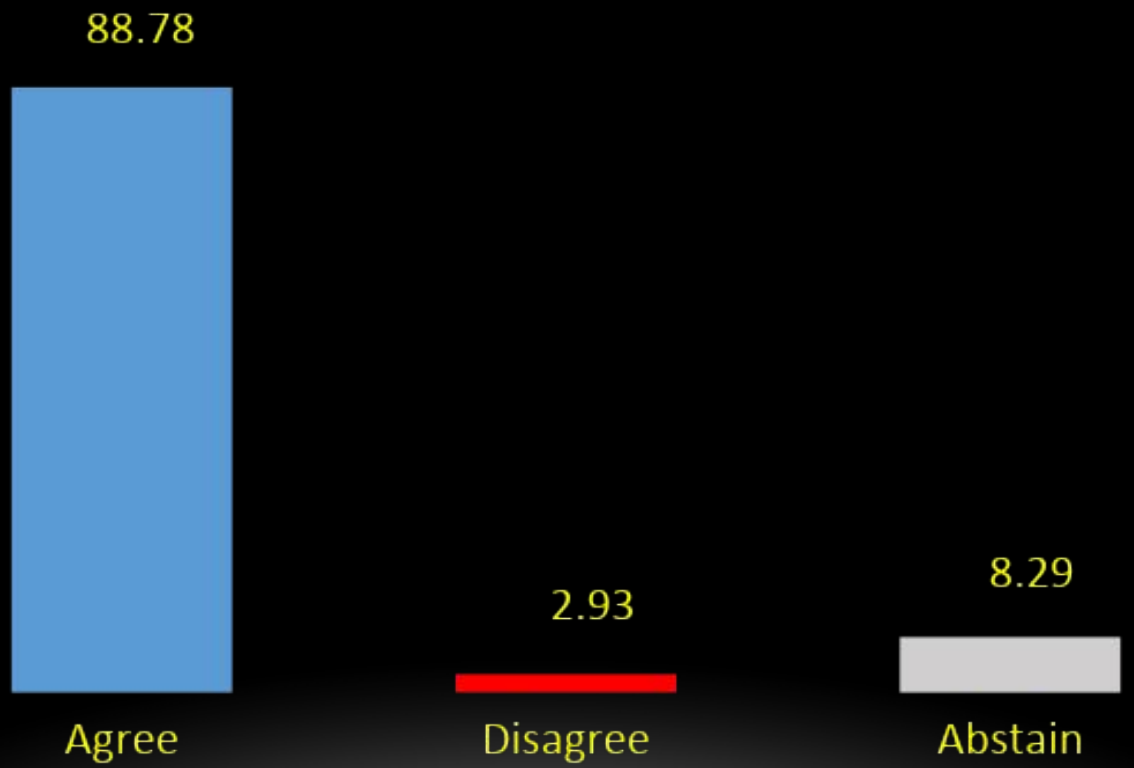
Response/Recommendation: Chronic thromboembolic pulmonary hypertension (CTEPH) is strongly associated with prior pulmonary embolism (PE); however, this association has not been adequately explored following major orthopaedic surgeries. Given that PE is a known complication following orthopaedic surgery and incidence of CTEPH after PE is between 0.1% and 9.1%, evaluation for CTEPH after postsurgical PE should be considered to allow for early treatment, particularly pulmonary endarterectomy (PEA), and to prevent downstream sequelae and mortality.

Strength of Recommendation: Limited.

*Mohammad S. Abdelaal, Amar H. Kelkar, Anita Rajasekhar, Peter F. Sharkey*

# ICM VTE General

44 - Is there an association between pulmonary embolus and secondary pulmonary hypertension after major orthopaedic surgery?




(Strong Consensus)

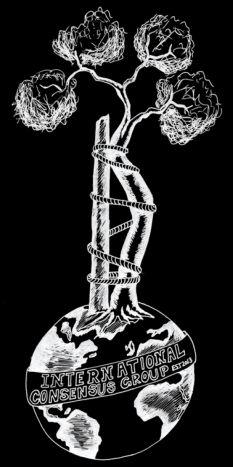
# ICM VTE General

## 45 - Is administration of any venous thromboembolism (VTE) prophylaxis effective in reducing the risk of fatal pulmonary embolism (PE)?

Response/Recommendation: There is no evidence that venous thromboembolism (VTE) prophylaxis reduces the risk of fatal pulmonary embolism (PE) in elective orthopaedic procedures, including lower limb joint replacement. In patients with a hip fracture, there is limited evidence that aspirin (ASA) may reduce fatal PE, but the strength of evidence does not support a recommendation.

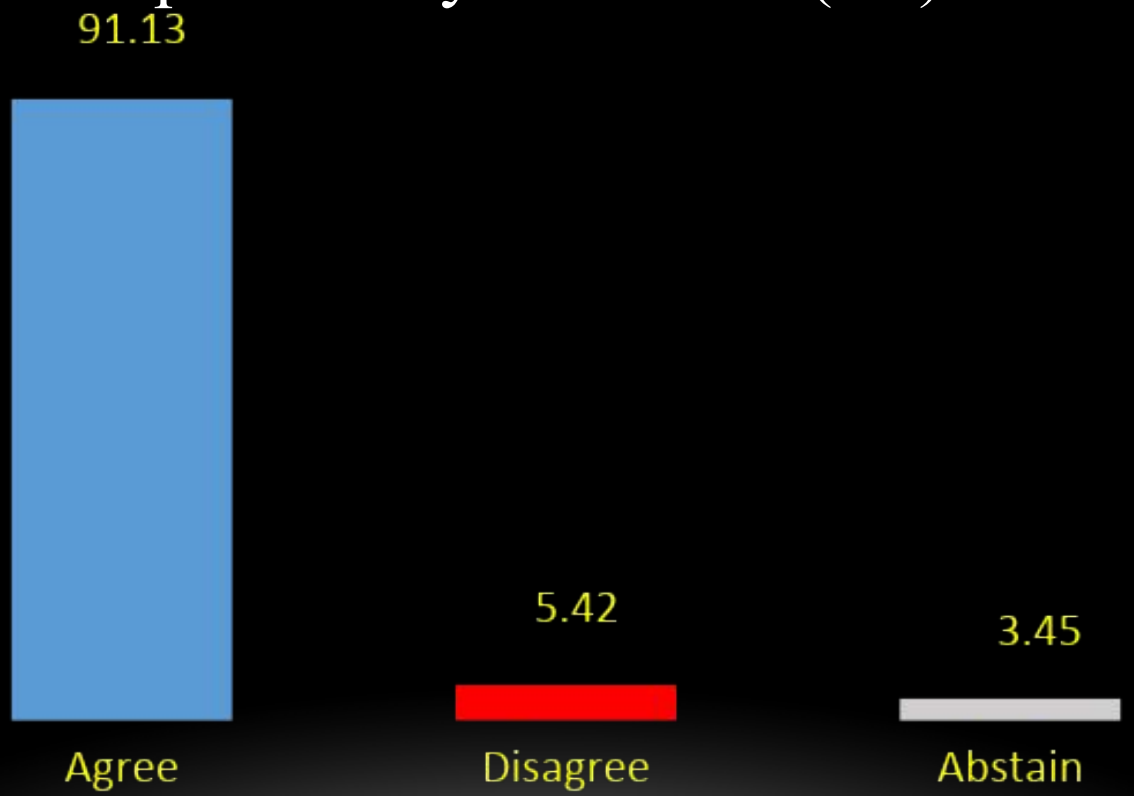
Strength of Recommendation: Limited.

*Benjamin R. Emmerson, Karan Goswami, Mike Reed*



# ICM VTE General

45 - Is administration of any venous thromboembolism (VTE) prophylaxis effective in reducing the risk of fatal pulmonary embolism (PE)?




(Strong Consensus)

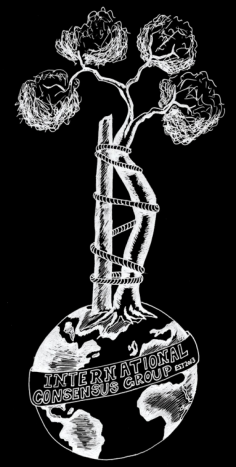
# ICM VTE General

## 46 - What endpoint should be used to determine the efficacy of a venous thromboembolism (VTE) prophylactic agent?

Response/Recommendation: The occurrence of symptomatic deep venous thrombosis (DVT) and pulmonary embolism (PE) should be used as an endpoint to evaluate the efficacy of a venous thromboembolism (VTE) prophylactic agent.

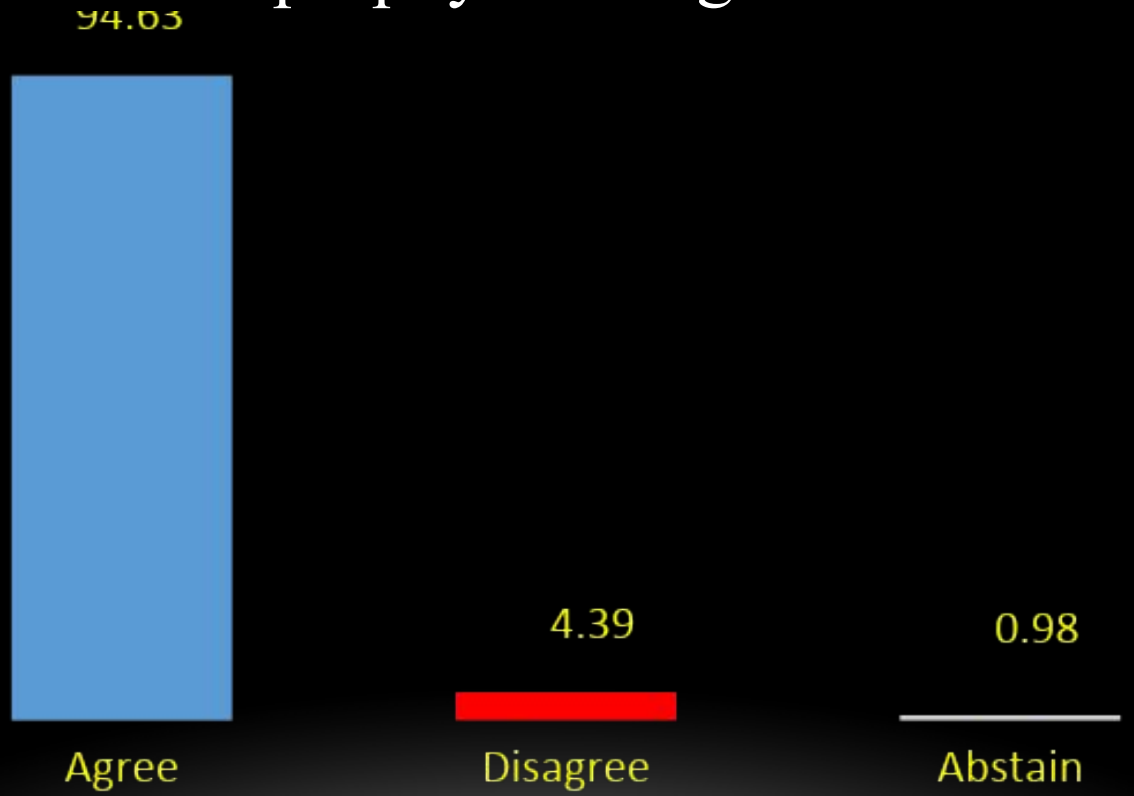
Strength of Recommendation: Moderate.

*Jessica Morton, Irfan A. Khan, Diana Fernandez-Rodriguez, Colin M. Baker, Javad Parvizi*



# ICM VTE General

46 - What endpoint should be used to determine the efficacy of a venous thromboembolism (VTE) prophylactic agent?




(Strong Consensus)

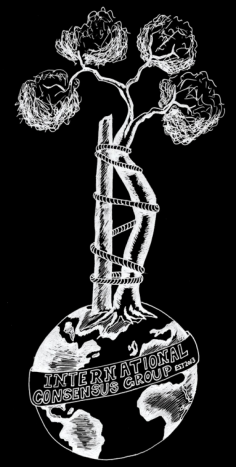
# ICM VTE General

## 47 - What is the optimal duration of VTE prophylaxis following major orthopaedic procedures?

Response/Recommendation: Following major orthopaedic surgery venous thromboembolism (VTE) prophylaxis-initiated in-hospital- should be continued for 14 to 35 days after patient discharge.

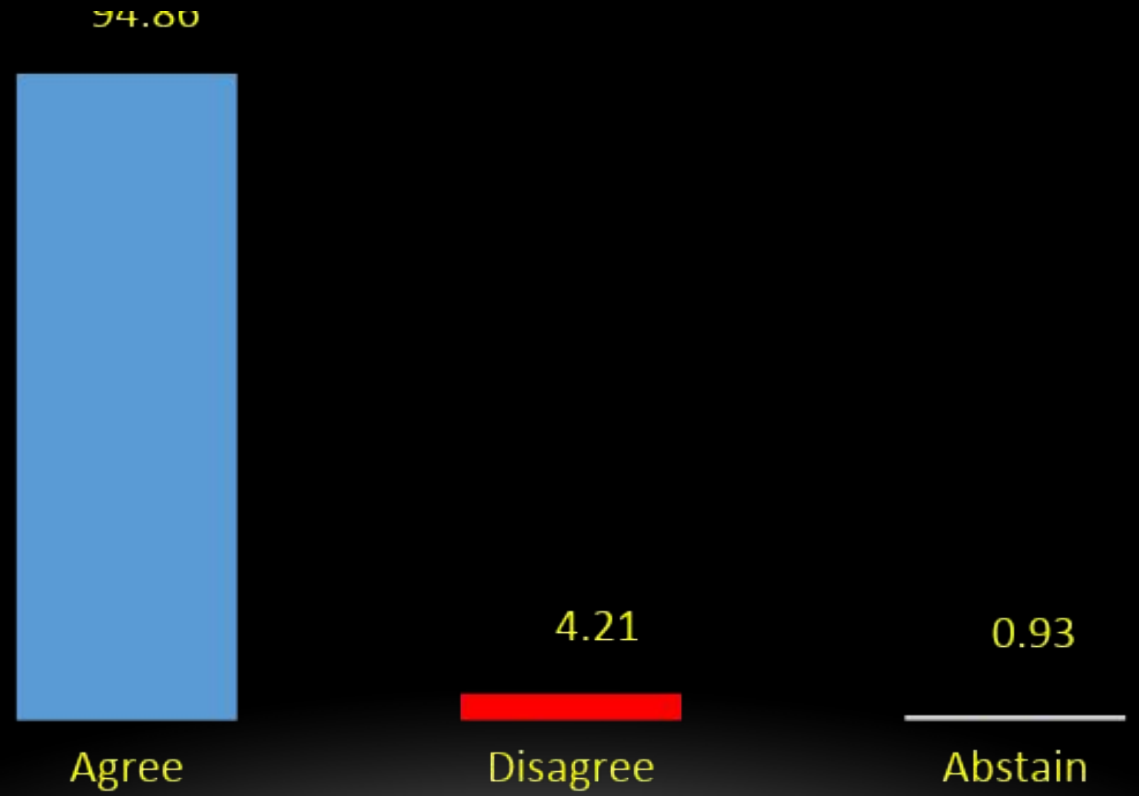
Strength of Recommendation: Strong.

*Graham S. Goh, John J. Corvi, Sabine Eichinger*



# ICM VTE General

47 - What is the optimal duration of VTE prophylaxis following major orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 48 - What is the cost-efficacy of each VTE prophylactic agent that may be used in patients undergoing orthopaedic surgery?

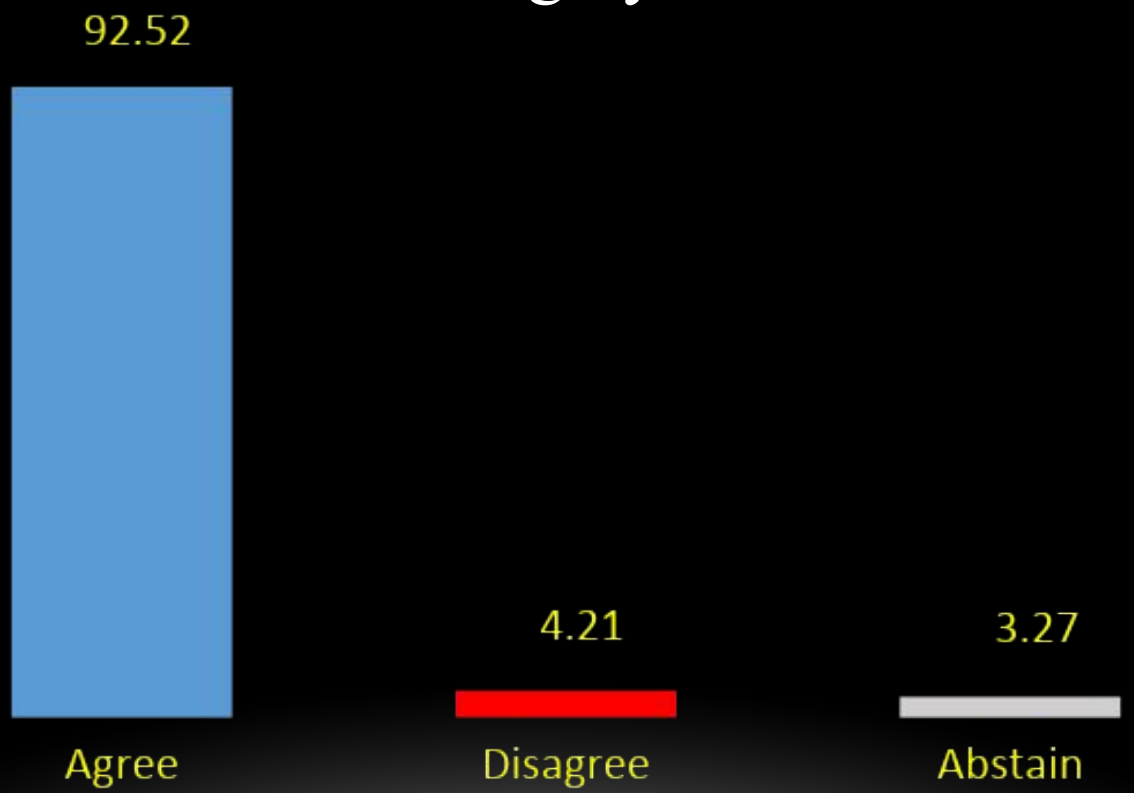
Response/Recommendation: Aspirin (ASA) is the most cost-effective venous thromboembolism (VTE) prophylaxis as the cost of drug is nominal, the rate of complications such as bleeding associated with administration of ASA is low, and there is no need for blood tests or other methods to monitor the agent. The cost-effectiveness of different methods of VTE prophylaxis depends mostly on the initial cost of the chemical or mechanical modality, the need for blood monitoring, rate of complications associated with administration of the modality, and the need for reversal agents. We recognize that the cost of various prophylactic agents varies widely across the globe.

Strength of Recommendation: Intermediate.

*Farzad Vosooghi, Mohammad S. Abdelaal, S.M. Javad Mortazavi*

# ICM VTE General

48 - What is the cost-efficacy of each VTE prophylactic agent that may be used in patients undergoing orthopaedic surgery?




(Strong Consensus)

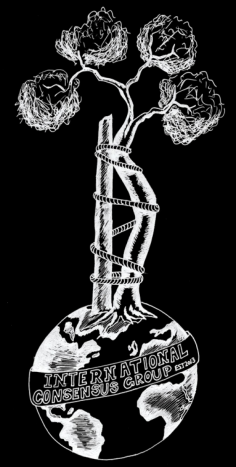
# ICM VTE General

## 49 - Are there differences between various venous thromboembolism (VTE) prophylaxis in terms of patient compliance/adherence?

Response/Recommendation: Although there is some variation in adherence to the various venous thromboembolism (VTE) prophylactic agents, most of the differences are explained by sociodemographic, socioeconomic, illness-related, patient-related, and medication-specific to health system-related factors. As a predictor of adherence, individual patient preferences present an opportunity to create value in person-centered care.

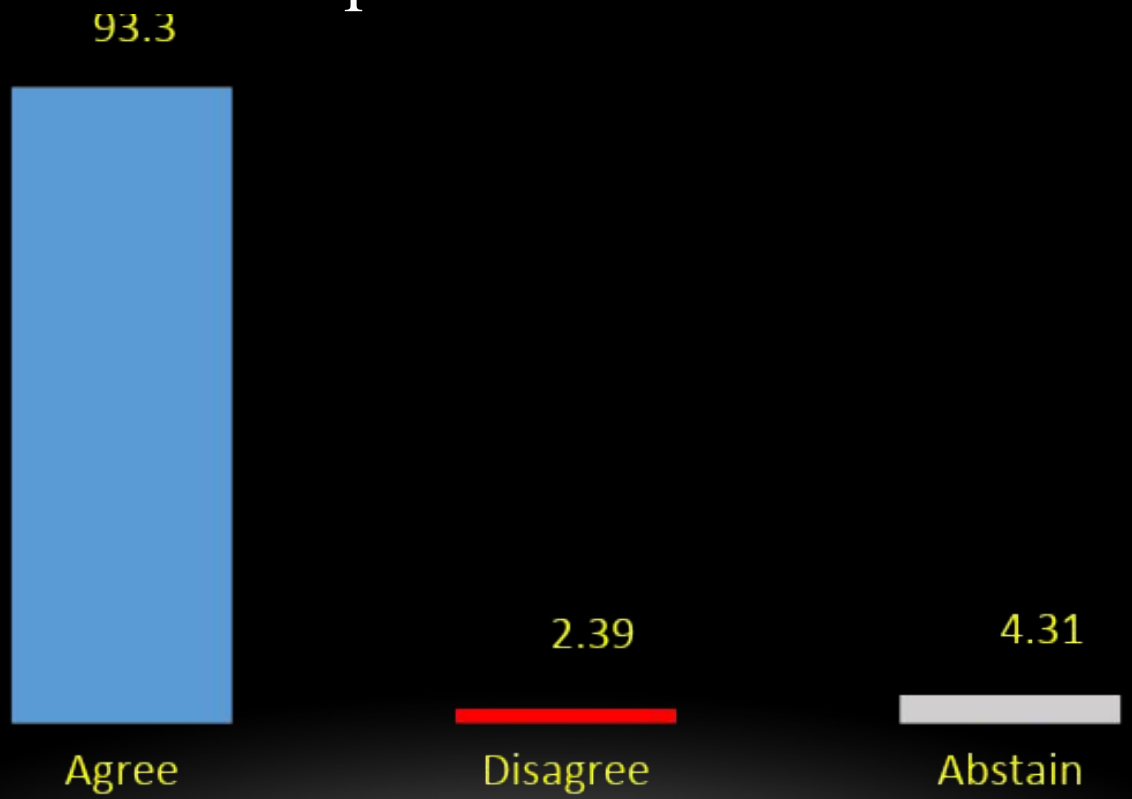
Strength of Recommendation: Limited.

*Adolfo Llinás, Guillermo Bonilla, Cristina Suarez, Daniel Monsalvo, Juan S. Sánchez-Osorio*



# ICM VTE General

49 - Are there differences between various venous thromboembolism (VTE) prophylaxis in terms of patient compliance/adherence?




(Strong Consensus)

# ICM VTE General

## 50 - Is there a role for sequential combination VTE prophylaxis in patients undergoing orthopaedic procedures?

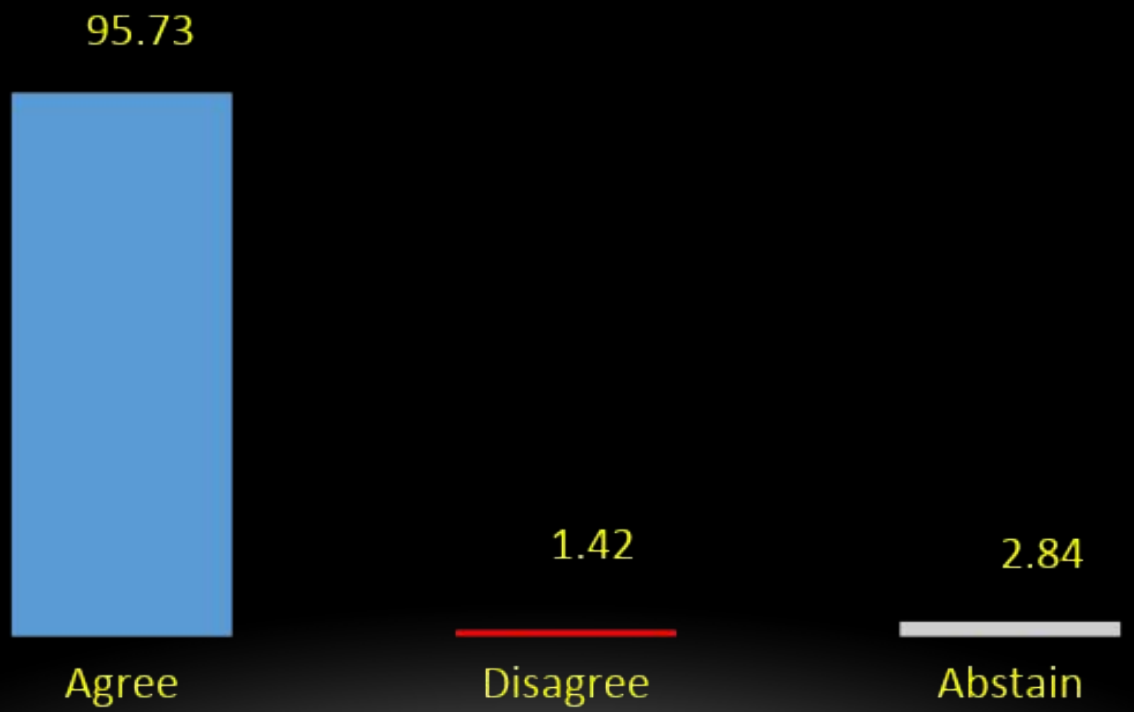
Response/Recommendation: Based on the available evidence, sequential combination venous thromboembolism (VTE) prophylaxis has not been shown to be superior to other established treatment regimens.

Strength of Recommendation: Limited.

*James A. Larkin, Michael J. Dunbar, Emil Schemitsch*

# ICM VTE General

50 - What is the optimal imaging modality for detection of upper and lower extremity DVT for patients undergoing orthopaedic procedures?




(Strong Consensus)

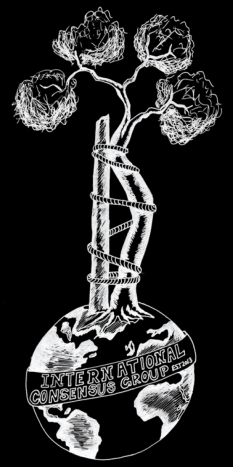
# ICM VTE General

51 - Are there specific contraindications for the administration of each VTE prophylactic agent?

Response/Recommendation: Each venous thromboembolism (VTE) prophylactic agent has evidence-based relative and absolute contraindications, which should be considered and balanced with the patient's VTE risk.

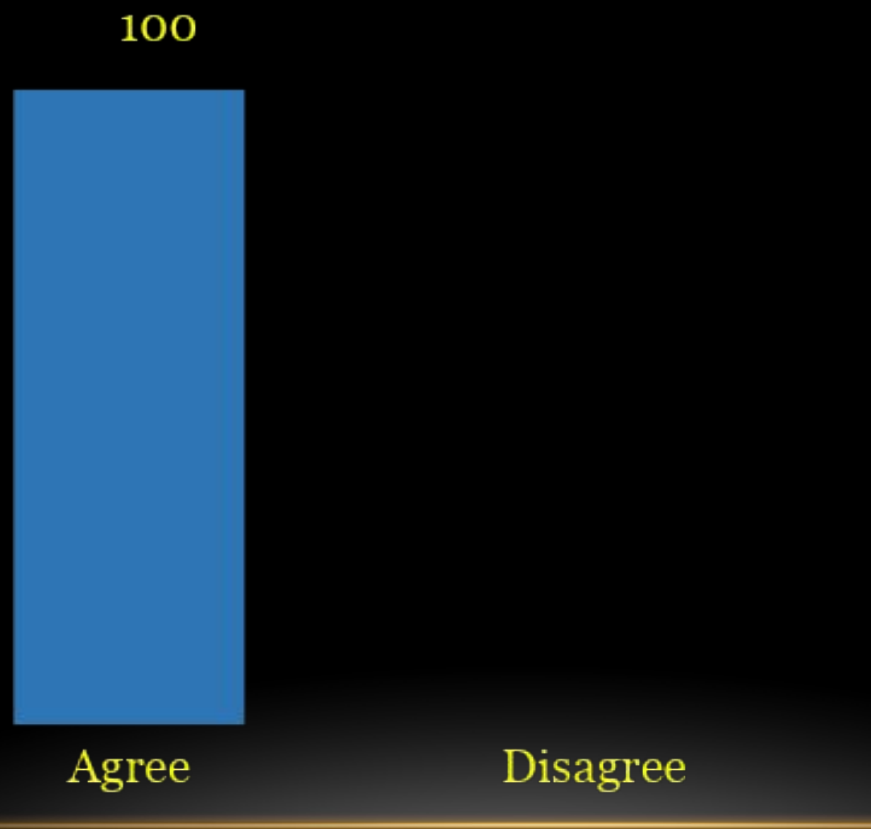
Strength of Recommendation: Strong.

*E. Bailey Terhune, Klaas Victor, Vasili Karas, Jan F.A. Somers*



# ICM VTE General

51 - Are there specific contraindications for the administration of each VTE prophylactic agent?




(Unanimous Strong Consensus)

# ICM VTE General

52 - Does VTE prophylaxis in patients with chronic kidney disease need to be altered when undergoing orthopaedic procedures?

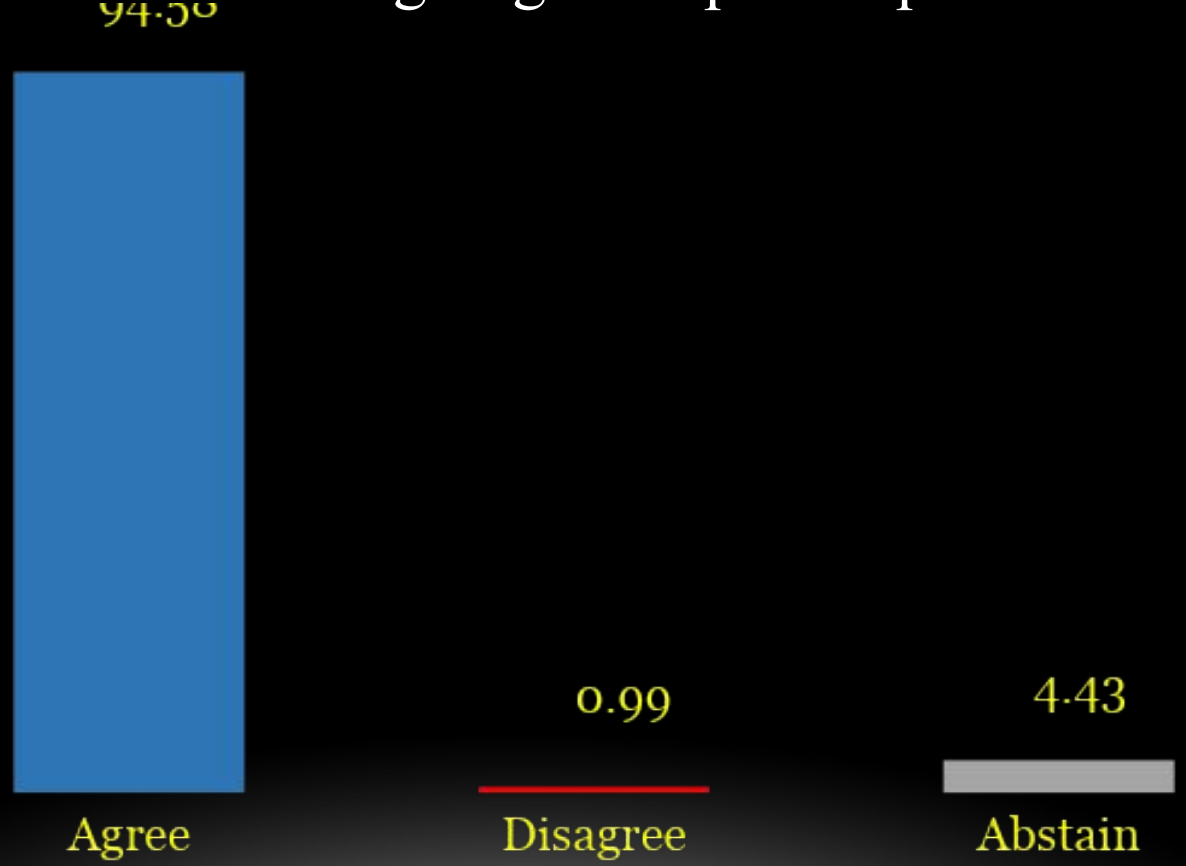
Response/Recommendation: In patients with chronic renal disease, pharmacological agents used in venous thromboembolism (VTE) prophylaxis may need a dose adjustment to prevent major bleeding or other complications based on their biochemical properties. In unstable advanced renal disease, unfractionated heparin (UFH) or mechanical prophylaxis alone may be preferred as VTE prophylaxis.

Strength of Recommendation: Limited.

*S.M. Javad Mortazavi, Kirill Lobastov*

# ICM VTE General

52 - Does VTE prophylaxis in patients with chronic kidney disease need to be altered when undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 53 - Does VTE prophylaxis in patients with chronic liver disease need to be altered when undergoing orthopaedic procedures?

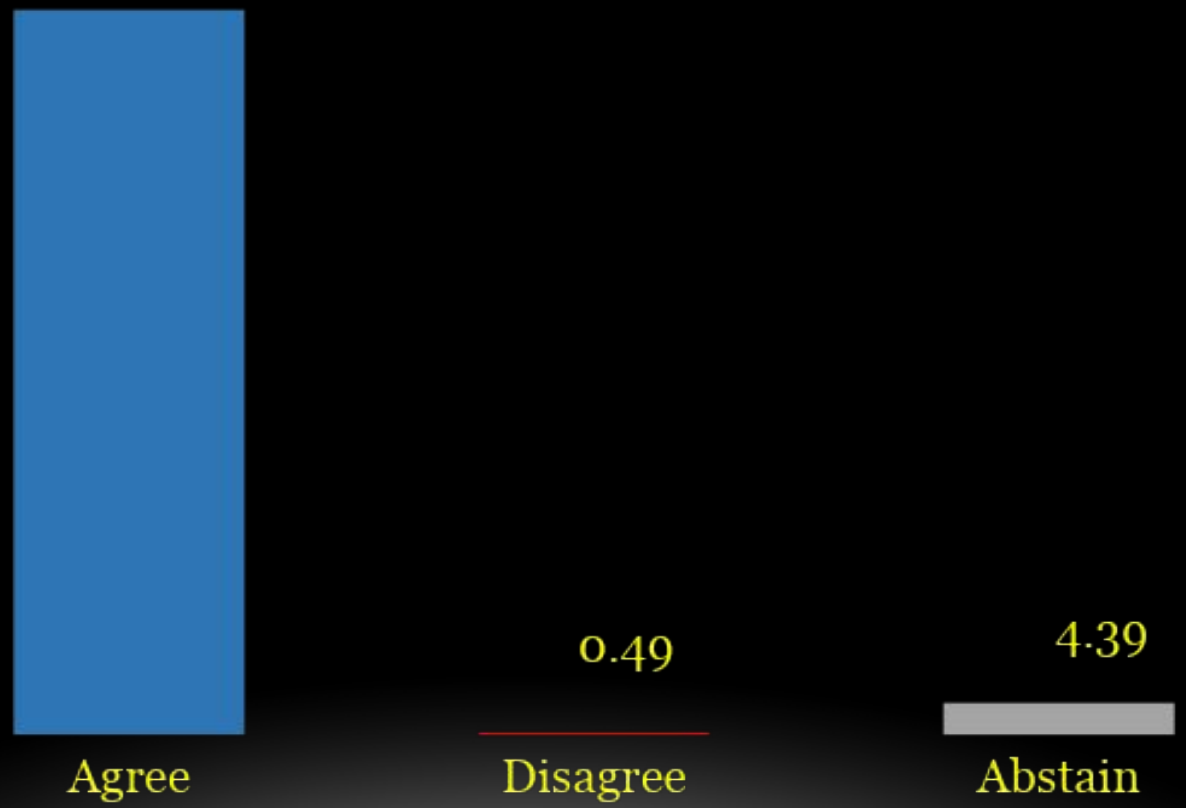
Response/Recommendation: : Chronic liver disease (CLD) alone should not be considered a reason to withhold or alter venous thromboembolism (VTE) prophylaxis. The decision to possibly modify VTE prophylaxis should be multidisciplinary and individualized based on risk factors for both VTE and bleeding.

Strength of Recommendation: Strong.

*Filippo Randelli, Emanuele Chisari, Viganò Martino, Claudio Cimminiello*

# ICM VTE General

53 - Does VTE prophylaxis in patients with chronic liver disease need to be altered when undergoing orthopaedic procedures?




(Strong Consensus)

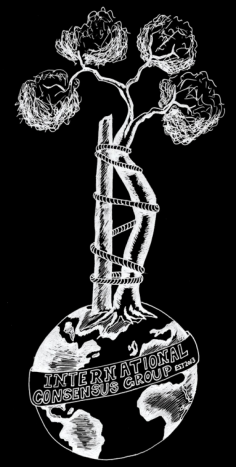
# ICM VTE General

54 - What are the indications for seeking a thrombosis specialist or a hematology consult for VTE prevention, in patients undergoing elective orthopaedic procedures?

Response/Recommendation: In the absence of reliable evidence, it is the opinion of this work group that patients with known or suspected bleeding or coagulation disorder, creatinine clearance < 30 mL/min, active hepatobiliary disease, with significant anemia or thrombocytopenia or patients requiring continuous use of antiplatelet and/or anticoagulant might benefit from a thrombosis specialist or a hematology consult.

Strength of Recommendation: Consensus.

*Daniel Caldeira, Geno Merli*



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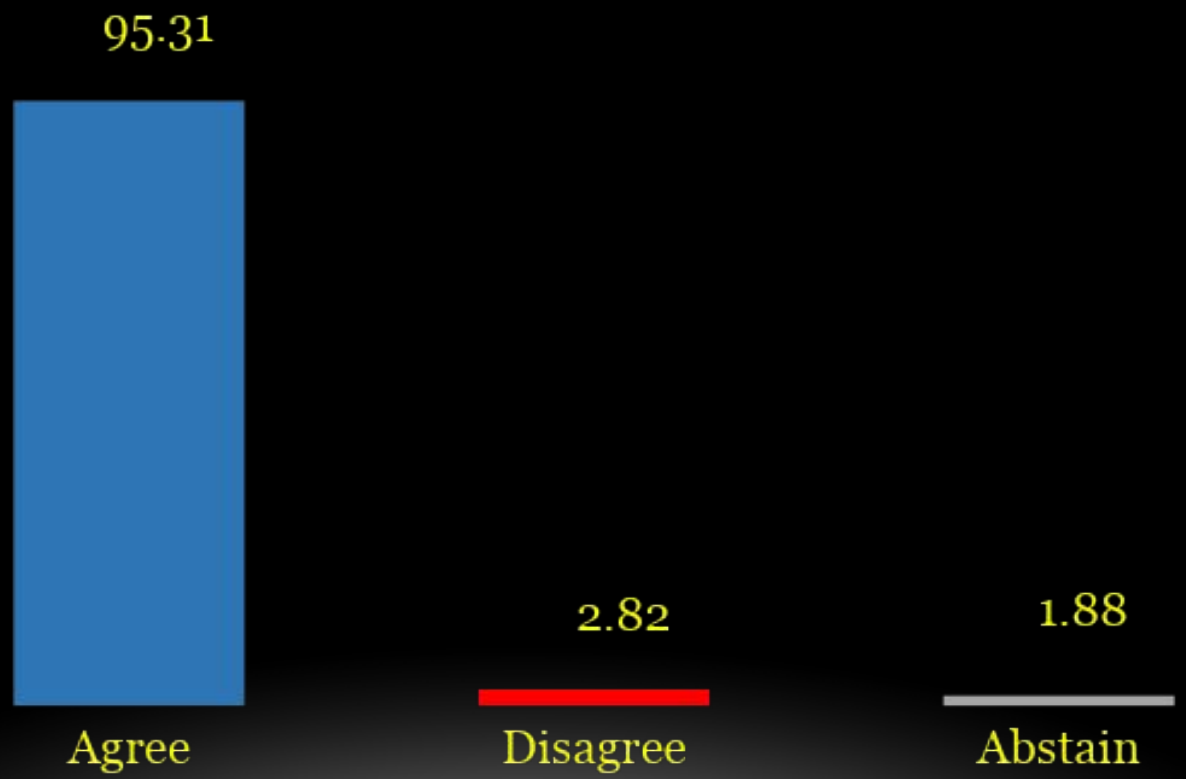



(Strong Consensus)

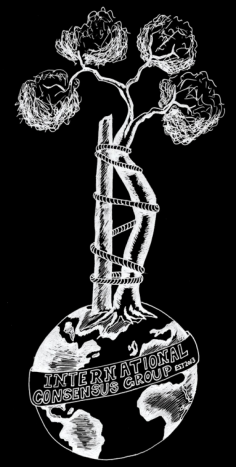
# ICM VTE General

55 - If a patient is in an "increased risk" group for the development of VTE, are there certain agents which have increased efficacy over other anticoagulants?

Response/Recommendation: There is limited evidence to support that certain anticoagulants have increased efficacy over other anticoagulants. The specific factor that increases a patient's risk for venous thromboembolism (VTE) must be considered and treatment tailored to that specific cause, after considering drug class, and dosing regimen.

Strength of Recommendation: Limited.

*Dennis A. Sievers, William Jiranek, Ronald Navarro*



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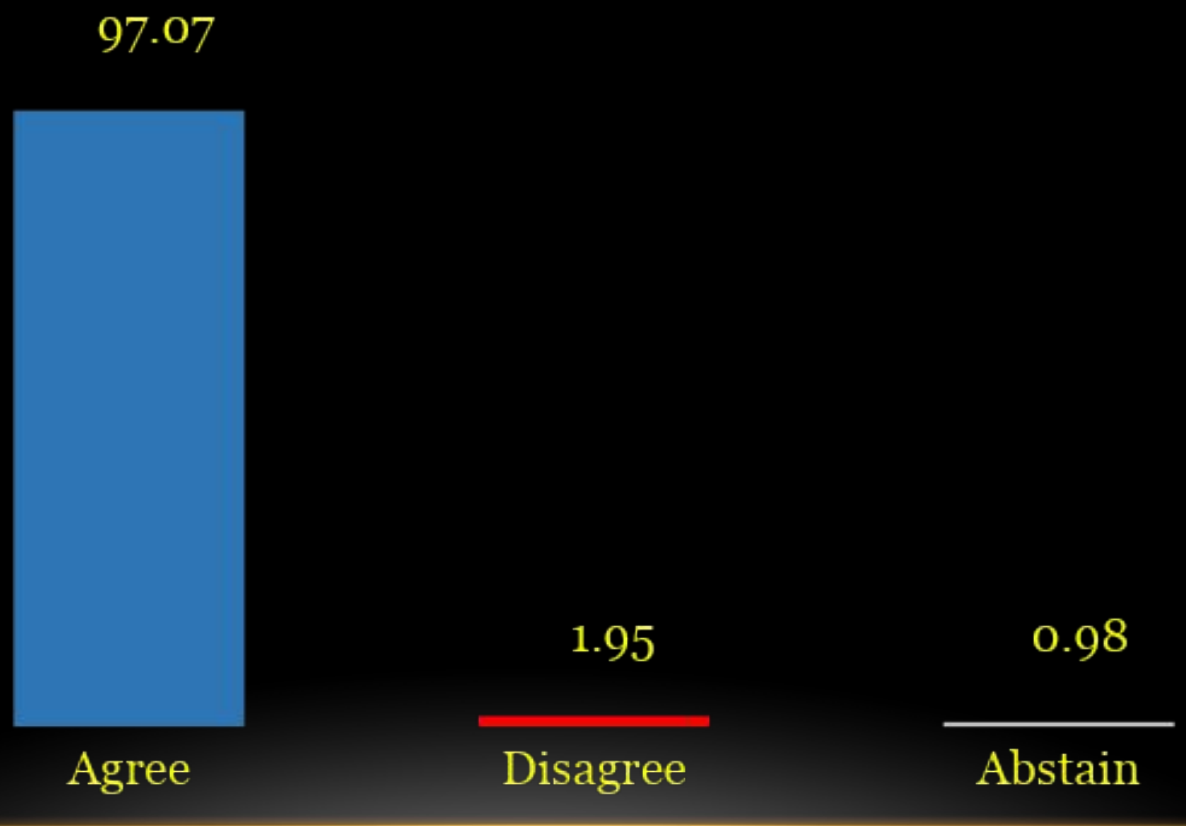



(Strong Consensus)

# ICM VTE General

## 56 - Should the perioperative VTE prophylaxis of a patient undergoing orthopaedic procedure who is diagnosed with acute atrial fibrillation be altered?

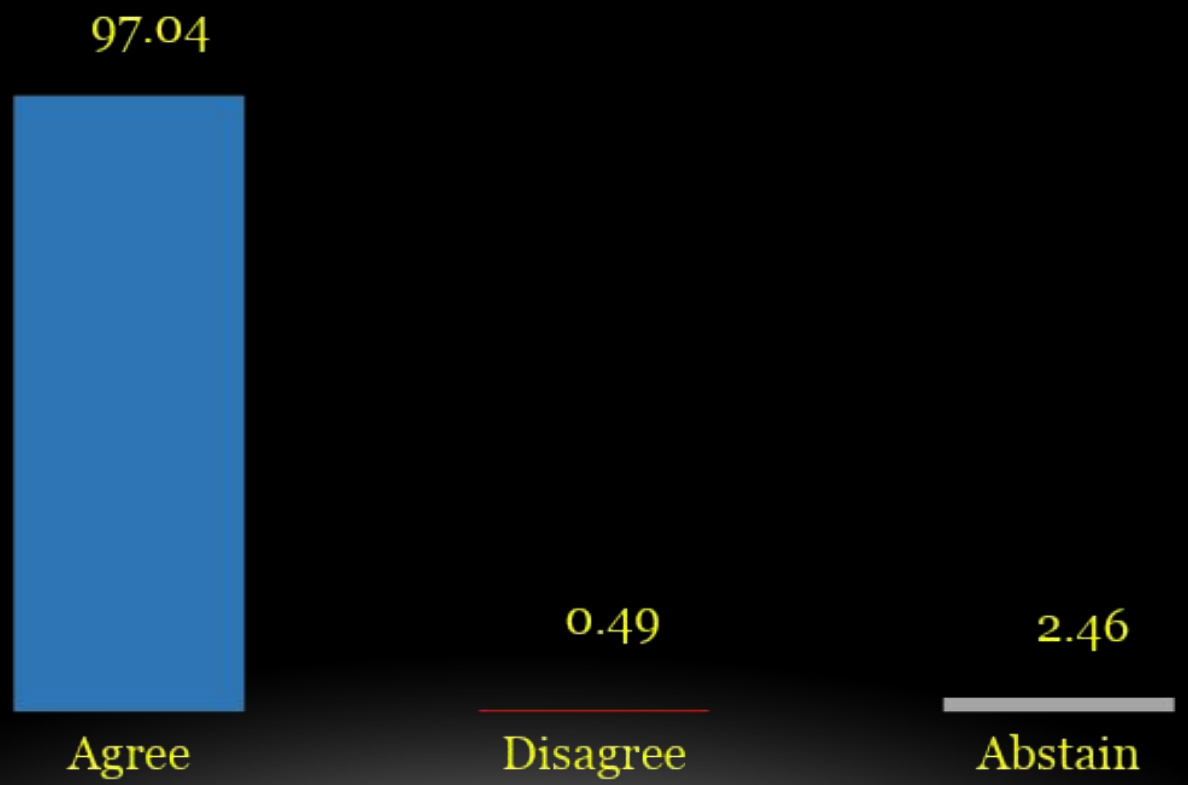
Response/Recommendation: There is no evidence to indicate that the perioperative venous thromboembolism (VTE) prophylaxis of patients undergoing orthopaedic procedure and diagnosed with acute atrial fibrillation (AF) should be altered. However, according to the latest recommendations of the American Heart Association (AHA), the American College of Cardiology (ACC), the Heart Rhythm Society (HRS), and the European Society of Cardiology (ESC), the patients with AF, and high risk of embolic events should receive anticoagulation therapy.

Strength of Recommendation: Moderate.

*Roya Sattarzadeh, Xavier Griffin*

# ICM VTE General

56 - Should the perioperative VTE prophylaxis of a patient undergoing orthopaedic procedure who is diagnosed with acute atrial fibrillation be altered?




(Strong Consensus)

# ICM VTE General

57 - What is the most optimal management of a patient with elevated coagulation parameters, such as high INR, undergoing emergency orthopaedic surgery?

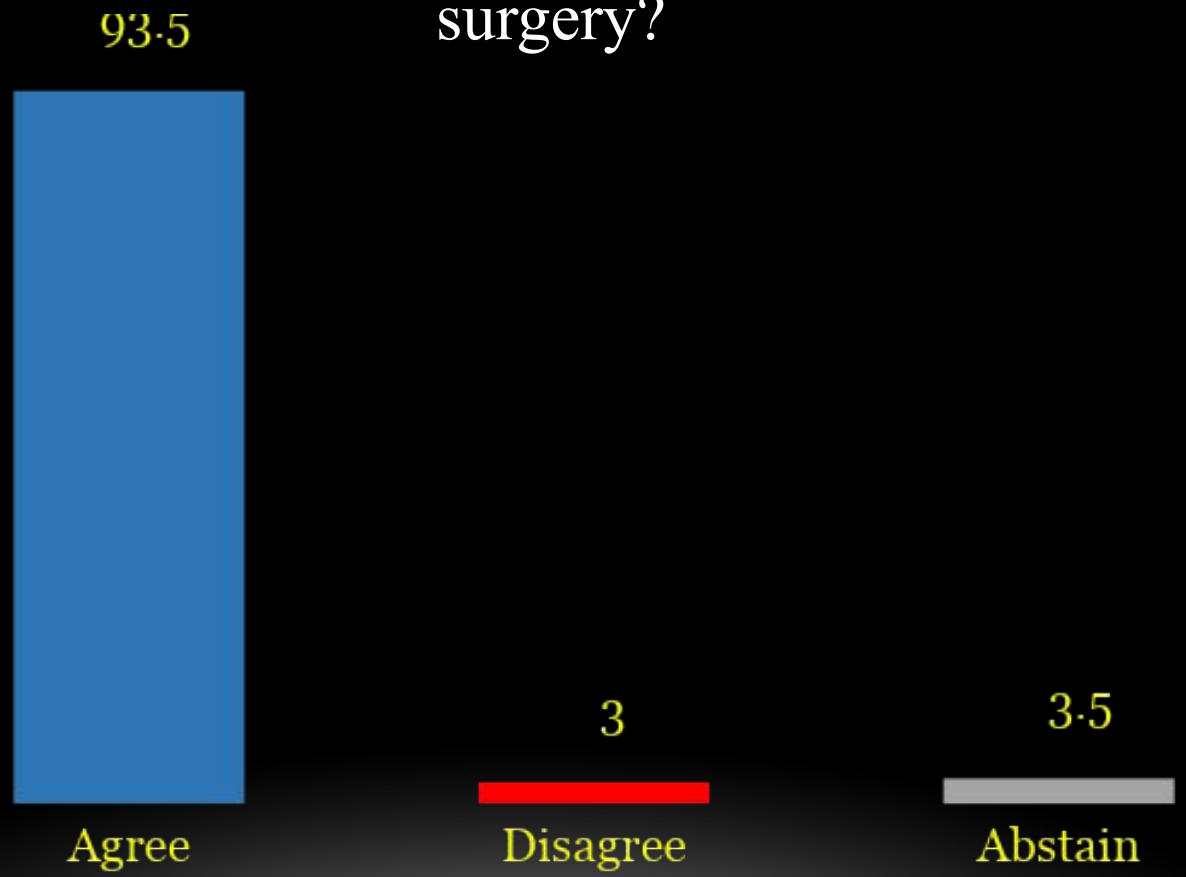
Response/Recommendation: : In patients on vitamin K antagonist (VKA) with an elevated international normalized ratio (INR) requiring emergency orthopaedic surgery, we suggest correction to an INR ≤ 1.5.

Strength of Recommendation: Limited.

*Marc Carrier, Alex C. Spyropoulos*

# ICM VTE General

57 - What is the most optimal management of a patient with elevated coagulation parameters, such as high INR, undergoing emergency orthopaedic surgery?




(Strong Consensus)

# ICM VTE General

58 - What is the optimal VTE prophylaxis modality for patients with bleeding disorders such as hemophilia or Von Willebrand disease?

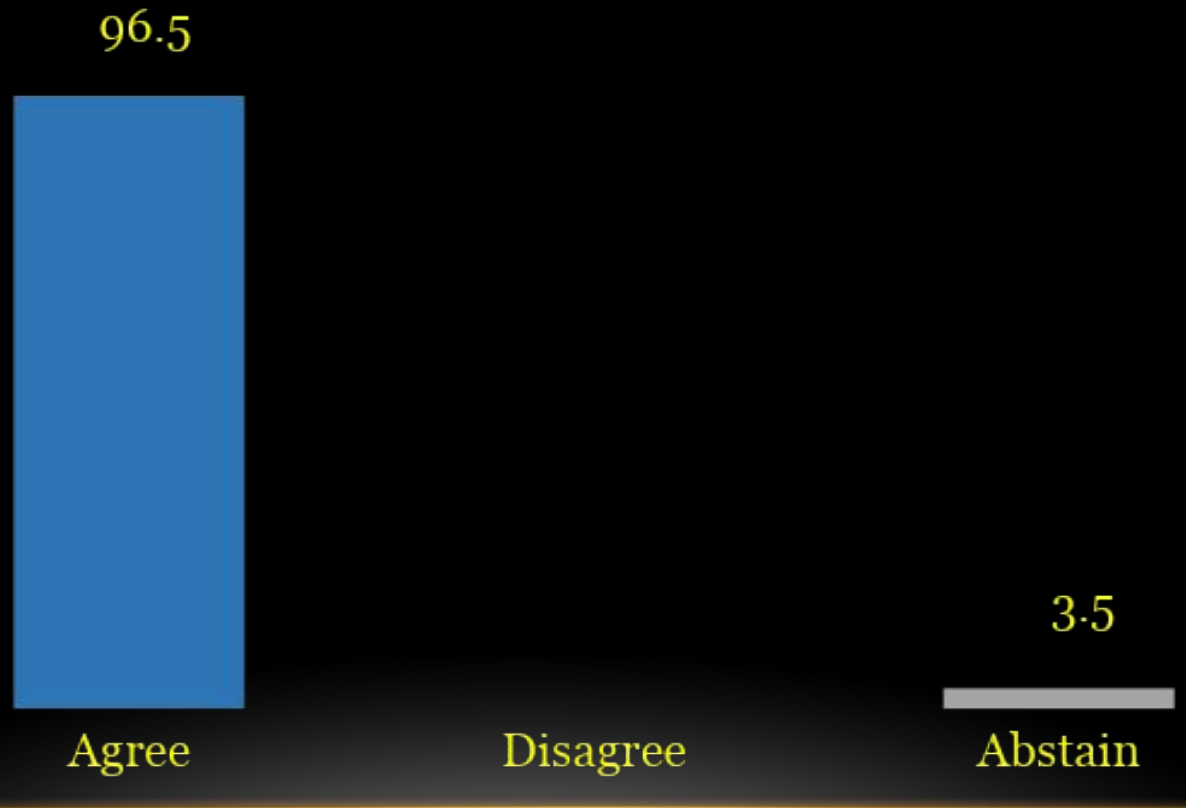
Response/Recommendation: : Mechanical venous thromboembolism (VTE) prophylaxis is most appropriate for patients with bleeding disorders undergoing orthopaedic surgery. However, the addition of mild pharmacologic VTE prophylaxis should be considered for select patient groups that may express a higher prothrombotic phenotype, and in those using clotting factor concentrates bypassing agents or monoclonal antibodies that may increase the risk of thrombosis.

Strength of Recommendation: Limited.

*Mustafa Akkaya, Adolfo Llinás, Juan Sebastian Sánchez-Osorio, Mustafa Citak*

# ICM VTE General

58 - What is the optimal VTE prophylaxis modality for patients with bleeding disorders such as hemophilia or Von Willebrand disease?




(Strong Consensus)

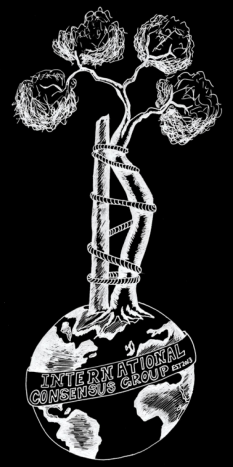
# ICM VTE General

## 59 - What is the optimal VTE prophylaxis modality for patients with clotting disorders such as thrombophilia?

Response/Recommendation: Patients with thrombophilia should receive venous thromboembolism (VTE) prophylaxis for major orthopaedic surgery. We recommend a combination of mechanical and pharmacological interventions for up to 35 days after the procedure to address the variability of VTE risk, which is difficult to estimate in frequency and magnitude. For less invasive musculoskeletal procedures, the VTE prophylaxis should be tailored according to the prothrombotic risk of each procedure, with emphasis on those of lower extremities.

Strength of Recommendation: Limited.

*Adolfo Llinás, Mustafa Citak, Mustafa Akkaya, Juan S. Sánchez-Osorio*



# ICM VTE General

59 - What is the optimal VTE prophylaxis modality for patients with clotting disorders such as thrombophilia?


(Strong Consensus)

# ICM VTE General

## 60 - What are the indications for use of an IVC filter in patients undergoing orthopaedic procedures?

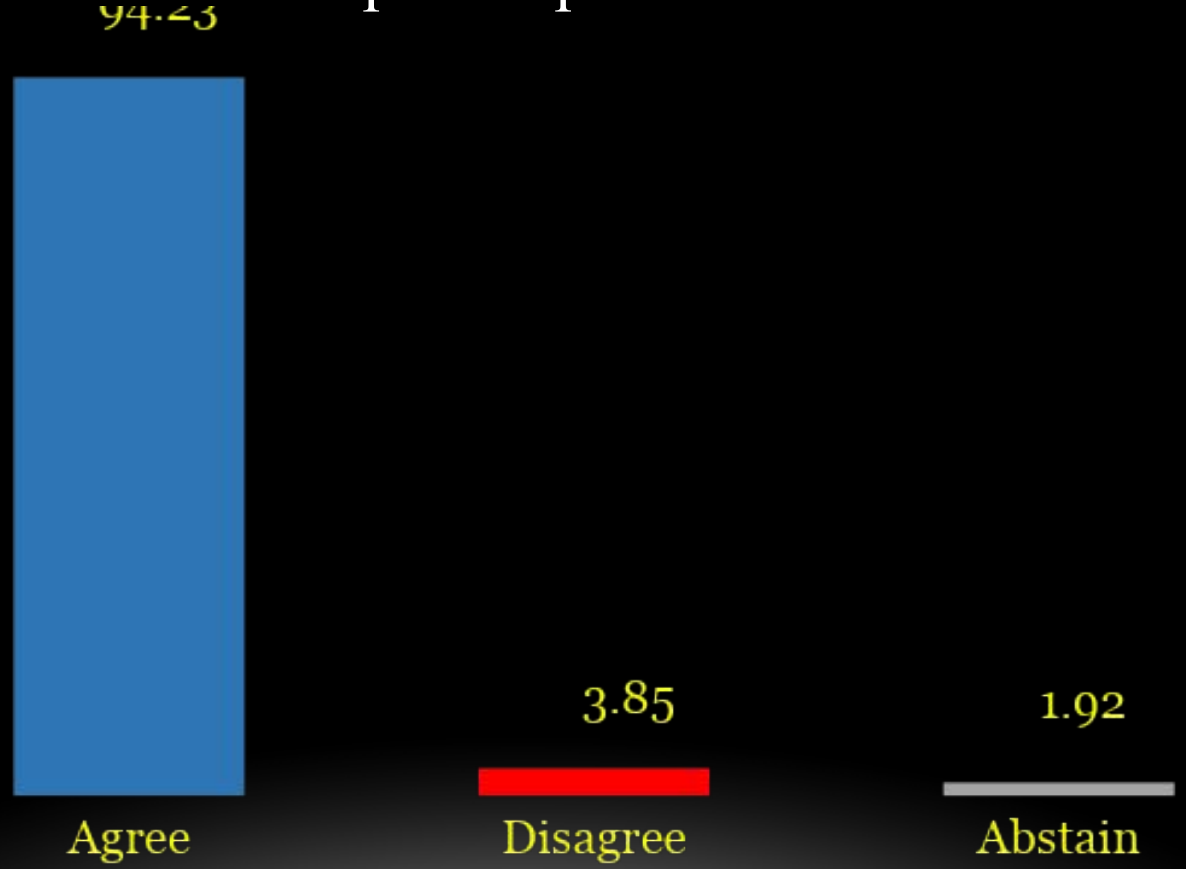
Response/Recommendation: Inferior vena cava (IVC) filters may be considered for patients who have a high risk of venous thromboembolism (VTE) and in whom chemical anticoagulation is contraindicated. IVC filters should not be used on a routine basis for deep venous thrombosis (DVT) prophylaxis, particularly when chemical prophylaxis can be administered.

Strength of Recommendation: Limited.

*Justin E. Kleiner, Paul Tornetta III*

# ICM VTE General

60 - What are the indications for use of an IVC filter in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 61 - Does the availability of reversal agents influence the choice of a selected chemical VTE prophylaxis agent?

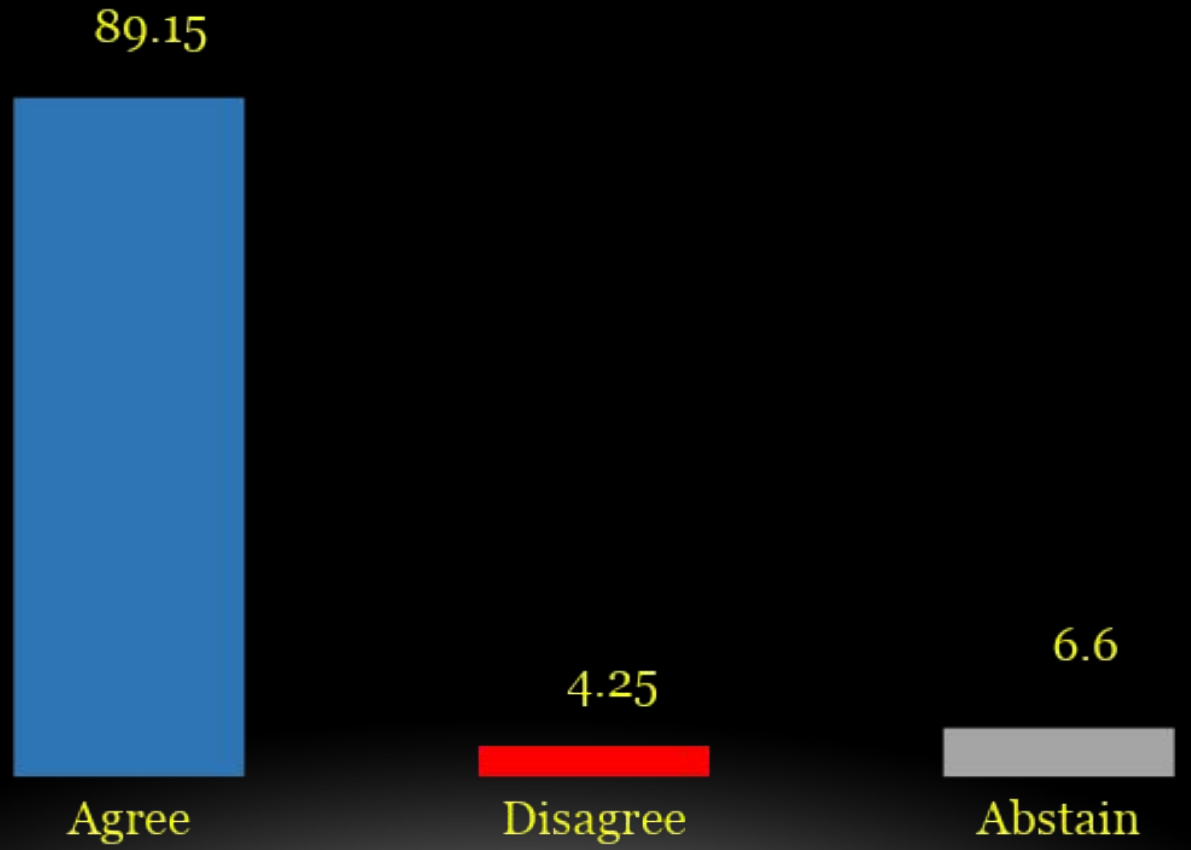
Response/Recommendation: Yes. Commonly used venous thromboembolism (VTE) prophylaxis agents have acceptable safety profiles as well as established guidelines for reversal. Some agents may be safely continued during surgery (e.g., aspirin [ASA], clopidogrel), while others can be promptly reversed by discontinuation (e.g., low-molecular-weight heparin [LMWH]). Other agents such as vitamin K antagonists (e.g., warfarin) and direct-oral anticoagulants (DOAC) require a longer discontinuation interval before surgery. The reversal agents such as such as Prothrombin Complex Concentrates as well as specific antidotes such as idarucizumab and endexine alfa, with limited availability may need to be administered for emergency cases. As such, the availability and cost of reversal agents are important factors that influence the choice of VTE prophylactic agent.

Strength of Recommendation: Limited.

*Ricardo Sousa, Humaid Al Farii, Muadh Alzeedi, Sultan Al Maskari*

# ICM VTE General

61 - Does the availability of reversal agents influence the choice of a selected chemical VTE prophylaxis agent?




(Strong Consensus)

# ICM VTE General

62 - Does post-operative rehabilitation protocol such as early ambulation influence the incidence of VTE after orthopaedic procedures?

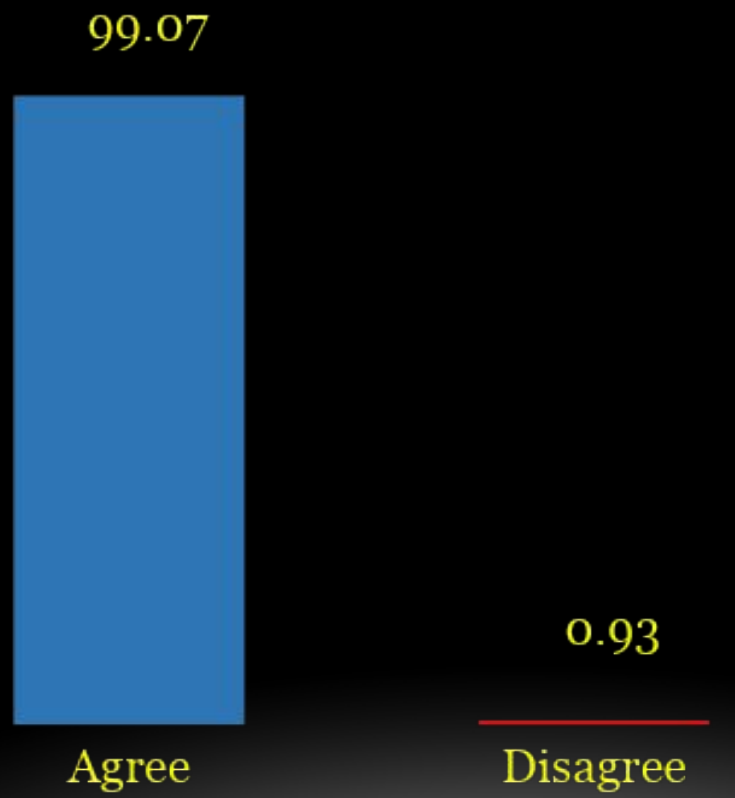
Response/Recommendation: : It is the opinion of this group that early ambulation reduces the incidence of venous thromboembolism (VTE) after orthopaedic procedures.

Strength of Recommendation: Moderate.

*Clara A. Lobo, Kenneth A. Egol*

# ICM VTE General

62 - Does post-operative rehabilitation protocol such as early ambulation influence the incidence of VTE after orthopaedic procedures?




(Strong Consensus)

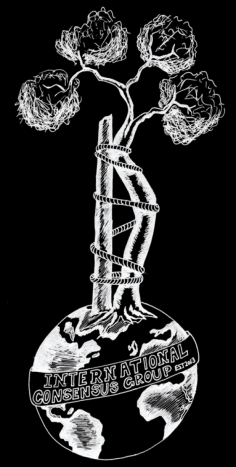
# ICM VTE General

63 - What is the most optimal VTE prophylaxis for patients who are on strict bed rest pre- or postoperatively?

Response/Recommendation: The most optimal thromboprophylaxis in patients on strict bed rest is not known. Any combination of chemical and/or mechanical (i.e., intermittent compression devices) prophylaxis may be considered in patients who will be on prolonged and strict bed rest.

Strength of Recommendation: Limited.

*Abtin Alvand, Raja Bhaskara Rajasekaran, Adolph J. Yates Jr.*



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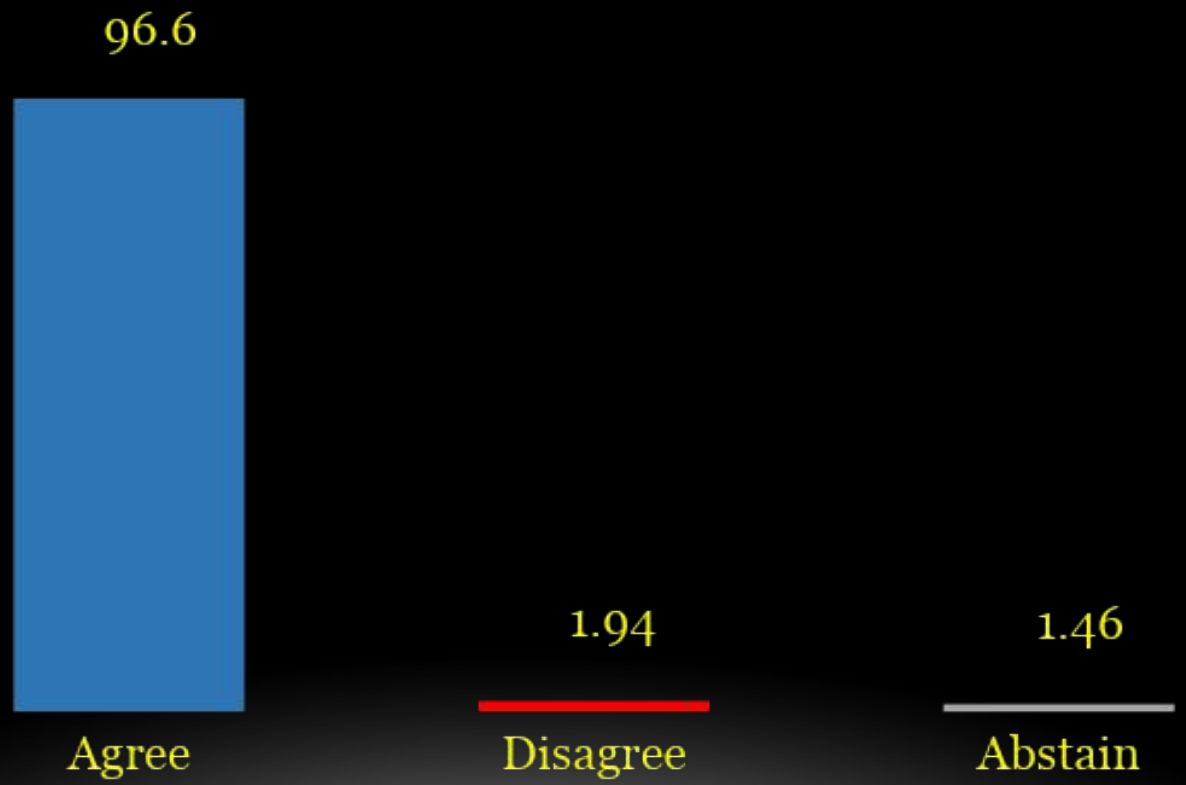



(Strong Consensus)

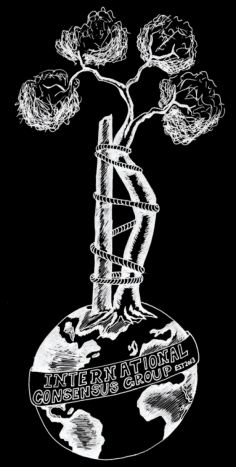
# ICM VTE General

64 - Is there a role for the use of intermittent compression devices as VTE prophylaxis for patients undergoing orthopaedic procedures?

Response/Recommendation: Yes. Intermittent compression devices (ICD) provide protection against venous thromboembolism (VTE) development following orthopaedic surgery. Utilizing these devices has been shown to be an effective prophylactic measure.

Strength of Recommendation: Moderate.

*Colin M. Baker, Clifford Colwell*



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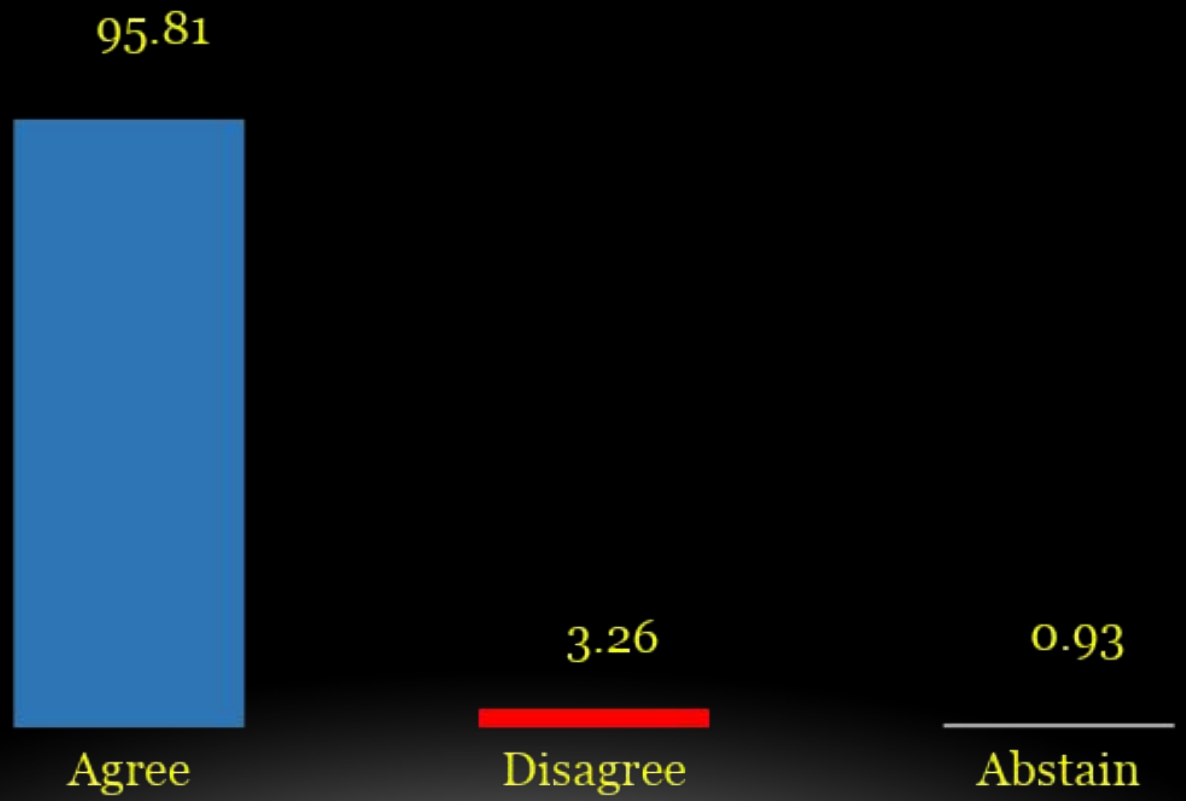



(Strong Consensus)

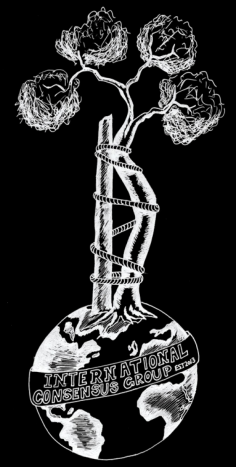
# ICM VTE General

65 - Is a foot pump as effective as a lower extremity intermittent compression device for VTE prophylaxis?

Response/Recommendation: The use of a foot pump is as effective as a lower extremity intermittent compression device, when used in combination with chemical prophylaxis.

Strength of Recommendation: Moderate.

*Tara G. Moncman, Alexander C. Top, Brian S. Winters, Charles Deltour, Jan F. Noyez*



# ICM VTE General

65 - Is a foot pump as effective as a lower extremity intermittent compression device for VTE prophylaxis?


(Strong Consensus)

# ICM VTE General

66 - Is there a role for the use of compression stockinette, as VTE prophylaxis, in patients undergoing orthopaedic procedures?

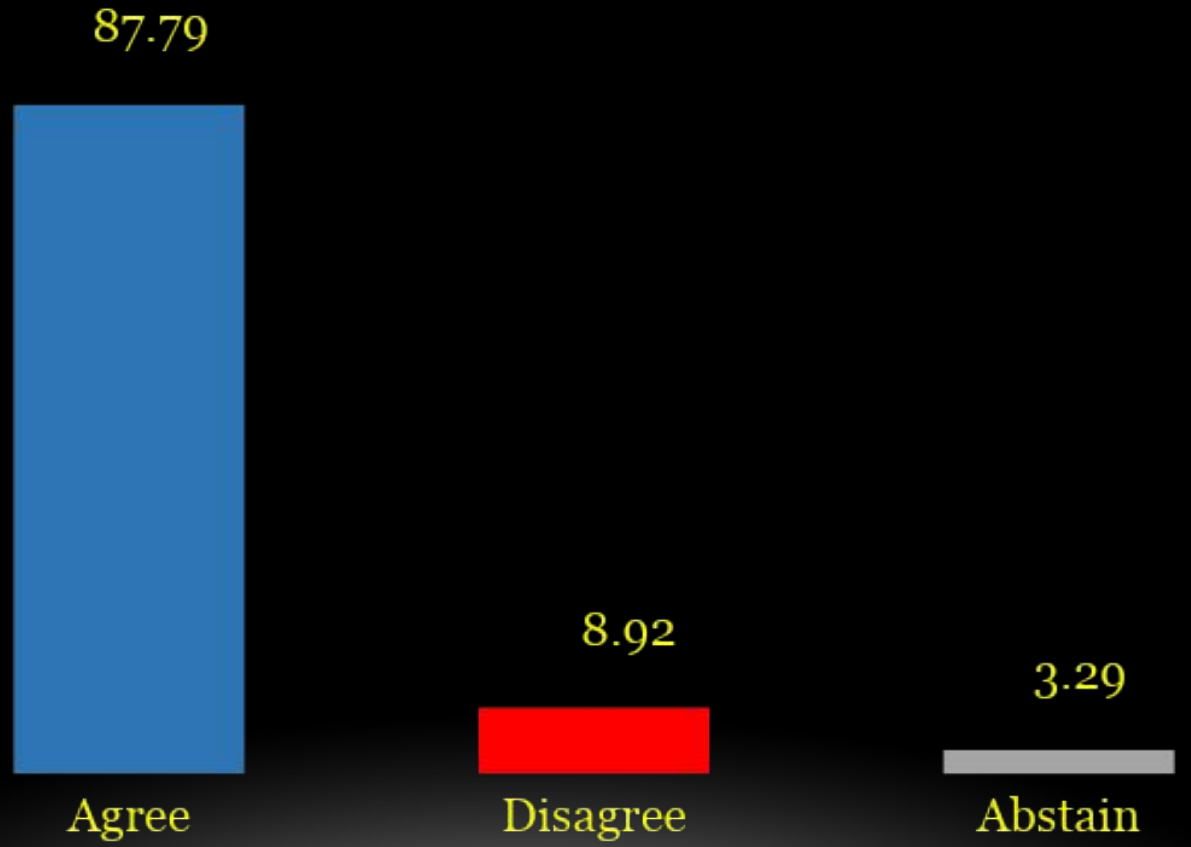
Response/Recommendation: : Elastic compression stockinette may provide some protection against venous thromboembolism (VTE).

Strength of Recommendation: Moderate.

*Alejandro Gonzalez Della Valle, Christian B. Ong, Eduardo A. Salvati, Paul F. Lachiewicz*

# ICM VTE General

66 - Is there a role for the use of compression stockinette, as VTE prophylaxis, in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

67 - Is there a difference between different types of intermittent pneumatic compression devices (IPCD)?

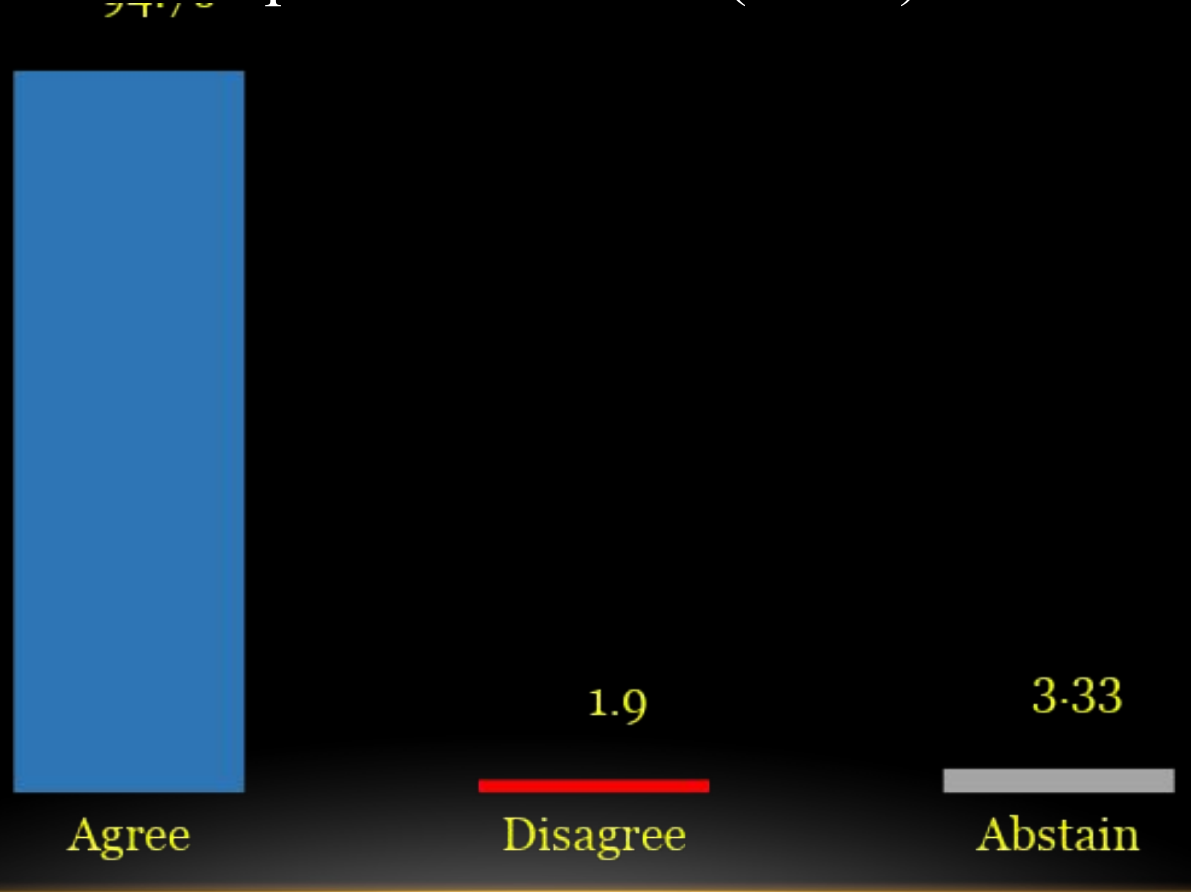
Response/Recommendation: The current evidence does not demonstrate notable differences in the clinical outcomes between different types of intermittent pneumatic compression devices (IPCD). However, devices with patient monitoring sensors and sequential compression may improve patient compliance.

Strength of Recommendation: Moderate.

*Kang-Il Kim, Jun-Ho Kim, Paul F. Lachiewicz*

# ICM VTE General

67 - Is there a difference between different types of intermittent pneumatic compression devices (IPCD)?




(Strong Consensus)

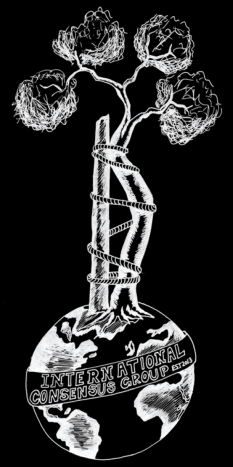
# ICM VTE General

## 68 - In patients with confirmed acute distal DVT, should a mechanical compression device be discontinued in the affected limb?

Response/Recommendation: The practitioner might continue the mechanical compression device (MCD) in patients with an acute distal deep venous thrombosis (DVT), in combination with the DVT treatment protocol (anticoagulation) as recommended in current guidelines.

Strength of Recommendation: Limited.

*Pedro Tort-Saade, Antonio Otero-López, Louis M. Kwong, David Beatón-Comulada, Norberto J. Torres-Lugo, Roberto G. Colón-Miranda, Ruben Tresgallo-Parés*



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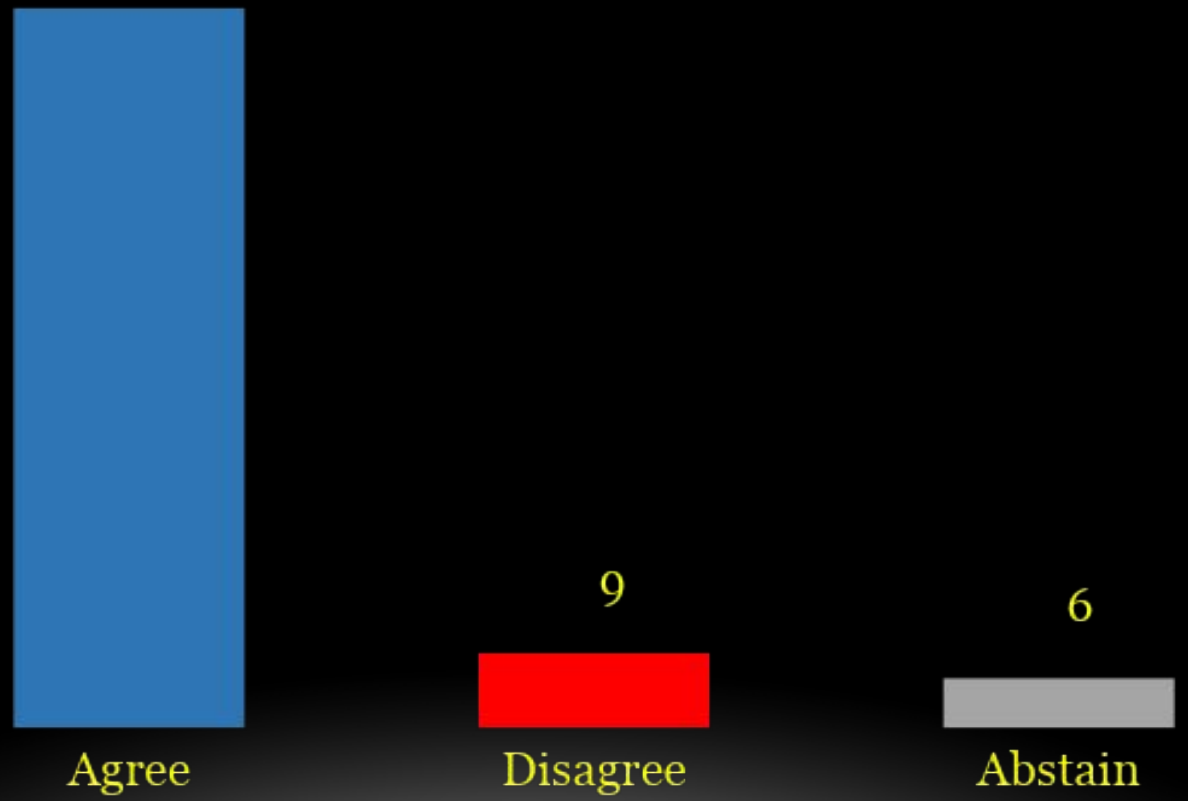



(Strong Consensus)

# ICM VTE General

69 - What is the optimal management of patients who are on antiplatelet medications prior to an elective orthopaedic procedure?

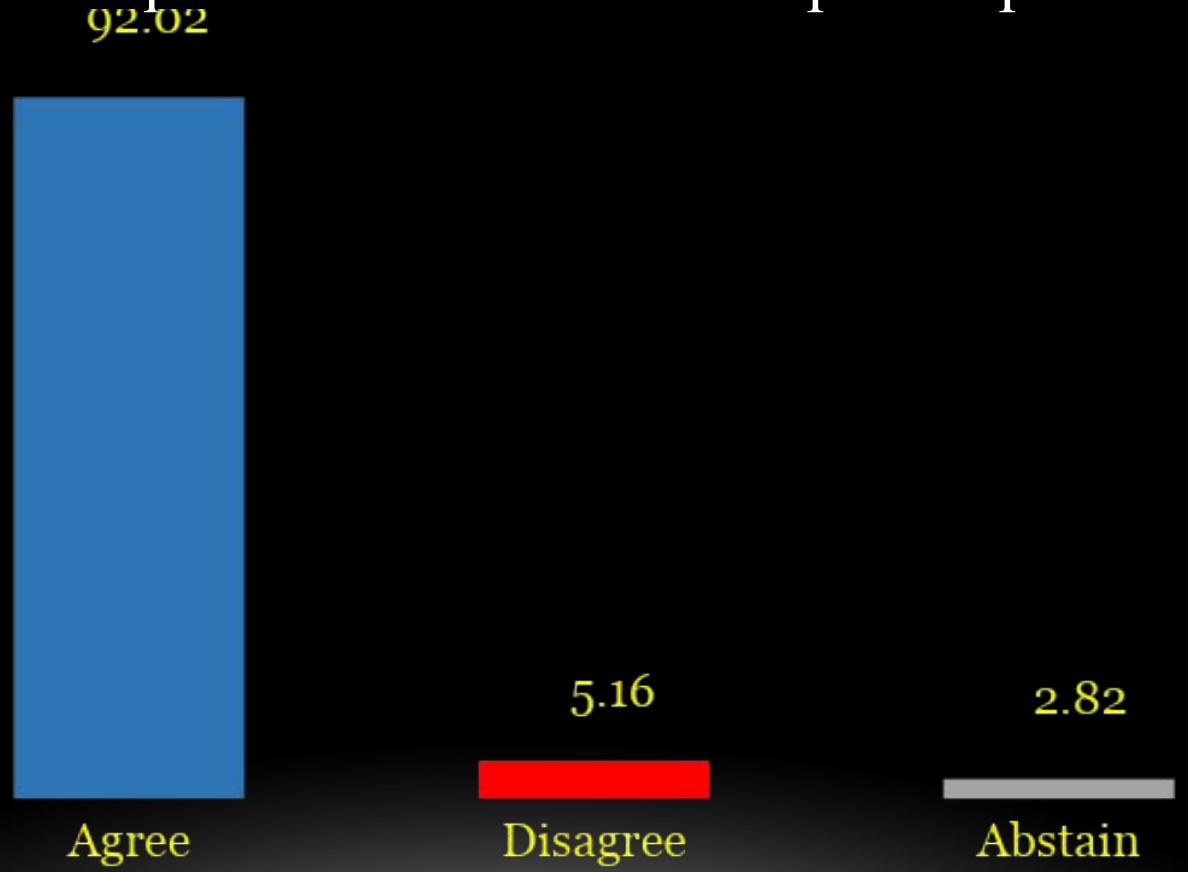
Response/Recommendation: There is insufficient evidence to recommend continuing or discontinuing antiplatelet medications prior to an elective orthopaedic procedure. Literature pertaining to this subject is of low quality and most studies pertain only to aspirin (ASA) and do not investigate other antiplatelet medications such as clopidogrel, ticagrelor, prasugrel, etc. Higher quality studies are needed before more definitive recommendations can be made.

Strength of Recommendation: Low.

*Gregg R. Klein, William V. Arnold, Minal Cordeiro, Mathew Mead, Ajay Srivastava*

# ICM VTE General

69 - What is the optimal management of patients who are on antiplatelet medications prior to an elective orthopaedic procedure?




(Strong Consensus)

# ICM VTE General

70 - What is the optimal management of patients who are on antiplatelet medications prior to an emergency orthopaedic procedure?

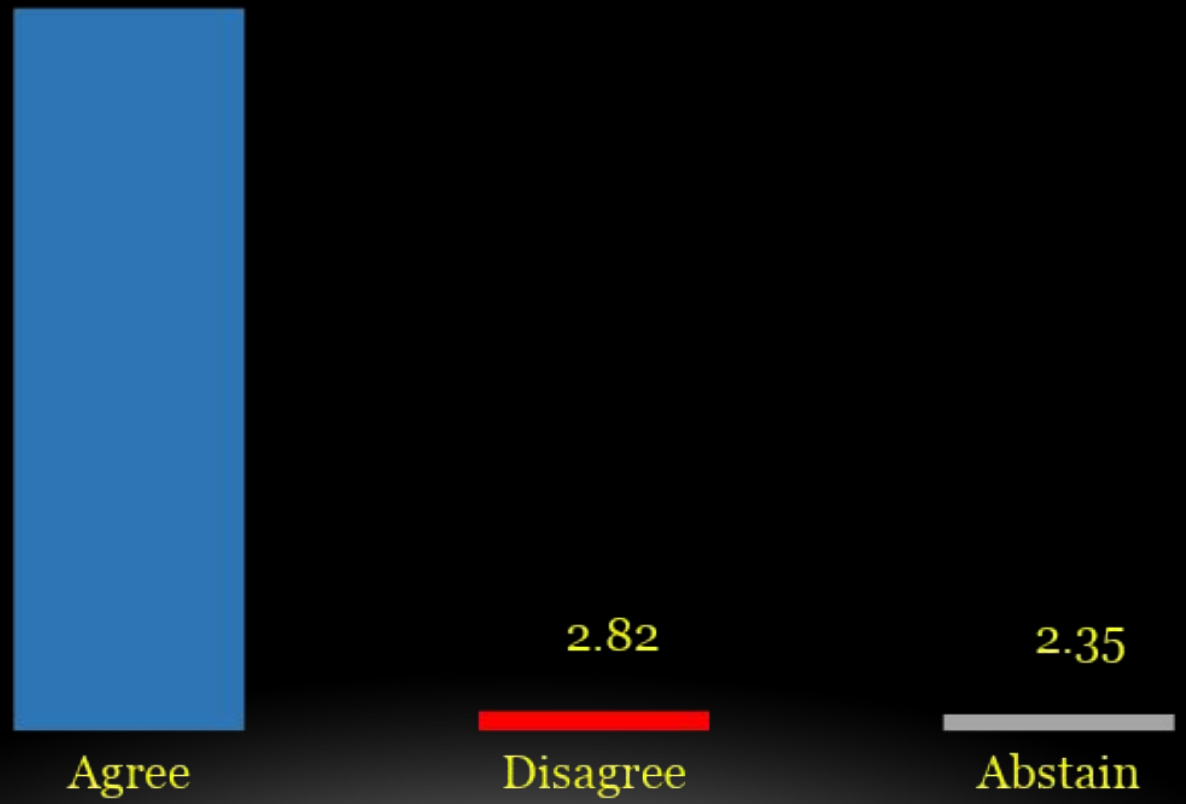
Response/Recommendation: There is no evidence to support delaying emergent orthopaedic procedure in patients on antiplatelet medications. However, literature pertaining to this topic is of low quality with no randomized controlled trials (RCT) to date and most studies focus on hip fracture surgery. These studies primarily concentrate on aspirin (ASA), and/or clopidogrel with few investigations about other antiplatelet medications like ticagrelor, prasugrel, etc. Higher quality research is needed before a more definitive recommendation can be made.

Strength of Recommendation: Low.

*Gregg R. Klein, William V. Arnold, Ajay Srivastava*

# ICM VTE General

70 - What is the optimal management of patients who are on antiplatelet medications prior to an emergency orthopaedic procedure?




(Strong Consensus)

# ICM VTE General

## 71 - Should aspirin be stopped pre-operatively in patients undergoing orthopaedic procedures?

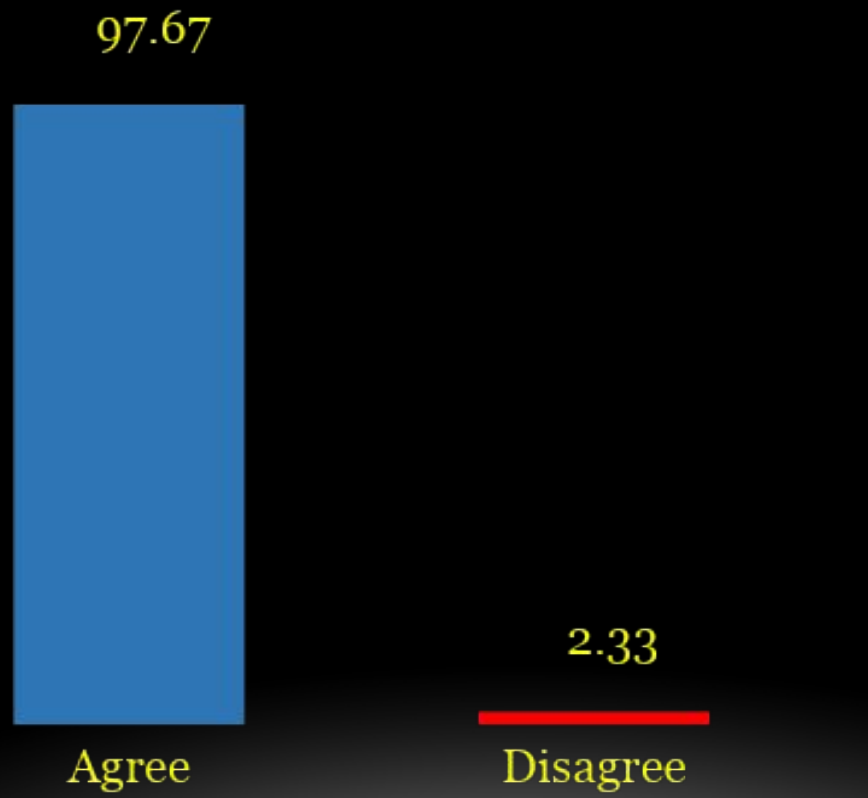
Response/Recommendation: Aspirin (ASA), administered for cardiovascular reasons, should not routinely be stopped in patients undergoing orthopaedic procedures. Continuation of ASA is likely to be cardioprotective and unlikely to be associated with increased blood loss.

Strength of Recommendation: Limited.

*Marcelo M. Lizarraga, Suhail Suresh, Takahiro Niikura, Luis F. Elias, Marzaid E. Manzaneda, Juan C. Castro Bejarano, Miguel S. Egoavil, Sara L. Whitehouse, Ross W. Crawford*

# ICM VTE General

71 - Should aspirin be stopped pre-operatively in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 72 - When should chronic anticoagulation be stopped in patients undergoing elective orthopaedic procedures?

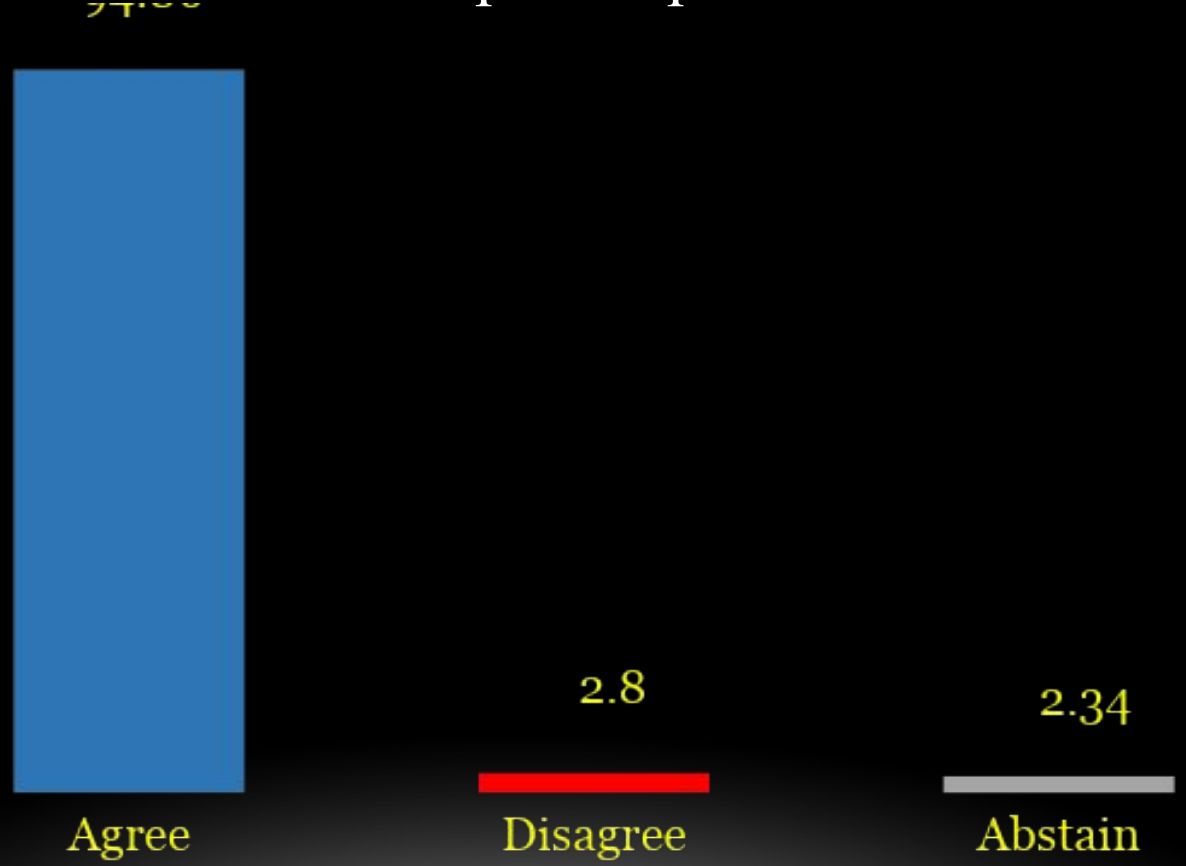
Response/Recommendation: Acenocoumarol should be stopped 3 days, warfarin and fluindione should be stopped 5 days, and phenprocoumon should be stopped 7 days prior to elective orthopedic surgery. Direct-acting oral anticoagulants (DOAC) (apixaban, edoxaban, dabigatran, and rivaroxaban) should be stopped at least two days prior to elective orthopedic surgery with an additional day added for dabigatran in patients with a creatinine clearance (CrCl) < 80 mL/min and two to three additional days for patients with a CrCl > 30 mL/min but < 50 mL/min.

Strength of Recommendation: Limited.

*Eric S. Schwenk, Thomas Volk, Alessandro Squizzato*

# ICM VTE General

72 - When should chronic anticoagulation be stopped in patients undergoing elective orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 73 - Should bridging by an injectable anticoagulation be considered in patients who are on chronic anticoagulation prior to undergoing elective orthopaedic procedures?

Response/Recommendation: Patients on chronic oral anticoagulation for venous thromboembolism (VTE) prevention or non-valvular atrial fibrillation should not be bridged with low-molecular-weight heparin (LMWH) or intravenous unfractionated heparin prior to orthopaedic procedures. Several high-quality studies demonstrate an increased risk of perioperative bleeding complications with no difference in thromboembolic events in patients undergoing bridging anticoagulation therapy. For patients on oral anticoagulation for prosthetic heart valve, bridging should be considered weighing the patient's risk of thromboembolic events versus the risk of bleeding. However, a recent randomized controlled clinical trial which included 305 patients with mechanical heart valves demonstrated no benefit to bridging therapy.

Strength of Recommendation: Strong.

*Arjun Saxena, P. Maxwell Courtney*

# ICM VTE General

73 - Should bridging by an injectable anticoagulation be considered in patients who are on chronic anticoagulation prior to undergoing elective orthopaedic procedures?


(Strong Consensus)

# ICM VTE General

## 74 - Is there a difference between low dose and regular dose aspirin for the prevention of VTE following orthopaedic procedures?

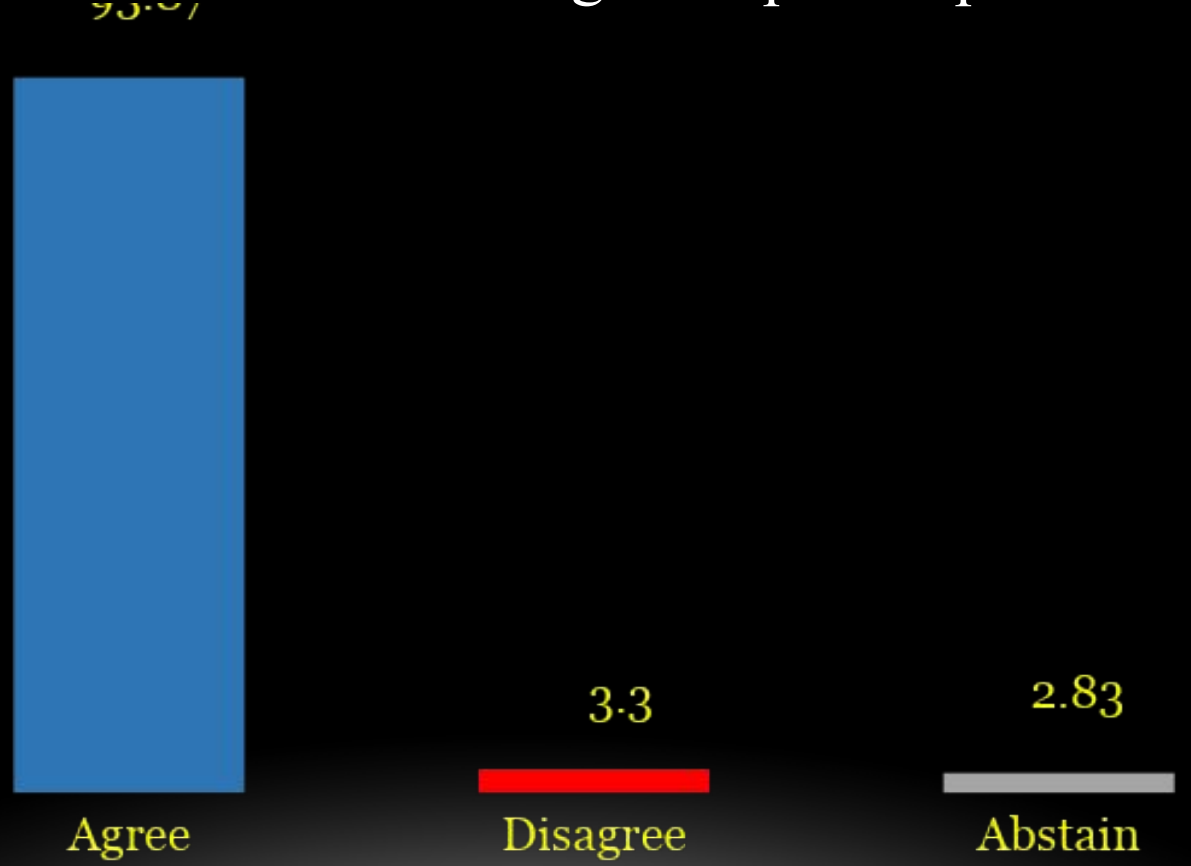
Response/Recommendation: There seems to be no difference in the efficacy of low dose and regular dose aspirin (ASA) for the prevention of venous thromboembolism (VTE) following orthopaedic procedures. However, tolerability and gastrointestinal side effect profile of low dose ASA is more favorable.

Strength of Recommendation: Limited.

*Corinne Mirkazemi, Jesus M. Villa, Tejbir S. Pannu, Carlos A. Higuera*

# ICM VTE General

74 - Is there a difference between low dose and regular dose aspirin for the prevention of VTE following orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

## 75 - What VTE prophylaxis should be administered to a patient who is allergic to aspirin?

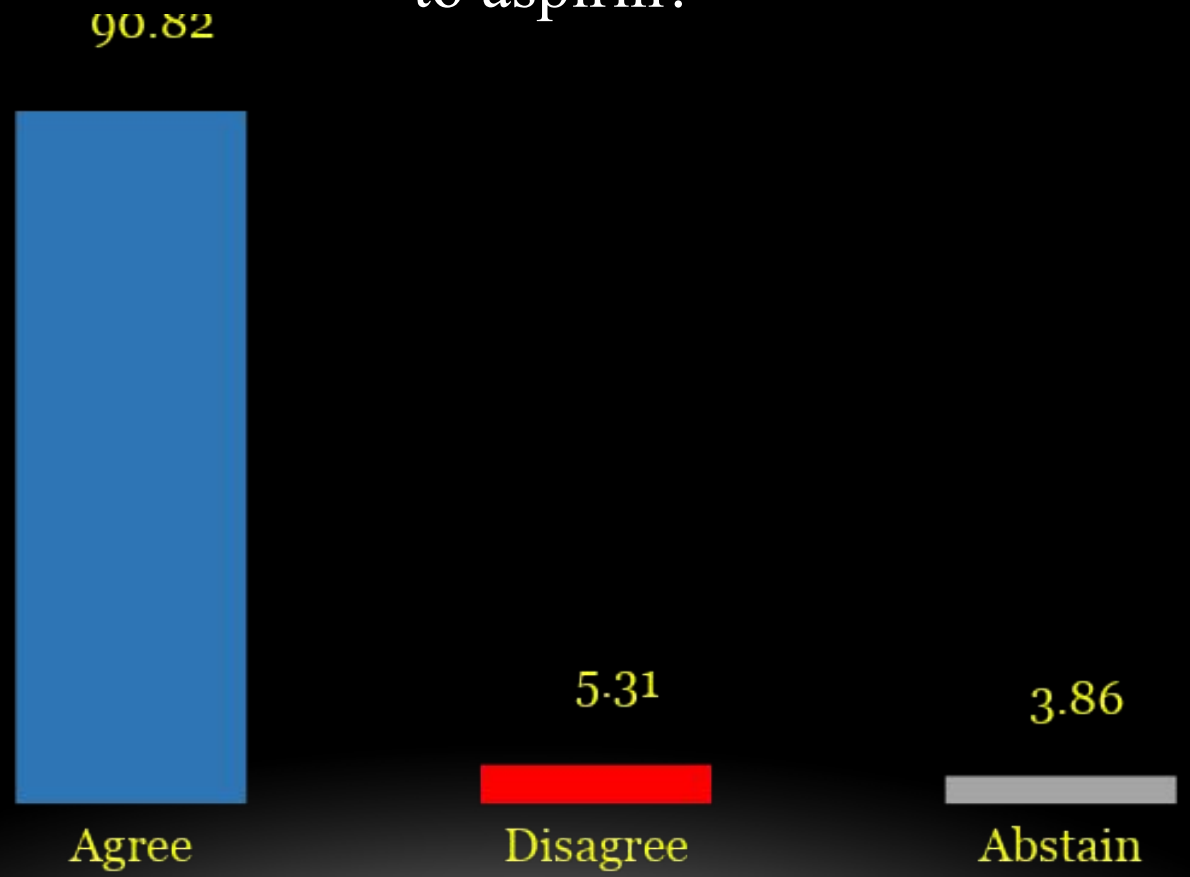
Response/Recommendation: In light of the advantageous safety profile and cost-effectiveness of aspirin (ASA) for prevention of venous thromboembolism (VTE), a detailed workup to confirm true hypersensitivity to ASA should be strongly considered unless systemic allergic reactions have been reported. Patients determined to have true aspirin-exacerbated respiratory disease (AERD) or mucocutaneous reactions may then undergo a desensitization protocol. On the rare occasion that a patient has a systemic allergic reaction to ASA, desensitization should be avoided, and alternative agents for VTE prophylaxis should be used.

Strength of Recommendation: Limited.

*Graham S. Goh, Terence L. Thomas, Henry Fu*

# ICM VTE General

75 - What VTE prophylaxis should be administered to a patient who is allergic to aspirin?




(Strong Consensus)

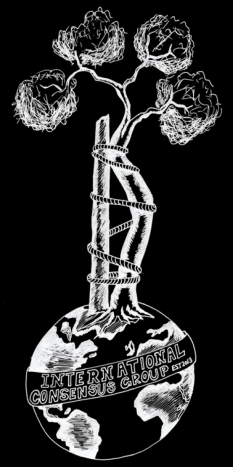
# ICM VTE General

**76** - Can non-steroidal anti-inflammatory drugs (NSAIDs) be used as prophylactic agents against VTE in patients undergoing orthopaedic procedures?

- Response/Recommendation: There is inadequate evidence to support the use of non-steroidal anti-inflammatory drugs (NSAIDs) as sole pharmacological agents to prevent venous thromboembolism (VTE) in patients undergoing orthopaedic surgery.

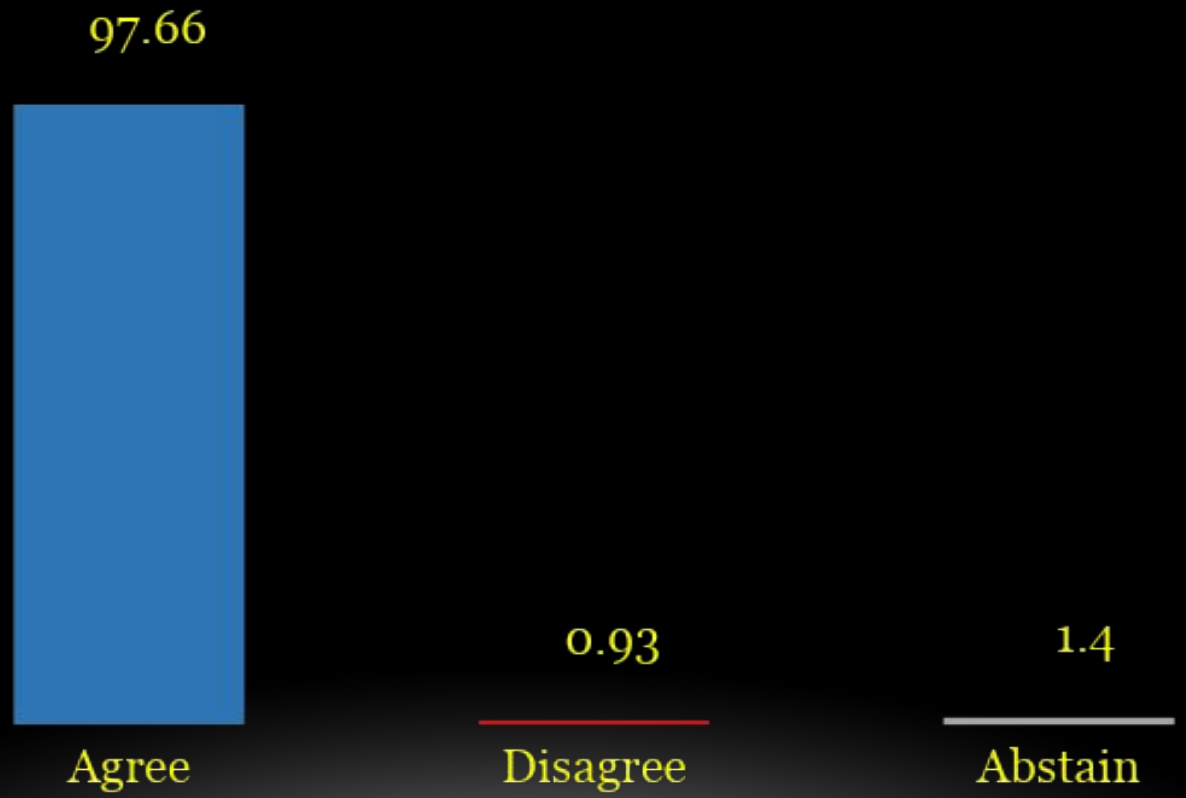
Strength of Recommendation: Limited.

*Dana Alameddine, Alessandro Squizzato, Nicoletta Riva, Cassius I. Ochoa Chaar*



# ICM VTE General

**76** - Can non-steroidal anti-inflammatory drugs (NSAIDs) be used as prophylactic agents against VTE in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

77 - Can NSAIDs be co-administered with aspirin, when used as a VTE prophylaxis, in patients undergoing orthopaedic procedures?

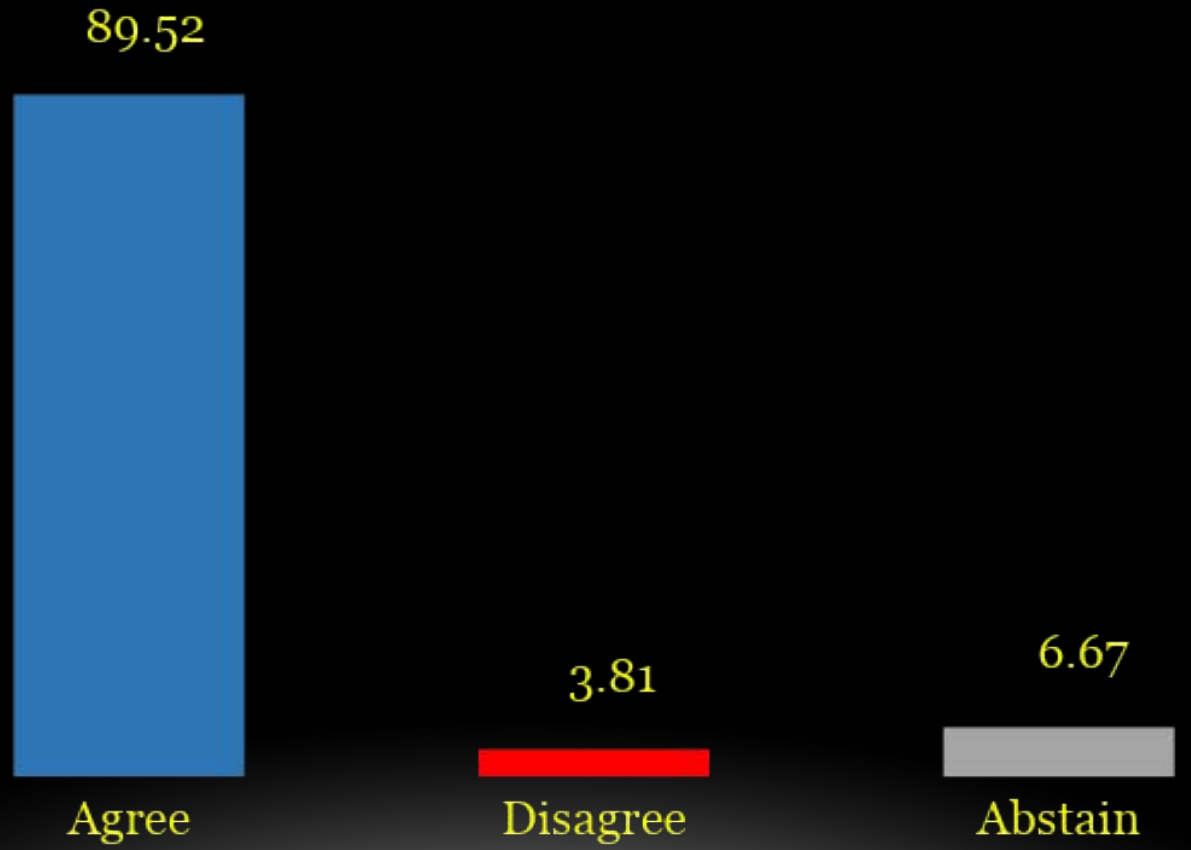
- Response/Recommendation: Non-steroidal anti-inflammatory drugs (NSAID) ingested together with aspirin (ASA) may reduce the antithrombotic activity of ASA. This effect is greater with the use of non-selective NSAID. Therefore, ASA should be taken at least 2 hours before taking NSAID.

Strength of Recommendation: Moderate.

*Mehmet A. Cacan, Ibrahim Azboy*

# ICM VTE General

77 - Can NSAIDs be co-administered with aspirin, when used as a VTE prophylaxis, in patients undergoing orthopaedic procedures?




(Strong Consensus)

# ICM VTE General

**78** - Are there differences between various Factor Xa inhibitors in prevention of VTE with regard to efficacy and safety profile?

- Response/Recommendation: There is insufficient data to demonstrate superiority for one Factor Xa inhibitor over another as venous thromboembolism (VTE) prophylaxis.

Strength of Recommendation: Limited.

*Charles Marc Samama, Jared Warren*

# ICM VTE General

**78** - Are there differences between various Factor Xa inhibitors in prevention of VTE with regard to efficacy and safety profile?


(Strong Consensus)

# ICM VTE General

## 79 - Are there any blood tests that can be used to monitor the activity/efficacy of factor Xa inhibitors used as VTE prophylaxis?

- Response/Recommendation: Activated partial thromboplastin time (aPTT) and prothrombin time (PT) can be used to monitor the activity of unfractionated heparin and vitamin K antagonists respectively. Neither the aPTT nor the international normalized ratio (INR) can be reliably used to monitor the activity of factor Xa inhibitors. The application of chromogenic anti-Xa assays is reliable for assessing the activity of factor Xa inhibitors in serum or plasma. No therapeutic ranges of anti-Xa assays are available, either for prevention or for therapy.

Strength of Recommendation: Limited.

*Stanislav Bondarenko, Masahiro Hasegawa, Valentyna Maltseva, Olexandr Vysotskyi, Yale A. Fillingham*

# ICM VTE General

79 - Are there any blood tests that can be used to monitor the activity/efficacy of factor Xa inhibitors used as VTE prophylaxis?


(Strong Consensus)

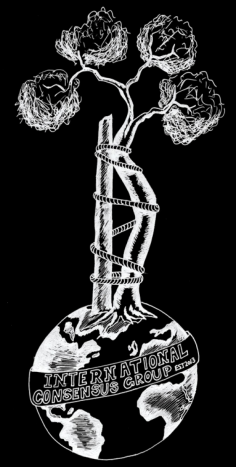
# ICM VTE General

## 80 - Does warfarin cause hypercoagulable state during initial administration?

- Response/Recommendation: The available literature suggests that the administration of warfarin leads to a temporary hypercoagulable state.

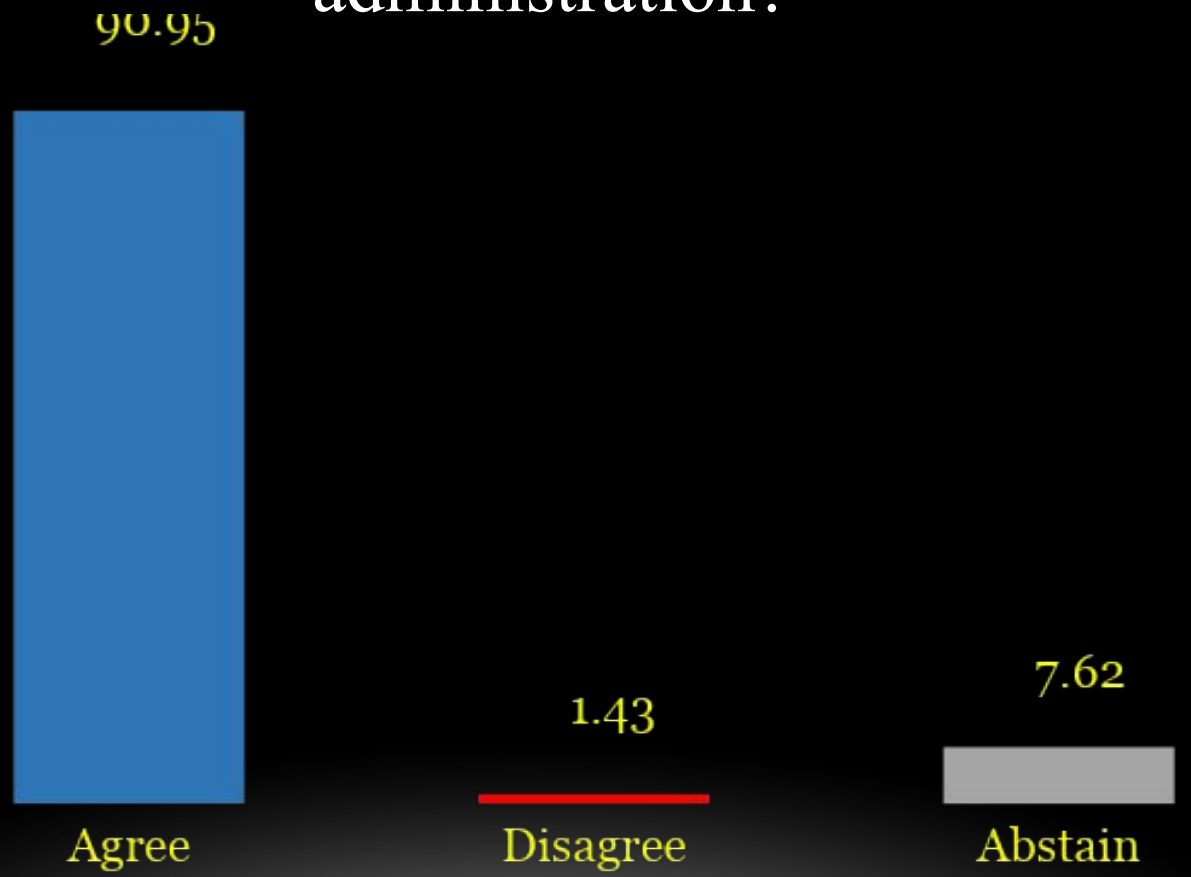
Strength of Recommendation: Moderate.

*Denis Nam, Robert L. Barrack*



# ICM VTE General

80 - Does warfarin cause hypercoagulable state during initial administration?




(Strong Consensus)

# ICM VTE General

81 - Is there a role for bridging with another therapeutic anticoagulant after orthopaedic surgery when warfarin is used for VTE prophylaxis?

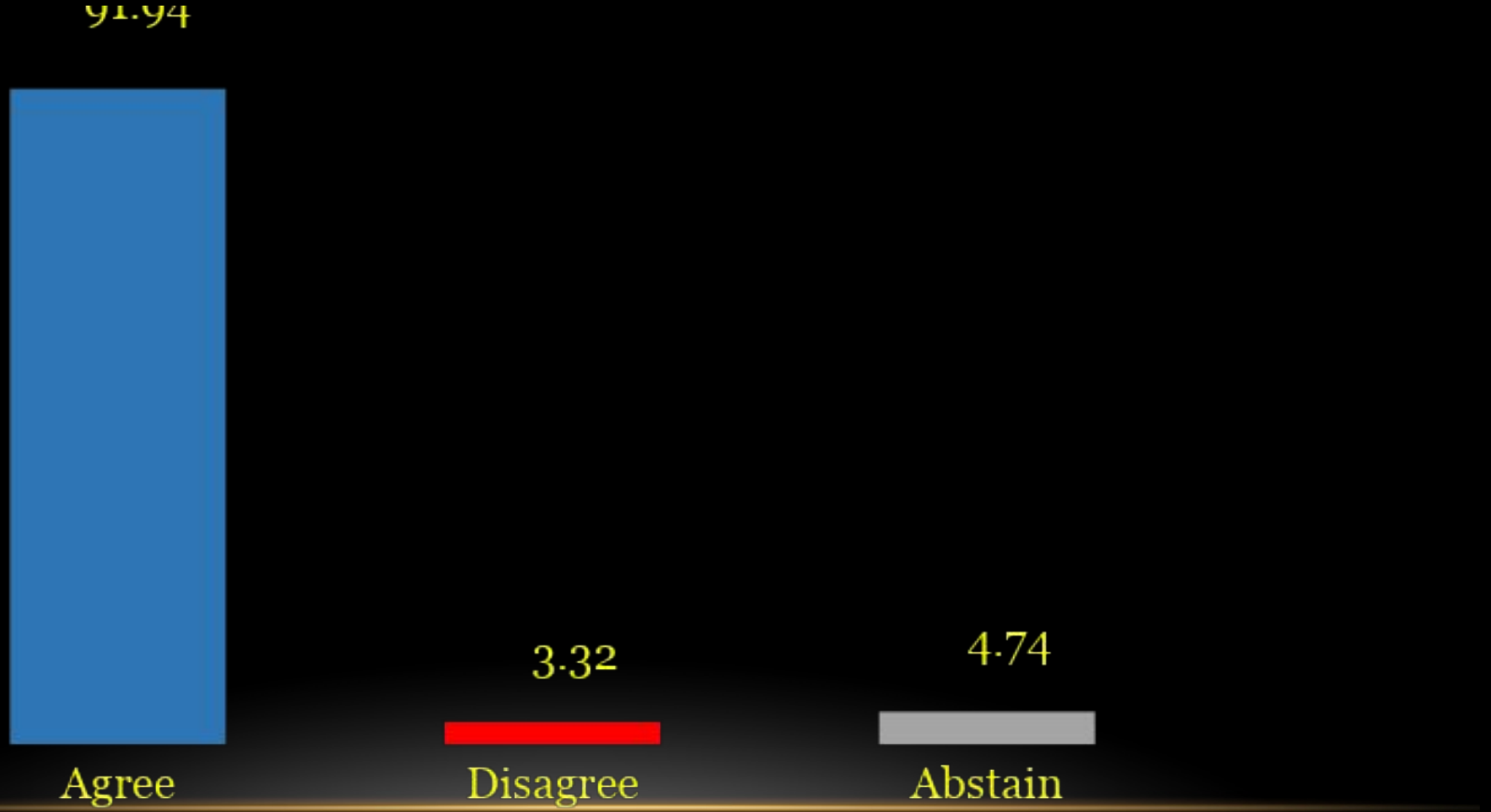
- Response/Recommendation: Patients on warfarin undergoing elective orthopaedic surgery should not routinely be bridged with unfractionated heparin (UFH) or low-molecular-weight heparin (LMWH). In patients with co-morbid conditions, such as a mechanical heart valve, where risks of thromboembolic events may outweigh the risk of bleeding, bridging may be considered.

Strength of Recommendation: Limited.

*Jourdan M. Cancienne, Brian C. Werner*

# ICM VTE General

81 - Is there a role for bridging with another therapeutic anticoagulant after orthopaedic surgery when warfarin is used for VTE prophylaxis?




(Strong Consensus)

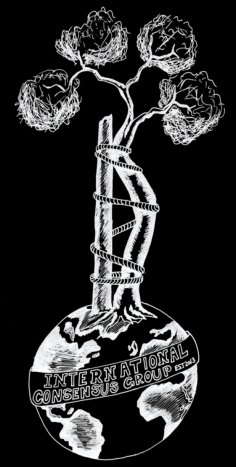
# ICM VTE General

82 - Are there differences between various injectable pharmacological agents for VTE prophylaxis with regard to efficacy and safety profile?

- Response/Recommendation: Compared to low- molecular-weight heparin (LMWH) and unfractionated heparin (UFH), fondaparinux appears to have a better efficacy profile for prevention of venous thromboembolism (VTE) following orthopaedic procedures. Based on current evidence, there appears to be no difference in the safety profile of the different injectable pharmacological agents in terms of peri- operative bleeding risk.

Strength of Recommendation: Moderate.

*Sahar Hamdi, Rudolf W. Poolman, Cassius I. Ochoa Chaar*



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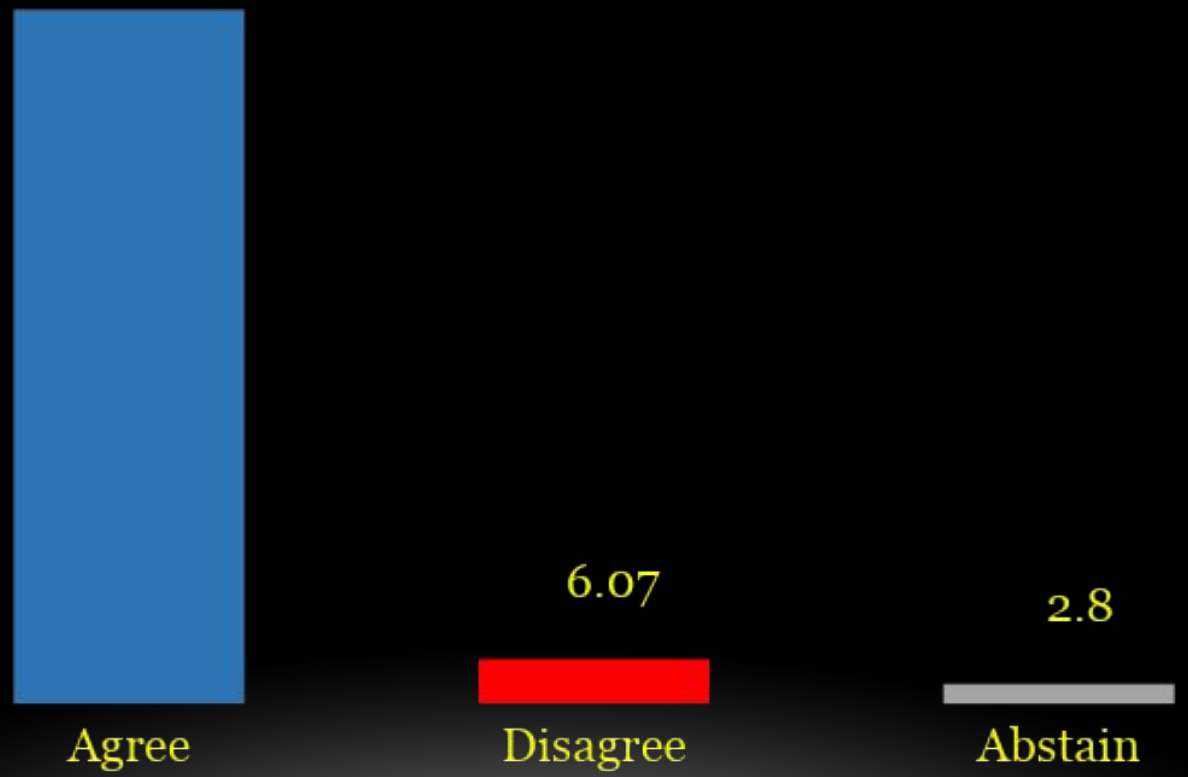



(Strong Consensus)

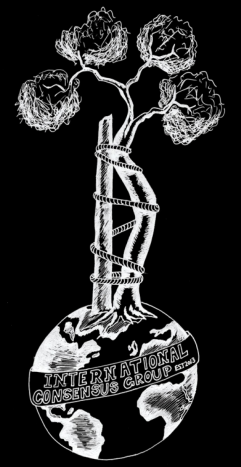
# ICM VTE General

## 83 - What is the optimal timing for the start of LMWH as a VTE prophylaxis in patients undergoing orthopaedic procedures?

- Response/Recommendation: The optimal timing for the initiation of low-molecular-weight heparin (LMWH) for venous thromboembolism (VTE) prophylaxis in patients undergoing orthopaedic procedures is 12 - 24 hours after surgery. Although high quality evidence is lacking, several studies have identified an increased risk of postoperative bleeding when LMWH is given preoperatively or immediately postoperatively. Concerns also exist for earlier initiation of LMWH in patients undergoing neuraxial anesthesia. There seems to be no benefit in starting LMWH preoperatively vs (> 12 hours) postoperatively. Exact timing for a specific procedure, particularly trauma patients or those at risk for VTE, should be in accordance with the chosen LMWH pharmacokinetics, surgeons/anesthesiologists' preferences, and patient comorbidities.

Strength of Recommendation: Limited.

*Dragan K. Radoičić, Harmen B. Ettema*



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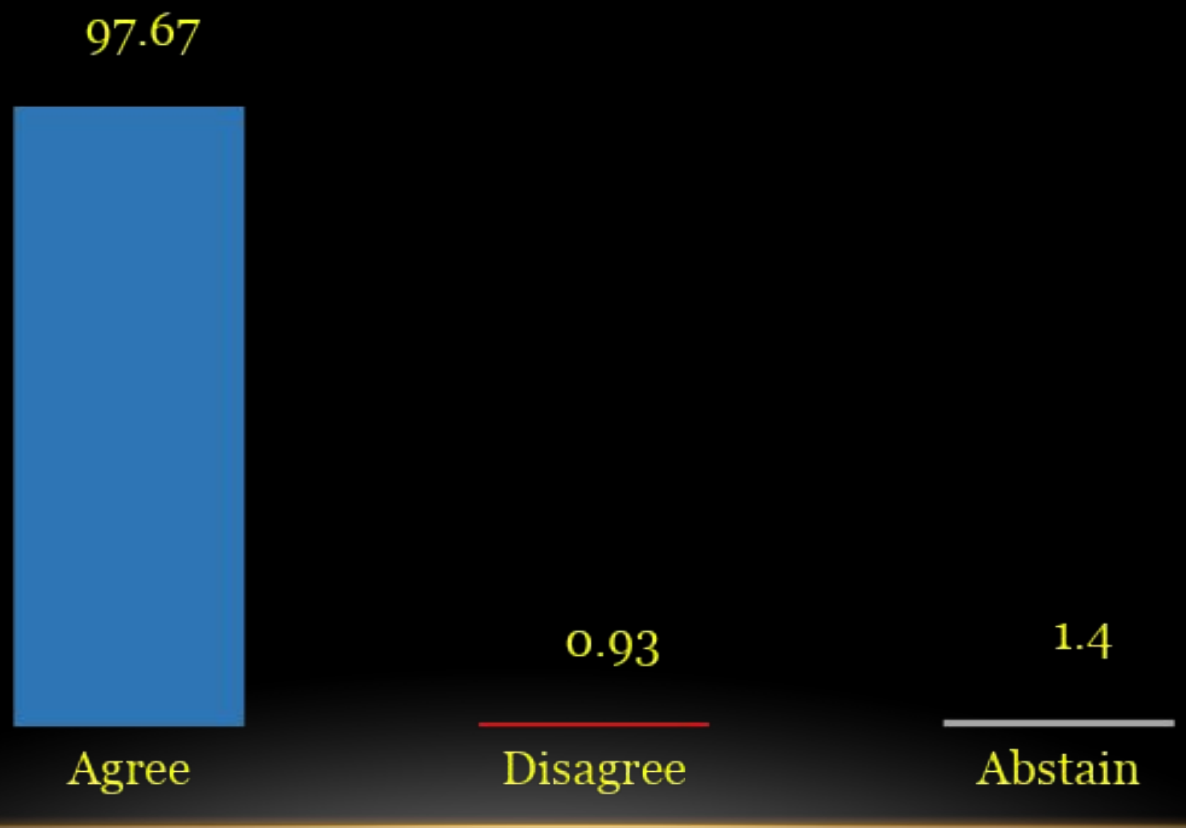



(Strong Consensus)

# ICM VTE General

## 84 - Should the dose of LMWH for the prevention of VTE be weight-adjusted?

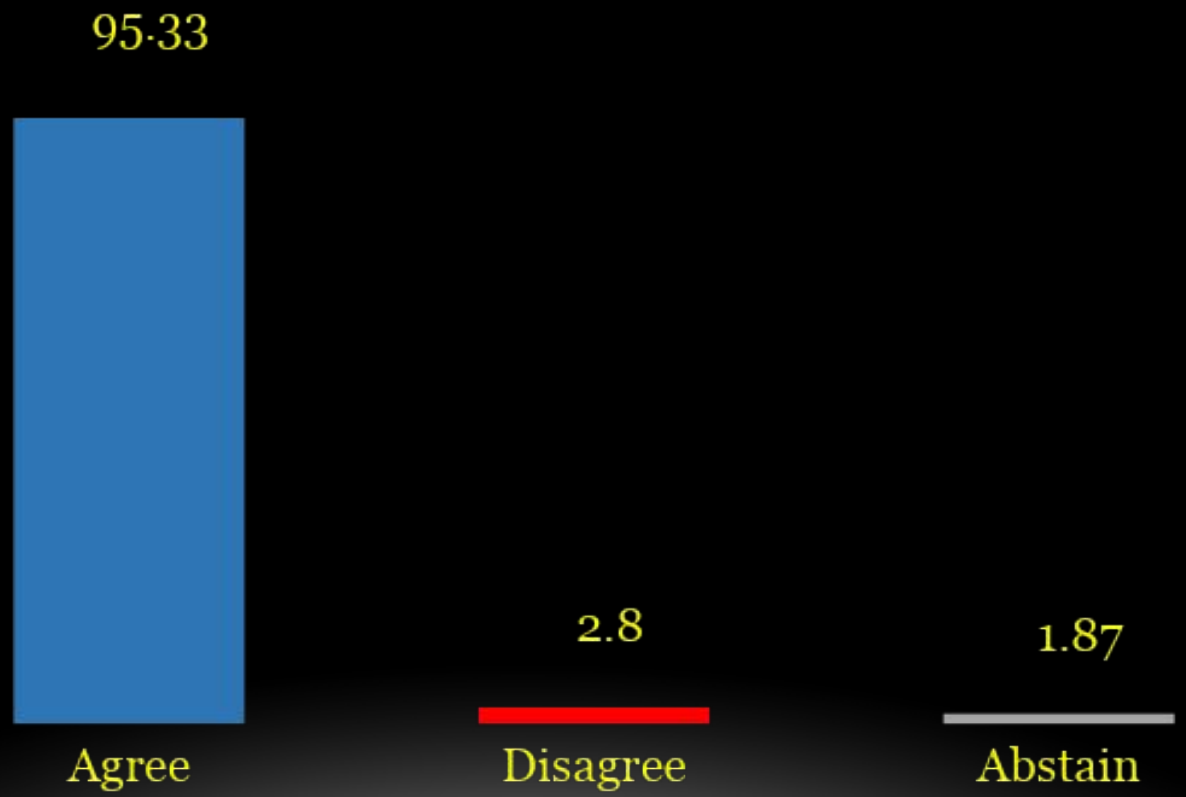
- Response/Recommendation: Limited data suggests that weight-adjusted dosing of low-molecular-weight heparin (LMWH) may be of benefit in venous thromboembolism (VTE) prophylaxis for very low body weight and obese patients.

Strength of Recommendation: Limited.

*Louis M. Kwong, Hasan Huseyin Ceylan*

# ICM VTE General

84 - Should the dose of LMWH for the prevention of VTE be weight-adjusted?




(Strong Consensus)

# ICM VTE General

85 - Does the administration of VTE prophylaxis to patients undergoing orthopedic procedures increase the rate of post-operative non-VTE complications?

- Response/Recommendation: Administration of pharmacological venous thromboembolism (VTE) prophylaxis to patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA) increases the rate of post-operative bleeding complications. Aspirin carries the lowest risk. The literature is inconclusive for other orthopaedic procedures.

- Strength of Recommendation: Strong.

*Jean-Yves Jenny*

# ICM VTE General

85 - Does the administration of VTE prophylaxis to patients undergoing orthopedic procedures increase the rate of post-operative non-VTE complications?


(Strong Consensus)

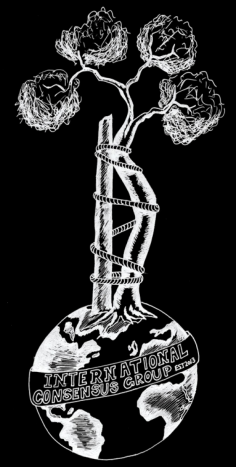
# ICM VTE General

86 - Does the administration of VTE prophylaxis increase the risk for intracranial bleeding in patients undergoing orthopaedic procedures? If so, are there differences between the various prophylactic agents?

Response/Recommendation: There is a known association between the use of antithrombotic drugs and the risk of intracranial bleeding in patients receiving long-term treatment. Intracranial bleeding has been less commonly reported in patients undergoing orthopaedic procedures, probably because of the shorter time of exposure to antithrombotic drugs. The incidence of intracranial bleed seems to be higher with the use of vitamin K antagonists (VKA).

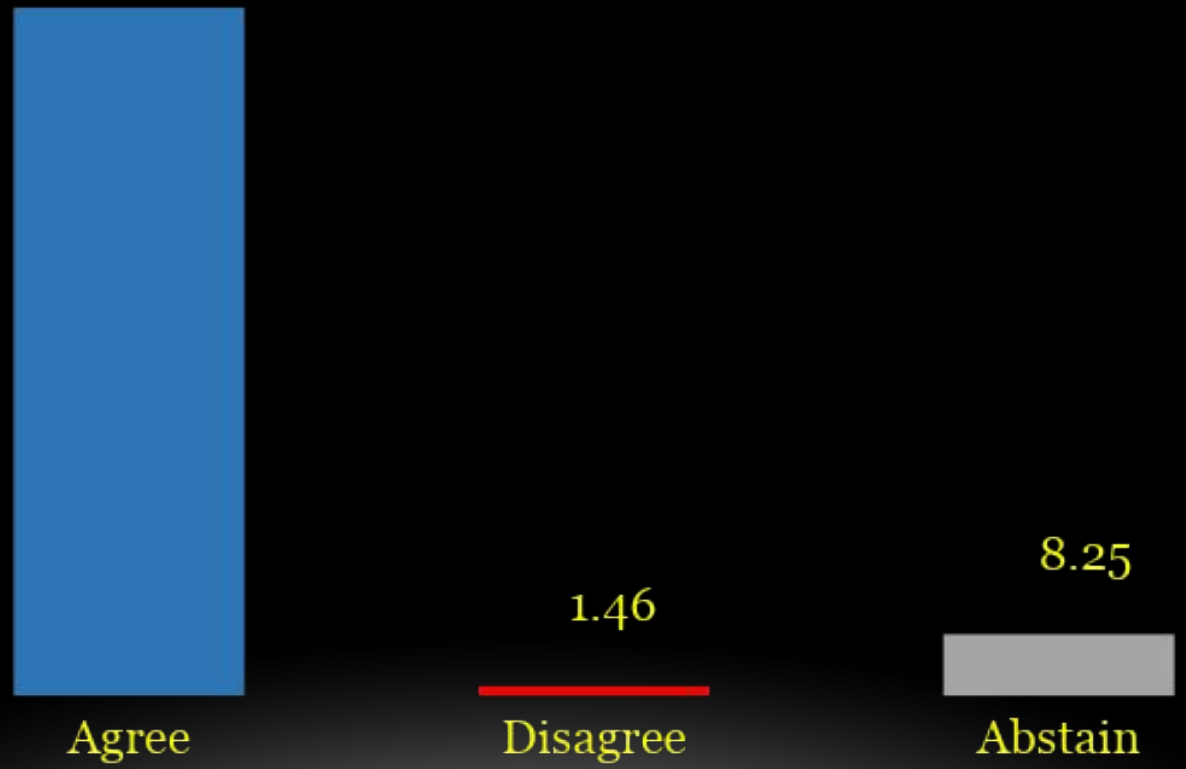
Strength of Recommendation: Limited.

*Walter Ageno, Daniel Caldeira*



# ICM VTE General

86 - Does the administration of VTE prophylaxis increase the risk for intracranial bleeding in patients undergoing orthopaedic procedures? If so, are there differences between the various prophylactic agents?




(Strong Consensus)

# ICM VTE General

87 - Does the administration of VTE prophylaxis increase the risk for epidural hematoma in patients undergoing orthopaedic procedures? If so, are there differences between the various agents?

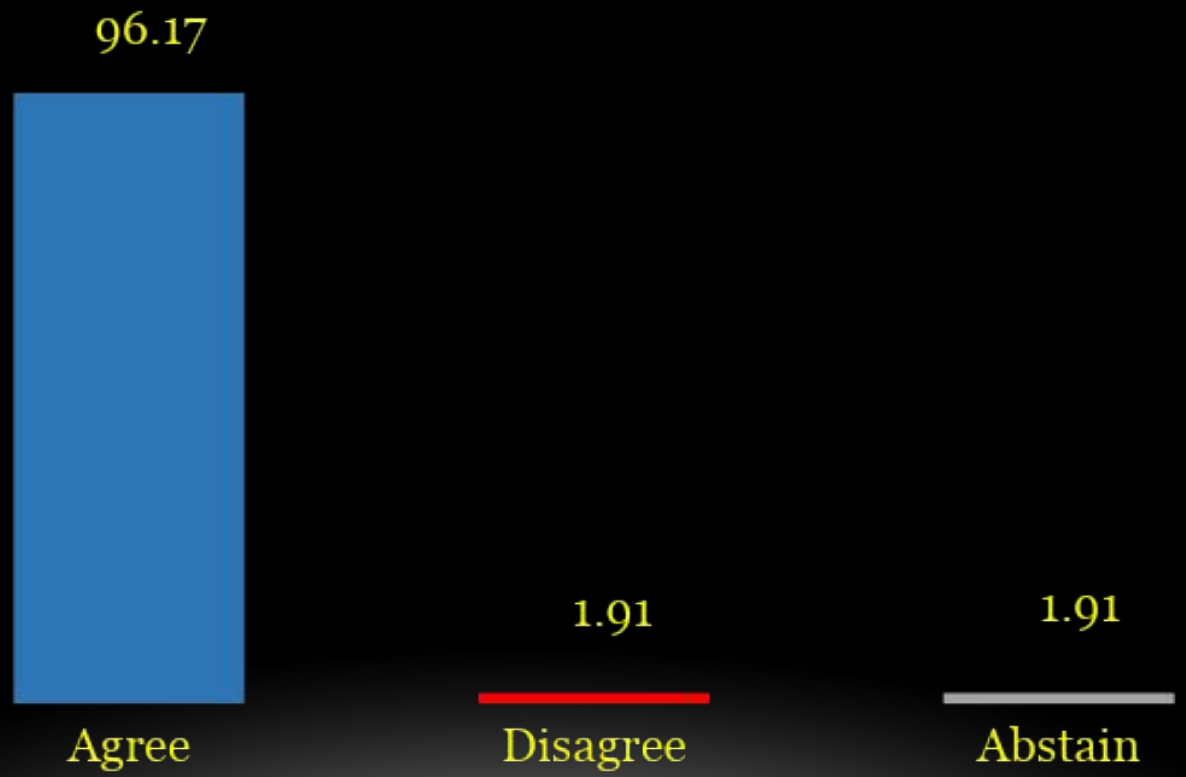
Response/Recommendation: Epidural hematoma (EH) is a rare but serious complication of neuraxial anesthesia. Venous thromboembolism (VTE) prophylaxis for total joint arthroplasty (TJA) has been associated with cases of EH and low-molecular-weight heparin (LMWH) appears to carry the greatest risk of the agents currently used. EH has also been associated with the use of direct-oral ac

Strength of Recommendation: Moderate.

*Jason Kopenitz, Eric S. Schwenk, Eugene R. Viscusi*

# ICM VTE General

87 - Does the administration of VTE prophylaxis increase the risk for epidural hematoma in patients undergoing orthopaedic procedures? If so, are there differences between the various agents?




(Strong Consensus)

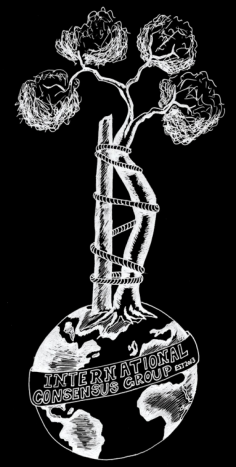
# ICM VTE General

88 - Does the risk of post-operative wound problems in patients undergoing orthopaedic procedures differ between various VTE prophylactic agents?

Response/Recommendation: Yes, aspirin (ASA) appears to confer a lower risk of postoperative wound problems com- pared to other chemoprophylactic agents.

Strength of Recommendation: Limited.

*Majd Tarabichi, Diana Fernandez-Rodriguez*



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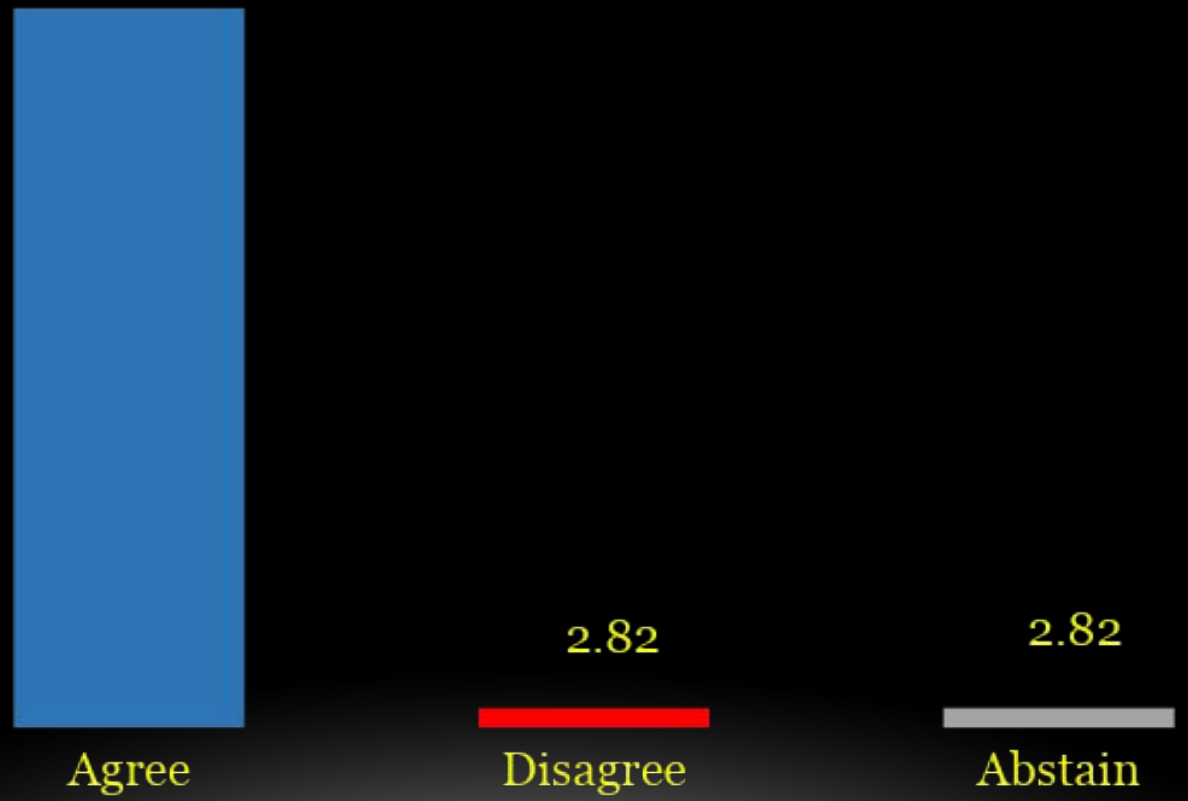



(Strong Consensus)

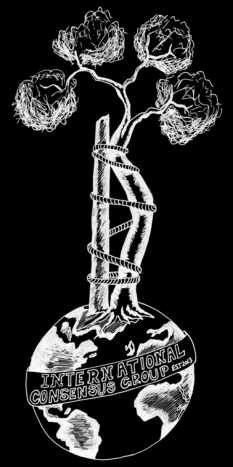
# ICM VTE General

89 - Should the VTE prophylaxis be altered in patients undergoing orthopaedic procedures who develop wound related problems?

Response/Recommendation: Yes. It is recommended to either hold anti-coagulation or change to a less aggressive anticoagulation agent in cases of wound related problems such as persistent wound drainage, bleeding, or hematoma formation

Strength of Recommendation: Low.

*Carlos Bracho, Marjan Wouthuyzen-Bakker, German Salazar, Estuardo Barragan, Mathias Salazar, Edwin Larco*



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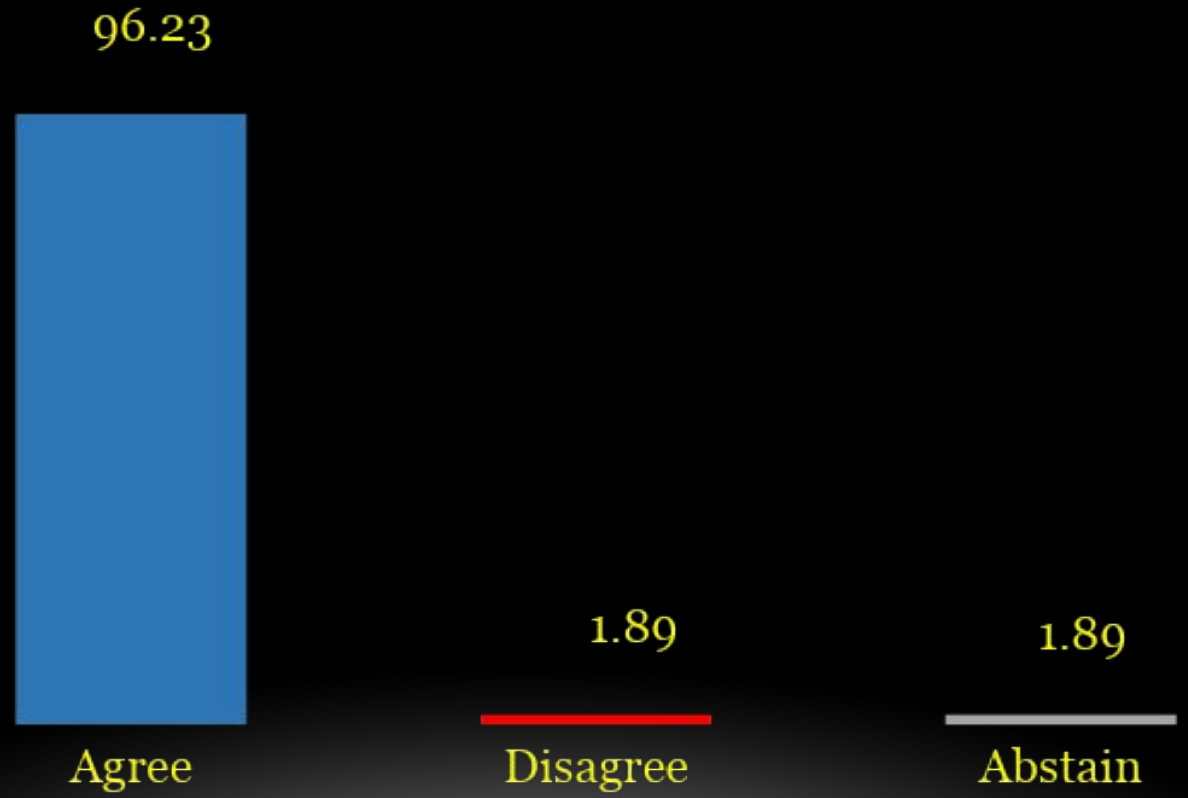



(Strong Consensus)

# ICM VTE General

## 90 - Does the development of a hematoma as a result of the administration of VTE prophylaxis increase the risk of subsequent arthrofibrosis?

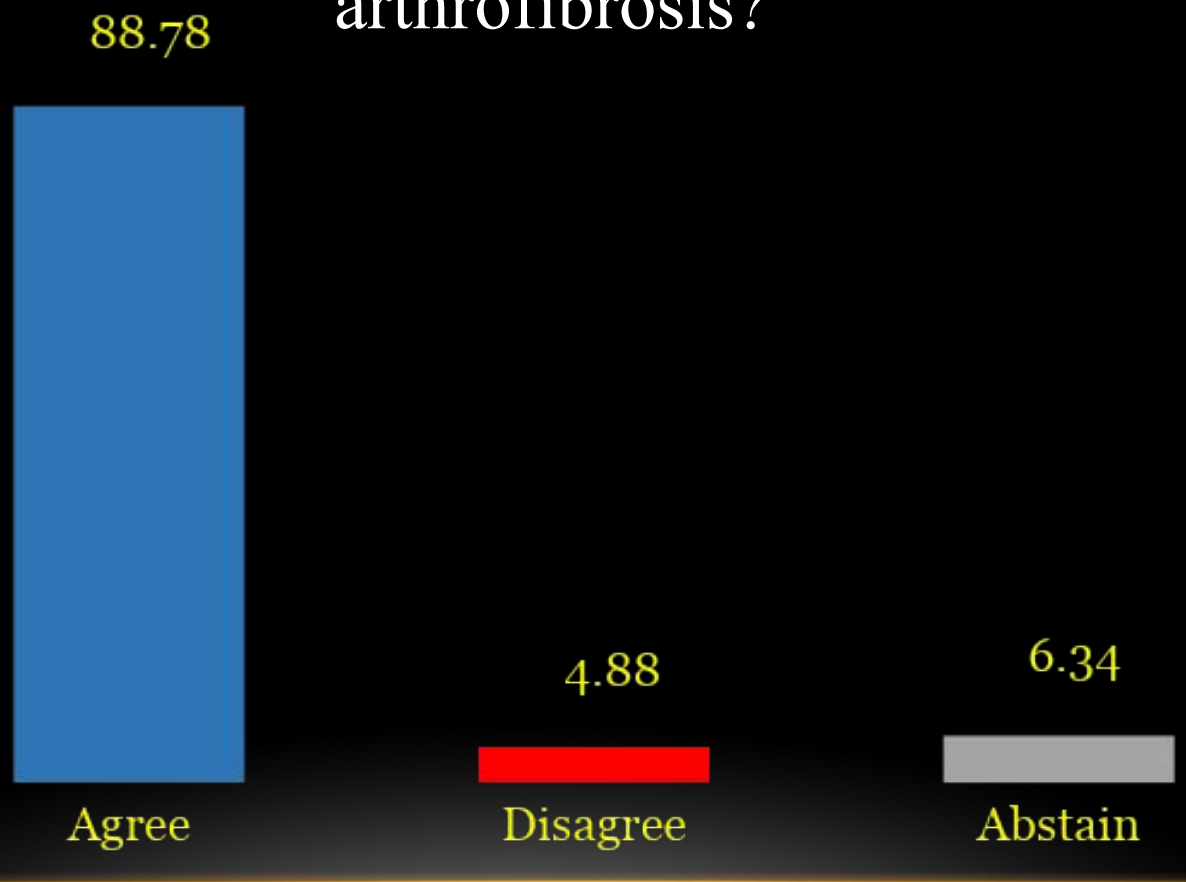
Response/Recommendation: There is a lack of robust data to link the use of VTE prophylaxis and arthrofibrosis. One retrospective study demonstrated an increased risk of manipulation under anesthetic/lysis of adhesions after anterior cru- ciate ligament reconstruction (ACLR) in patients receiving VTE prophylaxis with an agent other than aspirin (ASA), as compared to patients receiving no thromboprophylaxis.

Strength of Recommendation: Limited.

*Julian F. Maempel, Eustathios Kenanidis, Nikolaos Milonakis, Eleftherios Tsiridis*

# ICM VTE General

90 - Does the development of a hematoma as a result of the administration of VTE prophylaxis increase the risk of subsequent arthrofibrosis?




(Strong Consensus)

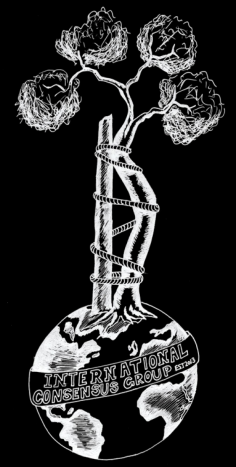
# ICM VTE General

## 91 - Is there a role for empirical treatment of patients with suspected, but not confirmed, VTE in the post- operative period?

Response/Recommendation: Empirical systemic treatment with anticoagulation for suspected venous thromboembolism (VTE) in the post-operative period should only be initiated when timely image-based diagnosis cannot be achieved. Early treatment reduces the risk of VTE-associated morbidity. However, the increased bleeding risk with recent surgery should also be considered. Initiation of anticoagulation is ultimately a clinical decision, and a comprehensive risk- benefit assessment should be undertaken based on individual patient factors.

Strength of Recommendation: low.

*Deepak Menon, Oussama Abcha, Sofiene Kallel, Hemant Pandit*



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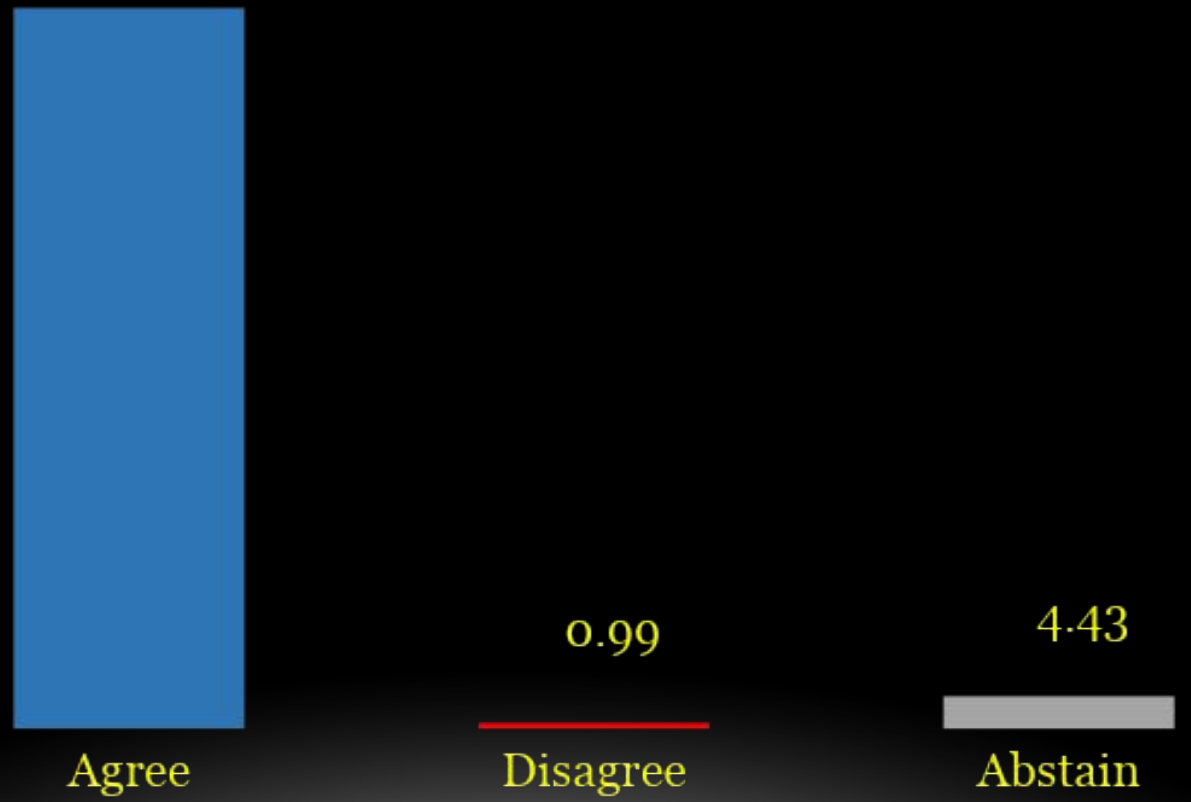



(Strong Consensus)

# ICM VTE General

92 - What is the most appropriate method to monitor patients with confirmed post-operative VTE?

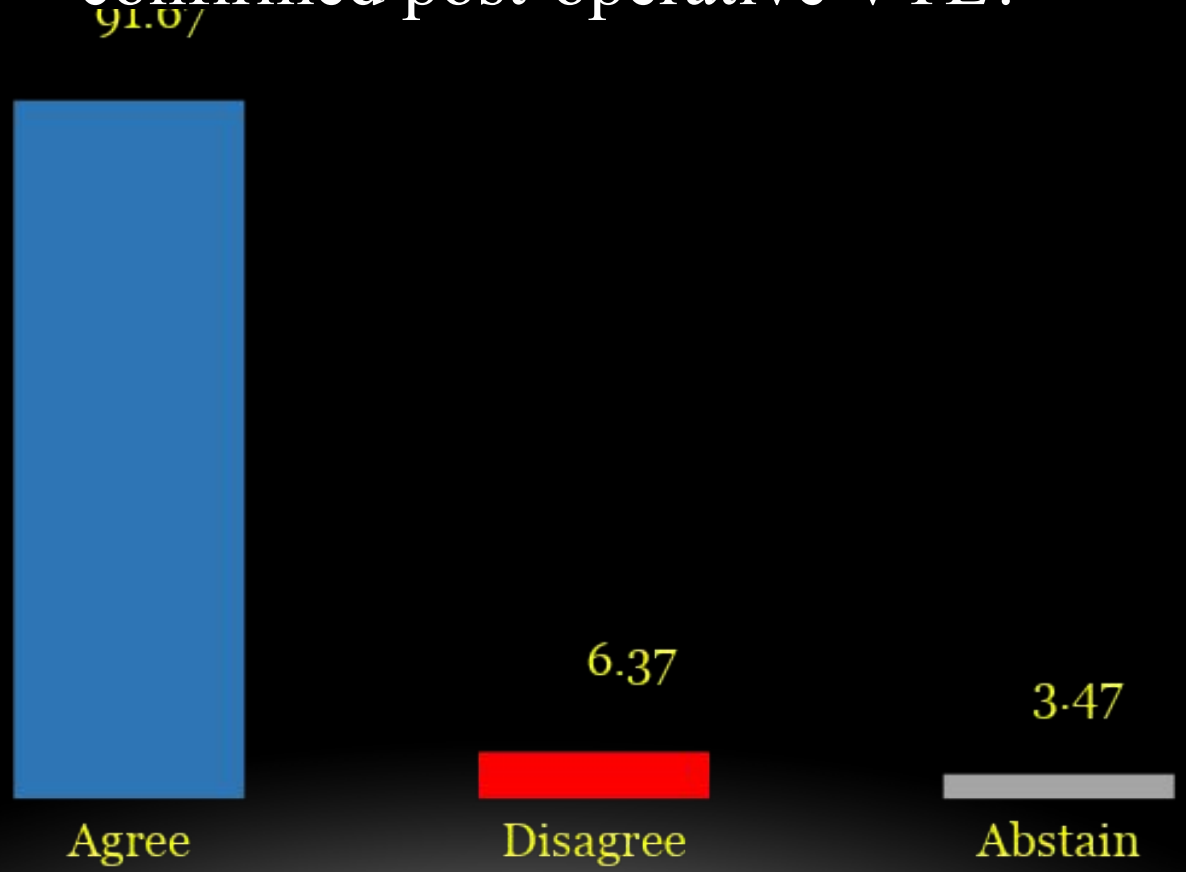
Response/Recommendation: Although it is not entirely clear whether venous thromboembolism (VTE) should be monitored after orthopaedic surgery, in selected patients suffering VTE due to persistent risk factors, the preferred method should be serial ultrasonography with or without serum D- dimer quantification.

Strength of Recommendation: Limited.

*Agustin Garcia-Mansilla, Fernando Holc, Martin Buttaro*

# ICM VTE General

92 - What is the most appropriate method to monitor patients with confirmed post-operative VTE?




(Strong Consensus)

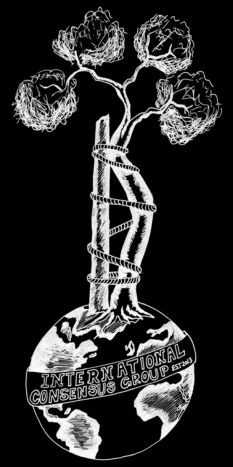
# ICM VTE General

## 93 - Should the post-operative rehabilitation of a patient with confirmed PE be modified?

Response/Recommendation: Following orthopaedic surgery, when a diagnosis of pulmonary embolism (PE) has been made and the patient is therapeutically anticoagulated, post-operative rehabilitation should proceed without delay. In patients who have high/intermediate risk PE, the rehabilitation, not only should address regaining function of the operated area, but also should include respiratory training and closely monitored aerobic exercise to gradually increase the pulmo- nary functional capacity and the patient's quality of life. This recommendation is made in the absence of evidence that an early mobilization or rehabilitation program is associated with a higher risk of adverse events (namely recurrent PE or bleeding), and that there are clear established benefits to rehabilitation. We recognize that some patients who have PE may have poor cardio-pulmonary tolerance or other medical complications, and for these patients, the exercise regimen may need to be modified based on symptoms.

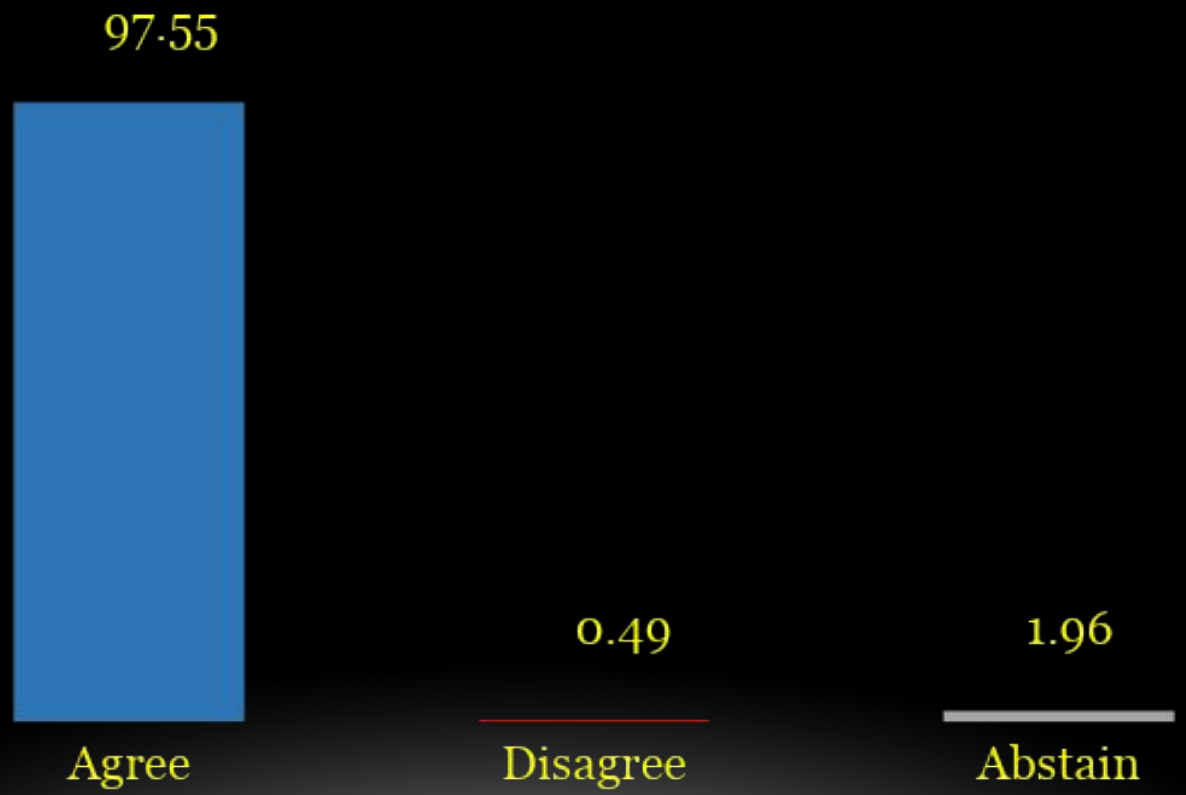
Strength of Recommendation: Limited.

*Noel Chan, Dina Brooks, David Beverland*



# ICM VTE General

93 - Should the post-operative rehabilitation of a patient with confirmed PE be modified?




(Strong Consensus)

# ICM VTE General

## 94 - Should the post-operative rehabilitation of patients who have confirmed symptomatic DVT be modified?

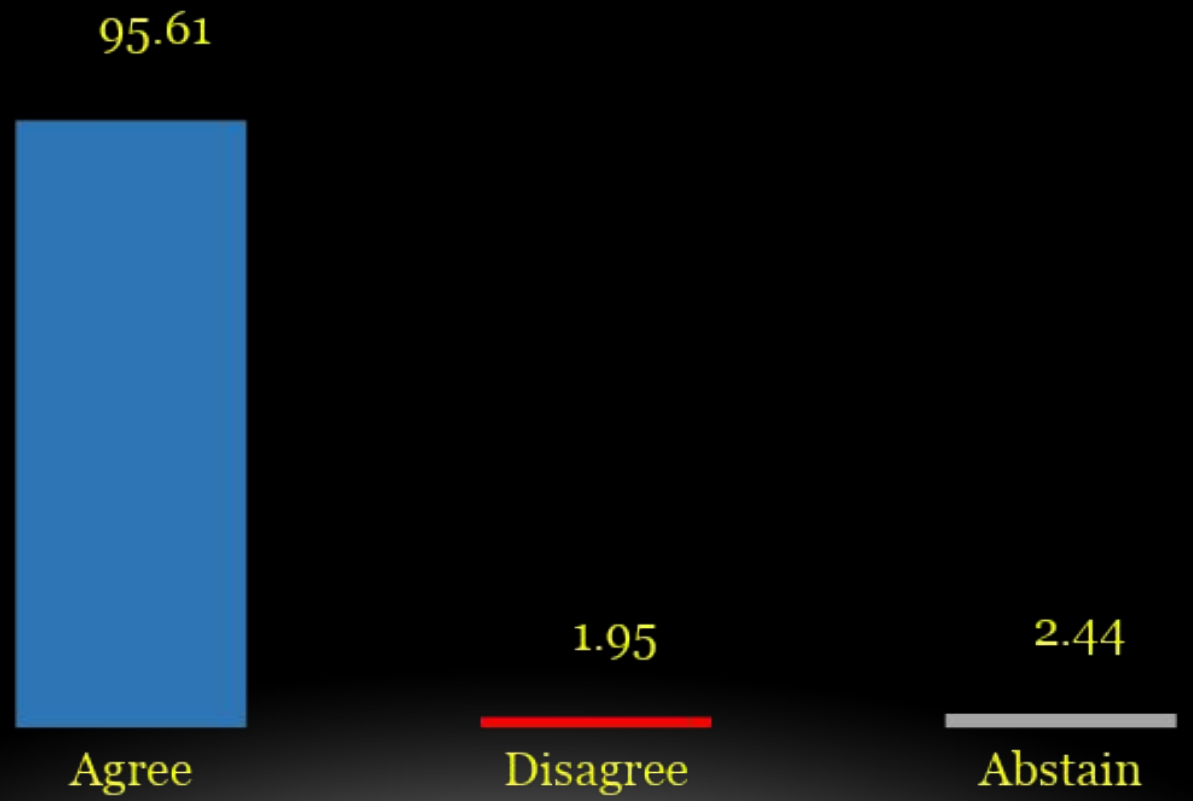
**Response/Recommendation:** Intravenous (IV) administration of intraoperative heparin to patients undergoing total hip arthroplasty (THA) has been investigated and found to be safe and effective in prevention of postoperative venous thromboembolism (VTE). Further studies are needed to evaluate the efficacy of this modality in other orthopaedic procedures.

**Strength of Recommendation:** Strong.

*Yong-Han Cha, Yavuz Saglam, Jun-Il Yoo, Kyung-Hoi Koo*

# ICM VTE General

94 - Should the post-operative rehabilitation of patients who have confirmed symptomatic DVT be modified?




(Strong Consensus)

# ICM VTE General

## 95 - Is there a role for thrombolysis in the management of patients with post-operative VTE?

Response/Recommendation: Despite the lack of evidence in the literature to establish a role for thrombolysis in patients with postoperative venous thromboembolism (VTE), there is a potential role for thrombolysis among select patients. Thrombolysis should be considered, with attention to iatro- genic bleeding and hematoma risk, among postoperative patients in the following circumstances:

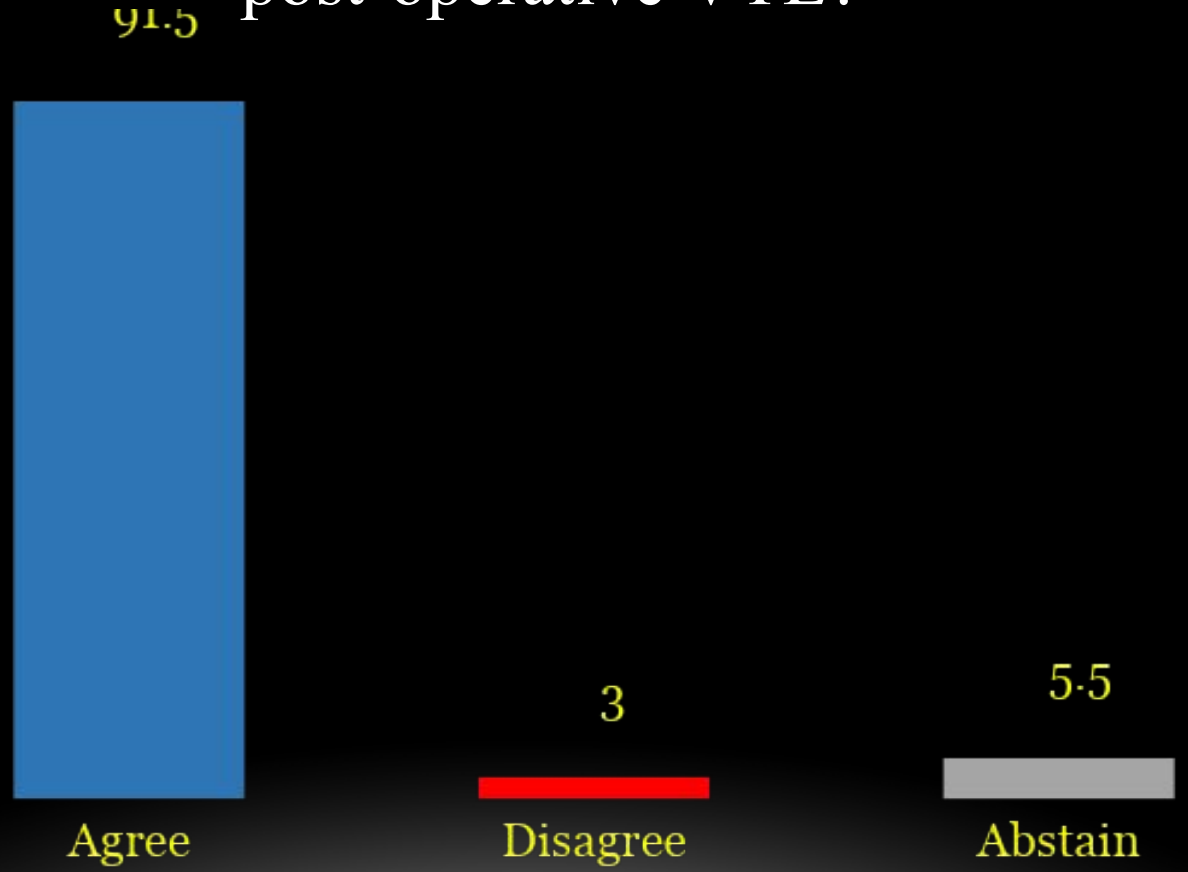
1. Limb threatening deep venous thrombosis (DVT) with acute limb ischemia (e.g., phlegmasia cerulea dolens).
2. 2. For selected patients at low risk for bleeding with symptomatic DVT involving the iliofemoral veins and at higher risk for severe post thrombotic syndrome (PTS).

Strength of Recommendation: Strong.

*Azlina A. Abbas, Chee Ken Chan, Cihan Ay, Mikel Sadek*

# ICM VTE General

95 - Is there a role for thrombolysis in the management of patients with post-operative VTE?




(Strong Consensus)

# ICM VTE General

## 96 - Are patients with prior history of COVID - 19 who undergo orthopaedic procedures at an increased risk of VTE? If so, should their post-operative anticoagulation regiment be altered?

Response/Recommendation: It is generally known that the severe acute respiratory syndrome-related coronavirus (SARS-CoV [COVID - 19]) infection predisposes individuals to a higher risk of thromboembolism. However, there is not sufficient data to suggest that a previous COVID - 19 infection increases the risk of venous thromboembolism (VTE) after an orthopaedic procedure. Thus, the VTE prophylaxis of patients with prior COVID - 19 does not need to be altered.

Strength of Recommendation: Limited.

*George Komnos, Theofilos Karachalios, Eugenia Cruz, Farideh Najafi, Neusha Hollingsworth, Javad Parvizi*

# ICM VTE General

96 - Are patients with prior history of COVID - 19 who undergo orthopaedic procedures at an increased risk of VTE? If so, should their post-operative anticoagulation regime be altered?


(Strong Consensus)

# ICM VTE General

## 97 - Does the risk for VTE increase after COVID - 19 vaccination?

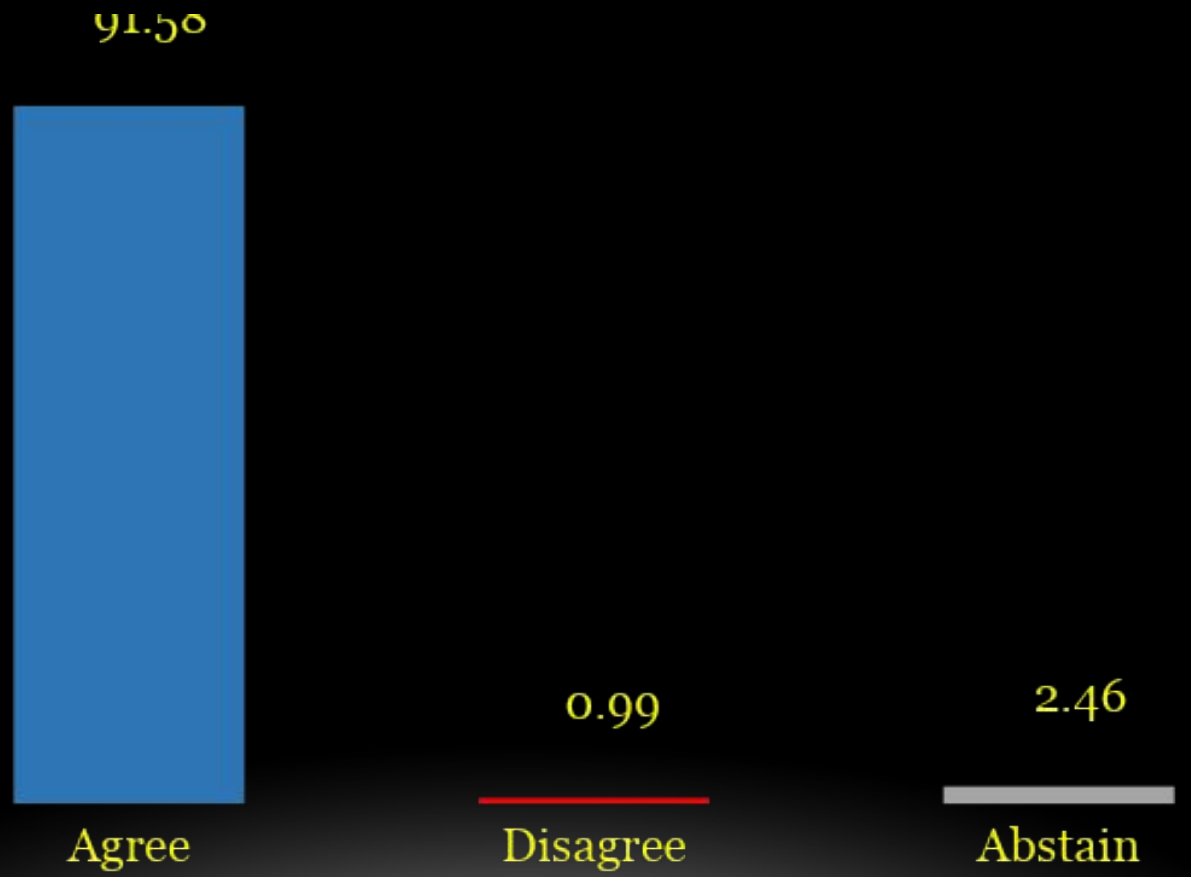
Response/Recommendation: The risk of venous thromboembolism (VTE) in individuals receiving the severe acute respiratory syndrome-related coronavirus (SARS-CoV [COVID - 19]) vaccination is similar to the general population. A rare but drastic side effect of adenoviral COVID - 19 vector vaccines is the development of venous thrombosis at unusual sites, such as the brain or abdomen, accompanied by thrombocytopenia. Because the mechanism is still unclear and similarity was observed with heparin-induced thrombocytopenia (HIT), treatment of such thrombus should include non-heparin anticoagulants and intravenous immunoglobulin.

Strength of Recommendation: Limited.

*Farideh Najafi, Mohammad S. Abdelaal, Javad Parvizi*

# ICM VTE General

97 - Does the risk for VTE increase after COVID - 19 vaccination?




(Strong Consensus)

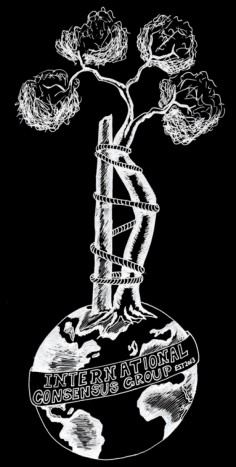
# ICM VTE General

## 98 - Do clinical practice guidelines set the standard of care for VTE prophylaxis?

Response/Recommendation: The development of the current clinical practice guidelines (CPG) which followed the Delphi method, thus removing the potential for bias, may set the “standard of care” in venous thromboembolism (VTE) prophylaxis in orthopaedic surgery, since for the first time, they cover all subspecialties in orthopaedics.

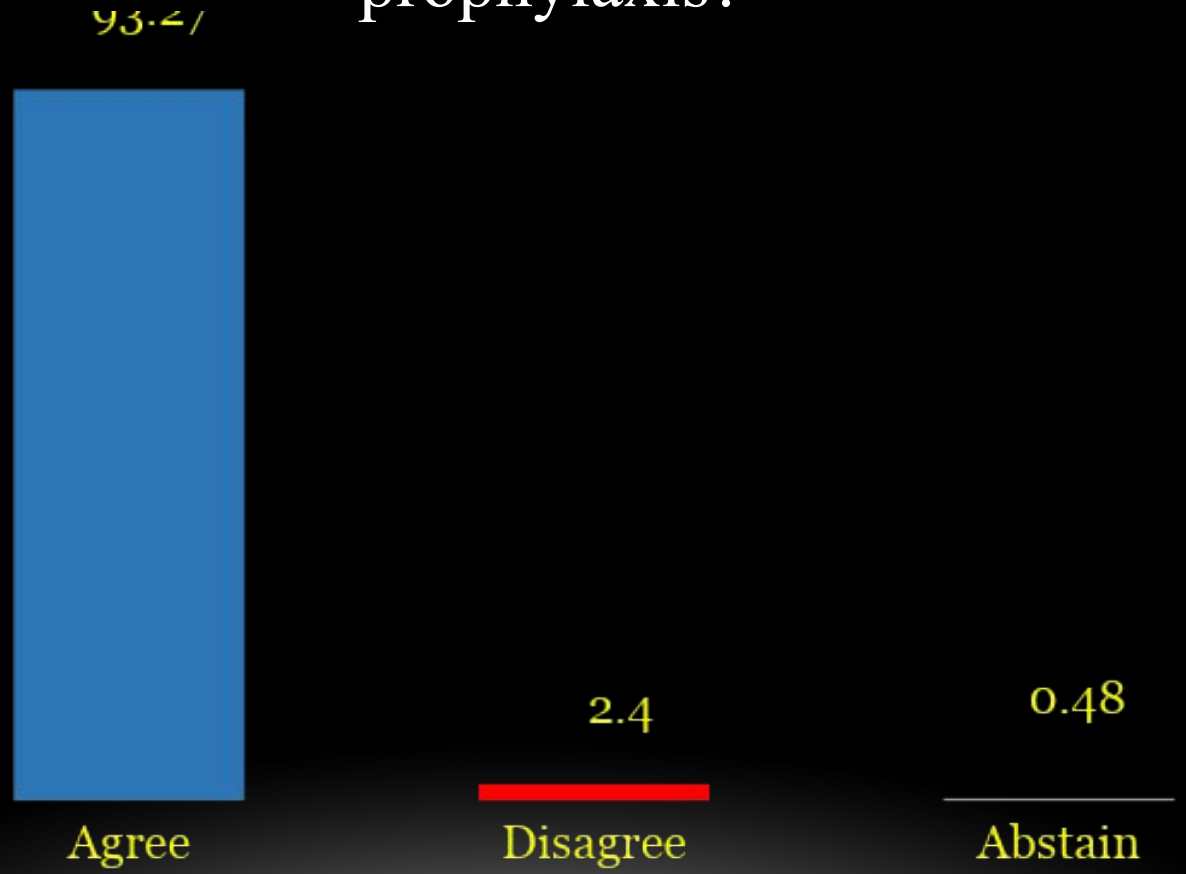
Strength of Recommendation: Moderate.

*Heather Hansen*



# ICM VTE General

98 - Do clinical practice guidelines set the standard of care for VTE prophylaxis?




(Strong Consensus)