

Current trends for venous thromboembolic prophylaxis for hip arthroscopy: a modified Delphi and nominal group technique consensus study

Ali Parsa¹, Asheesh Bedi² and Benjamin G. Domb^{1,3*}

¹American Hip Institute Research Foundation, 999 E Touhy Ave, Chicago, IL 60018, USA, ²Department of Orthopedics, NorthShore Medical Group, 9650 Gross Pointe Rd Suite 2900, Skokie, IL 60076, USA and ³American Hip Institute, 999 E Touhy Ave, Chicago, IL 60018, USA.

This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki. This study was carried out in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act. Details that might disclose the identity of the subjects under study have been omitted. This study was approved by the Institutional Review Board (IRB) (IRB ID: 5276).

This study was performed at the American Hip Institute Research Foundation.

*Correspondence to: B. G. Domb. E-mail: DrDomb@americanhipinstitute.org

ABSTRACT

The overall risk of venous thromboembolism (VTE) after hip arthroscopy (HA) is reported to range from 0.2% to 9.5%, but a clear set of recommendations for VTE prophylaxis in HA patients remains scarce. The aim is to survey high-volume hip arthroscopists about their current trends regarding VTE prophylaxis use. A combination of two consensus group methods was used in this study: nominal group technique (NGT) and modified Delphi. A preliminary questionnaire was prepared, and rounds of discussion were completed between NGT members. The final version of the survey was administered to 35 high-volume hip surgeons. Delegates' mean volume of annual hip arthroscopic surgery was 109. Approximately 22% of their patients are revision HA procedures. A total of 91.4% of delegates use chemoprophylaxis, 28.6% use sequential compression devices and 91.4% believed that chemoprophylaxis is necessary for more prolonged and complex procedures (strong consensus). Aspirin was the choice for all participants, and the duration was 2–3 weeks (31.4%), 1 month (65.7%) and 2–3 months (2.9%). History of VTE, hypercoagulable status, and malignancy were considered risk factors. No consensus was achieved for the discontinuation of oral contraceptive and smoking preoperatively. However, the optimal length of VTE prophylaxis is unclear. A total of 97.1% of the experts responded that they administer aspirin between 2 and 4 weeks. High-volume arthroscopic surgeons do consider VTE prophylaxis to be important and warranted in the postoperative setting. Aspirin is the mainstay of chemoprophylaxis, although the appropriate duration is unknown.

INTRODUCTION

Hip arthroscopy (HA) is a common and effective treatment for a variety of prearthritic hip conditions [1]. The growth in arthroscopic procedures reflects an evolution in the ability to address many different pathologies, including a range of impingement and instability, with this approach. A recent study on a large administrative database showed a 109% increase in HA procedures from 2010 to 2016 [2].

Venous thromboembolism (VTE) is not a common complication of arthroscopic surgeries [3–5]. A recent systematic review found that the cumulative proportion of thromboembolic events after HA is 2% [6]. The risk of VTE was found to be higher when including asymptomatic Deep Vein Thromboses. In a prospective study with routine bilateral leg Doppler ultrasonography at 2–3 weeks postoperatively, the rate of DVT was 4.3% [7]. The overall risk of VTE, after HA, was reported in a range of 0.2% to

9.5% [8]. There have been numerous large studies which demonstrate much lower risk for development of VTE in arthroscopic procedures compared to fracture fixation and arthroplasty procedures [9–13].

Even if the rate of VTE is low after arthroscopic lower extremity procedures in which patients are mobilized early [12], given the morbidity and mortality and preventable nature of this complication, more studies are warranted [5]. The guideline of American College of Chest Physicians (ACCP) for antithrombotic therapy and prevention of thrombosis suggests that no chemoprophylaxis is required following knee arthroscopy in patients without previous history of VTE, but nothing specific for HA [14].

Recent International consensus for VTE (International Consensus Meeting on Vein Thromboembolism (ICM/VTE) 2022) considered HA as a low-risk procedure for VTE, and

routine VTE prophylaxis for all patients was not recommended. In patients with some unique predisposing risk factors, such as a history of clot or hypercoagulable disorder, VTE prophylaxis might be considered [8]. Unfortunately, there are no randomized clinical trials or high-level studies on the efficacy of prophylaxis for VTE and choice of anticoagulant for hip arthroscopic procedures.

Accordingly, we hypothesized that consensus recommendations of high-volume, fellowship-trained hip arthroscopists can inform VTE prophylaxis following HA using a modified Delphi and nominal group technique (NGT).

MATERIALS AND METHODS

Outline of consensus group methods

Consensus group methods are utilized for providing guidance when evidence is lacking, doubtful or contradictory. Their premise is that consulting with a panel of experts and following their consensus is a reliable way to achieve a precise assessment on a specific question or concern. Three commonly used methods are (i) Delphi and its modifications, (ii) NGT and (iii) Rand method [15].

The Delphi method usually involves a sequence of stages starting with defining a research question followed by a literature search to find relevant existing evidence to develop a questionnaire of statement and then sending questionnaire to participant in a few rounds to collect their feedback and summarize the results. Using Delphi methods, we can overcome authority bias of experts or first speaker advantage in meetings [11, 16]. In contrast to alternative data gathering and analysis approaches, Delphi utilizes multiple iterations with the aim of reaching a consensus of opinions on a specific topic [11].

The NGT is a structured approach for group brainstorming that promotes the active participation of all members and

facilitates swift consensus on the relative significance of issues, problems or solutions. The process involves team members individually generating ideas, selecting their preferred one and subsequently presenting it to the group.

The NGT is a formal face-to-face interaction usually involving a smaller group of experts usually between three and five members in a specific field. Particularly, NGT begins by having a group act individually. This small group formulates a nominal question and collects members' idea and feedbacks. A structured group discussion is the next step with a skilled moderator and final vote to reach the consensus. NGT is a great way to debate target topics with lacking consensus and provides chance for more robust idea generation [11, 17].

Nominal group/Delphi rounds

The study was exempt from the institutional review board as the categories of interviews, educational tests and surveys that collected information are not identifiable. Anonymity provides an equal chance for each panel member to present and react to ideas unbiased by the identities of other participants [18].

A combination of two consensus group methods was used in this study: NGT and modified Delphi (Fig. 1). An extensive literature search on the existing evidence for VTE prophylaxis after HA was performed (ICM-VTE Philly, American Academy of Orthopedic Surgeons and ACCP) [14, 19, 20]. In August 2022, a preliminary questionnaire was prepared, which included 10 salient questions, and rounds of discussion were completed between NGT members (B.G.D., A.B. and A.P.) to improve the initial questionnaire. Members discussed each question, as well as the items that had not been initially included in the list, and the questionnaire was modified. The goal was to maximize ease of use for the Delphi session. The final version included 14 questions in three parts (Supplementary Appendix). Part A included

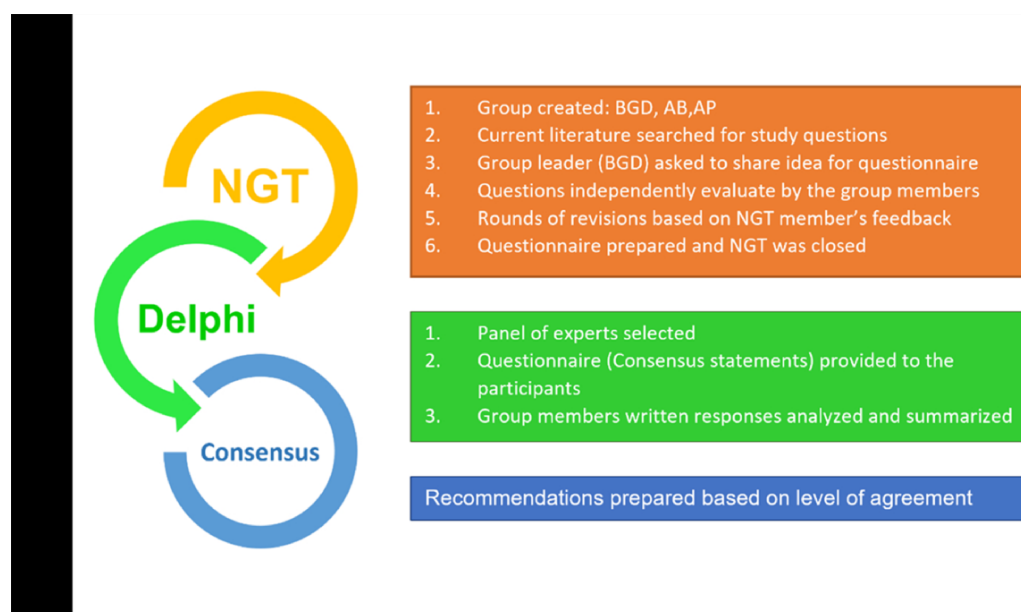


Fig. 1. Modified Delphi method and NGT flowchart: Summarization of the steps and phases in this study.

three questions to demonstrate the level of expertise of the participants, Part B included eight ‘yes’ or ‘no’ questions and Part C consists of three multiple choice questions.

In September 2022, a survey was administered to the faculty and expert participants during an international HA meeting. All participants of the consensus were high-volume providers with fellowship training in hip preservation. Participants were asked to fill out the survey in an anonymized fashion.

Cut-off points for the consensus

The content validity ratio (CVR) was used to determine the consensus cut-off point, which is a linear transformation of a proportional level of agreement on how many participants within an expert panel rate a question or item as ‘essential’ [21]. CVR calculation is shown in the following:

$$CVR = \frac{n_e - (N / -2)}{N / -2}$$

n_e is the number of panel experts indicating an item ‘essential’ and N is the total number of panel members. In this study, N was 35, with the CVR being 0.371, indicating that 24 agreed that participants are the minimum to reach consensus, which is equal to 70% of all participants in our study [22]. We considered greater than 90% agreement as ‘strong consensus’.

RESULTS

Participant characteristics

In total, 40 high-volume arthroscopic hip surgeons were present at the meeting and invited to participate at the consensus. They are all practice in United States. Thirty-five surgeons participated and filled out the survey. Experts mean volume of annual hip arthroscopic procedures was 109 (range 15–600). Approximately 21% of their patients were over the age of 40 years, and approximately 22% of their patients are revision HA procedures.

Routine VTE chemoprophylaxis

A total of 91.4% of participating surgeons use chemoprophylaxis for hip arthroscopic procedures, and 62.9% believe that VTE chemoprophylaxis for all HA patients would not increase non-VTE complications such as bleeding or hemarthrosis (strong consensus).

Mechanical prophylaxis upon discharge

A total of 28.6% of participants use sequential compression devices, thromboembolism deterrent hoses or any kind of mechanical DVT prophylaxis upon discharge (no consensus).

VTE prophylaxis in addition to heterotopic ossification prophylaxis

A total of 17.4% of experts used an anticoagulant in addition to heterotopic ossification prophylaxis (i.e. indomethacin) in their patients (no consensus).

Labral reconstruction and other complex procedures

A total of 91.4% of responders reported that chemoprophylaxis is necessary for longer and complex procedures, such as labral and/or capsular reconstruction procedures (strong consensus).

Oral contraceptive

A total of 62.6% of participants consider oral contraceptive (OCP) as a risk factor for developing VTE after HA, but only 28.6% ask their patients to discontinue OCP prior to HA (no consensus).

Smoking

A total of 45.7% of surgeons think that smoking is a potential risk factor for DVT, and 45.7% said that they ask their patients to discontinue smoking prior to surgery (no consensus).

First choice of chemoprophylaxis and duration

All experts in this study reported aspirin as their anticoagulant’s of choice for HA (strong consensus). A total of 31.4% continue prophylaxis for 2–3 weeks, 65.7% for 1 month, and 2.9% for 2–3 months (Fig. 2). The common prescribed dosage was 81 mg twice a day.

Risk factors for developing VTE in hip arthroscopic procedures

From a list of 12 possible risk factors that warranted additional VTE prophylaxis, three risk factors reached consensus: history of VTE, hypercoagulable status and malignancy (consensus and strong consensus). Details are given in Table I.

Surgeons’ volume of practice

According to a recent study on surgeon expertise and learning curve in HA [23], we applied three levels for annual rate of HA in this study (Table II). A total of 94.3% of participants were high- or medium-volume HA surgeons.

In summary, experts who involved in this study recommend prescribing chemoprophylaxis for all hip arthroscopic patients. The choice is aspirin (with no agreement about the dosage and duration) with special consideration for complex procedures such as labral reconstruction.

DISCUSSION

The main findings of this consensus study were that hip arthroscopic surgeons with specialized training and substantial experience advocate for the necessity of chemoprophylaxis in all arthroscopic procedures, particularly complex ones and hip labral reconstruction. The preferred prophylactic therapy identified by the consensus is aspirin, with variations in both duration and dosage.

Despite early mobilization, altered weightbearing and reduced activity are required postoperatively after arthroscopic hip procedures and increase the risk of postoperative VTE. In addition, intraoperative traction and other manipulations and maneuvers of the proximal thigh in proximity of the femoral and iliac venous system may cause venous stasis and endothelial injuries and increase the risk of VTE [9, 24]. There is a paucity of evidence to provide specific recommendations on the use of VTE chemoprophylaxis in patients undergoing HA, who are considered low-risk patients on popular guidelines [14, 19, 20]. Consequently, the decision about whether patients undergoing HA should receive chemoprophylaxis for VTE is often based on individual surgeon judgment.

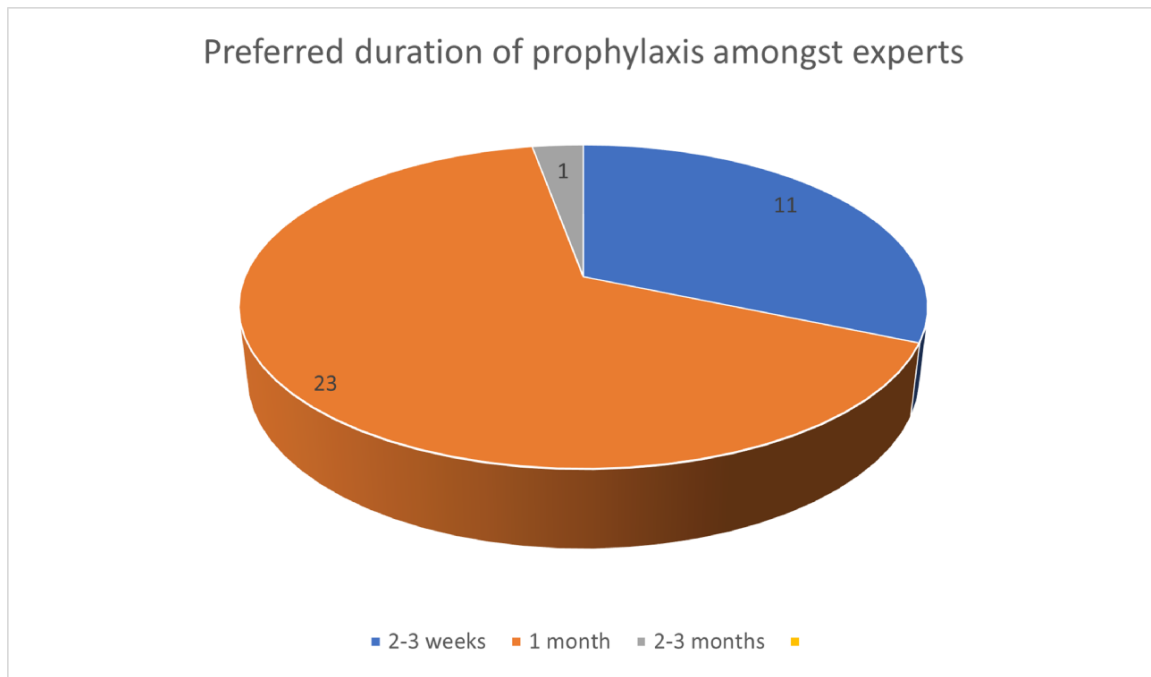


Fig. 2. Distribution of preferred duration of anticoagulant prophylaxis following hip arthroscopy among experts.

Table I. Expert panel perceptions on the relative significance of various risk factors for VTE during HA

Risk factor	Agreement (%)	Consensus
Age > 45 years	37.1	No
Diabetes	28.6	No
Smoking	45.7	No
BMI (Body Mass Index) > 35	51.4	No
COPD (Chronic Obstructive Pulmonary Disease)	31.4	No
OCP	48.6	No
Procedure time over 90 min	31.4	No
History of VTE	94.3	Strong consensus
Family history of VTE	45.7	No
Flight over 4 h within 1 month of surgery	48.6	No
Malignancy	71.4	Consensus
Thrombophilia	94.3	Strong consensus

A recent study by Mehta *et al.* [23] yielded four thresholds for HA surgeon volume (Table III). We simplified that to three groups (high, moderate and low volume). A total of 94.3% of the participants in the currently study is moderate- to high-volume surgeons with extensive experience in both primary and revision arthroscopic procedures.

Surprisingly, all participants of this study used aspirin as the choice of prophylaxis. Parvizi *et al.* [21] published findings of a study on 643 hip-preserving procedures and found that administration of aspirin appears to be adequate in reducing the risk

Table II. Practice volume of members of the Delphi group

Annual HA performed	Participant
≤100 (high volume)	14 (40%)
21–99 (moderate volume)	19 (54.3%)
<20 (low volume)	2 (5.7%)

Table III. Surgeon volume threshold for HA (Mehta *et al.*)

Hip arthroscopies within 5 years	Surgeon volume
≤519	Very high volume
389–518	High volume
98–388	Medium volume
0–97	Low volume

of VTE. In the past 10 years, aspirin became the choice of VTE prophylaxis in total joint arthroplasty patients [25, 26].

The optimal length of VTE prophylaxis to minimize the risk of VTE following HA, however, is unclear and consensus was absent even in the current study. A total of 97.1% of expert panel in this study respond that they administer aspirin between 2 and 4 weeks. In a study on the duration of prophylactic aspirin, Shohat *et al.* reported median time for developing DVT as 12 days and for Pulmonary emboli (PE) as 5 days respectively, which suggests that at least 2 weeks of prophylaxis may be sufficient [27].

The challenge of risk stratification for VTE in patients undergoing elective orthopedic procedures remains unsolved. Traditional risk appraisal tools such as 'Caprini' are not defined for elective orthopedic surgeries [28]. According to the ACCP, there

is no validated tool to assess individual risk factors of VTE in the field of orthopedic surgery [6].

In our study history of VTE, malignancy and hypercoagulable disorders reached 'strong consensus' (Table 1) as significant risk factors for VTE following HA. Factor V Leiden deficiency and prothrombin mutations are reported in patients who developed DVT and PE after HA [29, 30]. Also, patients with active malignancy are expected to have a higher risk of DVT and PE in orthopedic surgeries [31–34]. Based on the current results, our study suggests consideration of dedicated additional chemical and/or mechanical VTE prophylaxis in this population. ICM-VTE guideline stated that OCPs increase the incidence of post-operative VTE in women after orthopedic procedures. However, discontinuation of OCP in all cases is not universally recommended.

Results of a recent study on antithrombotic treatment of orthopedic and traumatology procedures [35] recommended that consideration of prophylaxis with Low Molecular Weight Heparin (LMWH) is recommended for patients exhibiting general or procedure-related risk factors, such as prolonged surgery or non-weight bearing and not for all patients, which is in contrast with our findings. The timing and duration of prophylaxis suggest administering pharmacological prophylaxis in the post-operative period. It is advisable to continue prophylaxis until the patient can bear weight and, in any instance, for a minimum of 7 days [36–39].

Prophylaxis for VTE may be influenced by cultural biases, surgeon preferences, availability, the medicolegal environment, cost and other potential disparities, despite existing recommendations and guidelines.

This study is not without limitation. The use of expert panel for consensus studies, like our study, has the potential for selection bias and can confound the results [18]. Another limitation of this study was the absence of specialists in thrombosis, specifically hematologists, cardiologists or pulmonologists, rather than orthopedic surgeons. It was almost inevitable due to the subspecialty nature of our meeting. Consensus studies, while valuable, do not supplant the need for controlled trials comparing the efficacy of these interventions in the defined patient populations. In addition, we believe that a validation study by involving the scientific societies of hip preservation surgery is needed.

CONCLUSION

High-volume, arthroscopic hip preservation surgeons do consider VTE prophylaxis to be important and warranted in the postoperative setting. Aspirin is the mainstay of chemoprophylaxis, although the appropriate duration is unknown.

SUPPLEMENTARY DATA

Supplementary data are available at *Journal of Hip Preservation Surgery* online.

DATA AVAILABILITY

The data underlying this article may be shared on reasonable request to the corresponding author.

ACKNOWLEDGEMENTS

The authors thank the American Hip Institute Research Foundation for their support.

CONFLICT OF INTEREST STATEMENT

Dr. Parsa reports non-financial support from Smith & Nephew Inc.

Dr. Bedi reports non-financial support from American Orthopaedic Society for Sports Medicine, personal fees from Arthrex, personal fees from SLACK Incorporated, personal fees from Springer, outside the submitted work.

Dr. Domb reports grants and other from American Orthopedic Foundation; personal fees from Amplitude, grants, personal fees and non-financial support from Arthrex, personal fees and non-financial support from DJO Global, grants, personal fees and non-financial support from Medacta, grants, personal fees, non-financial support and other from Stryker, grants from Breg, personal fees from Orthomerica, grants and non-financial support from Midwest Associates, grants from ATI Physical Therapy, personal fees and non-financial support from St. Alexius Medical Center, grants from Ossur, non-financial support from Zimmer Biomet, non-financial support from DePuy Synthes Sales, non-financial support from Medtronic, non-financial support from Prime Surgical, non-financial support from Trice Medical, outside the submitted work; In addition, Dr. Domb has a patent 8920497 - Method and instrumentation for acetabular labrum reconstruction with royalties paid to Arthrex, a patent 8708941 - Adjustable multi-component hip orthosis with royalties paid to Orthomerica and DJO Global, and a patent 9737292 - Knotless suture anchors and methods of tissue repair with royalties paid to Arthrex and Dr. Domb is a board member of American Hip Institute Research Foundation, AANA Learning Center Committee, the Journal of Hip Preservation Surgery, the Journal of Arthroscopy; has had ownership interests in the American Hip Institute, Hinsdale Orthopedic Associates, Hinsdale Orthopedic Imaging, SCD#3, North Shore Surgical Suites, and Munster Specialty Surgery Center.

FUNDING

This study did not receive any outside funding.

REFERENCES

1. Delegates IV. Recommendations from the ICM-VTE: sports. *J Bone Joint Surg Am* 2022; **104**: 267–79.
2. Bradsell HL, Lencioni A, Frank RM. Incidence and prevention of thromboembolic complications for sports and arthroscopic-related surgery: evidence-based recommendations. *Sports Med Arthrosc Rev* 2022; **30**: 24–8.
3. Humphrey-Murto S, Varpio L, Wood TJ *et al*. The use of the Delphi and other consensus group methods in medical education research: a review. *Acad Med* 2017; **92**: 1491–8.
4. Lewis CG, Inneh IA, Schutzer SF *et al*. Evaluation of the first-generation AAOS clinical guidelines on the prophylaxis of venous thromboembolic events in patients undergoing total joint arthroplasty: experience with 3289 patients from a single institution. *JBJS* 2014; **96**: 1327–32.
5. Caprini JA. Risk assessment as a guide to thrombosis prophylaxis. *Curr Opin Pulm Med* 2010; **16**: 448–52.

6. Falck-Ytter Y, Francis CW, Johanson NA *et al.* Prevention of VTE in orthopedic surgery patients: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of chest physicians evidence-based clinical practice guidelines. *Chest* 2012; **141**: e278S–325S.
7. Mehta N, Chamberlin P, Marx RG *et al.* Defining the learning curve for hip arthroscopy: a threshold analysis of the volume outcomes relationship. *Am J Sports Med* 2018; **46**: 1284–93.
8. Lameire DL, Khalik HA, Phillips M *et al.* Thromboprophylaxis after knee arthroscopy does not decrease the risk of deep vein thrombosis: a network meta-analysis. *Knee Surg Sports Traumatol Arthrosc* 2022; **3**: 1–3.
9. Hanke MS, Lerch TD, Schmaranzer F *et al.* Complications of hip preserving surgery. *EFORT Open Rev* 2021; **6**: 472–86.
10. Perets I, Craig MJ, Mu BH *et al.* Midterm outcomes and return to sports among athletes undergoing hip arthroscopy. *Am J Sports Med* 2018; **46**: 1661–7.
11. Bolia IK, Fagotti L, McNamara S *et al.* A systematic review-meta-analysis of venous thromboembolic events following primary hip arthroscopy for FAI: clinical and epidemiologic considerations. *J Hip Preserv Surg* 2018; **5**: 190–201.
12. Falck-Ytter Y, Francis C, Johanson N *et al.* Prevention of VTE in orthopedic surgery patients: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012; **141**: e278S–325S.
13. Richard RD, Maloney BE, Feltham GT. Concomitant venous thrombosis and pulmonary embolism after hip arthroscopy in a patient with heterozygous factor V Leiden Deficiency. *Am J Orthop* 2016; **45**: E240–4.
14. Mohtadi NG, Johnston K, Gaudelli C *et al.* The incidence of proximal deep vein thrombosis after elective hip arthroscopy: a prospective cohort study in low risk patients. *J Hip Preserv Surg* 2016; **3**: 295–303.
15. Jones J, Hunter D. Consensus methods for medical and health services research. *BMJ* 1995; **311**: 376–80.
16. Campbell SM, Cantrill JA. Consensus methods in prescribing research. *J Clin Pharm Ther* 2001; **26**: 5–14.
17. Ayre C, Scally AJ. Critical values for Lawshe's content validity ratio: revisiting the original methods of calculation. *Meas Eval Couns Dev* 2014; **47**: 79–86.
18. Keeney S, Hasson F, McKenna HP. A critical review of the Delphi technique as a research methodology for nursing. *Int J Nurs Stud* 2001; **38**: 195–200.
19. Haldane CE, Ekhtiari S, de Sa D *et al.* Venous thromboembolism events after hip arthroscopy: a systematic review. *Arthroscopy* 2018; **34**: 321–30.
20. Swiontkowski M, Parvizi J. ICM on VTE: a major step forward in patient care. *JBJS* 2022; **104**: 487–8.
21. Cevallos N, Soriano KK, Flores SE *et al.* Hip arthroscopy volume and reoperations in a large cross-sectional population: high rate of subsequent revision hip arthroscopy in young patients and total hip arthroplasty in older patients. *Arthroscopy* 2021; **37**: 3445–54.
22. Jacobs JJ, Mont MA, Bozic KJ *et al.* American Academy of Orthopaedic Surgeons clinical practice guideline on: preventing venous thromboembolic disease in patients undergoing elective hip and knee arthroplasty. *J Bone Joint Surg Am* 2012; **94**: 746–7. 826.
23. Wilson FR, Pan W, Schumsky DA. Recalculation of the critical values for Lawshe's content validity ratio. *Meas Eval Couns Dev* 2012; **45**: 197–210.
24. Nakano N, Khanduja V. Complications in hip arthroscopy. *Muscles Ligaments Tendons J* 2016; **6**: 402–9.
25. Delegates IV. Recommendations from the ICM-VTE: Spine. *J Bone Joint Surg Am* 2022; **104**: 309–28.
26. Chisari E, Tan TL, Shah R *et al.* Aspirin is an effective prophylaxis for venous thromboembolism in ambulatory patients with femoral neck fracture undergoing hip arthroplasty. *JBJS* 2022; **104**: 603–9.
27. Obalum DC, Giwa SO, Adekoya-Cole TO *et al.* Deep vein thrombosis: risk factors and prevention in surgical patients. *West Afr J Med* 2009; **28**: 77–82. 828.
28. Reynolds AW, Garay M, Lynch S *et al.* Incidence of venous thromboembolism following knee arthroscopy: effectiveness of a risk-based stratified chemoprophylaxis protocol. *J Knee Surg* 2022; **35**: 443–8.
29. Omari AM, Parcels BW, Levine HB *et al.* 2021 John N. Insall Award: aspirin is effective in preventing propagation of infrapopliteal deep venous thrombosis following total knee arthroplasty. *Bone Joint J* 2021; **103**: 18–22.
30. Parsa A, Nazal MR, Stelzer JW *et al.* A successful collaborative approach to the perioperative management after hip arthroscopy of a patient with heterozygous prothrombin G20210A mutation: a case report. *JBJS Case Connect* 2019; **9**: e0376.
31. Domb BG, Chen SL, Shapira J *et al.* The evolution of hip arthroscopy: what has changed since 2008—a single surgeon's experience. *Arthroscopy* 2020; **36**: 761–72.
32. Murphy MK, Black NA, Lamping DL *et al.* Consensus development methods, and their use in clinical guideline development. *Health Technol Assess* 1998; **2**: i–88.
33. Azboy I, Kheir MM, Huang R *et al.* Aspirin provides adequate VTE prophylaxis for patients undergoing hip preservation surgery, including periacetabular osteotomy. *J Hip Preserv Surg* 2018; **5**: 125–30.
34. Zhang H, Mao P, Wang C *et al.* Incidence and risk factors of deep vein thrombosis (DVT) after total hip or knee arthroplasty: a retrospective study with routinely applied venography. *Blood Coagul Fibrinolysis* 2017; **28**: 126–33.
35. Randelli F, Romanini E, Biggi F *et al.* II Italian intersociety consensus statement on antithrombotic prophylaxis in orthopaedics and traumatology. *J Orthop Traumatol* 2013; **14**: 1–13.
36. Khazi ZM, An Q, Duchman KR *et al.* Incidence and risk factors for venous thromboembolism following hip arthroscopy: a population-based study. *Arthroscopy* 2019; **35**: 2380–4.e1.
37. Ahmad J, Lynch MK, Maltenfort M. Incidence and risk factors of venous thromboembolism after orthopaedic foot and ankle surgery. *Foot Ankle Spec* 2017; **10**: 449–54.
38. Parvizi J, Abbas AA, Abcha O *et al.* Recommendations from the ICM-VTE: general. *J Bone Joint Surg Am-Series A* 2022; **104**: 4–162.
39. Shohat N, Ludwick L, Goel R *et al.* Thirty days of aspirin for venous thromboembolism prophylaxis is adequate following total knee arthroplasty, regardless of the dose used. *J Arthroplasty* 2021; **36**: 3300–4.