



Thromboprophylaxis in arthroscopy: Survey of current practices in France and comparison with recommendations

Jean-Yves Jenny

► To cite this version:

Jean-Yves Jenny. Thromboprophylaxis in arthroscopy: Survey of current practices in France and comparison with recommendations. *Orthopaedics & Traumatology: Surgery & Research*, 2020, 106, pp.S183 - S187. <10.1016/j.otsr.2020.08.004>. <hal-03493322>

HAL Id: hal-03493322

<https://hal.science/hal-03493322v1>

Submitted on 21 Nov 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY-NC 4.0 - Attribution - Non-commercial use - International License

Original article

Thromboprophylaxis in arthroscopy: Survey of current practices in France and comparison with recommendations

Jean-Yves **Jenny**¹ and the Francophone Arthroscopy Society (SFA)²

¹ Hôpitaux Universitaires de Strasbourg, Strasbourg, France,

² 15, rue Ampère, 92500 Rueil Malmaison, France

Correspondence: Jean-Yves JENNY, Hôpitaux Universitaires de Strasbourg, Pôle Locomax, 1
avenue Molière, F-67200 Strasbourg, France

Email: jean-yves.jenny@chru-strasbourg.fr

Phone +33368765287

ABSTRACT

Introduction

Current national and international recommendations for thromboprophylaxis after arthroscopy procedures are not very detailed and likely not well known by surgeons. The aim of this study was to compare the daily clinical practices of members of the Francophone Arthroscopy Society (SFA) with current national and international recommendations.

Hypothesis

The primary hypothesis was that the procedures adopted by more than 75% of SFA members conform to the national recommendations set out by the French Anesthesia and Intensive Care Society (SFAR) in effect at the time of this study.

Methods

A questionnaire was sent to members of the SFA asking three questions to capture their protocol (decision maker, prescriber, indication by procedure). Descriptive statistics were generated for each question. The percentage of prescription protocols conforming to each recommendation was compared to the target percentage (75% arbitrary threshold) by a Chi² test with a 5% threshold overall and for each type of procedure.

Results

Thirty-five percent of the SFA members responded to the questionnaire. Overall, the compliance rate was 69%, which was significantly lower than the target ($p < 0.001$). The compliance rate was significantly lower than the target for hip procedures, minor knee procedures and ankle procedures; each time, the prescription was excessive. The compliance rate was not different than the target for major knee procedures and upper limb procedures. The sole reason for non-compliance was a non-justified prescription.

Discussion

Less than 75% of SFA members have adopted thromboprophylaxis protocols that comply with national SFAR recommendations in effect at the time of this study, with excessive prescription for procedures on the lower limb. Recent studies do not confirm that broadening of the prescription is justified. This large gap between published recommendations and current practices means that we should reconsider the relevance of current recommendations and re-evaluate the cost-benefit ratio of prescribing a drug-based thromboprophylaxis after arthroscopy surgery.

Level of evidence: Level IV

Keywords: Arthroscopy; venous thrombotic event prophylaxis; practice; recommendations

1. INTRODUCTION

The occurrence of a thromboembolic complication is one thing that orthopedic surgeons dread. Prevention with pharmacological agents is now routine in joint replacement surgery [1,2], although the exact methods are still controversial [3,4,5]. There is less abundant and less unanimous literature for arthroscopic surgery, leaving the door open for different interpretations and consequently, highly varied clinical strategies. This is reflected in the current national and international recommendations currently that only very rarely mention arthroscopy procedures [1,2]. Also, it has been shown that compliance to medical prescription protocols, no matter the subject, was often less than expected [6], and that the compliance rate ranged from 30% to 75% [7,8,9]. The aim of this study was to compare the daily clinical practice of members of the Francophone Arthroscopy Society (SFA) with current national and international recommendations. The primary hypothesis was that the procedures adopted by more than 75% of SFA members (maximum compliance rate found in the literature) conform to the national recommendations set out by the French Anesthesia and Intensive Care Society (SFAR) in effect at the time of this study.

2. MATERIAL AND METHODS

Since this study did not analyze personal medical data, ethics approval was not required.

2.1. Study overview

The SFAR's recommendations [1] suggest prescribing a short course of thromboprophylaxis consisting of low-molecular weight heparin (LMWH) after meniscectomy if there are additional risk factors, and LMWH thromboprophylaxis after ACL reconstruction surgery until weight bearing is resumed. The other arthroscopic procedures are not mentioned, suggesting that there is no indication for thromboprophylaxis. To follow the changes in

current practices, the prescription of direct oral anticoagulants (DOACs) was considered as equivalent to that of LMWH.

Arthroscopy procedures were arbitrarily classified as follows:

- all hip arthroscopy procedures
- knee arthroscopy for minor procedure (meniscus or cartilage)
- knee arthroscopy for major procedure (ligament reconstruction)
- all ankle procedures
- shoulder arthroscopy for minor procedure (acromioplasty, acromioclavicular arthroplasty, arthrolysis, etc.)
- shoulder arthroscopy for major procedure (rotator cuff repair, bone block, capsular reattachment, etc.)
- all elbow arthroscopy procedures
- all wrist arthroscopy procedures.

The SFAR recommendations were adapted to each group of procedures based on a diagram derived from analyzing patients treated at the primary author's facility in 2018. The percentage of patients with high risk of bleeding or thrombosis was estimated with a wide safety margin through a random sampling of 100 patients out of 344 undergoing knee arthroscopy and 100 patients out of 422 undergoing shoulder arthroscopy. Thus, it was estimated that the indication for drug-based thromboprophylaxis was justified:

- in more than 95% of major knee procedures to factor in individual risk factors for bleeding
- less than 10% of other procedures in the lower limb to factor in individual risk factors for thrombosis
- less than 2% of procedures in the upper limb to factor in individual risk factors for thrombosis.

86

87 *2.2.Materials*

88 The study involved members of the SFA who had paid their dues in 2018.

89

90 *2.3.Methods*

91 A questionnaire (Table 1) containing three questions was sent to the 1479 SFA members:

92 - Who decides on the prescription?

93 - Who writes the prescription?

94 - What is the prescription rate for thromboprophylaxis by operated joint and by
95 procedure?96 The answers were collected by the secretarial office of the SFA and anonymized before being
97 analyzed.

98

99 *2.4.Statistical analysis*

100 Descriptive statistics were generated for each question. The percentage of prescription
 101 protocols conforming to each recommendation was compared to a target percentage (75%
 102 arbitrary threshold) by a Chi² test with a 5% threshold overall and for each type of procedure.
 103 The sample size was calculated based on the following parameters: comparison of a
 104 percentage to a theoretical percentage, non-inferiority hypothesis, alpha risk = 0.05, beta risk
 105 = 0.20, theoretical percentage of 75%, small detectable difference of 5%, non-inferiority
 106 margin of 5%. This resulted in a minimum number of 464 questionnaire responses needed.

107

108 **3. RESULTS**

109 We got responses to the questionnaire by 524 surgeons (35% of members). The decision
 110 about the need for a prescription and the prescription itself was most often made by the

surgeon, although there were large variations in practices (Table 2). The prescription rate for pharmacological thromboprophylaxis by procedure is listed in Tables 3 and 4. The prescribed molecules were LMWH only by 448 surgeons (85%), DOACs only by 4 surgeons (1%) and alternating use of two treatments by 72 surgeons (14%).

The compliance rate is reported in Table 5. Overall, the compliance rate of 69% was significantly lower than the 75% target ($p < 0.001$). The compliance rate was significantly lower than the target for hip procedures, minor knee procedures and ankle procedures. The compliance rate was not significantly lower than the target for major knee procedures and upper limb procedures. The noncompliance occurred because the prescription for thromboprophylaxis agents was excessive in every case.

4. DISCUSSION

The study hypothesis was not confirmed. Less than 75% of SFA members have adopted thromboprophylaxis protocols that comply with national SFAR recommendations [1] in effect at the time of this study. The non-compliance mainly impacted the lower limb procedures, due to excessive prescriptions.

The risk of a symptomatic venous thromboembolism event is well documented after knee arthroscopy [10,11,12,13], with large studies and meta-analyses confirming the incidence is much lower than 1% of procedures. The studies are less substantial after shoulder arthroscopy, although the incidence appears similar [14,15], sometimes anecdotal [16], and the conclusions are the same after hip arthroscopy [17,18] or ankle arthroscopy [19]. The data are less clear after elbow [20] or wrist arthroscopy [21]. The thromboembolism risk related to the surgical procedure is objectively low, although it is essential to consider individual patient-related factors [22].

The risk of major bleeding is also well documented. After knee arthroscopy, severe bleeding episodes are very rare (less than 1% incidence), although the incidence of hematomas and minor bleeding is 5% [21]. The bleeding risk appears to be much lower in other joints [18,23,24,25,26].

As for the antithrombotic prophylaxis applied to knee arthroscopy surgery, the risk of a thromboembolic event is low, no matter the type of procedure [10,11,12,13], although the benefit of this type of treatment was never been clearly demonstrated [27,28,29]. For this reason, both French [1] and American recommendations [2] have very restricted indications of thromboprophylaxis after knee arthroscopy. Of note, the current American practices strongly favor prescribing aspirin [30].

The benefits of antithrombotic prophylaxis have also not been demonstrated after shoulder arthroscopy [31], while no reliable data exists for the other joints. These joints are not mentioned in the current recommendations.

In this study, various individual protocols for prescription of thromboprophylaxis after arthroscopy surgery exceeded the current recommendations, particularly for procedures on the lower limb. There is no evidence that this excessive prescription was the result of a conscious decision. Instead, we can easily imagine that it results from gradual slipping, fed by the fear of complications and false security of the precautionary principle. In fact, the most recent literature (see above) does not confirm that current recommendations are exceeded, and thus that broadening of the prescription is justified.

This large gap between published recommendations and current practices means that we should reconsider the relevance of current recommendations and re-evaluate the cost-benefit ratio of prescribing a drug-based thromboprophylaxis after arthroscopy surgery in the current conditions. It also seems wise to disseminate the current recommendations more broadly for arthroscopic surgery, which are undoubtedly in the shadow of recommendations for joint

replacement surgery. In fact, the medical and legal consequences of a thromboembolic event, or on the contrary – of a complication related to prescription beyond the recommendations – could be important.

This study has several limitations. The population of surgeons who responded was not chosen randomly, thus may not be representative of reality. However, the high percentage of respondents make this hypothesis unlikely, thus we can consider the results as an acceptable snapshot of the national situation. The questions asked only focused on general protocols, without going into details of how these protocols were adapted to individual cases. Thus the answers may not reflect the reality of daily medical practice. But given the responses obtained, it is likely that individual adaptations trended towards increasing the prescriptions, which would amplify the differences observed with the recommendations. The percentage of prescriptions stated by the practitioners was not based on an analysis of medical records, only a simple subjective and instantaneous estimate; thus it may be incorrect. A true study of medical records to obtain a national picture would have been highly complex and very costly. The study did not consider the potential specialization of surgeons by joint. The surgeons who did not do certain procedures were identified and this information was collected and analyzed.

5. CONCLUSION

In France, the national practice of antithrombotic prophylaxis after arthroscopic surgery appears to be far removed from current recommendations. These two elements should be made more consistent.

6. ACKNOWLEDGEMENTS

The author is grateful to Corine Bensimon for helping with the logistics of dissemination and collection of the questionnaires.

185

186 **7. FUNDING, DISCLOSURES AND AUTHOR CONTRIBUTIONS**187 *Conflicts of interest:*

188 JYJ: Royalties from B-Braun, paid consultant for FH Orthopedics and Globus Medical, board
189 member for CAOS-International and ISTA

190 *Funding:* No financing was received for this study191 *Author contributions:* not applicable

192

REFERENCES

1. Samama MC, Gafsou B, Jeandel T, Laporte S, Steib A, Marret E, et al. Recommandations Formalisées d'Experts. Prévention de la maladie thromboembolique veineuse postopératoire. Actualisation 2011. Texte court. Annales Françaises d'Anesthésie et de Réanimation 2011;30:947–51.
2. Falck-Ytter Y, Francis CW, Johanson NA, Curley C, Dahl OE, Schulman S, 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-e325S.
3. Parvizi J, Huang R, Rezapoor M, Bagheri B, Maltenfort M. Individualized risk model for venous thromboembolism after total joint arthroplasty. J Arthroplasty 2016;31:S180-6.
4. Jenny JY, Pabinger I, Samama CM; ESA VTE Guidelines Task Force. European guidelines on perioperative venous thromboembolism prophylaxis: Aspirin. Eur J Anaesthesiol. 2018 Feb;35(2):123-9.
5. Anderson D, Dunbar M, Murnaghan J, Kahn S, Gross P, Forsythe M, et al. Aspirin or Rivaroxaban for VTE prophylaxis after hip or knee arthroplasty. N Engl J Med 2018;378:699-707.
6. Bos JM, Timmermans MJC, Kalkman GA, van den Bemt PMLA, De Smet PAGM, Wensing M, et al. The effects of substitution of hospital ward care from medical doctors to physician assistants on non-adherence to guidelines on medication prescribing. PLoS One 2018;13(8):e0202626.
7. Chen Y, Sloan FA, Yashkin AP. Adherence to diabetes guidelines for screening, physical activity and medication and onset of complications and death. J Diabetes Complicat. 2015;29(8):1228–33.

- 217 8. Drenth-van Maanen AC, van Marum RJ, Jansen PA, Zwart JE, van Solinge WW, Egberts
218 TC. Adherence with dosing guideline in patients with impaired renal function at hospital
219 discharge. PLoS ONE 2015;10(6):e0128237.
- 220 9. van den Bemt PM, Chaaouit N, van Lieshout EM, Verhofstad MH. Noncompliance with
221 guidelines on proton pump inhibitor prescription as gastroprotection in hospitalized
222 surgical patients who are prescribed NSAIDs. Eur J Gastroenterol
223 Hepatol 2016;28(8):857–62.
- 224 10. Maletis GB, Inacio MC, Reynolds S, Funahashi TT. Incidence of symptomatic venous
225 thromboembolism after elective knee arthroscopy. J Bone Joint Surg Am. 2012;94:714–
226 20.
- 227 11. Nemeth B, Cannegieter SC. Venous thrombosis following lower-leg cast immobilization
228 and knee arthroscopy: from a population-based approach to individualized therapy.
229 Thromb Res. 2019;174:62–75.
- 230 12. Schmitz JK, Lindgren V, Janary PM, Forssblad M, Stalman A. Deep venous thrombosis
231 and pulmonary embolism after anterior cruciate ligament reconstruction. Incidence,
232 outcome, and risk factors. Bone and Joint Journal 2019;101B(1):34-40.
- 233 13. Panisset JC, Pailhé R, Schlatterer B, Sigwalt L, Sonnery-Cottet B, Lutz C, et al. Short-
234 term complications in intra- and extra-articular anterior cruciate ligament reconstruction.
235 Comparison with the literature on isolated intra-articular reconstruction. A multicenter
236 study by the French Arthroscopy Society. Orthop Traumatol Surg Res. 2017;103:S231-6.
- 237 14. Imberti D, Dentali F, Ivaldo N, Murena L, Paladini P, Castagna A, et al. Venous
238 thromboembolism in patients undergoing shoulder arthroscopy: findings from the
239 RECOS registry. Clin Appl Thromb Hemost. 2015 Jul;21(5):486-8.

- 240 15. Sager B, Ahn J, Tran J, Khazzam M. Timing and risk factors for venous
 241 thromboembolism after rotator cuff repair in the 30-day perioperative period.
 242 Arthroscopy 2019;35(11):3011-8.
- 243 16. Hariri A, Nourissat G, Dumontier C, Doursounian L. Pulmonary embolism following
 244 thrombosis of the brachial vein after shoulder arthroscopy. A case report. Orthop
 245 Traumatol Surg Res. 2009;95(5):377-9.
- 246 17. Truntzer JN, Hoppe DJ, Shapiro LM, Abrams GD, Safran M. Complication rates for hip
 247 arthroscopy are underestimated: a population-based study. Arthroscopy. 2017
 248 Jun;33(6):1194-201.
- 249 18. Gedouin JE, May O, Bonin N, Nogier A, Boyer T, Sadri H, et al. Assessment of
 250 arthroscopic management of femoroacetabular impingement. A prospective multicenter
 251 study. Orthop Traumatol Surg Res. 2010;96(8 Suppl):S59-67.
- 252 19. Huntley SR, Abyar E, Lehtonen EJ, Patel HA, Naranje S, Shah A. Incidence of and risk
 253 factors for venous thromboembolism after foot and ankle surgery. Foot Ankle Spec. 2019
 254 Jun;12(3):218-27.
- 255 20. Intravia J, Acevedo DC, Chung WJ, Mirzayan R. Complications of elbow arthroscopy in
 256 a community-based practice. Arthroscopy. 2019 Nov 27 [Epub ahead of print]
- 257 21. Greene JW, Deshmukh AJ, Cushner FD. Thromboembolic complications in arthroscopic
 258 surgery. Sports Med Arthrosc Rev. 2013 Jun;21(2):69-74.
- 259 22. Venclauskas L, Llau JV, Jenny JY, Kjaersgaard-Andersen P, Jans Ø; ESA VTE
 260 Guidelines Task Force. European guidelines on perioperative venous thromboembolism
 261 prophylaxis: Day surgery and fast-track surgery. Eur J Anaesthesiol 2018;35:134-8.
- 262 23. Moen TC, Rudolph GH, Caswell K, Espinoza C, Burkhead WZ Jr, Krishnan SG.
 263 Complications of shoulder arthroscopy. J Am Acad Orthop Surg. 2014 Jul;22(7):410-9.

- 264 24. Blázquez Martín T, Iglesias Durán E, San Miguel Campos M. Complications after ankle
265 and hindfoot arthroscopy. *Rev Esp Cir Ortop Traumatol*. 2016 Nov - Dec;60(6):387-93.
- 266 25. Noticewala MS, Trofa DP, Vance DD, Jobin CM, Levine WN, Ahmad CS. Elbow
267 arthroscopy: 30-day postoperative complication profile and associated risk factors.
268 *Arthroscopy*. 2018 Feb;34(2):414-20.
- 269 26. Ahsan ZS, Yao J. Complications of wrist and hand arthroscopy. *Hand Clin*. 2017
270 Nov;33(4):831-8.
- 271 27. Van Adrichem RA, Nemeth B, Algra A, le Cessie S, Rosendaal FR, Schipper IB, et al.
272 Thromboprophylaxis after knee arthroscopy and lower-leg casting. *N Engl J Med*.
273 2017;376:515–25.
- 274 28. Ramos J, Perrotta C, Badariotti G, Berenstein G. Interventions for preventing venous
275 thromboembolism in adults undergoing knee arthroscopy. *Cochrane Database Syst Rev*.
276 2008;(4):CD005259
- 277 29. Camporese G, Bernardi E, Prandoni P, et al. KANT (Knee Arthroscopy Nadroparin
278 Thromboprophylaxis) Study Group. Low-molecular-weight heparin versus compression
279 stockings for thromboprophylaxis after knee arthroscopy: a randomized trial. *Ann Intern*
280 *Med*. 2008;149(2):73–82.
- 281 30. Keller RA, Moutzouros V, Dines JS, Bush-Joseph CA, Limpisvasti O. Deep
282 venous thrombosis prophylaxis in anterior cruciate ligament reconstructive surgery: what
283 is the current state of practice? *Sports Health* 2018;10(2):156-9.
- 284 31. Jameson SS, James P, Howcroft DW, Serrano-Pedraza I, Rangan A, Reed MR, et al.
285 Venous thromboembolic events are rare after shoulder surgery: Analysis of a national
286 database. *J Shoulder Elbow Surg*. 2011;20(5):764-70.

287 Table 1: Questionnaire

288

<i>Who decides on the prescription for thromboprophylaxis after arthroscopic surgery?</i>			<i>Who actually prescribes the thromboprophylaxis after arthroscopic surgery?</i>	
Anesthesiologist only			Anesthesiologist only	
Anesthesiologist mainly			Anesthesiologist mainly	
Surgeon only			Surgeon only	
Surgeon mainly			Surgeon mainly	
Surgeon and anesthesiologist in collaboration			Surgeon and anesthesiologist in collaboration	
Facility protocol			Facility protocol	
Another practitioner			Another practitioner	

289

<i>What is the prescription rate for thromboprophylaxis by operated joint and by procedure?</i>	Hip arthroscopy	Minor knee arthroscopy procedure	Major knee arthroscopy procedure	Ankle arthroscopy	Minor shoulder arthroscopy procedure	Major shoulder arthroscopy procedure	Elbow arthroscopy	Wrist arthroscopy
Never								
Less than 10% of cases								
In 11% to 50% of cases								
In 51% to 90% of cases								
More than 90% of cases								
Do not practice								

Minor knee arthroscopy procedures: meniscus or cartilage procedure

Major knee arthroscopy procedure: ligament reconstruction

Minor shoulder arthroscopy procedure: acromioplasty, acromioclavicular resection arthroplasty, arthrolysis

Major shoulder arthroscopy procedure: rotator cuff repair, bone block, capsule reattachment, etc.

290 Table 2: Decision maker and prescriber for the thromboprophylaxis

291

	Decision maker	Prescriber
	(Number –	(Number –
	Percentage)	Percentage)
Anesthesiologist only	37 (7.1%)	65 (12.4%)
Anesthesiologist mainly	7 (1.3%)	5 (1.0%)
Surgeon only	303 (41.9%)	394 (75.2%)
Surgeon mainly	45 (8.6%)	11 (2.1%)
Surgeon and anesthesiologist in collaboration	103 (19.7%)	38 (7.3%)
Facility protocol	16 (3.1%)	8 (1.5%)
Another practitioner	13 (.5%)	3 (0.6%)
Overall total	524 (100%)	524 (100%)

292

293

Table 3: Prescription after arthroscopy of lower limb (Number – Percentage calculated based on respondents)

Prescription	Hip	Minor knee procedure	Major knee procedure	Ankle
Never	32 (16.9%)	88 (18.8%)	8 (1.8%)	44 (15.1%)
Less than 10% of cases	10 (5.3%)	77 (16.5%)	17 (3.7%)	20 (6.8%)
In 11% to 50% of cases	13 (6.9%)	48 (10.3%)	20 (4.4%)	38 (13.0%)
In 51% to 90% of cases	3 (1.6%)	37 (7.9%)	11 (2.4%)	13 (4.5%)
More than 90% of cases	131 (69.3%)	218 (46.6%)	401 (87.7%)	177 (60.6%)
Total respondents	189 (100%)	468 (100%)	457 (100%)	292 (100%)
Do not practice	335	56	56	232
Overall total	524	524	524	524

Table 4: Prescription after arthroscopy of upper limb (Number – Percentage calculated based on respondents)

Prescription	Minor shoulder procedure	Major shoulder procedure	Elbow	Wrist
Never	236 (82.5%)	202 (73.2%)	210 (95.5%)	177 (96.2%)
Less than 10% of cases	36 (12.6%)	21 7.6%)	7 (3.2%)	6 (3.3%)
In 11% to 50% of cases	11 (3.8%)	23 8.3%)	3 (1.3%)	1 0.5%)
In 51% to 90% of cases	1 (0.3%)	5 (1.8%)	0	0
More than 90% of cases	2 (0.7%)	25 (9.1%)	0	0
Total respondents	286 (100%)	276 (100%)	220 (100%)	184 (100%)
Do not practice	238	248	304	340
Overall total	524	524	524	524

Table 5: Compliance with SFAR recommendations

Procedure	Total number	Compliance with SFAR (number – percentage)	Significance relative to 75% target
Hip	189	42 (22.2%)	Less (p < 0.001)
Minor knee procedure	468	165 (35.3%)	Less (p < 0.001)
Major knee procedure	457	432 (94.5%)	More (p < 0.001)
Ankle	292	164 (56.2%)	Less (p < 0.001)
Minor shoulder procedure	286	242 (84.6%)	More (p < 0.001)
Major shoulder procedure	276	204 (73.9%)	Not different
Elbow	220	210 (95.5%)	More (p < 0.001)
Wrist	184	177 (96.2%)	More (p < 0.001)
Total	2372	1636 (69.0%)	Less (p < 0.001)

305 **FIGURE LEGENDS**

306 Figure 1: Study flow chart

1479

Surgeons eligible



1479

Surgeons queried



542

Questionnaires collected



542

Questionnaires analyzed