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# French Guidelines for the Management of Ambulatory Endovascular Procedures for Lower Extremity Peripheral Artery Disease

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**Background:** Ambulatory hospitalization for endovascular repair of lower extremity peripheral arterial disease (PAD) could be a real opportunity to respond to the burden of PAD, to reduce costs, and to improve patients' empowerment. The French Society of Vascular and Endovascular Surgery (SCVE) established guidelines to facilitate the development of ambulatory hospitalization in France.

**Methods:** In 2017, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and MEDLINE database to conduct a systematic review of available literature. A total of 448 relevant articles were found. Twelve articles, all published after the year 2000, were included and reviewed by two independent investigators. The SCVE mandated a scientific committee to collectively establish these guidelines.

**Results:** Eligibility for ambulatory management shall be based on the assessment of the triad: (1) patient, (2) procedure, and (3) structure. Comprehensive information and a detailed procedural pathway should be provided for the patient. No age limit is recommended. American Society of Anesthesiologists I, II, and III stable patients are eligible for ambulatory intervention. Specific comorbidities such as severe obesity, sleep apnea, and/or chronic kidney failure should be assessed preoperatively. Critical limb ischemia and complex lesions have not been considered as exclusion criteria. Antiplatelet drug use (aspirin and/or clopidogrel) has not been considered as a contraindication. Femoral ultrasound-guided puncture is recommended. Manual compression or closure devices have been recommended for 7F sheath or less. A minimum of 4 hours of monitoring after percutaneous femoral access is required before discharge.

**Conclusions:** The SCVE guidelines aim to frame the practice of ambulatory endovascular procedures for lower extremity peripheral artery disease and to give vascular interventionalists help in their routine practice.

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## INTRODUCTION

The increasing burden of lower extremity peripheral artery disease, pressure to reduce costs, and patients' wishes have tended to develop ambulatory care rather than conventional hospitalization.[1] Thanks to the use of minimally invasive procedures such as endovascular repair, ambulatory management can now be proposed for patients instead of conventional hospitalization without compromising the quality, safety, or the efficiency of patient care.

Ambulatory management has presented a marked proliferation, predominantly in the United States during the last 4 years, alongside with the development of physicians' office-based endovascular suites.[2] In Europe, adherence to ambulatory management for lower extremity peripheral artery disease varies considerably depending on the country. Some limitations to the development of ambulatory surgery could be a group's diagnosis-related classification or legal issues. For these reasons, specific guidelines could provide interventionalists with increased medical knowledge about the management of endovascular procedures for lower extremity peripheral artery disease in an ambulatory setting. Guidelines from the French Society of Ambulatory surgery are the only currently available recommendations but are not specific to lower extremity peripheral artery disease endovascular repair.[3] So far, no guidelines specifically frame ambulatory procedures for lower extremity artery disease.

To frame this practice in France and to assist vascular interventionalists in their routine practice, the French Society of Vascular and Endovascular Surgery (SCVE) has decided to establish such guidelines.

## METHODS

The literature review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, with the help of PRISMA statement and explanation and elaboration documents.[4,5] The bibliography was performed using the MEDLINE register.[6] The following terms were added to the search builder using MeSH: peripheral arterial disease, percutaneous transluminal angioplasty, stent, endovascular procedure, ambulatory, outpatient, and day care (Fig. 1). A total of 448 articles were found. Titles and abstracts were screened for relevance by two independent investigators. The last research was updated on December 31, 2017. Inclusion criteria for relevance affected the domain of the article, which consisted of assessment of ambulatory management of lower extremity peripheral artery disease by endovascular procedures. A vast majority of articles were related to percutaneous coronary intervention, venous disease, and vascular access to hemodialysis and were, therefore, excluded. Case reports, clustered studies (less than 4 patients included), and commentaries were also excluded. Thirteen articles were excluded because they had been published before the year 2000. Twelve observational studies were included in the review; of which, seven were prospective studies and five were retrospective studies (Fig. 2).

((((("endovascular procedures"[MeSH Terms] OR "endovascular procedures"[MeSH Terms]) OR "angioplasty"[MeSH Terms]) OR "stents"[MeSH Terms]) OR "peripheral arterial disease"[MeSH Terms]) AND ((((("outpatients"[MeSH Terms] OR "ambulatory surgical procedures"[MeSH Terms]) OR "ambulatory surgical procedures"[MeSH Terms]) OR "ambulatory care"[MeSH Terms]) OR "day care, medical"[MeSH Terms])

**Fig. 1.** Search algorithm using PubMed via MEDLINE advanced research.

In 2018, the SCVE mandated a scientific committee of experienced vascular interventionalists from public and private practice to collectively establish these conditions. The discussions were based on most recently available clinical practice data and on the previously mentioned comprehensive systematic review conducted on the subject. The level of evidence and the strength of the recommendations of particular management options were weighed and graded according to predefined scales, as outlined in Table I on the basis of the type, quantity, and consistency of data from clinical trials and other sources.[7] The manuscript was amended and validated by the SCVE's board of administration. No subject was engaged in this work. No ethical committee was involved to approve this work.

## RESULTS

### Setting of Ambulatory Endovascular Procedures for Lower Extremity Peripheral Artery Disease

The choice of ambulatory management for a patient undergoing an endovascular procedure for lower limb extremity artery disease shall not modify the type of diagnostic investigations, surgical indications, preoperative assessment, or the choice of the endovascular technique (see Table II). The

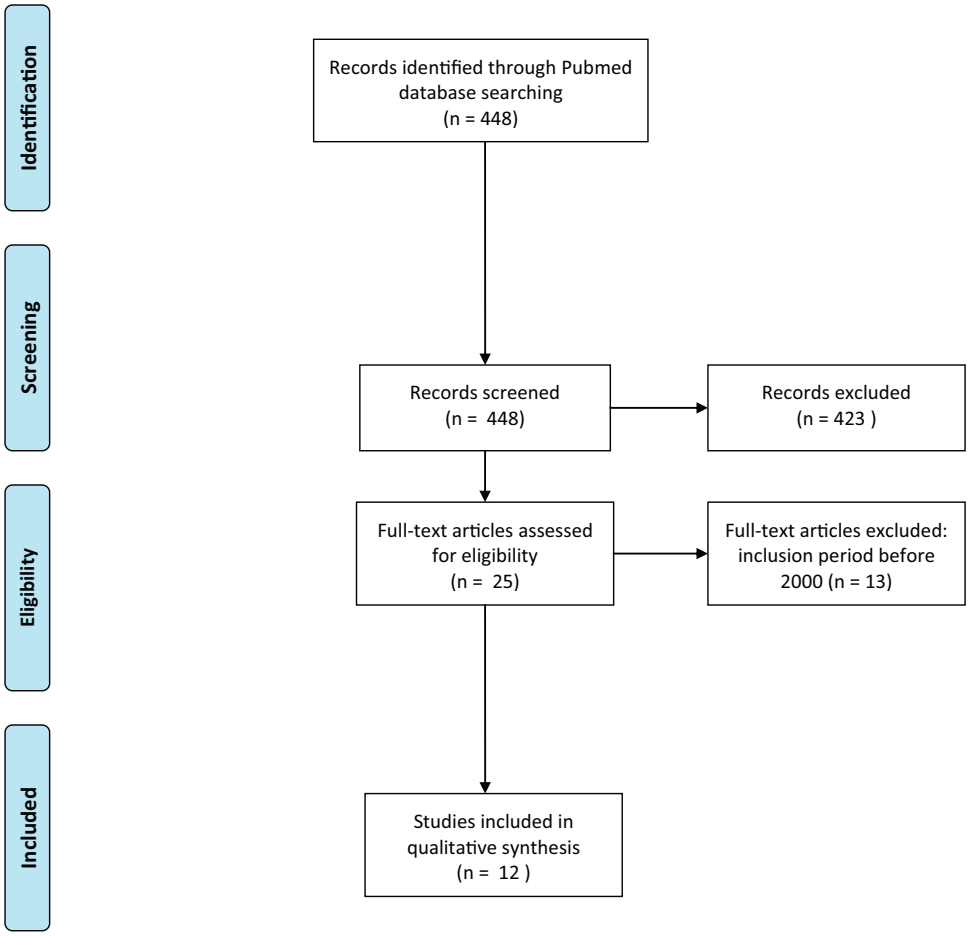


**Fig. 2.** PRISMA flow diagram. From Moher et al.[4]

ambulatory care pathway for ambulatory endovascular procedures for lower limb extremity artery disease follows the general guidelines for ambulatory intervention edited in 2013 by the *Agence Nationale d'Appui à la Performance des établissements de santé* and the *Haute Autorité de Santé*.[8]

The interventionalist and anesthesiologist will verify, during preoperative consultation, that all the medical and sociological eligibility criteria are met by patients and their close relatives (Table III). They will provide a comprehensive explanation of the clinical care pathway (Fig. 3) and general information on ambulatory management rules and steps and will verify that the appropriate comprehension has been obtained. The ambulatory pathway includes the patient's admission to the ambulatory unit on the scheduled date and the creation of the medical and nursing chart files. It should be completed by the confirmation of the availability of an accompanying person upon discharge, for home transfer and oversight after the intervention, until at least the next morning. The procedure should be followed by postoperative monitoring and then admission to the outpatient unit to await the interventionalist's assessment for discharge approval, which will have to be time-stamped and date-stamped. At discharge, a brief hospitalization report describing the procedure and specifying postoperative recommendations, a follow-up consultant's appointment with the vascular interventionalist, all the prescriptions, and a contact phone number of the surgical center or the closest emergency department (reachable 24/7) will be delivered to the patient.

## Eligibility Criteria of Ambulatory Endovascular Procedures for Lower Extremity Peripheral Artery Disease

### *Medical criteria*

*Age:* No limit of age is imposed.[9] The eligibility assessment will be performed on a case-by-case basis, considering physical versus physiological age

**Table I.** Applying class of recommendation and level of evidence to clinical strategies, interventions, treatments, or diagnostic testing in patient care[a] (updated August 2015)[7]

**Class (strength) of recommendation**

**Class I (strong)** **Benefit > > > Risk**

Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-effectiveness phrases[b]:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

**Class IIa (moderate)** **Benefit > > Risk**

Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Should be performed/administered/other
- Comparative-effectiveness phrases[b]:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

**Class IIb (weak)** **Benefit ≥ Risk**

Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered performed/administered/other
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

**Class IIIa: no benefit (moderate)** **Benefit = Risk**

(Generally, LOE A or B use only)
Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

**CLASS IIIb: Harm (STRONG)** **Benefit > Risk**

Suggested phrases for writing recommendations:
- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

**Level (quality) of evidence**

**Level A**
- High-quality evidence[c] from more than 1 RCT
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

**Level B-R (randomized)**
- Moderate-quality evidence[c] from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

**Level B-NR (nonrandomized)**
- Moderate-quality evidence[c] from 1 or more well-designed and well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

(*Continued*)

**Table I.** Continued

| Level (quality) of evidence |
|---|
| **Level C-LD (limited data)**<br>• Randomized or nonrandomized, observational, or registry studies with limitations of design or execution<br>• Meta-analyses of such studies<br>• Physiological or mechanistic studies in human subjects |
| **Level C-EO (expert opinion)**<br>Consensus of expert opinion based on clinical practice |

The class of recommendation (COR) indicates the strength of the recommendation, encompassing the estimated magnitude and certainty of benefit in proportion to risk. The level of evidence (LOE) rates the quality of scientific evidence that supports the intervention on the basis of the type, quantity, and consistency of data from clinical trials and other sources (Table I).
COR and LOE are determined independently (any COR may be paired with any LOE).
A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.
RCT, randomized controlled trial.
[a]The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).
[b]For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.
[c]The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence-grading tools and for systematic reviews, the incorporation of an evidence review committee.

**Table II.** Recommendations for the periprocedural ambulatory management

| Recommendations for the periprocedural ambulatory management | | |
|---|---|---|
| COR | LOE | Recommendations |
| I | C-EO | 1. The vascular interventionalist and anesthesiologist will verify, during preoperative consultation, that all the medical and sociological eligibility criteria are met by the patient and their close relatives. |
| I | C-EO | 2. The vascular interventionalist and anesthesiologist will provide a comprehensive explanation of the care pathway and general information on ambulatory management rules and steps and will verify that the appropriate comprehension has been obtained. |
| I | C-EO | 3. The availability of an accompanying person upon discharge, for home transfer and oversight after the intervention, until at least the next morning must be confirmed at admission. |

and socioenvironmental context (Tables III and IV). This discussion will be held in close contact with the referring general practitioner. Patients also have to meet specific psychosociological criteria to benefit from ambulatory management, which are assessed by the interventionalist and anesthesiologist together.

*Body mass index:* Obesity is a major criterion for consideration. Body mass index >40 kg/m$^2$ should be considered as a contraindication, except in specific patients after extensive evaluation.[9] Morbidly obese patients should be excluded from ambulatory management in the case of concurrent unstable sleep apnea and in the absence of continuous positive airway pressure support at home.[10,11]

*American Society of Anesthesiologists score:* Only American Society of Anesthesiologists I, II, and III stable patients are eligible for ambulatory intervention according to the French Society of Anesthesiology and Reanimation's guidelines.[12]

*Chronic renal failure:* A preoperative assessment of renal function needs to be conducted. Iterative infusions of nephrotoxic contrast agent during intervention are the main limiting factor, for which a precise preoperative evaluation will be key in the benefit

**Table III.** Major medical and sociological eligibility criteria

| Medical | Sociological |
|---|---|
| - No limit of age is imposed<br>- Body mass index >40 kg/m$^2$ should be considered as a contraindication, except in specific patients after extensive evaluation<br>- Only ASA I, II, and III stable patients are eligible<br>- Patients presenting with unstable chronic renal failure should be excluded<br>- Evaluate the need for hyperhydration in case of chronic renal failure<br>- The use of antiplatelet is not considered as a contraindication | - Sufficient comprehension skills<br>- Proper compliance to the medical prescriptions<br>- Equivalent hygiene and housing conditions to those available during hospitalization<br>- Available person on hand to accompany the patient home<br>- Medical care should be accessible less than one hour from patient's home<br>- Convenient and rapid telephone access |

versus risk ratio assessment. If a postoperative hyperhydration is required, the patient should not be eligible for ambulatory intervention, except if intravenous hydration can be organized safely at home.

*Critical limb ischemia:* Critical limb ischemia (CLI) is not considered as an exclusion criterion. Medical follow-up of trophic disorders and wound care after intervention have to be anticipated and scheduled before the procedure.[13,14]

*TransAtlantic InterSociety Consensus evaluation:* Lesions' complexity is not considered as an exclusion criterion for ambulatory intervention.[15]

*Antiplatelet therapy:* The use of antiplatelet drugs before and/or after the intervention is not considered as a contraindication for ambulatory intervention.[16]

*Anticoagulant therapy:* In case of anticoagulant therapy, the eligibility will mostly depend on their indication and the patient's risk profile and require a specific evaluation of the risk versus benefit ratio.

### *Psychosociological Criteria*

To be eligible for ambulatory intervention, sufficient comprehension skills are mandatory. If this is not the case, a designated accompanying person will be necessary to allow ambulatory management. In addition, proper compliance to the medical prescriptions should be observed, including equivalent hygiene and housing conditions to those available during hospitalization. An available person should be on hand to accompany the patient home. If this is not possible, transfer by taxi or ambulance will be considered. The patient has to be accompanied by a responsible adult after the procedure, until the next morning. The accompanying person in charge of the transfer duty can be different from the one at home. Medical care should be accessible less than one hour from patients' home, either at the center where the intervention was performed or at any closer emergency department delivering 24/7 medical care. At least, the patient should have a convenient and rapid telephone access.

## Preoperative Rules

The choice of ambulatory management for a patient undergoing an endovascular procedure for lower extremity peripheral arterial disease (PAD) shall not modify diagnostic investigations, surgical indications, preoperative assessment, or the choice of endovascular techniques. The vascular interventionalist has to provide comprehensive information to the patient, explaining the rules of ambulatory management, with handed information sheet signed by the practitioner. The physician should also specify that in case of complications, he/she or the anesthesiologist may have to ask the patient to switch to conventional hospitalization. An explanatory letter will be sent to the general practitioner and referring doctors mentioning the choice of ambulatory management and specific perioperative follow-up imposed by the procedure, specifically ones related to drug therapies such as the cessation date of oral anticoagulants and/or antiplatelet along with their potential bridging therapy if needed. Finally, the prescriptions covering the initial postoperative care will be given to the patient.

## Rules Covering the Ambulatory Hospitalization

***The procedure***. The procedure has to follow specific recommendations (see Table V). However, no

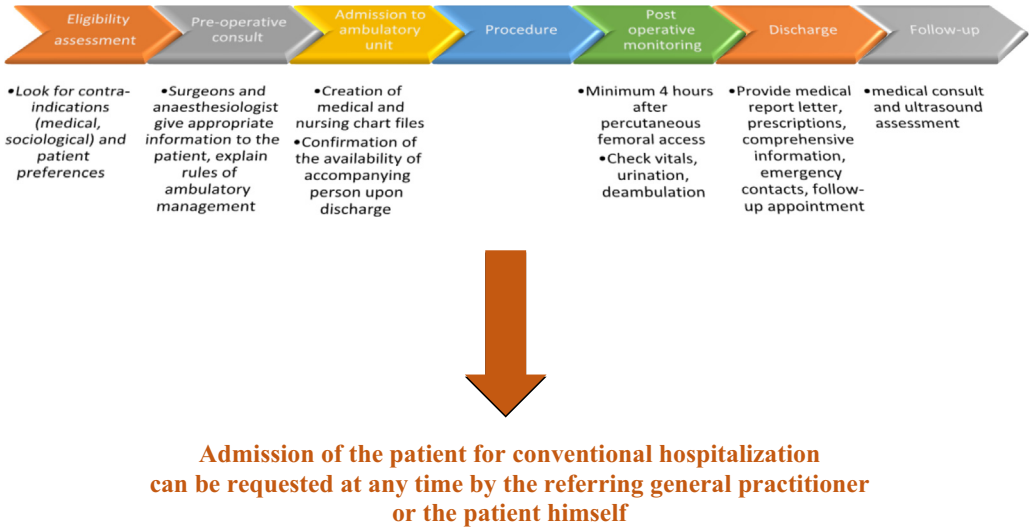


**Fig. 3.** Patient care pathway in an ambulatory setting.

**Table IV.** Recommendations for eligibility criteria

| Recommendations for eligibility criteria | | |
|---|---|---|
| COR | LOE | Recommendations |
| I | C-LD | 1. No limit of age is imposed. The eligibility assessment will be performed on a case-by-case basis, considering physical versus physiological age and socioenvironmental context. |
| I | C-LD | 2. Only ASA I, II, and III stable patients are eligible for ambulatory intervention. |
| I | C-LD | 3. A preoperative assessment of renal function needs to be conducted. If a postoperative hyperhydration is required, the patient should not be eligible for ambulatory intervention, except if intravenous hydration can be organized safely at home. |
| IIa | C-LD | 4. Critical limb ischemia is not considered as an exclusion criterion. |
| I | C-LD | 5. Lesions' complexity is not considered as an exclusion criterion for ambulatory intervention. |
| IIa | C-LD | 6. In case of anticoagulant therapy, the eligibility will mostly depend on their indication and the patient's risk profile and require a specific evaluation of the risk vs. benefit ratio. |

specific strategy related to the type of anesthesia is required with ambulatory surgery.[12] Both ultrasound-guided puncture[17,18] and antegrade or retrograde femoral artery puncture are recommended.[19,20] Regarding upper limb approaches, the radial approach should be considered as posing a risk of stroke because of navigation through the aortic arch.[21] The radial approach can be used in addition to the femoral puncture for complex procedures. Moreover, the brachial approach can be considered in this case as well and presents an equivalent stroke risk to the radial artery approach.[22–25] Direct puncture of the brachial artery can expose the patient to a secondary risk of peripheral nerve damage, which can justify a small surgical incision without jeopardizing the choice of ambulatory management. Concerning closure devices, according to the currently available literature, arterial closure devices are equivalent to manual compression in the establishment of hemostasis and do not expose the patient to a significantly greater risk of complications. Furthermore, no individual device was clearly superior.[26,27] The use of arterial closure devices should be related to the external sheath diameter used during the procedure, to the presence of clinical elements that raise concerns on hemostasis success at puncture site (obesity, coagulation disorder, and so forth), and to the practitioner's experience. Above 7F sheaths, the use of percutaneous closure devices is

**Table V.** Recommendations regarding the procedure

| Recommendations regarding the procedure | | |
|---|---|---|
| COR | LOE | Recommendations |
| I | B-NR | 1. Ultrasound-guided femoral artery puncture is recommended. |
| IIa | C-LD | 2. Radial or brachial approaches can be used in addition to the femoral approach for complex procedures. |
| IIa | C-LD | 3. The use of percutaneous closure devices is recommended for ambulatory intervention involving 7F or more sheath and/or in the presence of clinical elements raising concerns to get hemostasis at the puncture point (obesity, coagulation disorder, and so forth). |
| IIa | C-LD | 4. For 7F sheaths or less, manual compression with compression dressing or arterial closure device could be considered. |

recommended for ambulatory intervention.[26,28,29] For 7F sheath or less, either manual compression or an arterial closure device could be considered. A compression dressing is recommended in the absence of percutaneous closure devices. Concerning heparin therapy, intraoperative anticoagulation is performed following each center's protocol. The length of postoperative monitoring has to be suited to the amount and half-life of the administered anticoagulant.

***Postoperative monitoring***. A minimum of 4 hours of monitoring after percutaneous femoral access is required to allow the patient's discharge from hospital after an approved clinical assessment (Table VI).[13,15,30,31] The absence of major complications at the puncture site has to be assessed along with the absence of ischemic signs at the limb level. Assessment of the access site after the procedure can be performed clinically and/or using a portable duplex scan machine if available. Autonomous ambulation has to be achieved for able-bodied patients upon discharge. A second look at the access site after autonomous ambulation and before discharge is also necessary. Efficient postoperative pain therapy has to be ensured.

***Upon discharge***. Discharge authorization, at least 4 hours after the procedure in case of femoral approach, is a medical decision and has to be certified with the signature of one of the physician involved in the patient's care pathway. A medical report has to be issued to the patient. A medical report letter has been mandated for ambulatory intervention in France since July 20, 2016, by the decree n° 2016-995. This letter shall include the reason for hospitalization, a brief summary of the procedure, and potential complications, as well as detailed prescriptions and the scheduled follow-up. The medical report letter can serve as a discharge authorization form as long as it contains all the required elements imposed by the medical structure.[32]

All the prescriptions, for drugs and nursing care, shall be given to the patient, ideally at the same time as the preoperative consultation with the interventionalist or anesthesiologist. Guidelines regarding follow-up, medical treatment, and contact information of the structure in charge of the continuity of care have to be given to the patient upon discharge. A medical appointment with the vascular interventionalist, generally associated with vascular ultrasound assessment consultations, has to be fixed upon discharge. An emergency telephone number, reachable 24/7, has to be provided. Concerning antiplatelet therapy, ambulatory management shall not modify the choice of type or duration of postoperative antiplatelet therapy. A phone call, or text message, on the day after the procedure is recommended and might be charted.[32] Admission of the patient for conventional hospitalization can be requested at any time by the referring general practitioner or the patient himself.

## DISCUSSION

For the first time, guidelines for endovascular procedures for lower extremity peripheral artery disease have been established, focusing on different steps such as eligibility criteria, preoperative rules, rules for the procedures, postoperative monitoring, and discharge.

Currently, ambulatory surgery is not a worldwide standard of care regarding endovascular procedures for lower extremity peripheral artery disease. However, ambulatory hospitalization is increasing considerably and encouraged in some countries by modified reimbursement rates in order to reduce overall costs.[33]

The guidelines' objectives are to provide practical information and to encourage interventionalists to

**Table VI.** Recommendations for postoperative monitoring

| Recommendations for postoperative monitoring | | |
|---|---|---|
| COR | LOE | Recommendations |
| I | B-R | 1. A minimum of 4 hours of monitoring after the procedure is required to allow patient's discharge from hospital after approved clinical assessment |
| I | C-EO | 2. A medical letter reporting the reason for hospitalization, a brief summary of the procedure and potential complications, as well as the detailed prescriptions and scheduled follow-up has to be issued to the patient |
| I | C-EO | 3. Emergency telephone number, reachable 24/7, has to be provided. Phone call or text message, on the day after the procedure, is recommended and might be charted. |

start ambulatory management or to make ambulatory hospitalization more efficient. In addition, they represent a legal frame to increase physicians' confidence when dealing with potential perioperative complications. So far, learned societies' guidelines such as those written by the French Society of Ambulatory surgery[3] are the only currently available guidelines in France. Among these, only general outpatient information was provided without any practical advice regarding ambulatory endovascular treatment. Dedicated societies such as the Outpatient Endovascular and Interventional Society for outpatient endovascular repair exist,[34] but again no guidelines are provided for physicians.

Social isolation, such as no access to communication systems or the absence of a responsible adult after the procedure until the next morning, is one of the most common exclusion criteria for outpatient endovascular repair.[35] However, social isolation may not be considered as an exclusion criterion in other cases such as outpatient venous procedures. Nevertheless, the morbidity of patients with PAD and the bleeding risk make social isolation a relevant exclusion criterion for ambulatory endovascular procedures for lower extremity peripheral artery disease.

Severe renal insufficiency was considered as an exclusion criterion in different studies.[2,30,36–38] In the case of chronic renal failure, nephrotoxic contrast agent effect happens 2 to 3 days after the procedure. Consequently, the regular 24 hours of postoperative follow-up is not enough to detect acute renal failure after nephrotoxic contrast agent injection. However, if the physician considers that hyperhydration is required after contrast agent use, the patient should not be eligible for ambulatory intervention, except if intravenous hydration can be organized safely at home.

CLI was specifically mentioned as an exclusion criterion in only 2 studies.[30,39] We consider that the eligibility of patients with CLI shall be more related to their medical history than the severity of their lower extremity arterial symptomatology.

In addition, we noted that the use of anticoagulants such as vitamin K antagonist (VKA) was considered as a contraindication in only 2 studies and did not depend on the pathology for which they were used.[35,39] In the case of anticoagulant therapy, eligibility will mostly depend on the VKA indication and the patient's risk profile and requires a specific evaluation of the risk versus benefit ratio.

The lesions' complexity was not considered as an exclusion criterion for ambulatory intervention. Indeed, in the literature review, no patients were excluded for a certain type of lesion.[15] Outpatient procedures could be performed in different types of structures such as an outpatient hospital department, ambulatory surgery center, or physician office-based clinics. Despite existing concerns regarding the office-based setting,[40] more and more endovascular procedures for lower extremity peripheral artery disease in a physician office-based setting are performed in the United States with efficient and safe outcomes.[2]

We recommended the use of ultrasound guidance for femoral puncture to avoid calcified plaque and to ensure the safe use of arterial closure devices. Only a few studies have reported the use of ultrasound guidance for all cases. However, instructions on the use of arterial closure devices do recommend ultrasound guidance to visualize the location of the common femoral artery bifurcation or the presence of calcium deposits.[2,13,37]

The use of arterial closure devices is a source of many debates. Currently, no data have shown advantages of arterial devices over manual compression in terms of major complications such as bleeding.[41] Nonetheless, they demonstrated marked improvement in patients' comfort and satisfaction and in the time to hemostasis and ambulation after endovascular procedures. On the other hand, some interventionalists use manual compression as the

only way to obtain hemostasis at the puncture site for outpatient peripheral endovascular procedures, and, consequently, this could be an option for outpatient management for 7F or less sheath.[31,35,36]

The duration of in-hospital follow-up has been defined as a minimum of 4 hours of monitoring after the procedure to enable the patient's discharge from hospital. Indeed, different studies have reported that unpredictable complications occurred within the first 4 hours after the procedure.[13,30,31] In a large outpatient registry, Lin et al. described patient mobilization within 1-2 hours after the placement of a closure device, but monitoring duration before discharge was not reported.[2] Recently, Liang et al. reported major adverse events occuring within 30 days after discharge of lower extremity revascularization.[42]

In the percutaneous vascular intervention group, the mean duration of stay was 1 day (0-1), with 13% of major adverse events and 64% of major limb events occurring only after discharge. These data demonstrate that occurrence of most postoperative complications in patients undergoing endovascular lower extremity revascularization was not prevented by conventional hospitalization. Moreover, instructions should be delivered to the patient to detect and manage complications.

These guidelines have several limitations. First of all, little high-level evidence is currently available regarding ambulatory endovascular procedures for lower extremity peripheral artery disease. More evidence should be obtained to make these guidelines more robust and to make safer and more efficient ambulatory endovascular treatment. In addition, if these guidelines have been realized to assist practitioners and patients' decisions about ambulatory endovascular management, they may have also been influenced by opinion, country-specific practices, and the composition of the guidelines' editorial committee, and consequently, they might not be as accurate for other physicians and countries.

To conclude, guidelines for endovascular procedures for lower extremity peripheral artery disease were established to help interventionalists develop ambulatory management without compromising quality, safety, and efficiency of patient care. Further clinical trials and partnership with additional professional societies are required to improve these recommendations.

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