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**Atherosclerosis knowledge of general practice residents  
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internes de médecine générale diagnostic et prise en  
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► **To cite this version:**

M. Charasson, C. Le Brun, E. Rossignol, C. Mauger, L. Omarjee, et al.. Atherosclerosis knowledge of general practice residents Diagnosis and management in primary care [Connaissance de la pathologie athéromateuse par les internes de médecine générale diagnostic et prise en charge en soins primaires]. JMV-Journal de Médecine Vasculaire, 2019, 44 (5), pp.331-335. 10.1016/j.jdmv.2019.06.004 . hal-02281614

**HAL Id: hal-02281614**

**<https://univ-rennes.hal.science/hal-02281614>**

Submitted on 20 Jul 2022

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## **ORIGINAL ARTICLE**

**Title: Atherosclerosis knowledge of general practice residents: diagnosis and management in primary care.**

**Titre: Connaissance de la pathologie athéromateuse par les internes de médecine générale français: diagnostic et prise en charge en soins primaires**

Short title: GP residents' awareness and atherosclerosis

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Address for correspondence:

Word count: 1358 words

Keywords: Atherosclerosis, General practice residents, Intermittent claudication, Stable angina, Transient ischemic attack

Mots clés : Pathologie athéromateuse, Interne de Médecine Générale, Claudication intermittente, Angor stable, Accident ischémique transitoire

Declaration of interest: none

Summary:

Objectives

Cardiovascular diseases represent the leading cause of death worldwide. In a previous survey, we have shown that the management of patients with atherosclerosis by general practitioners depends on the locations of the disease. The aim of this survey was to assess general practice residents' (GPR) knowledge on three clinical presentations which are ischemic stroke, coronary artery disease (CAD), and peripheral artery disease (PAD).

#### Materials and methods:

Between May 2017 and September 2017, a national self-administered survey that we previously used to assess the GPs' knowledge was emailed to GPRs from French medicine faculties. The questionnaire was composed of three clinical cases dealing with transient ischemic attack (TIA), stable angina (SA) and intermittent claudication (IC) . Each clinical case was explored by seven similar questions. The primary endpoint was the number of GPRs who correctly answered 5 of the 7 questions for each clinical case.

#### Results

Five hundred and fifty-three GPRs (10%) answered the questionnaire entirely. There is a significant difference between TIA knowledge (19.9% of correct answers) which is greater than SA knowledge (0.9%) and IC knowledge (0.4%). The diagnosis was correctly done by 525 (94.9%) GPRs for TIA, 513 (92.8%) for SA, and 532 (96.2%) for IC. The main difficulties encountered by the GPRs concerned complementary investigations and treatment.

#### Conclusion

As for general practitioners, this study reveals a difference in GPRs' knowledge depending on the location of the atherosclerosis. Considering the results, the improvement of initial training and CME in general medicine would be desirable.

#### Résumé

##### But de l'étude

Les maladies cardiovasculaires représentent la première cause de décès dans le monde. Nous avons montré lors d'une précédente étude que la prise en charge de la pathologie athéromateuse variait significativement en fonction de la localisation de l'atteinte. Le but de

cette étude est d'évaluer à travers trois cas cliniques, la connaissance des internes de médecine générale (IMG) français sur la maladie athéromateuse.

### Matériel et méthodes

Entre Mai 2017 et Septembre 2017, les IMG ont reçu par mail le questionnaire précédemment utilisé pour évaluer les médecins généralistes sur la pathologie athéromateuse. Ce questionnaire comportait trois cas cliniques portant sur un accident ischémique transitoire, un angor stable et une claudication intermittente. Chaque cas clinique se composait de sept questions identiques. Le critère de jugement principal portait sur le nombre d'IMG ayant répondu correctement à cinq questions.

### Résultats

Cinq cent cinquante-trois IMG (10 %) ont répondu entièrement au questionnaire. Le pourcentage de prises en charge en adéquation avec les recommandations de la Haute Autorité de Santé était significativement plus élevé pour l'AIT (19,9 %) comparativement à l'angor stable (0,9 %) et à la claudication intermittente (0,4 %). Le diagnostic a été majoritairement posé par l'ensemble des IMG : 525 (94,9 %) ont retenu le diagnostic d'AIT, 513 (92,8 %) celui d'angor stable et 532 (96,2 %) celui de claudication intermittente. Les principales difficultés portaient sur les examens complémentaires et le traitement.

### Conclusion

Comme pour les médecins généralistes, cette étude met en évidence une différence de connaissance de la pathologie athéromateuse en fonction de la localisation de l'atteinte. Une amélioration de la formation initiale serait donc souhaitable.

### ***Introduction***

With 15.2 million deaths in 2016, cardiovascular diseases represent the leading cause of death worldwide. The annual estimated cost of cardiovascular disease in Europe is 169 billion euros [1]. Depending on the location of the atherosclerosis, there are different clinical presentations, such as ischemic cerebrovascular disease (ICD), coronary heart disease (CHD), and peripheral artery disease (PAD).

In a previous survey, we have shown that the management by General Practitioners (GPs) of the patients depends on the location of atherosclerosis disease. Indeed, GPs who are the first caregivers that see patients when they have symptoms have a significantly better knowledge on ICD than CHD and PAD [2,3]. The knowledge of general practice residents (GPR) is unknown.

Therefore, our objective was to assess GPR's knowledge about ICD, CHD and PAD diagnosis and management in France.

### ***Material and methods***

Between May 2017 and September 2017, a self-administered survey (Annexe 1) that we previously used to assess GPs' knowledge was emailed to GPRs from French medicine faculties. Sixteen of the 26 faculties agreed to send the questionnaire to the GPRs.

The survey was created under limesurvey® (LimeSurvey Project Team / Carsten Schmitz (2015)/LimeSurvey: An Open Source survey tool /LimeSurvey Project Hamburg, Germany. URL <http://www.limesurvey.org>).

The different locations of atherosclerotic disease (ICD, CHD, PAD) were studied by their corresponding presentations outside emergency situations: transient ischemic stroke (TIA), stable angina (SA) and intermittent claudication (IC).

The survey was divided into three parts: the first part collected GPRs' characteristics, the second part comprised of three clinical cases (one for TIA, one for SA and one for IC) each with seven similar questions and the last part assessed the GPRs' training. The clinical cases section was based on previously published studies that used the same methodology to assess GP awareness on a disease [4]. For each clinical case, we had a similar number of questions about diagnosis, definition, care network, supplementary investigations, treatment, LDL cholesterol threshold objectives and the risk for a patient to have a multiple vessels disease.

Correct answers were determined according to the latest French recommendations (According the Haute Autorité de Santé [HAS]) and were validated by specialist physicians [5–7].

The primary endpoint was the number of GPRs who correctly answered the 5 questions dealing with management for each clinical case. Statistical analyses were performed using

SAS software, Version 9.4 (SAS Institute Inc., Cary, NC, USA). Categorical variables were expressed in numbers of GPRs and percentages. Comparisons across the three clinical cases were performed using logistic regression models for repeat measures followed by Tukey multiple comparison tests. A p value <0.05 was considered as statistically significant. Statistical analyses were performed by the CIC 1414 team.

## ***Results***

About 5,500 GPRs received our survey. Five hundred and fifty-three GPRs (10%) answered the questionnaire entirely. Three hundred and ninety (70.5%) were women.

There is a significant difference between TIA knowledge (19.9% of correct answers) and both SA knowledge (0.9%) and IC knowledge (0.4%). However, we did not find any significant difference between SA and IC.

The diagnosis was correctly done by 525 (94.9%) GPRs for TIA, 513 (92.8%) for SA, and 532 (96.2%) for IC (Figure 1).

The summary of the different correct answers on each clinical case concerning the diagnosis, definition, care network, supplementary investigations, treatment, LDL cholesterol threshold objectives and the risk for a patient to have a multiple vessels disease are presented in table 1.

In a case of TIA, 443 GPRs (80.1%) would hospitalize the patients to carry out further investigations. Concerning the SA case, 106 GPRs (19.2%) would prescribe the right investigations in line with the HAS recommendations. Fifty-one GPRs (9.2%) would prescribe Doppler ultrasound, treadmill and blood analysis as recommended in IC.

For the TIA case, 371 GPRs (67.1%) would prescribe antiplatelet and statin medication as recommended. Concerning the SA case, the HAS recommended therapy with antiplatelet, statin and beta-blocker medication is prescribed by only 11.4% GPRs (n=63). For the IC case, only 118 GPRs (21.3%) would prescribe the right therapy. Indeed 411 GPRs (74.3%) forget to add an ACE inhibitor.

Few GPRs knew the latest objectives of LDL, only 24.1% (n=133) answered 0.7g/dL.

The HAS recommendations are not very well known. Only 24% of GPRs declare to read them for TIA, with 20.7% for SA and 8.4% for IC.

GPRs considered themselves to be less well trained about IC (71.5%).

In terms of type of CME, GPRs prefer to train on internet or via meeting with specialists.

### ***Discussion***

This study shows that there are differences in GPRs' awareness and management of atherosclerotic disease depending on its location. The best awareness was for TIA such as in our previous GPs' study [3]. Unlike the study about GPs, here, we don't find any significant difference between SA-and IC.

As we found the same trends in the two studies concerning GPs' and GPRs' knowledge of atherosclerosis disease, this questions the quality of initial training in French medical Faculties [3]. TIA was the best-known disease in our studies (19.9% for GPRs and 48.2% for GPs), followed by SA (0.9% for GPRs and 3.0% for GPs) and IC (0.4% for GPRs and GPs). It doesn't seem incoherent that IC is less known than TIA and SA. There are only a few vascular departments in France as compared to stroke and cardiology units. The development of a dedicated vascular team where medical students could practice their medical training is required [8]. Furthermore, it has been shown that in France the medical training is not optimal to teach the ankle brachial index measurement that is a major issue to diagnose PAD [9]. Indeed, practical training is required [10–12]. Moreover, another explanation could be that vascular medicine has only become a specialty in 2017. We can suggest that the birth of vascular medicine as a specialty and more practical teaching might improve management gradually with better training of GPRs on IC.

Even if the management of the different diseases is not optimal, GPRs and GPs establish the correct diagnosis almost unanimously [3]. GPs are the first caregivers for the patient [2]. To correctly diagnose atherosclerotic disease allows a correct orientation of the patient and a management of the pathology by specialists potentially more aware of the recommendations.

Less than half of the GPRs and GPs had appropriate knowledge about the different atherosclerosis locations [3]. The main difficulties are based on supplementary investigations and treatment. Supplementary investigations are an issue in general practice especially in SA (19.2% of correct answers for GPRs and 11.6% for GPs). GPRs and GPs would perform more investigations (Troponins, NT-proBNP, HbA1c) than required by the HAS recommendations

which leads to an increased cost for the public health system [7]. Concerning IC, only a few GPRs (12.7%) and GPs (6.4%) prescribe a treadmill test to assess maximum walking distance. French recommendations are less precise than the American ones concerning the realization of this exam [6,13].

Previous studies have shown that PAD patients do not have optimal treatment when compared with other atherosclerosis localizations [14,15]. The optimal treatment of TIA is the best known both for GPRs (67.1%) and for GPs (72.6%). HAS recommends an antiplatelet agent and a statin for the optimal treatment of TIA, which is relatively clear. For GPRs, the worst known treatment is the SA treatment (11.4%). Indeed, 49% of GPRs would prescribe ACE inhibitors for SA and 49.4% would forget to prescribe a beta-blocker. According to HAS recommendations, ACE inhibitors are recommended in case of heart failure, abnormal ventricular ejection fraction, hypertension or diabetes and this was not the case in our clinical case [7]. Betablockers have a cardioprotective effect in SA [16]. For GPs, the worse known treatment was the IC treatment (13.6%). Indeed, studies show that patients suffering from PAD had poorer cardiovascular risk management [17,18]. A minority of GPs would initiate ACE inhibitors which are recommended for IC patients whatever their blood pressure according to the HOPE study [19]. The difficulty in setting up the treatment may also stem from the fact that the recommendations are not all concordant [20]. The latest ESC recommendation for PAD, advise to initiate ACE treatment only in case of hypertension (>140/80mmHg) whereas the AHA guidelines stated that the use of angiotensin-converting enzyme inhibitors or angiotensin-receptors blockers can be effective to reduce the risk of cardio-vascular ischemic events in patients with PAD [13,21].

Only few GPRs and GPs were aware of the HAS French Recommendations [5–7]. This can be explained by a lack of communication about new publications. Considering the result of the study and given the cost of developing these guidelines, we can wonder whether another method of diffusion of medical information should be studied.

### *Limitations*

In this study, there are several limitations. First, GPRs from 10 faculties did not have access to the questionnaire since the faculties did not agree to distribute the questionnaire.



Others limitations are similar to the GPs' study. We used a questionnaire rather than analyzing actual practice. Nevertheless, the clinical cases were developed in line with previous studies [3,4]. The advantage of this methodology was that the questions were similar for the three diseases, which made it possible to compare the results and reduce bias. Moreover, the clinical cases were not randomized due to technical considerations. At the end, we analyzed three specific clinical presentations of ICH, CHD and PAD, which do not represent all clinical presentations. Our results cannot be generalized to other clinical presentations.

### ***Conclusion***

As for general practitioners, this study reveals a difference in GPRs' knowledge depending on the location of the atherosclerosis. Considering the results, the improvement of initial training and CME in general medicine would be desirable. We can also encourage team-work with specialists that could lead to better patient care.

**Acknowledgement:** We would like to thank Leanne Moloney who corrected our English .

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Figure 1 title: Percentage of correct answers of the general practice residents.

Figure 1 legend: \*: Statistical difference between Transient ischemic stroke and intermittent claudication

\*\* : Statistical difference between stable angina and intermittent claudication

\*\*\*: Statistical difference between transient ischemic stroke and stable angina.

Table 1: Number of General practitioner residents with good answer for each clinical case.

(n=553)	Transient ischemic stroke	Stable angina	Intermittent claudication
Diagnosis	525 (94,9%)	513 (92,8%) +	532 (96,2%)
Definition	255 (46,1%)	253 (45,8%) +	76 (13,7%) °
Care network	496 (89,7%) *	422 (76,3%) +	511 (92,4%)
Supplementary investigations	443 (80,1%) *	106 (19,2%) +	51 (9,2%) °
Treatment	371 (67,1%) *	63 (11,4%) +	118 (21,3%) °
LDL cholesterol threshold objective	210 (38,0%) *	236 (42,7%) +	133 (24,1%) °
Percentage of polyvascular patients	130 (23,5%) *	43 (7,8%) +	293 (53,0%) °

Table 1 legend: \* Significant difference between TIA and SA

° Significant difference between TIA and IC

+ Significant difference between SA and IC

