BMJ Open

Post-procedural rehabilitation after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-034713
Article Type:	Original research
Date Submitted by the Author:	02-Oct-2019
Complete List of Authors:	Hamid, Asma; EHESP, Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449 Lamirault, Guillaume; Institut du thorax Gouëffic, Yan ; Université de Nantes, CHU Nantes, l'institut du thorax, service de chirurgie vasculaire, Nantes, France; INSERM, U957 Le Meur, Nolwenn; Ecole des Hautes Etudes en Sante Publique, Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449
Keywords:	PUBLIC HEALTH, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, VASCULAR SURGERY, VASCULAR MEDICINE

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Post-procedural rehabilitation after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Asma Hamid[1], Guillaume Lamirault[2,3], Yann Gouëffic [4], and Nolwenn Le Meur[*1]

(1) Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449, F-35000 Rennes, France

(2) l'institut du thorax, INSERM, CNRS, UNIV Nantes, Nantes, France.

(3) l'institut du thorax, CHU Nantes, Nantes, France

(4) CHU Nantes, l'institut du thorax, service de chirurgie vasculaire, Nantes, France; INSERM, U957, Nantes, France; Université de Nantes, Nantes, France.

* Corresponding author: Nolwenn Le Meur

Affiliation : *Univ Rennes, EHESP Rennes, Sorbonne Paris Cité, Département METIS, REPERES Pharmacoepidemiology and Health Services Research - EA 7449*

Postal address: EHESP, Avenue du Professeur Leon Bernard, 35043 Rennes, FR

E-mail : nolwenn.lemeur@ehesp.fr

Phone: +33 2 99 02 25 14

Word count: 3023

Keywords: same day discharge, lower extremity arterial disease, varicose vein, sick leave, health insurance database, health care coordination

ABSTRACT

OBJECTIVE

To assess whether disparities in rates of same day discharge for lower extremities arterial disease (5%) and varicose vein interventions (90%) are associated with the burden of post-procedural rehabilitation.

DESIGN

Retrospective observational study using French national health insurance data in 2012-2016

SETTING

The French national health data system (SNDS), which covers 98.8% of the 66 million people in the French population.

PARTICIPANTS

French workforce population aged 18 to 65 years-old who underwent a first angioplasty with stent placement for LEAD (N=30238) or a first varicose vein intervention (N=265670) between 2013 and 2016.

MAIN OUTCOME MEASURES

Duration and renewals of sick leave within 180 days after endovascular intervention, continuity of care and prescription indices to assess coordination among health care professionals after intervention associated with specific intervention settings: conventional (inpatient) or same day discharge (outpatient). Association were estimated by multivariate negative binomial regressions adjusting for age, gender and comorbidities.

RESULTS

Outpatient settings decrease the incidence rate ratio (IRR) of the number of cumulated days of sick leave by 14% in both interventions. The increasing variety of prescribers decreases the IRR of cumulated days of sick leave and prescription renewals for varicose interventions by 25% and 21%, respectively, but increases them for LEAD interventions by 240% and 106%. Less coordination between health care specialists increases the IRR of cumulative days of sick leave and renewals by

37% and 29% for varicose, and 11% and 9% for LEAD interventions.

CONCLUSIONS

Outpatient rates in LEAD angioplasty does not seem related to the burden of post-procedural rehabilitation. Outpatient setting reduces the duration of sick leave and their renewals, whatever the intervention. Coordination of health care professionals is a key element of interventions follow-up with pathology specificities.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This retrospective study is based on data extracted from the French National Health Insurance System (SNDS – Système National des Données de Santé) which covers 98.8% of the 66 million people in the French population.
- The cohort enables the analysis of health care pathways including hospital stays, office medicine consultations, drug prescriptions, and sick leave prescriptions.
- The cohort includes patients who beneficiated from an angioplasty with stent placement which represent 85% of the angioplasties for lower extremities arterial disease
- The SNDS lack of detailed socio-demographic and clinical information preventing the inclusion of valuable information relating to hospital stay conversion, family environment, and socio-professional category in our analysis model.

INTRODUCTION

In the French health care system, same day discharge procedures are outpatients' hospitalisations, while inpatients' care include overnight hospitalisations. Outpatient procedure appears to be beneficial for both patients' quality of care and health care systems by relieving the pressure on hospital beds and material resources.[1–3] Long time lagging behind for the development of ambulatory surgeries and interventions, France has made significant progress in developing same day discharge. Since 2010, same day discharge has grown up to represent on average 56% of all surgeries and interventions but, depending on the medical procedure and geographical area, important variations can be observed. In 2016, almost 90% of varicose vein interventions were performed in outpatient setting, while we estimated at less than 5% the rate of same day discharge procedures for stent placement in the context of for lower extremities arterial disease (LEAD), with regional variations from 0% to 58%. These disparities may result from the complexity of the therapeutic management for LEAD patients, who tend to have more complicated post-procedural follow-up and rehabilitation than varicose patients as they are older, they have more comorbidities, and their condition is more disabling. As a consequence, outpatient endovascular procedures for LEAD patients may result in shifting the burden of early post-procedural follow-up to ambulatory health services and in increasing the time before resuming work.[4]

To approximate the burden of post-procedural rehabilitation in the context of inpatient and outpatient settings, we propose to compare the number of days of medical leave from work and the number of their renewals after intervention. Research conducted on sick leave according to intervention settings for the treatment of varicose vein and angioplasty with stent placement for LEAD is scarce. In varicose veins, most studies compare procedures (i.e., stripping versus radiofrequency or laser ablation) but not the setting as most interventions are day cases. Few international studies mentioned however that the mean number of days of sick leave after conventional surgery of varicose vein vary between 4 to 14 days, whatever the intervention setting.

The French guidelines by the health regulatory agency vary from 3 days to 10 days (including the day of the procedure) in the case of sedentary workers.[5] For LEAD procedures, the French guidelines concern only inpatient interventions and vary from 7 days to 28 days, according to the type of intervention and the patient's employment characteristics.[5]

In this paper, we propose for the first time a description and a comparison of post-procedural rehabilitation in function of the hospitalisation setting (i.e., inpatient or outpatient) after LEAD and varicose interventions. The indicators used are *(i)* the delays before resuming work and *(ii)* the number of renewals of sick leave prescriptions per patients. The differences in sick leave duration and renewals according to health care prescribers in the continuum of care are also highlighted.

METHODS

A retrospective analysis from January 1st, 2013 to June 30st, 2016 was conducted using data from the French national health data system (SNDS), which covers 98.8% of the 66 million people in the French population. The SNDS contains anonymous and individual health insurance users' data with demographic characteristics and all reimbursed care, including outpatient medical care, ambulatory consultations, and hospitalisation discharge data.[6]

Study Population and demographics

The population of interest was the French workforce population aged 18 to 65 years-old. All incident patients who underwent angioplasty and stent placement for LEAD (N=30238) or varicose vein interventions (N=265670) between January 1st, 2013 and June 30st, 2016 were included (Figure 1). Clinical selection criteria were based on hospital discharge principal diagnosis identified by International Classification of Diseases, 10th Revision (ICD10) codes and surgical procedures identified by the French Common Classification of Medical Procedures (Supplemental Tables I and II). Outpatient setting corresponded to one-day intervention where patient stayed less than 12 hours in a hospital with same day discharge, coming from home and leaving back home. For comparison

purposes, and following health regulatory agencies' guidelines, inpatient whose hospital length of stay was longer that 10 days for an endovascular procedure and 3 days for a varicose veins' intervention were excluded (Supplemental Figures 1 and 2).[5] Patients with no sick leave within 180 days following the intervention were excluded. The final population of included 83448 varicose patients and 6192 LEAD patients.

Study Variables and Outcomes

Each patient was characterized by the following covariates: gender, age categorized in 3 age groups (18-39, 40-59, 60-65), surgical intervention setting (inpatient or outpatient), and group of comorbidity index. The Charlson's Comorbidity Index was computed per patient to quantify the burden of comorbidities.[7,8] Comorbidities were obtained based on the principal and associated diagnoses that a patient may have had during hospitalisation one year prior the index intervention. For regression analysis, the Charlson's Comorbidity Index was transformed into 5 classes (0, [1-2], 3, 4, [5-12]).

For each patient, continuum of care after surgery was characterized by the Bice-Boxerman Continuity of Care Index (COCI),[9,10] and an adapted version measured the continuity of sick leave prescribers (COPI) (Supplemental Equation 1 and 2). The COCI varies between 0 and 1, and measures the extent to which a patient seek care through a unique care provider category (e.g. COCI=1 if only GP) or several different ones (e.g. COCI~0 if GP+angiologists +…). The COPI varies between 0 and 1, and measures the extent to which a patient had his/her sick leaves prescribed by a unique care provider category (COPI=1) or several different ones (COPI~0). Categories of sick leave prescribers were built according to the medical specialties and place of practice: "GP" refers to general practitioners, "hospital" refers to prescriptions written by hospital services, "specialists" refer to radiologists, vascular, and cardiovascular doctors in town practice, and "others" refer to other prescribers.

To assess post-procedural rehabilitation, the outcomes of the study were (*i*) the cumulative days off

work for medical leave after hospital intervention per patient within 180 post-procedural days, and (*ii*) the number of renewals of medical leave from work per patient within 180 post-procedural days and without rehospitalisation

Statistical analyses

The patients' characteristics were described and compared using Pearson's $\chi 2$ test when qualitative and Student *t*-test when quantitative. A *P*-value <0.05 was considered statistically significant. The association between covariates and outcomes of interest was assessed using negative binomial regression analyses. Propensity score weighting was used to take into account the year of intervention, sex, age, comorbidity, and the interaction age*comorbidity.[11] Results were reported as incidence rate ratios (IRR) with 95% confidence intervals (CI) and *P*-values. Forest plot were used to visually compare the results. All computations were performed using R.[12]

RESULTS

LEAD patients differ from varicose vein patients by most characteristics (Table 1). Only 4.7% of LEAD patients were outpatients while it concerns 89% of varicose vein patients. Among the varicose vein patients, the Female/Male sex ratio approximated 1.5. Among LEAD patients, the sex ratio was around 0.19 in both settings. More than 90% of varicose vein patients had no comorbidity. LEAD patients were older than varicose vein patients with most patients aged between 40 to 59 years old. Comorbidity profiles were different between pathologies with a majority of diabetes and pulmonary diseases in the varicose vein population (Supplemental Table III and Supplemental Figure 1) and a majority of cardiovascular diseases in the LEAD population (Supplemental Table IV and Supplemental Figure 2).

Table 1. Characteristics of the active population of French patients who had a sick leave prescription within 30 days of a vascular intervention for lower extremity arterial disease or varicose veins between 01/01/2013 and 30/06/2016

	Varicose N= 83448			Lower extremity arterial disease N= 6192		
	Inpatient	Outpatient	p-value*	Inpatient	Outpatient	p-value*
N (%)	9463(11)	73985(89)		5901(95.30)	291(4.70)	
Gender						
Male	3910(41.32)	28844(38.99)	1.30^{-5}	4960(84.05)	243(83.51)	0.80
Female	5553(58.68)	45141(61.01)		941(15.95)	48(16.49)	
Age (mean +/- sd) †	47.9(8.36)	45.6(9.32)		53.45(5.30)	53.03(4.90)	
18- 39	1729(18.27)	19777(26.73)	2.10^{-16}	72(1.22)	3(1.03)	0.28
40-59	7178(75.85)	51474(69.57)		5307(89.93)	270(92.78)	
60-65	556(5.88)	2736(3.70)		522(8.85)	18(6.19)	
Comorbidity index‡	0.086	0.0317		1.32	0.04	
0	8894(93.99)	72348(97.79)	2.10^{-16}	1266(21.45)	98(33.68)	2.10^{-16}
[1-2]	552(5.83)	1527(2.06)		3805(64.48)	160(54.98)	
3	24(0.25)	53(0.07)		474(8.03)	18(6.19)	
4	7(0.07)	7(0.01)		184(3.12)	7(2.41)	
[5-12]	16(0.17)	50(0.07)		172(2.91)	8(2.75)	

* p-values are results of univariate tests: Fisher Exact tests for qualitative variable and Student T tests for quantitative variables

† sd stands for standard deviation

‡ as defined by Charlson's Comorbidity algorithm

Varicose vein post procedural rehabilitation

An increase trend of IRR was observed for the cumulated number of workday breaks in relation with comorbidities levels compare to no comorbidities whatever the intervention setting. Similarly, an increase trend of IRR was estimated for the cumulated number of workday breaks and number of workday break renewals in relation with population aging (Figure 2, Supplemental Tables V and VI). The mean duration of the first sick leave was similar for inpatients and outpatients with 3.90 and 3.87 days, respectively (*p-value* = 0.52). The average duration of each prescribed sick leaves over the 180 days period after intervention was significantly different between inpatients and outpatients with 5.95 days and 5.51 days, respectively (*p-value* < 2e-16). On average, the cumulated number of workday breaks and the number of renewals of prescriptions differ between inpatients and outpatients with 61 days and 48.5 days of cumulated number of workday breaks, respectively and prescription renewals 8.7 and 7.2 times. Intervention settings have a significant impact on the cumulated number of workday breaks and the number of sick leave renewals. While holding all other variables constant, interventions in outpatient setting significantly decreased the trend of IRR of the number of sick leave days by 14%, and the IRR of sick leave renewals by 9% compared to inpatient settings.

Compared to sick leaves prescribed by GPs, the IRR of total number of the cumulated sick leave days prescribed within 180 days of varicose intervention decreased by 43% if prescribed within hospitals and by 39% if prescribed by town vascular doctors like angiologists but increased by 40% if prescribed by other specialists. Similarly, the IRR of the total number of sick leave renewals was expected to decrease by 19% if prescribed in a hospital and by 27% if prescribed by a vascular specialist but increased by 47% if it was prescribed by another specialist.

The COCI showed that when the number of visits to the same group of providers increased, the IRR of cumulative days of sick leave increased by a factor of 38% and the number of sick leave renewals increased by a factor of 29%. The COPI indicated that when the number of prescribers from distinct specialties decreases, the IRR of the cumulated days of sick leave decreased by 25%,

and the IRR the total number of sick leave renewals decreased by 21%. Interestingly, outpatients have a lower percentage of visits to the same group of providers but a higher percentage of prescriptions from the same group of providers than inpatients, possibly synonymous of tighter coordination (Supplemental Table VII). Although COCI and COPI indices are not linearly correlated (r = -0.05), when prescriptions were delivered by few providers of the same specialty, sick leaves were shorter on average, reducing the overall cumulated days of sick leaves or their renewals.

Lower extremities arterial disease

In the LEAD population, the number of prescription renewals for workday breaks and their cumulated number did not seem to be significantly associated with the age and the sex of the patient (Figure 3). However, the levels of comorbidities did affect the IRR of the cumulated number of workday breaks and the renewals of workday break prescriptions. Although no specific trend was observed, 2 groups could be highlighted: comorbidity levels 1 and 2 demonstrated an IRR increase of 12% for the cumulated number of workdays breaks compare to no comorbidities and comorbidity levels above 2 showed an IRR increase of around 50%. Although, the mean duration of the first sick leaves was similar whatever the intervention setting (5.29 and 5.46 days for inpatient and outpatient, respectively with *p-value*=0.57), intervention settings was a significant determinant of the number of the cumulated workday breaks (Figure 3 and Supplemental Table VIII). Outpatient management decreased the IRR of the number of cumulated workday breaks by 14%. The number of prescription renewals was slightly smaller for outpatients than inpatients (Figure 3 and Supplemental Table IX). However, intervention setting had no impact on the overall number of sick leave renewals. This observation might be explained by the average number of workday breaks per period of sick leaves that is greater for inpatients (*p-value=0.01*) with 6.5 and 5.9 days, respectively.

Compared to prescriptions by a GP, the IRR of total number of cumulated sick leave days within 180 days of endovascular interventions decreased by ~30% if prescribed within a hospital or by town vascular doctors (Figure 3). However, it increased by 37% when prescribed by other doctors. The IRR of the number of sick leave renewals decreased by 15% and 16% if prescribed within hospitals or by town angiologists, respectively, but increased by 27% if prescribed by other town doctors.

The COCI showed that when the degree of coordination between different health care providers decreased, the IRR of cumulative days of sick leave increased by 12% and the number of sick leave renewals increases by 10%. The COPI showed that when the number of sick leave prescriptions delivered by the same group of health care practitioners increases, the IRR of cumulated days of sick leaves significantly increased by a factor of 3.43, and the number of sick leave renewals increased by a factor of 2.06. The principal group of prescribers of sick leave were GPs and other town doctors with a median of 6 and 3 prescriptions per patient, respectively. Interestingly, the COCI and COPI measurements were on average similar whatever the intervention setting (Supplemental Table X)

Overall, except for the coordination indices, the effects of the observed determinants on the number of cumulated days of sick leaves and the renewals of sick leaves after LEAD and varicose vein interventions were similar. Patients' age and sex had no or moderate effects. An increasing trend effect could be observed for comorbidity levels. Outpatients tend to show lower IRR that inpatients. Sick leaves duration and renewals were more important when prescribed by GP than any other health services. The main effect seemed to be coordination that differ between the two pathologies and between settings.

DISCUSSION

In this analysis of sick leave durations and renewals as proxies of rehabilitation within 180 days of

post-procedural follow-up of LEAD and varicose vein interventions according to care settings in France, our findings suggest that outpatient interventions do not induce longer post-procedural rehabilitations than inpatient interventions. In fact, our results highlight the benefits of outpatient interventions in decreasing by 13% the IRR of the cumulated time before resuming work whatever the pathology. Furthermore, the study shows that the variations of practices in the number of cumulated days of sick leave and their renewals prescribed according to the health care services are similar for both pathologies. Prescriptions by GPs induced higher numbers of cumulated sick leave days and more renewals. This finding corroborates the importance of coordinating post-procedural follow-up, since the concentration of post-intervention care within a single practitioner significantly increases the IRR of duration of the post-procedural rehabilitation whatever the pathology. Interestingly, when sick leaves were prescribed by the same group of health care providers the IRR of duration of post-intervention rehabilitation increased for LEAD patients but decreased for varicose vein patients.

To our knowledge, research on post-surgery rehabilitation using sick leave prescriptions for LEAD with stent placement or varicose vein interventions in inpatient and outpatient settings is scarce. Our findings on the benefits of outpatient interventions for varicose are coherent with the work by van Groenendael et al.(2009) and the Health Quality Ontario report (2011). Although one limitation of our study is the use of sick leave prescriptions as the only measure for the estimation of post-procedural rehabilitation. The observed variations in sick leave prescriptions are similar to previous studies based on the French health care system where GPs are at the origin of 74% of the total number of sick leave prescriptions.[15,16] These observations are likely due to the pivotal role of GPs in patient care pathways and an answer to the geographical disparities in the access to health care specialists, such as angiologists.

The first strength of our study is the analysis of health care consumption for the quasi-exhaustive

population of LEAD and varicose vein patients as data were issued from the SNDS, a national medico-administrative database that covers 99% of the French population. The second strength is the historical depth of our data as our retrospective cohort covers a four-year period while studies by others were done over a one-year period.[13,14]

Although representative of the French population, the SNDS has limitations. The database essentially contains data of reimbursed health care and associated expenditures but few clinical and socio-demographical information. For instance, adjustment or stratification of the study population by type of work or weekly work load that may be related to post-follow rehabilitation cannot be done. Similarly, family environment (e.g. marital status, offspring) is unknown which is related to intervention setting choice and possible hospital stay conversion from planned same day discharge to overnight stay. Another limitation is the thresholds chosen for the length of stay to select the inpatient population. Although the defined thresholds were based on national guidelines, variations of practices exist at different levels: between hospitals and health care professionals, notably. Finally, length of stay in hospital for inpatients were not counted as days off work which may underestimate the benefit of outpatient settings in decreasing the time to rehabilitation.

CONCLUSIONS

Outpatient interventions for LEAD and varicose vein proved to be beneficial in terms of decreasing the duration of post-procedural rehabilitation. Therefore, outpatient interventions help saving health insurance money not only associated with hospitals' expenses for bed management but although associated with work-break payment. In addition, same day discharge interventions for LEAD have similar timing in post-procedural rehabilitation than for varicose veins. Therefore, post-procedural rehabilitation does not seem a determinant of the observed differences in rates of same day discharge interventions for LEAD and varicose veins. However, the analysis of the coordination indices suggests that health care provider coordination is critical for post-procedural follow-up.

Coordination should be specific to the intervention setting and the pathology, especially in the acute care context where post-procedural accessibility to health care specialists might be complicated (territorial disparities in travel time and availability).[4,17,18] Compare to varicose vein interventions, LEAD interventions require a greater diversity of health care providers for post-intervention care with tighter coordination. Although we suggest that health care coordination after LEAD interventions may not be exclusive to one health care specialty, like the GP-centred approach in varicose vein interventions. In addition, in the area of participatory medicine and eHealth, the use of shared electronic health records should be seriously considerate by the health care providers and users.[19–21] Though key legal and security challenges are unsolved,[22] shared electronic health records could become a coordination and shared decision-making tool.[23] In France, the current promotion of shared e-health records will hopefully be accepted by health care services, which should improve care trajectories with enhanced coordination between hospital and office medicine and equity of access to outpatient interventions.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the INDS and CNAMTS for support in accessing the data.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

This work was support by the French Health Products Agency (ANSM) as part of the PEPS platform and the TRACKEDAYS project (TRAjectory of Care for Knowledge on Endovascular DAY Surgery).

ETHICS APPROVAL

Data are issued from the French national health insurance information system with agreement from the French data protection authority (#1968571). The study protocol was approved by the National Institute of Health Data review board (#201). Patient and Public involvement statement do not

apply. Data are not publicly available as requested. Statistical analysis (R scripts) may be available upon request to the authors.

AUTHOR CONTRIBUTIONS

All four authors were involved in the conception and design of the study. Asma Hamid and Nolwenn Le Meur wrote the article with critical revision were by Yann Gouëffic and Guillaume Lamirault. Statistical analysis and interpretation of the data were performed by Asma Hamid and Nolwenn Le Meur. All four authors approved the final version of the article.

REFERENCES

1 Lombardi JV, Calligaro KD, Dougherty MJ. Safety and Cost Savings of Endovascular Procedures: Are Outpatient Interventions Feasible when Combined with Open Surgery? *Vasc Endovascular Surg* 2002;**36**:231–5. doi:10.1177/153857440203600312

2 Akopian G, Katz SG. Peripheral angioplasty with same-day discharge in patients with intermittent claudication. *J Vasc Surg* 2006;**44**:115–8. doi:10.1016/j.jvs.2006.03.025

3 Albert B, Davaine J-M, Chaillet M-P, *et al.* Clinical and economic evaluation of ambulatory endovascular treatment of peripheral arterial occlusive lesions. *Ann Vasc Surg* 2014;**28**:137–43. doi:10.1016/j.avsg.2013.06.008

4 Knutsen Glette M, Kringeland T, Røise O, *et al.* Hospital physicians' views on discharge and readmission processes: a qualitative study from Norway. *BMJ Open* 2019;**9**:e031297. doi:10.1136/bmjopen-2019-031297

5 High Authority of Health H. Referencials of Work Leave Prescriptions in Five Pathologies. 2014. https://www.has-sante.fr/portail/upload/docs/application/pdf/2014-09/reponse_a_la_saisine_du_10_mars_2014_en_application_de_larticle_l.161-39_du_code_de_la_securite_sociale.pdf (accessed 19 Oct 2018).

6 Tuppin P, de Roquefeuil L, Weill A, *et al.* French national health insurance information system and the permanent beneficiaries sample. *Rev Epidémiologie Santé Publique* 2010;**58**:286–90. doi:10.1016/j.respe.2010.04.005

7 Bannay A, Chaignot C, Blotière P-O, *et al.* The Best Use of the Charlson Comorbidity Index With Electronic Health Care Database to Predict Mortality: *Med Care* 2016;**54**:188–94. doi:10.1097/MLR.0000000000000471

8 Wasey JO. *icd: Tools for Working with ICD-9 and ICD-10 Codes, and Finding Comorbidities*. 2018. https://CRAN.R-project.org/package=icd

9 Pollack CE, Hussey PS, Rudin RS, *et al.* Measuring Care Continuity: A Comparison of Claims-based Methods. *Med Care* 2016;**54**:e30–4. doi:10.1097/MLR.0000000000000018

10 Bice TW, Boxerman SB. A quantitative measure of continuity of care. *Med Care* 1977;**15**:347–9.

11 van der Wal WM, Geskus RB. ipw : An R Package for Inverse Probability Weighting. *J Stat Softw* 2011;**43**. doi:10.18637/jss.v043.i13

12 R Core Team. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: : R Foundation for Statistical Computing 2018. https://www.R-project.org

13 van Groenendael L, van der Vliet JA, Flinkenflögel L, *et al.* Treatment of recurrent varicose veins of the great saphenous vein by conventional surgery and endovenous laser ablation. *J Vasc Surg* 2009;**50**:1106–13. doi:10.1016/j.jvs.2009.06.057

14 Health Quality Ontario. Endovascular radiofrequency ablation for varicose veins: an evidence-based analysis. *Ont Health Technol Assess Ser* 2011;**11**:1–93.

15 Masson P. La prescription des médecins généralistes : conflits entre la profession médicale et

l'Assurance maladie. *Sociétés Contemp* 2011;**83**:33–57. doi:10.3917/soco.083.0033

16 Junod W. Prescription and control of work break prescription for disease with regard to medical ethics. Conseil national de l'Ordre des médecins 2000. http://web.fdn.fr/~amagnouat/metge/IMG/pdf/arret_travail_ordre.pdf

17 Shahzad M, Upshur R, Donnelly P, *et al.* A population-based approach to integrated healthcare delivery: a scoping review of clinical care and public health collaboration. *BMC Public Health* 2019;**19**:708. doi:10.1186/s12889-019-7002-z

18 Horstman MJ, Mills WL, Herman LI, *et al.* Patient experience with discharge instructions in postdischarge recovery: a qualitative study. *BMJ Open* 2017;**7**:e014842. doi:10.1136/bmjopen-2016-014842

19 Abd-alrazaq AA, Bewick BM, Farragher T, *et al.* Factors that affect the use of electronic personal health records among patients: A systematic review. *Int J Med Inf* 2019;**126**:164–75. doi:10.1016/j.ijmedinf.2019.03.014

20 Gagnon M-P, Payne-Gagnon J, Breton E, *et al.* Adoption of Electronic Personal Health Records in Canada: Perceptions of Stakeholders. *Int J Health Policy Manag* 2016;**5**:425–33. doi:10.15171/ijhpm.2016.36

21 Seroussi B, Bouaud J. Use of a Nationwide Personally Controlled Electronic Health Record by Healthcare Professionals and Patients: A Case Study with the French DMP. *Stud Health Technol Inform* 2017;**235**:333–7.

22 Christiansen EK, Skipenes E, Hausken MF, *et al.* Shared Electronic Health Record Systems: Key Legal and Security Challenges. *J Diabetes Sci Technol* 2017;**11**:1234–9. doi:10.1177/1932296817709797

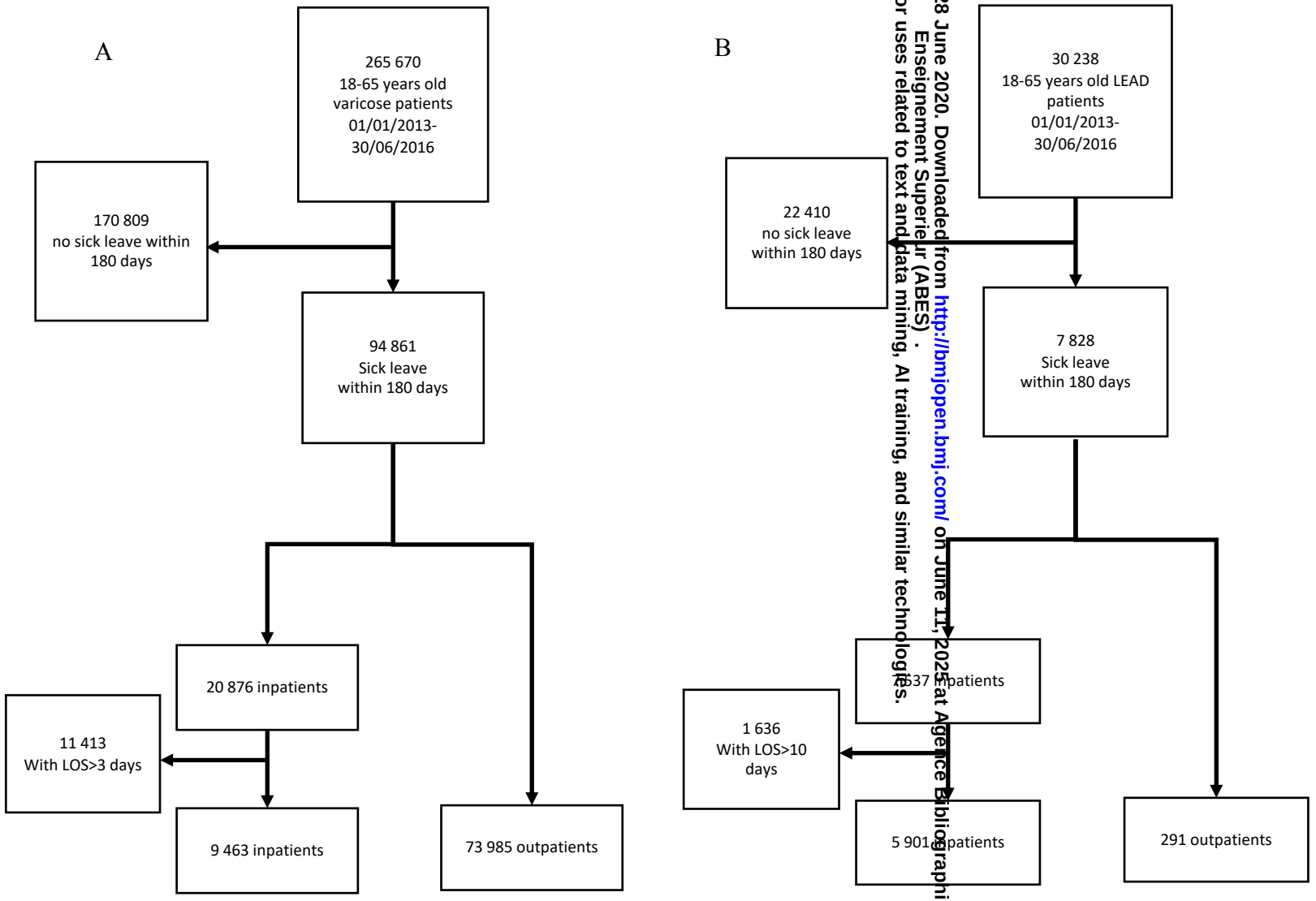
23 Davis S, Roudsari A, Raworth R, *et al.* Shared decision-making using personal health record

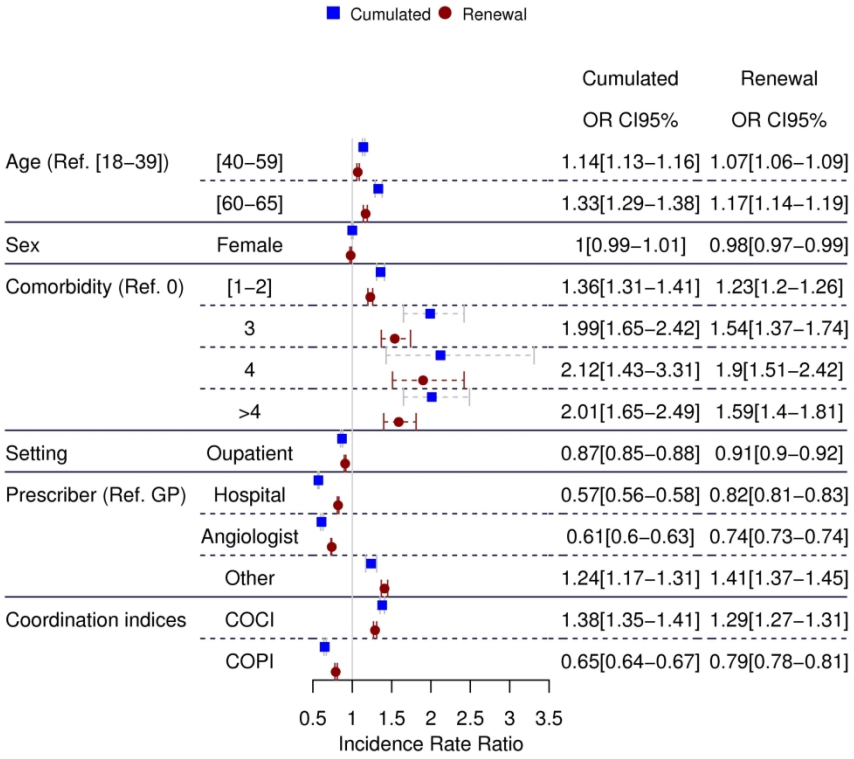
technology: a scoping review at the crossroads. *J Am Med Inform Assoc* 2017;**24**:857–66. doi:10.1093/jamia/ocw172

Figure 1. Flowchart of study population. (A) Varicose vein patients (B) Lower Extremity Arterial Disease patients.

Figure 2. Incidence rate ratios of cumulated and prescription renewals of sick leave after varicose vein intervention, in France between 2013 and 2016.

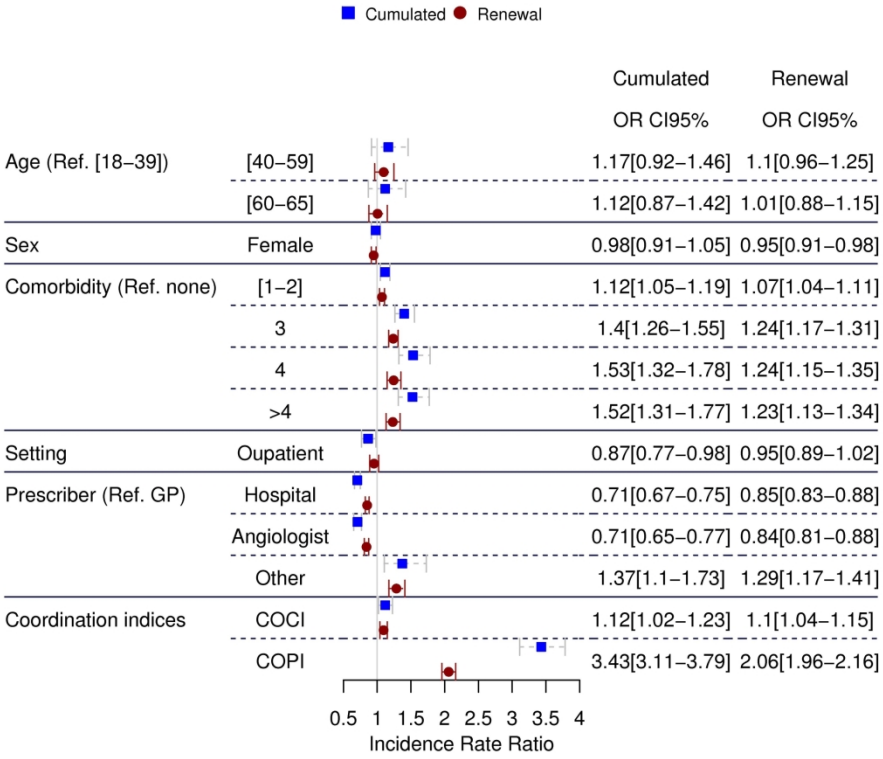
Figure 3. Incidence rate ratios of cumulated and prescription renewals of sick leave after angioplasty for lower extremity arterial diseases intervention with stent placement, in France between 2013 and 2016.





Incidence rate ratios of cumulated and prescription renewals of sick leave after varicose vein intervention, in France between 2013 and 2016.

211x185mm (300 x 300 DPI)



Incidence rate ratios of cumulated and prescription renewals of sick leave after angioplasty for lower extremity arterial diseases intervention with stent placement, in France between 2013 and 2016.

211x185mm (300 x 300 DPI)

SUPPLEMENTAL MATERIAL.

Post-procedural rehabilitation after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Asma Hamid[1], Guillaume Lamirault [2,3], Yann Gouëffic [4], and Nolwenn Le Meur[*1]

(1) *Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449, F-35000 Rennes, France*

(2) *l'institut du thorax, INSERM, CNRS, UNIV Nantes, Nantes, France.*

(3) *l'institut du thorax, CHU Nantes, Nantes, France*

(4) *CHU Nantes, l'institut du thorax, service de chirurgie vasculaire, Nantes, France; INSERM, U957, Nantes, France; Université de Nantes, Nantes, France.*

* Corresponding author: Nolwenn Le Meur

Affiliation: *Univ Rennes, EHESP Rennes, Sorbonne Paris Cité, Département METIS, REPERES Pharmacoepidemiology and Health Services Research - EA 7449*

Postal address: EHESP, Avenue du Professeur Leon Bernard, 35043 Rennes, FR

E-mail: nolwenn.lemeur@ehesp.fr

Phone: +33 2 99 02 25 14

Population

Inclusion criteria

The population of interest was the French workforce population aged 18 to 65 years-old. All incident patients who underwent angioplasty for lower extremity aretial disease (LEAD N=30238) or varicose vein interventions (N=265670) between January 1st, 2013 and June 30st, 2016 were included. Clinical selection criteria were based on hospital discharge principal diagnosis identified by International Classification of Diseases, 10th Revision (IDC10) codes and surgical procedures identified by a hierarchical, structured, fine-grained, multi-axial procedure nomenclature, namely

the French Classification Commune Des Actes Medicaux (CCAM or Common Classification of Medical Procedures) (Table A1 and Table A2). Outpatient setting was synonymous to one-day intervention (day-case) where patient stayed less than 12 hours in a hospital with same day discharge, coming from home in early morning and leaving back home in late afternoon. For comparison purposes, and following health regulatory agencies' guidelines, inpatient whose hospital length of stay was longer that 10 days for an endovascular procedure (N=1636) and 3 days for a varicose veins' intervention were excluded (N=11413) (Appendix Figure 1 and Figure 2)(High Authority of Health 2014). Patients who were not prescribed a sick leave within 30 days following the intervention were excluded (65% of varicose patients and 84% of LEAD patients, respectively). The high proportion of patients without sick leave prescription might be related to some long-term invalidity or sick leave prescribed more than 30 days prior intervention, or the self-employed status of the patient who do not receive compensation from the French national fund. Finally, the population of varicose patients included 83448 subjects (9463 inpatients – 11%- and 73985 outpatients – 89%) and the population of LEAD patients included 6192 subjects (5901 inpatients – 94.3%- and 291 outpatients – 4.7%).

Table I Codes of principal diagnosis (ICD10) and medical procedure (CCAM) for algorithm selection of LEAD patients

ICD10	LABEL FR	LABEL EN
I74.0	Embolie et thrombose de l'aorte abdominale	Embolism and thrombosis of abdominal aorta
I74.3	Embolie et thrombose des artères des membres inférieurs	Embolism and thrombosis of arteries of lower extremities
I70.2	Athérosclérose des artères distales	Atherosclerosis of arteries of extremities
I74.4	Embolie et thrombose des artères distales, sans précision	Embolism and thrombosis of arteries of extremities, unspecified
I73.9	Maladie vasculaire périphérique, sans précision	Peripheral vascular disease, unspecified
I74.5	Emoblie et thrombose de l'artère iliaque	Embolism and thrombosis of iliac artery
CCAM	**LABEL FR**	**LABEL EN**
DGLF001	Pose d'endoprothèse couverte bifurquée aortobisiliaque, par voie artérielle transcutanée	Aortobisiliac bifurcated stent-graft stent placement by transcutaneous arterial approach
DGLF002	Pose d'endoprothèse couverte aorto-uniiliaque, par voie artérielle transcutanée	Aorto-uniiliac covered stent, transcutaneous arterial
EDAF003	Dilatation intraluminale de l'artère iliaque commune et/ou de l'artère iliaque externe avec pose	Intraluminal dilatation of the common iliac artery and / or external iliac artery with stenting,

	d'endoprothèse, par voie artérielle transcutanée	by transcutaneous arterial approach
EDAF006	Dilatation intraluminale de l'artère iliaque interne avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of the internal iliac artery with stenting, transcutaneous artery
EDLF004	Pose d'endoprothèse couverte dans l'artère iliaque commune et/ou l'artère iliaque externe avec embolisation de l'artère iliaque interne, par voie artérielle transcutanée	Stent-graft placement in the common iliac artery and / or the external iliac artery with embolization of the internal iliac artery by transcutaneous arterial delivery
EDLF007	Pose d'endoprothèse couverte dans l'artère iliaque interne ou une branche extradigestive de l'aorte abdominale, par voie artérielle transcutanée	Stent-graft placement in the internal iliac artery or extradigestive branch of the abdominal aorta via the transcutaneous arterial approach
EDPF006	Recanalisation de l'artère iliaque commune et/ou de l'artère iliaque externe avec pose d'endoprothèse couverte, par voie artérielle transcutanée	Recanalization of the common iliac artery and / or the external iliac artery with stent graft placement, transcutaneous arterial
EEAF002	Dilatation intraluminale d'une artère du membre inférieur avec dilatation intraluminale de l'artère iliaque commune et/ou de l'artère iliaque externe homolatérale avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of a lower extremity artery with intraluminal dilatation of the common iliac artery and / or the ipsilateral external iliac artery with stenting, by the transcutaneous arterial approach
EEAF004	Dilatation intraluminale d'une artère du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of a lower extremity artery with stent grafting by transcutaneous arterial artery

EEAF006	Dilatation intraluminale de plusieurs artères du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Dilatation intraluminale de plusieurs artères du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée
EELF002	Pose d'endoprothèse couverte dans une artère du membre inférieur, par voie artérielle transcutanée	Stent-graft placement in lower extremity artery via transcutaneous arterial approach
EEPF001	Recanalisation d'une artère du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Recanalization of a lower extremity artery with stenting, by transcutaneous arterial approach

Table II Codes of principal diagnosis (ICD10) and medical procedure (CCAM) for algorithm selection of varicose veins patients

ICD10	LABEL FR	LABEL EN
I87.2	Insuffisance veineuse	Varicose veins of lower extremities without ulcer or inflammation
I83.9	Varices des membres inférieurs sans ulcère ou inflammation	Varicose veins of lower extremities with inflammation
I83.2	Varices des membres inférieurs, avec ulcère et inflammation	Varicose veins of lower extremities with ulcer
I83.1	Varices des membres inférieurs, avec inflammation	Varicose veins of lower extremities with both ulcer and inflammation
I83.0	Varices ulcérées	Venous insufficiency (chronic) (peripheral)
CCAM	**LABEL FR**	**LABEL EN**
EJSA001	Ligature de plusieurs veines perforantes jambières, par abord direct	Ligature of several perforating veins leggings, by direct approach
EJGA001	Extraction [Stripping] de la petite veine saphène, par abord direct	Extraction [Stripping] of the small saphenous vein, by direct approach
EJFA004	Exérèse de la crosse de la petite veine saphène, par abord direct	Excision of the arch of the small saphenous vein, by direct approach
EJFA007	Exérèse de la crosse de la grande veine saphène, par abord direct	Excision of the arch of the long saphenous vein, by direct approach
EJGA002	Extraction [Stripping] de la grande veine saphène, par abord direct	Extraction [Stripping] of the long saphenous vein, by direct approach
EJGA003	Extraction [Stripping] de la grande veine saphène et de la petite veine saphène, par abord direct	Extraction [Stripping] of the long and the small saphenous veins, by direct approach
EJFB001	Séance d'exérèse de segment de varice ou de veine perforante du membre inférieur, par voie transcutanée sous anesthésie locale	Excision of segment of varicose vein or perforating vein of the lower limb, by transcutaneous approach under local anesthesia
EJFA006	Exérèse secondaire de la crosse de la grande veine saphène ou de la petite veine saphène, par abord direct	Excision of the arch of the long or the small saphenous veins, by direct approach

EJFA002	Exérèses multiples de branches de la grande veine saphène et/ou de la petite veine saphène sous anesthésie générale ou locorégionale, par abord direct	Multiple excisions of branches of the long saphenous vein and / or small saphenous vein under general or locoregional anesthesia, by direct approach

Exclusion criteria

For comparison purposes, and following health authorities' guidelines, inpatient whose hospital length of stay was longer that 10 days for an angioplasty (N=) and 3 days for a varicose veins' intervention were excluded (N=). Moreover, patients who were not prescribed a sick leave within 180 days months following the surgery were excluded (Figure 1 and Figure 2).

Coordination of care

Continuity of Care Index (COCI) – the index measures the dispersion of visits, which quantifies the number or percentage of visits to same provider. COCI range between 0 and 1, with 1 indicating the patient always consults the same healthcare provider.

$$COCI = \frac{(\sum_{j=1}^{M} n_j^2) - N}{N(N-1)} \qquad \text{Equation 1}$$

where N = total number of visits

nj: number of visits to the *j*th different provider, j = 1, 2… M

Continuity of Prescription Index (COPI) – the index measures the dispersion of prescriber, which quantifies the number or percentage of prescription delivered by the same provider. COPI range between 0 and 1, with 1 indicating that the prescription is always delivered by the same healthcare provider

$$COPI = \frac{(\sum_{i=1}^{K} p_i^2) - P}{P(P-1)} \qquad \text{Equation 2}$$

where P = total number of prescription

p: number of prescription by the *j*th different prescriber, i = 1, 2… K

Statistical analysis

Comorbidity profiles

Table III. Comorbidities profile of the active population with varicose vein diseases, in France in 2013-2016

*	inpatient (N=9463)	/1000	outpatient (N=73985)	/1000
MI	16	0.10	41	0.03
CHF	30	0.19	45	0.04
PVD	34	0.21	83	0.07
Stroke	18	0.11	79	0.06
Dementia	1	0.01	2	0.00
Pulmonary	135	0.84	466	0.37
Rheumatic	15	0.09	64	0.05
PUD	10	0.06	51	0.04
LiverMild	33	0.21	92	0.07
DM	222	1.38	512	0.41
DMcx	32	0.20	53	0.04
Paralysis	6	0.04	23	0.02
Renal	9	0.06	24	0.02
Cancer	32	0.20	164	0.13
LiverSevere	8	0.05	14	0.01
Mets	4	0.02	22	0.02
HIV	10	0.06	22	0.02

*MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

** Note that a patient may have more than one comorbidity

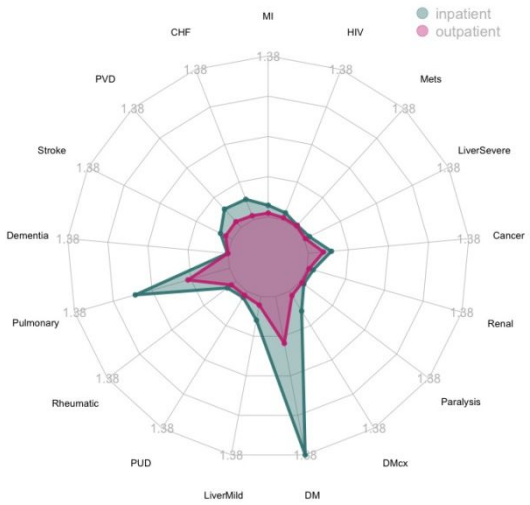


Figure 1. Comorbidities profile of the active population with varicose vein disease (per 1000 inpatiants or outpatients). MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

Table IV. Comorbidities profile of the active population with LEAD, in France in 2013-2016

\	inpatient (N=5901).	/1000	outpatient (N=291)	/1000
MI	334	3.33	11	2.22
CHF	312	3.11	13	2.63
PVD	4209	41.96	182	36.79
Stroke	256	2.55	8	1.62
Dementia	3	0.03	0	0.00
Pulmonary	481	4.79	11	2.22
Rheumatic	11	0.11	1	0.20
PUD	21	0.21	1	0.20
LiverMild	65	0.65	4	0.81
DM	391	3.90	9	1.82
DMcx	410	4.09	13	2.63
Paralysis	30	0.30	0	0.00
Renal	86	0.86	2	0.40
Cancer	123	1.23	8	1.62
LiverSevere	11	0.11	0	0.00
Mets	38	0.38	3	0.61
HIV	24	0.24	2	0.40

*MI: Myocardial Infraction; CHF: Congestive Heart Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

** Note that a patient may have more than one comorbidity

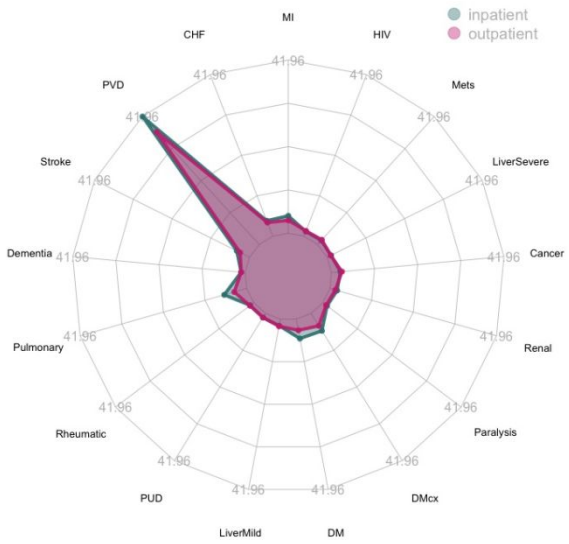


Figure 2. Comorbidities profile of the active population with LEAD (per 1000 inpatiants or outpatients). MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

Determinants sick leaves duration and renewals for varicose vein patients

Table V. Incidence rate ratio for determinants of the cumulated duration of sick leaves after varicose vein intervention, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	53.70	51.83	55.64	< 2e-16
Age ref. [18-39]				
[40,60[	1.14	1.13	1.16	< 2e-16
[60,65[	1.33	1.29	1.38	< 2e-16
Sex ref. Male	1.00	0.99	1.01	0.81391
Comorbidity ref. none				
[1-2]	1.36	1.31	1.41	< 2e-16
3	1.99	1.65	2.42	1.93e-12
4	2.12	1.43	3.31	0.000407
>4	2.01	1.65	2.49	2.64e-11
Setting ref. Inpatient	0.87	0.85	0.88	< 2e-16
Prescriptors ref. GP				
Hospital	0.57	0.56	0.58	< 2e-16
Other	1.24	1.17	1.31	1.07e-13
Specialist	0.61	0.60	0.63	< 2e-16
Coordination indices				
coci	1.38	1.35	1.41	< 2e-16
copi	0.65	0.64	0.67	< 2e-16

Table VI. Incidence rate ratio for determinant of the renewal of sick leaves after varicose vein intervention, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	6.74	6.61	6.87	< 0.001
Age ref. [18-39]				
[40,60[	1.07	1.06	1.09	< 0.001
[60,65[	1.17	1.14	1.19	< 0.001
Sex ref. Male	0.98	0.97	0.99	< 0.001
Comorbidity ref. none				
[1-2]	1.23	1.20	1.26	< 0.001
3	1.54	1.37	1.74	< 0.001
4	1.90	1.51	2.42	< 0.001
>4	1.59	1.40	1.81	< 0.001
Setting ref. Inpatient	0.91	0.90	0.92	< 0.001
Prescriptors ref. GP				
Hospital	0.82	0.81	0.83	< 0.001
Other	1.41	1.37	1.45	< 0.001
Specialist	0.74	0.73	0.74	< 0.001
Coordination indices				
coci	1.29	1.27	1.31	< 0.001
copi	0.79	0.78	0.81	< 0.001

Table VII. Comparison of inpatients and outpatients COPI and COCI statistics after varicose vein intervention, in France in 2013-2016

AMBU	n	median	average	sd	min	max	p-value
COCI							
0	8750	0.5000000	0.5161439	0.3215104	0.0	1	< 2.2e-16
1	67666	0.4666667	0.4785970	0.3337189	0.0	1	
COPI							
0	8750	0.5555556	0.6033501	0.3573928	-0.5	1	< 2.2e-16
1	67666	0.8000000	0.6813231	0.3618581	-0.5	1	

coci-copi r correlation = -0.05

Outpatients have lower percentage of visits to the same group of providers (average COCI= 0.47 vs 0.52), probably synonimous of tighter coordination which is not inconsitent with greater percentage of prescription delivered by the same group of providers, reducing the overall cumulated days and renewals of sick leaves.

Determinants sick leaves duration and renewals for LEAD patiets

Table VIII. Incidence rate ratio for determinant of the cumulated duration of sick leaves after angioplasty for lower extremity arterial disease, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	28.42	22.26	36.80	< 0.001
Age ref. [18-39]				
[40,60)	1.17	0.92	1.46	0.20
[60,65)	1.12	0.87	1.42	0.37
Sex ref. Male	0.98	0.91	1.05	0.53
Comorbidity ref. none				
[1-2]	1.12	1.05	1.19	< 0.001
3	1.40	1.26	1.55	< 0.001
4	1.53	1.32	1.78	< 0.001
>4	1.52	1.31	1.77	< 0.001
Setting ref. Inpatient	0.87	0.77	0.98	0.02
Prescriptors ref. GP				
Hospital	0.71	0.67	0.75	< 0.001
Other	1.37	1.10	1.73	0.01
Specialist	0.71	0.65	0.77	< 0.001
Coordination indices				
coci	1.12	1.02	1.23.	0.01
copi	3.43	3.11	3.79	< 0.001

* *statistically significant*

Table IX. Incidence rate ratio for determinant of the number of renewals of sick leaves after angioplasty for lower extremity arterial disease, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	5.97	5.21	6.85	0.00
Age ref. [18-39]				
[40,60)	1.10	0.96	1.25	0.16
[60,65)	1.01	0.88	1.15	0.94
Sex ref. Male	0.95	0.91	0.98	0.01
Comorbidity ref. none				
[1-2]	1.07	1.04	1.11	< 0.001
3.	1.24	1.17	1.31	< 0.001
4.	1.24	1.15	1.35	< 0.001
>4.	1.23	1.13	1.34	< 0.001
Setting ref. Inpatient	0.95	0.89	1.02	0.18
Prescriptors ref. GP				
Hospital	0.85	0.83	0.88	< 0.001
Other	1.29	1.17	1.41	< 0.001
Specialist	0.84	0.81	0.88	< 0.001
Coordination indices				
coci	1.10	1.04	1.15	< 0.001
copi	2.06	1.96	2.16	< 0.001

Table X. COPI and COCI statistics after angioplasty for lower extremity arterial disease, in France in 2013-2016

AMBU	n	median	average	sd	min	max	p-value
COCI							
0	5041	0.5357143	0.5729896	0.2966465	0.0	1	0.6327
1	235	0.5000000	0.5630898	0.3040998	0.0	1	
COPI							
0	5041	0.5238095	0.5203114	0.3715545	-0.5	1	0.1506
1	235	0.6000000	0.5580041	0.3926373	-0.5	1	

- NS: T-test

coci-copi r correlation = 0.09

Outpatients and inpatients have different patterns for COCI and COPI.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	P1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P4
Objectives	3	State specific objectives, including any prespecified hypotheses	P5
Methods			
Study design	4	Present key elements of study design early in the paper	P5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	P5-6 + supplementary material
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*P5 and p7*
Bias	9	Describe any efforts to address potential sources of bias	P7
Study size	10	Explain how the study size was arrived at	P5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P5 and figure 1
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	Figure1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	P7-10
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Figure 2 and Figure 3
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	P10
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P12
Generalisability	21	Discuss the generalisability (external validity) of the study results	P11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Duration of sick leave after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-034713.R1
Article Type:	Original research
Date Submitted by the Author:	14-Feb-2020
Complete List of Authors:	Hamid, Asma; EHESP, Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449 Lamirault, Guillaume; Institut du thorax Gouëffic, Yann; Groupe hospitalier Paris Saint-Joseph, Vascular center Le Meur, Nolwenn; Ecole des Hautes Etudes en Sante Publique, Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Cardiovascular medicine, Public health
Keywords:	PUBLIC HEALTH, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, VASCULAR SURGERY, VASCULAR MEDICINE

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Duration of sick leave after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Asma Hamid[1], Guillaume Lamirault[2,3], Yann Gouëffic [4], and Nolwenn Le Meur[*1]

(1) Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449, F-35000 Rennes, France

(2) Institut du thorax, INSERM, CNRS, UNIV Nantes, Nantes, France.

(3) Institut du thorax, CHU Nantes, Nantes, France

(4) Vascular center, Groupe Hospitalier Paris Saint-Joseph, 185 rue Raymond Losserand, 75014, Paris

* Corresponding author: Nolwenn Le Meur

Affiliation : *Univ Rennes, EHESP Rennes, Sorbonne Paris Cité, Département METIS, REPERES Pharmacoepidemiology and Health Services Research - EA 7449*

Postal address: EHESP, Avenue du Professeur Leon Bernard, 35043 Rennes, FR

E-mail : nolwenn.lemeur@ehesp.fr

Phone: +33 2 99 02 25 14

Word count: 3023

Keywords: same day discharge, lower extremity arterial disease, varicose vein, sick leave, health insurance database, health care coordination

ABSTRACT

OBJECTIVE

To assess whether disparities in rates of same day discharge for lower extremities arterial disease (5%) and varicose vein interventions (90%) are associated with the burden of post-procedural rehabilitation process, measured thru the duration of sick leave.

DESIGN

Retrospective observational study using French national health insurance data in 2012-2016

SETTING

The French national health data system (SNDS), which covers 98.8% of the 66 million people in the French population.

PARTICIPANTS

French workforce population aged 18 to 65 years-old who underwent a first angioplasty with stent placement for LEAD (N=30238) or a first varicose vein intervention (N=265670) between 2013 and 2016.

MAIN OUTCOME MEASURES

Duration and renewals of sick leave within 180 days after endovascular intervention, continuity of care and prescription indices to assess coordination among health care professionals after intervention associated with specific intervention settings: conventional (inpatient) or same day discharge (outpatient). Association were estimated by multivariate negative binomial regressions adjusting for age, gender and comorbidities.

RESULTS

Outpatient settings decrease the incidence rate ratio (IRR) of the number of cumulated days of sick leave by 14% in both interventions. The increasing variety of prescribers decreases the IRR of cumulated days of sick leave and prescription renewals for varicose interventions by 25% and 21%, respectively, but increases them for LEAD interventions by 240% and 106%. Less coordination between health care specialists increases the IRR of cumulative days of sick leave and renewals by

37% and 29% for varicose, and 11% and 9% for LEAD interventions.

CONCLUSIONS

Outpatient low rates in LEAD angioplasty does not seem related to the duration of sick leave. Outpatient setting reduces the duration of sick leave and their renewals, whatever the intervention. Coordination of health care professionals is a key element of interventions follow-up with pathology specificities.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This retrospective study is based on data extracted from the French National Health Insurance System (SNDS – Système National des Données de Santé) which covers 98.8% of the 66 million people in the French population.
- The cohort enables the analysis of health care pathways including hospital stays, office medicine consultations, drug prescriptions, and sick leave prescriptions.
- The cohort includes patients who beneficiated from an angioplasty with stent placement which represent 85% of the angioplasties for lower extremities arterial disease
- The SNDS lack of detailed socio-demographic and clinical information preventing the inclusion of valuable information relating to hospital stay conversion, family environment, and socio-professional category in our analysis model.

INTRODUCTION

In the French health care system, same day discharge procedures are outpatients' hospitalisations, while inpatients' care include overnight hospitalisations. Outpatient procedure appears to be beneficial for both patients' quality of care and health care systems by relieving the pressure on hospital beds and material resources.[1–3] Long time lagging behind for the development of ambulatory surgeries and interventions, France has made significant progress in developing same day discharge. Since 2010, same day discharge has grown up to represent on average 56% of all surgeries and interventions but, depending on the medical procedure and geographical area, important variations can be observed. In 2016, almost 90% of varicose vein interventions were performed in outpatient setting, while we estimated at less than 5% the rate of same day discharge procedures for stent placement in the context of for lower extremities arterial disease (LEAD), with regional variations from 0% to 58%. These disparities may result from the complexity of the therapeutic management for LEAD patients, who tend to have more complicated post-procedural follow-up and rehabilitation than varicose patients as they are older, they have more comorbidities, and their condition is more disabling. As a consequence, outpatient endovascular procedures for LEAD patients may result in shifting the burden of early post-procedural follow-up to ambulatory health services and in increasing the time before resuming work.[4]

To approximate the burden of post-procedural rehabilitation in the context of inpatient and outpatient settings, we propose to compare the number of days of medical leave from work and the number of their renewals after intervention. Research conducted on sick leave according to intervention settings for the treatment of varicose vein and angioplasty with stent placement for LEAD is scarce. In varicose veins, most studies compare procedures (i.e., stripping versus radiofrequency or laser ablation) but not the setting as most interventions are day cases. However, few international studies report that the mean number of days of sick leave after conventional surgery of varicose vein vary between 4 to 14 days, whatever the intervention setting. The French

guidelines by the health regulatory agency vary from 3 days to 10 days (including the day of the procedure) in the case of sedentary workers.[5] For LEAD procedures, the French guidelines concern only inpatient interventions and vary from 7 days to 28 days, according to the type of intervention and the patient's employment characteristics.[5]

In this paper, we propose for the first time a description and a comparison of duration of sick leave in function of the hospitalisation setting (i.e., inpatient or outpatient) after LEAD and varicose interventions. The indicators used are *(i)* the delays before resuming work and *(ii)* the number of renewals of sick leave prescriptions per patient. The differences in sick leave duration and renewals according to health care prescribers in the continuum of care are also highlighted.

METHODS

A retrospective analysis from January 1st, 2013 to June 30st, 2016 was conducted using data from the French national health data system (SNDS), which covers 98.8% of the 66 million people in the French population. The SNDS contains anonymous and individual health insurance users' data with demographic characteristics and all reimbursed care, including outpatient medical care, ambulatory consultations, and hospitalisation discharge data.[6]

Patient and Public Involvement

No patient involved.

Study Population and demographics

The population of interest was the French workforce population aged 18 to 65 years-old. All incident patients who underwent angioplasty and stent placement for LEAD (N=30238) or varicose vein invasive interventions (ligature, stripping or crossectomy) (N=265670) between January 1st, 2013 and June 30st, 2016 were included (Figure 1). Clinical selection criteria were based on hospital discharge principal diagnosis identified by International Classification of Diseases, 10th Revision (ICD10) codes and surgical procedures identified by the French Common Classification of

Medical Procedures (Supplemental Tables I and II). Outpatient setting corresponded to one-day intervention where patient stayed less than 12 hours in a hospital with same day discharge, coming from home and leaving back home. For comparison purposes, and following health regulatory agencies' guidelines, inpatient whose hospital length of stay was longer that 10 days for an endovascular procedure and 3 days for a varicose veins' intervention were excluded (Supplemental Figures 1 and 2).[5] Patients with no sick leave within 180 days following the intervention were excluded. The final population of included 83448 varicose patients and 6192 LEAD patients.

Study Variables and Outcomes

Each patient was characterized by the following covariates: gender, age categorized in 3 age groups (18-39, 40-59, 60-65), surgical intervention setting (inpatient or outpatient), and group of comorbidity index. The Charlson's Comorbidity Index was computed per patient to quantify the burden of comorbidities.[7,8] Comorbidities were obtained based on the principal and associated diagnoses that a patient may have had during hospitalisation one year prior the index intervention. For regression analysis, the Charlson's Comorbidity Index was transformed into 5 classes (0, [1-2], 3, 4, [5-12]).

For each patient, continuum of care after surgery was characterized by the Bice-Boxerman Continuity of Care Index (COCI),[9,10] and an adapted version measured the continuity of sick leave prescribers (COPI) (Supplemental Equation 1 and 2). The COCI varies between 0 and 1, and measures the extent to which a patient seek care through a unique care provider category (e.g. COCI=1 if only GP) or several different ones (e.g. COCI~0 if GP+angiologists+…). The COPI varies between 0 and 1, and measures the extent to which a patient had his/her sick leaves prescribed by a unique care provider category (COPI=1) or several different ones (COPI~0). Categories of sick leave prescribers were built according to the medical specialties and place of practice: "GP" refers to general practitioners, "hospital" refers to prescriptions written by hospital services, "specialists" refer to radiologists, vascular, and cardiovascular doctors in town practice

(i.e., medical office), and "others" refer to all other prescribers in medical offices.

To approximate the post-procedural rehabilitation process, the outcomes of the study were (*i*) the cumulative days off work for medical leave after hospital intervention per patient within 180 post-procedural days, and (*ii*) the number of renewals of medical leave from work per patient within 180 post-procedural days and without rehospitalisation

Statistical analyses

The patients' characteristics were described and compared using Pearson's $\chi 2$ test when qualitative and Student *t*-test when quantitative. A *P*-value <0.05 was considered statistically significant. The association between covariates and outcomes of interest was assessed using negative binomial regression analyses. Propensity score weighting was used to address possible treatment bias associated with to the year of intervention, the sex, the age, the comorbidities, and the age*comorbidity interactions.[11] Results were reported as incidence rate ratios (IRR) with 95% confidence intervals (CI) and *P*-values. Forest plot were used to visually compare the results. All computations were performed using R.[12]

RESULTS

LEAD patients differ from varicose vein patients by most characteristics (Table 1). Only 4.7% of LEAD patients were outpatients while it concerns 89% of varicose vein patients. Among the varicose vein patients, the Female/Male sex ratio approximated 1.5. Among LEAD patients, the sex ratio was around 0.19 in both settings. More than 90% of varicose vein patients had no comorbidity. LEAD patients were older than varicose vein patients with most patients aged between 40 to 59 years old. Comorbidity profiles were different between pathologies with a majority of diabetes and pulmonary diseases in the varicose vein population (Supplemental Table III and Supplemental Figure 1) and a majority of cardiovascular diseases in the LEAD population (Supplemental Table IV and Supplemental Figure 2).

Table 1. Characteristics of the active population of French patients who had a sick leave prescription within 30 days of a vascular intervention for lower extremity arterial disease or varicose veins between 01/01/2013 and 30/06/2016

	Varicose N= 83448			Lower extremity arterial disease N= 6192		
	Inpatient	Outpatient	p-value*	Inpatient	Outpatient	p-value*
N (%)	9463(11)	73985(89)		5901(95.30)	291(4.70)	
Gender						
Male	3910(41.32)	28844(38.99)	1.30^{-5}	4960(84.05)	243(83.51)	0.80
Female	5553(58.68)	45141(61.01)		941(15.95)	48(16.49)	
Age (mean +/- sd) †	47.9(8.36)	45.6(9.32)		53.45(5.30)	53.03(4.90)	
18- 39	1729(18.27)	19777(26.73)	2.10^{-16}	72(1.22)	3(1.03)	0.28
40-59	7178(75.85)	51474(69.57)		5307(89.93)	270(92.78)	
60-65	556(5.88)	2736(3.70)		522(8.85)	18(6.19)	
Comorbidity index‡	0.086	0.0317		1.32	0.04	
0	8894(93.99)	72348(97.79)	2.10^{-16}	1266(21.45)	98(33.68)	2.10^{-16}
[1-2]	552(5.83)	1527(2.06)		3805(64.48)	160(54.98)	
3	24(0.25)	53(0.07)		474(8.03)	18(6.19)	
4	7(0.07)	7(0.01)		184(3.12)	7(2.41)	
[5-12]	16(0.17)	50(0.07)		172(2.91)	8(2.75)	

* p-values are results of univariate tests: Fisher Exact tests for qualitative variable and Student T tests for quantitative variables

† sd stands for standard deviation

‡ as defined by Charlson's Comorbidity algorithm

Varicose vein and post procedural duration of sick leave

An increase trend of IRR was observed for the cumulated number of workday breaks in relation with comorbidities levels compare to no comorbidities whatever the intervention setting. Similarly, an increase trend of IRR was estimated for the cumulated number of workday breaks and number of workday break renewals in relation with population aging (Figure 2, Supplemental Tables V and VI). The mean duration of the first sick leave was similar for inpatients and outpatients with 3.90 and 3.87 days, respectively (*p-value* = 0.52). The average duration of each prescribed sick leaves over the 180 days period after intervention was significantly different between inpatients and outpatients with 5.95 days and 5.51 days, respectively (*p-value* < 2e-16). On average, the cumulated number of workday breaks and the number of renewals of prescriptions differ between inpatients and outpatients with 61 days and 48.5 days of cumulated number of workday breaks, respectively and prescription renewals 8.7 and 7.2 times. Intervention settings have a significant impact on the cumulated number of workday breaks and the number of sick leave renewals. While holding all other variables constant, interventions in outpatient setting significantly decreased the trend of IRR of the number of sick leave days by 14%, and the IRR of sick leave renewals by 9% compared to inpatient settings.

Compared to sick leaves prescribed by GPs, the IRR of the total number of cumulated sick leave days prescribed within 180 days of varicose intervention decreased by 43% if prescribed within hospitals and by 39% if prescribed by vascular doctors in outpatient sites (e.g. angiologists in medical offices) but increased by 40% if prescribed by other specialists in their medical offices. Similarly, the IRR of the total number of sick leave renewals was expected to decrease by 19% if prescribed in a hospital and by 27% if prescribed by a vascular specialist but increased by 47% if it was prescribed by another specialist.

The COCI showed that when the number of visits to the same group of providers increased, the IRR of cumulative days of sick leave increased by a factor of 38% and the number of sick leave

renewals increased by a factor of 29%. The COPI indicated that when the number of prescribers from distinct specialties decreases, the IRR of the cumulated days of sick leave decreased by 25%, and the IRR the total number of sick leave renewals decreased by 21%. Interestingly, outpatients have a lower percentage of visits to the same group of providers but a higher percentage of prescriptions from the same group of providers than inpatients, possibly synonymous of tighter coordination (Supplemental Table VII). Although COCI and COPI indices are not linearly correlated (r = -0.05), when prescriptions were delivered by few providers of the same specialty, sick leaves were shorter on average, reducing the overall cumulated days of sick leaves or their renewals.

Lower extremities arterial disease and post-procedural duration of sick leave

In the LEAD population, the number of prescription renewals for workday breaks and their cumulated number did not seem to be significantly associated with the age and the sex of the patient (Figure 3). However, the levels of comorbidities did affect the IRR of the cumulated number of workday breaks and the renewals of workday break prescriptions. Although no specific trend was observed, 2 groups could be highlighted: comorbidity levels 1 and 2 demonstrated an IRR increase of 12% for the cumulated number of workdays breaks compare to no comorbidities and comorbidity levels above 2 showed an IRR increase of around 50%. Although, the mean duration of the first sick leaves was similar whatever the intervention setting (5.29 and 5.46 days for inpatient and outpatient, respectively with *p-value*=0.57), intervention settings was a significant determinant of the number of the cumulated workday breaks (Figure 3 and Supplemental Table VIII). Outpatient management decreased the IRR of the number of cumulated workday breaks by 14%. The number of prescription renewals was slightly smaller for outpatients than inpatients (Figure 3 and Supplemental Table IX). However, intervention setting had no impact on the overall number of sick leave renewals. This observation might be explained by the average number of workday breaks per period of sick leaves that is greater for inpatients (*p-value=0.01*) with 6.5 and 5.9 days,

respectively.

Compared to prescriptions by a GP, the IRR of the total number of cumulated sick leave days within 180 days of endovascular interventions decreased by ~30% if prescribed within a hospital or by vascular doctors in medical offices (Figure 3). However, it increased by 37% when prescribed by other specialists in their medical offices. The IRR of the number of sick leave renewals decreased by 15% and 16% if prescribed within hospitals or by angiologists in medical offices, respectively, but increased by 27% if prescribed by other specialists in their medical offices.

The COCI showed that when the degree of coordination between different health care providers decreased, the IRR of cumulative days of sick leave increased by 12% and the number of sick leave renewals increases by 10%. The COPI showed that when the number of sick leave prescriptions delivered by the same group of health care practitioners increases, the IRR of cumulated days of sick leaves significantly increased by a factor of 3.43, and the number of sick leave renewals increased by a factor of 2.06. The principal group of prescribers of sick leave were GPs and other doctors in medical offices with a median of 6 and 3 prescriptions per patient, respectively. Interestingly, the COCI and COPI measurements were on average similar whatever the intervention setting (Supplemental Table X)

Overall, except for the coordination indices, the effects of the observed determinants on the number of cumulated days of sick leaves and the renewals of sick leaves after LEAD and varicose vein interventions were similar. Patients' age and sex had no or moderate effects. An increasing trend effect could be observed for comorbidity levels. Outpatients tend to show lower IRR that inpatients. Sick leaves duration and renewals were more important when prescribed by GP than any other health services. The main effect seemed to be coordination that differ between the two pathologies and between settings.

DISCUSSION

In this analysis of sick leave durations and renewals as proxies of rehabilitation within 180 days of post-procedural follow-up of LEAD and varicose vein interventions according to care settings in France, our findings suggest that outpatient interventions do not induce longer duration of sick leave than inpatient interventions. In fact, our results highlight the benefits of outpatient interventions in decreasing by 13% the IRR of the cumulated time before resuming work whatever the pathology. Furthermore, the study shows that the variations of practices in the number of cumulated days of sick leave and their renewals prescribed according to the health care services are similar for both pathologies. Prescriptions by GPs induced higher numbers of cumulated sick leave days and more renewals. This finding corroborates the importance of coordinating post-procedural follow-up, since the concentration of post-intervention care within a single practitioner significantly increases the IRR of duration of sick leave whatever the pathology. Interestingly, when sick leaves were prescribed by the same group of health care providers the IRR of their duration increased for LEAD patients but decreased for varicose vein patients.

To our knowledge, research on the duration of post-procedural rehabilitation process using sick leave prescriptions as proxies for LEAD or varicose vein interventions in inpatient and outpatient settings is scarce. Our findings on the benefits of outpatient interventions for varicose vein are coherent with the work by van Groenendael et al.(2009) and the Health Quality Ontario report (2011).[13,14] Although one limitation of our study is the use of sick leave prescriptions and their duration as the only measure to estimate the duration of post-procedural rehabilitation process. Nevertheless, our study describes the contribution of distinct health care providers involved in that process while prescribing sick leave. The observed variations in sick leave prescriptions are similar to previous studies based on the French health care system where GPs are at the origin of 74% of the total number of sick leave prescriptions.[15,16] These observations are likely due to the pivotal

role of GPs in patient care pathways and an answer to the geographical disparities in the access to health care specialists, such as angiologists.

The first strength of our study is the analysis of health care consumption for the quasi-exhaustive population of LEAD and varicose vein patients as data were issued from the SNDS, a national medico-administrative database that covers 99% of the French population. The second strength is the historical depth of our data as our retrospective cohort covers a four-year period while studies by others were done over a one-year period.[13,14].

Although representative of the French population, the SNDS has limitations. The database essentially contains data of reimbursed health care and associated expenditures but few clinical and socio-demographical information. For instance, adjustment or stratification of the study population by type of work or weekly work load that may be related to post-follow rehabilitation process cannot be done. Similarly, family environment (e.g. marital status, offspring) is unknown which is related to intervention setting choice and possible hospital stay conversion from planned same day discharge to overnight stay. Another limitation is the threshold chosen for the length of stay to select of the inpatient population. Although the defined thresholds were based on national guidelines, variations of practices exist at different levels: between hospitals and health care professionals, notably. Finally, length of stay in hospital for inpatients were not counted as days off work which may underestimate the benefit of outpatient settings in decreasing sick leave duration and consequently the time to rehabilitation.

CONCLUSIONS

Outpatient interventions for LEAD and varicose vein proved to decrease the duration of sick leave compare to conventional intervention. Therefore, outpatient interventions could help saving health insurance money not only associated with hospitals' expenses for bed management but although

associated with work-break payment. In addition, same day discharge interventions for LEAD have similar timing in post-procedural rehabilitation than for varicose veins. Therefore, duration of sick leave does not seem a determinant of the observed differences in rates of same day discharge interventions for LEAD and varicose veins. However, the analysis of the coordination indices suggests that health care provider coordination is critical for sick leave duration and post-procedural follow-up. Coordination should be specific to the intervention setting and the pathology, especially in the acute care context where post-procedural accessibility to health care specialists might be complicated (territorial disparities in travel time and availability).[4,17,18] Compare to varicose vein interventions, LEAD interventions require a greater diversity of health care providers for post-intervention care with tighter coordination. Although we suggest that health care coordination after LEAD interventions may not be exclusive to one health care specialty, like the GP-centred approach in varicose vein interventions. In addition, in the area of participatory medicine and eHealth, the use of shared electronic health records should be considered seriously by the health care providers and users.[19–21] Though key legal and security challenges are unsolved,[22] shared electronic health records could become a coordination and shared decision-making tool.[23] In France, the current promotion of shared e-health records will hopefully be accepted by health care services, which should improve care trajectories with enhanced coordination between hospital and office medicine and equity of access to outpatient interventions.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the INDS and CNAMTS for support in accessing the data.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

This work was support by the French Health Products Agency (ANSM) as part of the PEPS platform and the TRACKEDAYS project (TRAjectory of Care for Knowledge on Endovascular

DAY Surgery).

ETHICS APPROVAL

Data are issued from the French national health insurance information system with agreement from the French data protection authority (#1968571). The study protocol was approved by the National Institute of Health Data review board (#201). Patient and Public involvement statement do not apply.

DATA AVAILABILITY

No additional data available.

AUTHOR CONTRIBUTIONS

All four authors were involved in the conception and design of the study. Asma Hamid and Nolwenn Le Meur wrote the article with critical revision were by Yann Gouëffic and Guillaume Lamirault. Statistical analysis and interpretation of the data were performed by Asma Hamid and Nolwenn Le Meur. All four authors approved the final version of the article.

REFERENCES

1 Lombardi JV, Calligaro KD, Dougherty MJ. Safety and Cost Savings of Endovascular Procedures: Are Outpatient Interventions Feasible when Combined with Open Surgery? *Vasc Endovascular Surg* 2002;**36**:231–5. doi:10.1177/153857440203600312

2 Akopian G, Katz SG. Peripheral angioplasty with same-day discharge in patients with intermittent claudication. *J Vasc Surg* 2006;**44**:115–8. doi:10.1016/j.jvs.2006.03.025

3 Albert B, Davaine J-M, Chaillet M-P, *et al.* Clinical and economic evaluation of ambulatory endovascular treatment of peripheral arterial occlusive lesions. *Ann Vasc Surg* 2014;**28**:137–43. doi:10.1016/j.avsg.2013.06.008

4 Knutsen Glette M, Kringeland T, Røise O, *et al.* Hospital physicians' views on discharge and

readmission processes: a qualitative study from Norway. *BMJ Open* 2019;**9**:e031297. doi:10.1136/bmjopen-2019-031297

5 High Authority of Health H. Referencials of Work Leave Prescriptions in Five Pathologies. 2014. https://www.has-sante.fr/portail/upload/docs/application/pdf/2014-09/reponse_a_la_saisine_du_10_mars_2014_en_application_de_larticle_l.161-39_du_code_de_la_securite_sociale.pdf (accessed 19 Oct 2018).

6 Tuppin P, de Roquefeuil L, Weill A, *et al.* French national health insurance information system and the permanent beneficiaries sample. *Rev Epidémiologie Santé Publique* 2010;**58**:286–90. doi:10.1016/j.respe.2010.04.005

7 Bannay A, Chaignot C, Blotière P-O, *et al.* The Best Use of the Charlson Comorbidity Index With Electronic Health Care Database to Predict Mortality: *Med Care* 2016;**54**:188–94. doi:10.1097/MLR.0000000000000471

8 Wasey JO. *icd: Tools for Working with ICD-9 and ICD-10 Codes, and Finding Comorbidities*. 2018. https://CRAN.R-project.org/package=icd

9 Pollack CE, Hussey PS, Rudin RS, *et al.* Measuring Care Continuity: A Comparison of Claims-based Methods. *Med Care* 2016;**54**:e30–4. doi:10.1097/MLR.0000000000000018

10 Bice TW, Boxerman SB. A quantitative measure of continuity of care. *Med Care* 1977;**15**:347–9.

11 van der Wal WM, Geskus RB. ipw : An R Package for Inverse Probability Weighting. *J Stat Softw* 2011;**43**. doi:10.18637/jss.v043.i13

12 R Core Team. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: : R Foundation for Statistical Computing 2018. https://www.R-project.org

13 van Groenendael L, van der Vliet JA, Flinkenflögel L, *et al.* Treatment of recurrent varicose veins of the great saphenous vein by conventional surgery and endovenous laser ablation. *J Vasc Surg* 2009;**50**:1106–13. doi:10.1016/j.jvs.2009.06.057

14 Health Quality Ontario. Endovascular radiofrequency ablation for varicose veins: an evidence-based analysis. *Ont Health Technol Assess Ser* 2011;**11**:1–93.

15 Masson P. La prescription des médecins généralistes : conflits entre la profession médicale et

l'Assurance maladie. *Sociétés Contemp* 2011;**83**:33–57. doi:10.3917/soco.083.0033

16 Junod W. Prescription and control of work break prescription for disease with regard to medical ethics. Conseil national de l'Ordre des médecins 2000. http://web.fdn.fr/~amagnouat/metge/IMG/pdf/arret_travail_ordre.pdf

17 Shahzad M, Upshur R, Donnelly P, *et al.* A population-based approach to integrated healthcare delivery: a scoping review of clinical care and public health collaboration. *BMC Public Health* 2019;**19**:708. doi:10.1186/s12889-019-7002-z

18 Horstman MJ, Mills WL, Herman LI, *et al.* Patient experience with discharge instructions in postdischarge recovery: a qualitative study. *BMJ Open* 2017;**7**:e014842. doi:10.1136/bmjopen-2016-014842

19 Abd-alrazaq AA, Bewick BM, Farragher T, *et al.* Factors that affect the use of electronic personal health records among patients: A systematic review. *Int J Med Inf* 2019;**126**:164–75. doi:10.1016/j.ijmedinf.2019.03.014

20 Gagnon M-P, Payne-Gagnon J, Breton E, *et al.* Adoption of Electronic Personal Health Records in Canada: Perceptions of Stakeholders. *Int J Health Policy Manag* 2016;**5**:425–33. doi:10.15171/ijhpm.2016.36

21 Seroussi B, Bouaud J. Use of a Nationwide Personally Controlled Electronic Health Record by Healthcare Professionals and Patients: A Case Study with the French DMP. *Stud Health Technol Inform* 2017;**235**:333–7.

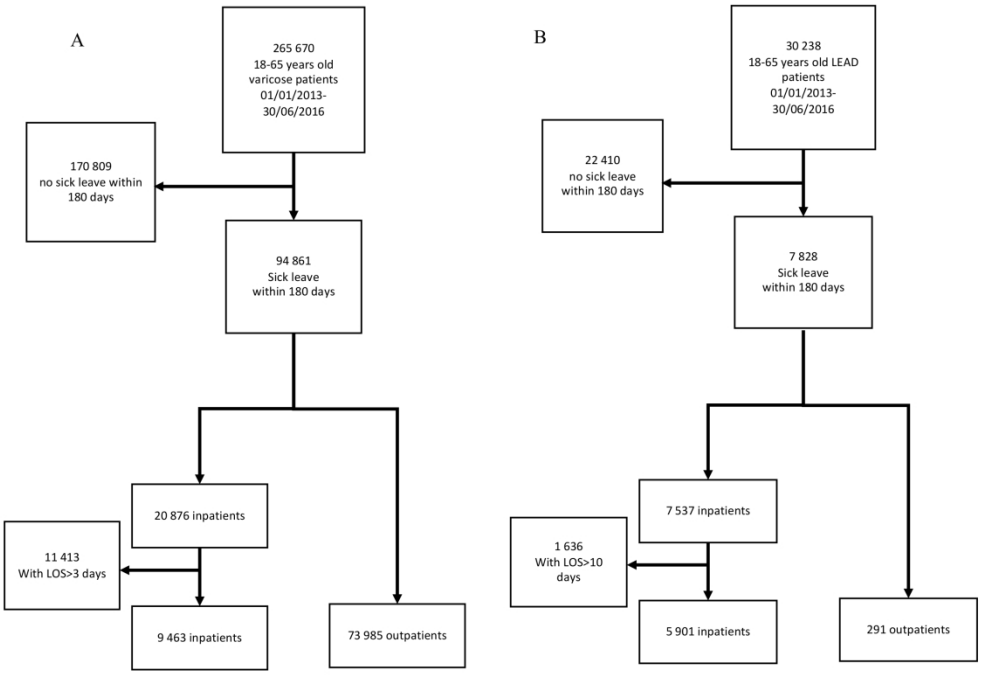
22 Christiansen EK, Skipenes E, Hausken MF, *et al.* Shared Electronic Health Record Systems: Key Legal and Security Challenges. *J Diabetes Sci Technol* 2017;**11**:1234–9. doi:10.1177/1932296817709797

23 Davis S, Roudsari A, Raworth R, *et al.* Shared decision-making using personal health record technology: a scoping review at the crossroads. *J Am Med Inform Assoc* 2017;**24**:857–66. doi:10.1093/jamia/ocw172

Figure 1. Flowchart of study population. (A) Varicose vein patients (B) Lower Extremity Arterial Disease patients.

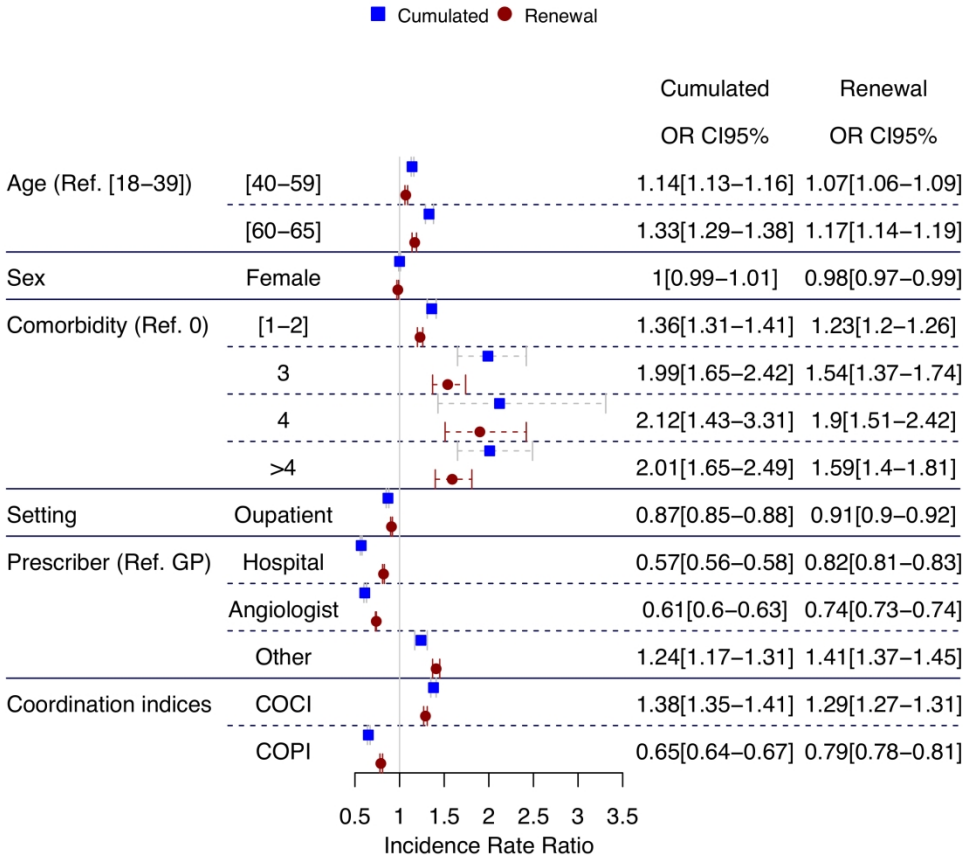
Figure 2. Incidence rate ratios of cumulated and prescription renewals of sick leave after varicose vein intervention, in France between 2013 and 2016.

Figure 3. Incidence rate ratios of cumulated and prescription renewals of sick leave after angioplasty for lower extremity arterial diseases intervention with stent placement, in France between 2013 and 2016.



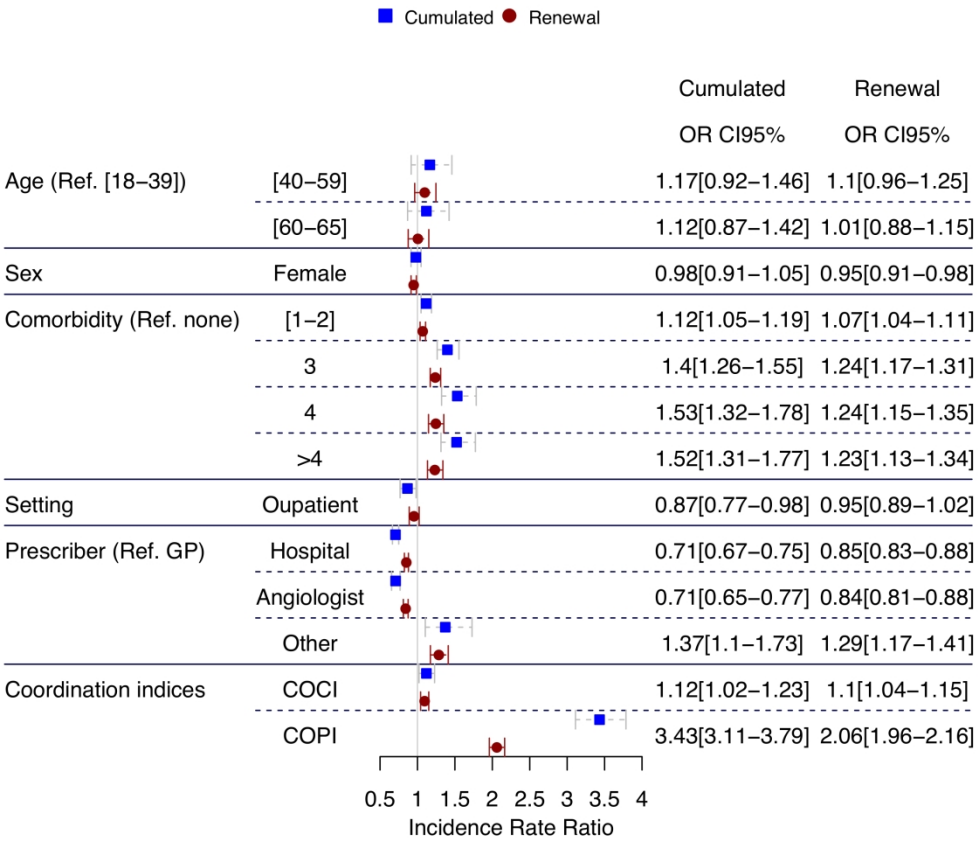
Flowchart of study population. (A) Varicose vein patients (B) Lower Extremity Arterial Disease patients.

217x152mm (300 x 300 DPI)



Incidence rate ratios of cumulated and prescription renewals of sick leave after varicose vein intervention, in France between 2013 and 2016.

211x187mm (300 x 300 DPI)



Incidence rate ratios of cumulated and prescription renewals of sick leave after angioplasty for lower extremity arterial diseases intervention with stent placement, in France between 2013 and 2016.

216x188mm (300 x 300 DPI)

SUPPLEMENTAL MATERIAL.

Duration of sick leave after same day discharge for lower extremity arterial disease and varicose vein interventions in French active patients, 2013-16: observational study

Asma Hamid[1], Guillaume Lamirault [2,3], Yann Gouëffic [4], and Nolwenn Le Meur[*1]

(1) *Univ Rennes, EHESP, REPERES (Recherche en Pharmaco-épidémiologie et Recours aux Soins) - EA 7449, F-35000 Rennes, France*

(2) *Institut du thorax, INSERM, CNRS, UNIV Nantes, Nantes, France.*

(3) *Institut du thorax, CHU Nantes, Nantes, France*

(4) *Vascular center, Groupe Hospitalier Paris Saint-Joseph, 185 rue Raymond Losserand, 75014, Paris*

* Corresponding author: Nolwenn Le Meur

Affiliation: *Univ Rennes, EHESP Rennes, Sorbonne Paris Cité, Département METIS, REPERES Pharmacoepidemiology and Health Services Research - EA 7449*

Postal address: EHESP, Avenue du Professeur Leon Bernard, 35043 Rennes, FR

E-mail: nolwenn.lemeur@ehesp.fr

Phone: +33 2 99 02 25 14

Population

Patient and Public Involvement

No patient involved. Data were extracted from the French national health data system (SNDS), which covers 98.8% of the 66 million people in the French population. The SNDS contains anonymous and individual health insurance users' data with demographic characteristics and all reimbursed care, including outpatient medical care, ambulatory consultations, and hospitalisation discharge data

Inclusion criteria

The population of interest was the French workforce population aged 18 to 65 years-old. All incident patients who underwent angioplasty for lower extremity aretial disease (LEAD N=30238) or varicose vein interventions (N=265670) between January 1st, 2013 and June 30st, 2016 were included. Clinical selection criteria were based on hospital discharge principal diagnosis identified by International Classification of Diseases, 10th Revision (IDC10) codes and surgical procedures identified by a hierarchical, structured, fine-grained, multi-axial procedure nomenclature, namely the French Classification Commune Des Actes Medicaux (CCAM or Common Classification of Medical Procedures) (Table A1 and Table A2). Outpatient setting was synonymous to one-day intervention (day-case) where patient stayed less than 12 hours in a hospital with same day discharge, coming from home in early morning and leaving back home in late afternoon. For comparison purposes, and following health regulatory agencies' guidelines, inpatient whose hospital length of stay was longer that 10 days for an endovascular procedure (N=1636) and 3 days for a varicose veins' intervention were excluded (N=11413) (Appendix Figure 1 and Figure 2)(High Authority of Health 2014). Patients who were not prescribed a sick leave within 30 days following the intervention were excluded (65% of varicose patients and 84% of LEAD patients, respectively). The high proportion of patients without sick leave prescription might be related to some long-term invalidity or sick leave prescribed more than 30 days prior intervention, or the self-employed status of the patient who do not receive compensation from the French national fund. Finally, the population of varicose patients included 83448 subjects (9463 inpatients – 11%- and 73985 outpatients – 89%) and the population of LEAD patients included 6192 subjects (5901 inpatients – 94.3%- and 291 outpatients – 4.7%).

Table I Codes of principal diagnosis (ICD10) and medical procedure (CCAM) for algorithm selection of LEAD patients

ICD10	LABEL FR	LABEL EN
I74.0	Embolie et thrombose de l'aorte abdominale	Embolism and thrombosis of abdominal aorta
I74.3	Embolie et thrombose des artères des membres inférieurs	Embolism and thrombosis of arteries of lower extremities
I70.2	Athérosclérose des artères distales	Atherosclerosis of arteries of extremities
I74.4	Embolie et thrombose des artères distales, sans précision	Embolism and thrombosis of arteries of extremities, unspecified
I73.9	Maladie vasculaire périphérique, sans précision	Peripheral vascular disease, unspecified
I74.5	Emoblie et thrombose de l'artère iliaque	Embolism and thrombosis of iliac artery
CCAM	**LABEL FR**	**LABEL EN**
DGLF001	Pose d'endoprothèse couverte bifurquée aortobisiliaque, par voie artérielle transcutanée	Aortobisiliac bifurcated stent-graft stent placement by transcutaneous arterial approach
DGLF002	Pose d'endoprothèse couverte aorto-uniiliaque, par voie artérielle transcutanée	Aorto-uniiliac covered stent, transcutaneous arterial
EDAF003	Dilatation intraluminale de l'artère iliaque commune et/ou de l'artère iliaque externe avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of the common iliac artery and / or external iliac artery with stenting, by transcutaneous arterial approach
EDAF006	Dilatation intraluminale de l'artère iliaque interne avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of the internal iliac artery with stenting, transcutaneous artery
EDLF004	Pose d'endoprothèse couverte dans l'artère iliaque commune et/ou l'artère iliaque externe avec embolisation de l'artère iliaque interne, par voie artérielle transcutanée	Stent-graft placement in the common iliac artery and / or the external iliac artery with embolization of the internal iliac artery by transcutaneous arterial delivery
EDLF007	Pose d'endoprothèse couverte dans l'artère iliaque interne ou une branche extradigestive de l'aorte abdominale, par voie artérielle transcutanée	Stent-graft placement in the internal iliac artery or extradigestive branch of the abdominal aorta via the transcutaneous arterial approach
EDPF006	Recanalisation de l'artère iliaque commune et/ou de l'artère iliaque externe avec pose d'endoprothèse couverte, par voie artérielle transcutanée	Recanalization of the common iliac artery and / or the external iliac artery with stent graft placement, transcutaneous arterial
EEAF002	Dilatation intraluminale d'une artère du membre inférieur avec dilatation intraluminale de l'artère iliaque commune et/ou de l'artère iliaque	Intraluminal dilatation of a lower extremity artery with intraluminal dilatation of the common iliac artery and / or the ipsilateral external iliac

	externe homolatérale avec pose d'endoprothèse, par voie artérielle transcutanée	artery with stenting, by the transcutaneous arterial approach
EEAF004	Dilatation intraluminale d'une artère du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Intraluminal dilatation of a lower extremity artery with stent grafting by transcutaneous arterial artery
EEAF006	Dilatation intraluminale de plusieurs artères du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Dilatation intraluminale de plusieurs artères du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée
EELF002	Pose d'endoprothèse couverte dans une artère du membre inférieur, par voie artérielle transcutanée	Stent-graft placement in lower extremity artery via transcutaneous arterial approach
EEPF001	Recanalisation d'une artère du membre inférieur avec pose d'endoprothèse, par voie artérielle transcutanée	Recanalization of a lower extremity artery with stenting, by transcutaneous arterial approach

Table II Codes of principal diagnosis (ICD10) and medical procedure (CCAM) for algorithm selection of varicose veins patients

ICD10	LABEL FR	LABEL EN
I87.2	Insuffisance veineuse	Varicose veins of lower extremities without ulcer or inflammation
I83.9	Varices des membres inférieurs sans ulcère ou inflammation	Varicose veins of lower extremities with inflammation
I83.2	Varices des membres inférieurs, avec ulcère et inflammation	Varicose veins of lower extremities with ulcer
I83.1	Varices des membres inférieurs, avec inflammation	Varicose veins of lower extremities with both ulcer and inflammation
I83.0	Varices ulcérées	Venous insufficiency (chronic) (peripheral)
CCAM	**LABEL FR**	**LABEL EN**
EJSA001	Ligature de plusieurs veines perforantes jambières, par abord direct	Ligature of several perforating veins leggings, by direct approach
EJGA001	Extraction [Stripping] de la petite veine saphène, par abord direct	Extraction [Stripping] of the small saphenous vein, by direct approach
EJFA004	Exérèse de la crosse de la petite veine saphène, par abord direct	Excision of the arch of the small saphenous vein, by direct approach
EJFA007	Exérèse de la crosse de la grande veine saphène, par abord direct	Excision of the arch of the long saphenous vein, by direct approach
EJGA002	Extraction [Stripping] de la grande veine saphène, par abord direct	Extraction [Stripping] of the long saphenous vein, by direct approach
EJGA003	Extraction [Stripping] de la grande veine saphène et de la petite veine saphène, par abord direct	Extraction [Stripping] of the long and the small saphenous veins, by direct approach
EJFB001	Séance d'exérèse de segment de varice ou de veine perforante du membre inférieur, par voie transcutanée sous anesthésie locale	Excision of segment of varicose vein or perforating vein of the lower limb, by transcutaneous approach under local anesthesia
EJFA006	Exérèse secondaire de la crosse de la grande veine saphène ou de la petite veine saphène, par abord direct	Excision of the arch of the long or the small saphenous veins, by direct approach
EJFA002	Exérèses multiples de branches de la grande veine saphène et/ou de la petite veine saphène sous anesthésie générale ou locorégionale, par abord direct	Multiple excisions of branches of the long saphenous vein and / or small saphenous vein under general or locoregional anesthesia, by direct approach

Exclusion criteria

For comparison purposes, and following health authorities' guidelines, inpatient whose hospital length of stay was longer that 10 days for an angioplasty (N=) and 3 days for a varicose veins' intervention were excluded (N=). Moreover, patients who were not prescribed a sick leave within 180 days months following the surgery were excluded (Figure 1 and Figure 2).

Coordination of care

Continuity of Care Index (COCI) – the index measures the dispersion of visits, which quantifies the number or percentage of visits to same provider. COCI range between 0 and 1, with 1 indicating the patient always consults the same healthcare provider.

$$COCI = \frac{(\sum_{j=1}^{M} n_j^2) - N}{N(N-1)}$$ Equation 1

where N = total number of visits

nj: number of visits to the *j*th different provider, j = 1, 2… M

Continuity of Prescription Index (COPI) – the index measures the dispersion of prescriber, which quantifies the number or percentage of prescription delivered by the same provider. COPI range between 0 and 1, with 1 indicating that the prescription is always delivered by the same healthcare provider

$$COPI = \frac{(\sum_{i=1}^{K} p_i^2) - P}{P(P-1)}$$ Equation 2

where P = total number of prescription

p: number of prescription by the *j*th different prescriber, i = 1, 2… K

Statistical analysis

Comorbidity profiles

Table III. Comorbidities profile of the active population with varicose vein diseases, in France in 2013-2016

*	inpatient (N=9463)	/1000	outpatient (N=73985)	/1000
MI	16	0.10	41	0.03
CHF	30	0.19	45	0.04
PVD	34	0.21	83	0.07
Stroke	18	0.11	79	0.06
Dementia	1	0.01	2	0.00
Pulmonary	135	0.84	466	0.37
Rheumatic	15	0.09	64	0.05
PUD	10	0.06	51	0.04
LiverMild	33	0.21	92	0.07
DM	222	1.38	512	0.41
DMcx	32	0.20	53	0.04
Paralysis	6	0.04	23	0.02
Renal	9	0.06	24	0.02
Cancer	32	0.20	164	0.13
LiverSevere	8	0.05	14	0.01
Mets	4	0.02	22	0.02
HIV	10	0.06	22	0.02

*MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

** Note that a patient may have more than one comorbidity

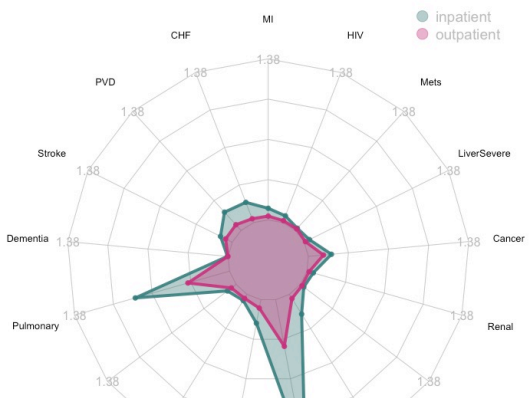


Figure 1. Comorbidities profile of the active population with varicose vein disease (per 1000 inpatiants or outpatients). MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

Table IV. Comorbidities profile of the active population with LEAD, in France in 2013-2016

\	inpatient (N=5901).	/1000	outpatient (N=291)	/1000
MI	334	3.33	11	2.22
CHF	312	3.11	13	2.63
PVD	4209	41.96	182	36.79
Stroke	256	2.55	8	1.62
Dementia	3	0.03	0	0.00
Pulmonary	481	4.79	11	2.22
Rheumatic	11	0.11	1	0.20
PUD	21	0.21	1	0.20
LiverMild	65	0.65	4	0.81
DM	391	3.90	9	1.82
DMcx	410	4.09	13	2.63
Paralysis	30	0.30	0	0.00
Renal	86	0.86	2	0.40
Cancer	123	1.23	8	1.62
LiverSevere	11	0.11	0	0.00
Mets	38	0.38	3	0.61
HIV	24	0.24	2	0.40

*MI: Myocardial Infraction; CHF: Congestive Heart Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

** Note that a patient may have more than one comorbidity

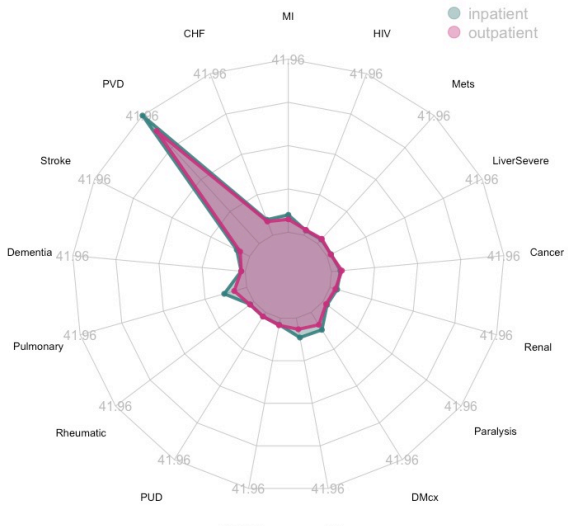


Figure 2. Comorbidities profile of the active population with LEAD (per 1000 inpatiants or outpatients). MI: Myocardial Infraction; CHF: Congestive Heat Failaure; PVD: Peripheral Vascular Disease; Stroke: Cerebrovascular Disease; Pulmonary: Chronic Pulmonary Disease; Rheumatic: Connective Tissue Diesase-Rheumatic Disease; PUD: Peptic Ulcer Disease; LiverMild: Mild Liver Disease; DM : Diabetes without complications; DMcx : Diabetes with complications; Paralysis: Paraplegia and Hemiplegia; LiverSevere: Moderate to severe liver disease; Mets: Metastatic Carcinoma; HIV: HIV/AIDS.

Determinants sick leaves duration and renewals for varicose vein patients

Table V. Incidence rate ratio for determinants of the cumulated duration of sick leaves after varicose vein intervention, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	53.70	51.83	55.64	< 2e-16
Age ref. [18-39]				
[40,60[	1.14	1.13	1.16	< 2e-16
[60,65[	1.33	1.29	1.38	< 2e-16
Sex ref. Male	1.00	0.99	1.01	0.81391
Comorbidity ref. none				
[1-2]	1.36	1.31	1.41	< 2e-16
3	1.99	1.65	2.42	1.93e-12
4	2.12	1.43	3.31	0.000407
>4	2.01	1.65	2.49	2.64e-11
Setting ref. Inpatient	0.87	0.85	0.88	< 2e-16
Prescriptors ref. GP				
Hospital	0.57	0.56	0.58	< 2e-16
Other	1.24	1.17	1.31	1.07e-13
Specialist	0.61	0.60	0.63	< 2e-16
Coordination indices				
coci	1.38	1.35	1.41	< 2e-16
copi	0.65	0.64	0.67	< 2e-16

Table VI. Incidence rate ratio for determinant of the renewal of sick leaves after varicose vein intervention, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	6.74	6.61	6.87	< 0.001
Age ref. [18-39]				
[40,60[	1.07	1.06	1.09	< 0.001
[60,65[	1.17	1.14	1.19	< 0.001
Sex ref. Male	0.98	0.97	0.99	< 0.001
Comorbidity ref. none				
[1-2]	1.23	1.20	1.26	< 0.001
3	1.54	1.37	1.74	< 0.001
4	1.90	1.51	2.42	< 0.001
>4	1.59	1.40	1.81	< 0.001
Setting ref. Inpatient	0.91	0.90	0.92	< 0.001
Prescriptors ref. GP				
Hospital	0.82	0.81	0.83	< 0.001
Other	1.41	1.37	1.45	< 0.001
Specialist	0.74	0.73	0.74	< 0.001
Coordination indices				
coci	1.29	1.27	1.31	< 0.001
copi	0.79	0.78	0.81	< 0.001

Table VII. Comparison of inpatients and outpatients COPI and COCI statistics after varicose vein intervention, in France in 2013-2016

AMBU	n	median	average	sd	min	max	p-value
COCI							
0	8750	0.5000000	0.5161439	0.3215104	0.0	1	< 2.2e-16
1	67666	0.4666667	0.4785970	0.3337189	0.0	1	
COPI							
0	8750	0.5555556	0.6033501	0.3573928	-0.5	1	< 2.2e-16
1	67666	0.8000000	0.6813231	0.3618581	-0.5	1	

coci-copi r correlation = -0.05

Outpatients have lower percentage of visits to the same group of providers (average COCI= 0.47 vs 0.52), probably synonimous of tighter coordination which is not inconsitent with greater percentage of prescription delivered by the same group of providers, reducing the overall cumulated days and renewals of sick leaves.

Determinants sick leaves duration and renewals for LEAD patiets

Table VIII. Incidence rate ratio for determinant of the cumulated duration of sick leaves after angioplasty for lower extremity arterial disease, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	28.42	22.26	36.80	< 0.001
Age ref. [18-39]				
[40,60)	1.17	0.92	1.46	0.20
[60,65)	1.12	0.87	1.42	0.37
Sex ref. Male	0.98	0.91	1.05	0.53
Comorbidity ref. none				
[1-2]	1.12	1.05	1.19	< 0.001
3	1.40	1.26	1.55	< 0.001
4	1.53	1.32	1.78	< 0.001
>4	1.52	1.31	1.77	< 0.001
Setting ref. Inpatient	0.87	0.77	0.98	0.02
Prescriptors ref. GP				
Hospital	0.71	0.67	0.75	< 0.001
Other	1.37	1.10	1.73	0.01
Specialist	0.71	0.65	0.77	< 0.001
Coordination indices				
coci	1.12	1.02	1.23.	0.01
copi	3.43	3.11	3.79	< 0.001

* *statistically significant*

Table IX. Incidence rate ratio for determinant of the number of renewals of sick leaves after angioplasty for lower extremity arterial disease, in France in 2013-2016

\	Estimate	2.5 %	97.5 %	p-value
(Intercept)	5.97	5.21	6.85	0.00
Age ref. [18-39]				
[40,60)	1.10	0.96	1.25	0.16
[60,65)	1.01	0.88	1.15	0.94
Sex ref. Male	0.95	0.91	0.98	0.01
Comorbidity ref. none				
[1-2]	1.07	1.04	1.11	< 0.001
3.	1.24	1.17	1.31	< 0.001
4.	1.24	1.15	1.35	< 0.001
>4.	1.23	1.13	1.34	< 0.001
Setting ref. Inpatient	0.95	0.89	1.02	0.18
Prescriptors ref. GP				
Hospital	0.85	0.83	0.88	< 0.001
Other	1.29	1.17	1.41	< 0.001
Specialist	0.84	0.81	0.88	< 0.001
Coordination indices				
coci	1.10	1.04	1.15	< 0.001
copi	2.06	1.96	2.16	< 0.001

Table X. COPI and COCI statistics after angioplasty for lower extremity arterial disease, in France in 2013-2016

AMBU	n	median	average	sd	min	max	p-value
COCI							
0	5041	0.5357143	0.5729896	0.2966465	0.0	1	0.6327
1	235	0.5000000	0.5630898	0.3040998	0.0	1	
COPI							
0	5041	0.5238095	0.5203114	0.3715545	-0.5	1	0.1506
1	235	0.6000000	0.5580041	0.3926373	-0.5	1	

- NS: T-test

coci-copi r correlation = 0.09

Outpatients and inpatients have different patterns for COCI and COPI.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	P1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P4
Objectives	3	State specific objectives, including any prespecified hypotheses	P5
Methods			
Study design	4	Present key elements of study design early in the paper	P5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	P5-6 + supplementary material
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*P5 and p7*
Bias	9	Describe any efforts to address potential sources of bias	P7
Study size	10	Explain how the study size was arrived at	P5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P5 and figure 1
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	Figure1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	P7-10
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Figure 2 and Figure 3
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	P10
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P12
Generalisability	21	Discuss the generalisability (external validity) of the study results	P11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.