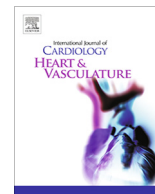




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Association between a national public health campaign for physical activity for patients with chronic diseases and the participation in Phase III cardiac rehabilitation in Luxembourg



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ABSTRACT

Background: A 2-stage national campaign promoting physical activity for patients with chronic diseases (including cardiovascular disease) was implemented in the Grand-Duchy of Luxembourg in 2018. The first stage consisted of national TV and radio advertisements broadcasted from June 15, 2018 to July 29, 2018. The second stage was a promotional mail sent to all medical doctors on September 3, 2018. This study investigated the association between this campaign and the participation of cardiac patients in Phase III cardiac rehabilitation as well as the visibility of a dedicated website (www.sport-sante.lu).

Methods: The daily numbers of participants in the classes of the Phase III cardiac rehabilitation and the visits on www.sport-sante.lu were collected from January 1, 2016 to December 31, 2018. Segmented regression analysis was used to assess the association between the promotional campaign and the participation in the Phase III cardiac rehabilitation as well as the website visibility.

Results: The baseline participation rate, which was 30 participants/day, increased temporarily by 11 ($p = 0.0267$) and 18 ($p = 0.0030$) participants/day after the first and second stages of the campaign, respectively. The baseline visit rate on www.sport-sante.lu, which was 12 visits/day, increased temporarily by 20 ($p < 0.0001$) and 15 ($p = 0.0002$) visits/day after the first and second stages of the campaign, respectively.

Conclusions: The national public health campaign was associated with a limited increased participation in the Phase III cardiac rehabilitation and the website visibility. However, no conclusion can be drawn about causality due to the long and difficult process from health promotion to patient's behavior change.

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1. Introduction

Cardiovascular diseases remain the leading cause of death in the world [1]. Since 1970, increased medical knowledge and technical improvements have decreased consistently the number of deaths due to cardiovascular diseases [2]. Indeed, primary prevention reduced the number of events, and improved treatment increased the chance of survival after a cardiovascular event. Moreover, secondary prevention, including cardiac rehabilitation, is also known to decrease morbidity and mortality in patients with car-

diovascular diseases [3]. Myers et al. showed that physical fitness was the most important determinant of survival both for healthy individuals and for cardiac patients: the better the fitness, the better the prognosis [4]. Cardiac rehabilitation is traditionally divided into three phases [5]: an acute inpatient service (Phase I), a supervised ambulatory outpatient programme (Phase II), and a lifetime maintenance phase with the aim to continue ambulatory exercise training (Phase III). In the Grand-Duchy of Luxembourg, Phase II cardiac rehabilitation, which can be prescribed in the main hospitals to patients who had an acute cardiovascular event, lasts for 2 months (3 times a week), and can be renewed [6]. After Phase II cardiac rehabilitation, patients are encouraged to adopt a sustainable lifelong active lifestyle and are invited to participate in a Phase III cardiac rehabilitation which is organized by a dedicated

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association of cardiac patients (i.e. “Association Luxembourgeoise des Groupes Sportifs pour Cardiaques” – ALGSC). The ALGSC was created in 1984 and offers more than 20 h per week of health-enhancing physical activity (HEPA) across the country [7–10]. This HEPA offer is organized in sport facilities of cities and schools or outdoor. In 2018, the ALGSC had 344 active members. Surveys performed in 2014 [8], 2016 [9] and 2018 [10] in convenience samples of the active members showed that they were mainly male and aged over 65 (Table 1). In addition, they participated in the Phase III cardiac rehabilitation for almost 8 years and were mainly referred by healthcare professionals (i.e. cardiologists, physiotherapists). Unfortunately, the number of currently active members is relatively small compared to the 55 000 estimated patients living with a cardiovascular condition in Luxembourg (an estimation based on a study published by Townsend et al. in 2016 [11]). Several factors were identified to explain the low participation and adherence in Phase III cardiac rehabilitation. Firstly, some healthcare professionals underestimate the importance of referring their patients [12]. Secondly, the lack of patient’s motivation appears to be one of the most important factors. Indeed, the participants in Phase III cardiac rehabilitation expect more positive outcomes and report higher self-efficacy concerning exercise when compared to patients who did not participate [13]. In addition, the non-intenders have misconceptions concerning the Phase III cardiac rehabilitation and do not feel the need to participate [14]. Thirdly, personal factors (e.g. age, sex, member of an ethnic or racial minority, language issues, and/or comorbidities) and practical factors (e.g. commuting to training sessions, professional reintegration and cost burden) were also identified to explain the low participation in cardiac rehabilitation [12,15,16]. The adherence in Phase III cardiac rehabilitation may be explained by lower intention and maintenance self-efficacy [13]. Different strategies are possible to tackle the modifiable barriers of the participation and the adherence in cardiac rehabilitation [17]. One of them consists to increase the awareness of the HEPA offer within the general population, the patients, and the healthcare professionals. We previously showed that HEPA promotion in lay press (e.g. the most-read newspaper in Luxembourg) increased the number of visits in a promoted national HEPA website, which displays the HEPA offer (e.g. the Phase III cardiac rehabilitation) [18]. However, we did not know if this HEPA promotion had practical consequences, i.e. an increase in participation in the HEPA offer (e.g. Phase III cardiac rehabilitation). In 2018, the Sport-Santé National Campaign was set up in Luxembourg and aimed to increase the awareness of HEPA offer. This campaign targeted not only patients with cardiovascular diseases but also patients with other chronic diseases. The website displaying all the HEPA offers (www.sport-sante.lu) was also promoted in this campaign. This study aimed to assess the possible association between a national public health campaign of HEPA for patients with chronic diseases and (i) the participation of patients with cardiovascular diseases in the Phase III cardiac reha-

Table 1

Characteristics of convenience samples of individuals who are participating in the Phase III cardiac rehabilitation in Luxembourg in 2014 (8), 2016 (9) and 2018 (10). NB: the convenience samples described here are not necessarily representative of the total population.

	Jan-2014	Mar-2016	Nov-2018
Interviewed participants, n	76	62	112
Age, mean (SD)	66.3 (8.6)	65.3 (9.2)	68.6 (9.2)
Sex, male, n (%)	64 (84.3)	47 (75.8)	75 (67.0)
Time since first participation, mean (SD)	7.8 (5.3)	6.8 (6.7)	7.8 (6.9)
Recruitment			
Healthcare professionals, n (%)	55 (72.4)	46 (74.2)	70 (62.4)
Relatives, n (%)	18 (23.7)	14 (22.6)	32 (28.2)
Media, n (%)	3 (3.9)	2 (3.2)	10 (9.4)

habilitation in Luxembourg, and (ii) the visibility of the promoted website.

2. Materials and methods

2.1. Intervention

Interventions were defined as the practical implementation of the Sport-Santé National Campaign. We distinguished two intervention variables corresponding respectively to the first stage (Intervention 1) and second stage (Intervention 2) of the campaign.

The first stage (Intervention 1) consisted in daily broadcasting, from June 15, 2018 until July 29, 2018, of six HEPA advertisements in the main Luxembourgish TV and radio programs. The advertisements (35 s for TV - and 10 s for radio) were based on testimonies of physically active patients together with healthcare professionals. They were also shared on the Sport-Santé website as well as on YouTube, Facebook and Twitter. One advertisement was specifically focused on Phase III cardiac rehabilitation; the five other focused on HEPA for patients with cancer, stroke, Parkinson’s disease, rare diseases, and orthopedic disorders (www.sport-sante.lu/videos/).

The second stage (Intervention 2) was a mail sent on September 3, 2018 to all medical doctors working in Luxembourg (n = 2616). Beside the cover letter, the mail contained flyers highlighting the rationale of HEPA promotion and the local HEPA offer for patients with chronic diseases, and a Sport-Santé Actimeter (a cardboard tool designed to assist healthcare professionals in evaluating HEPA levels of their patients by asking two simple questions [19]).

The Sport-Santé website (www.sport-sante.lu), which displays the HEPA offer for patients with chronic diseases, was promoted at the end of the TV and radio advertisements as well as on the materials sent to the medical doctors. Patients with chronic diseases and medical doctors were invited to visit this website to find the local HEPA offer as well as theoretical factsheets explaining the benefits of HEPA for the different conditions.

Intervention variables were coded 0 before the intervention and coded 1 after the intervention.

2.2. Time

Since the Sport-Santé National Campaign took place in two stages, we defined three time variables (Fig. 1). The first time variable corresponded to the time before Intervention 1 (Time before Intervention 1, i.e. from January 1, 2016 to June 15, 2018). The second time variable corresponded to the time after Intervention 1 and before Intervention 2 (Time after Intervention 1, i.e. from the June 15, 2018 to September 3, 2018). The third time variable corresponded to the time after Intervention 2 (Time after Intervention 2, i.e. from September 3, 2018 to December 31, 2018). Each time variable is supposed to measure the trend, or the change in the dependent variable considered over time.

2.3. Primary outcome

The primary outcome of our study was the daily total number of participants in the HEPA classes of Phase III cardiac rehabilitation (organized by the ALGSC in three regions – south, center and north [7–10]). The HEPA classes (including water aerobics, swimming, fitness, Nordic walking, and cycling) were offered following a precise schedule which did not change during the three investigated years (i.e. 2016–2018). Individuals with cardiovascular diseases had to be member of the ALGSC to participate in the HEPA classes. They were encouraged by the ALGSC to participate as often as possible in the different HEPA classes. Therefore, any given participant

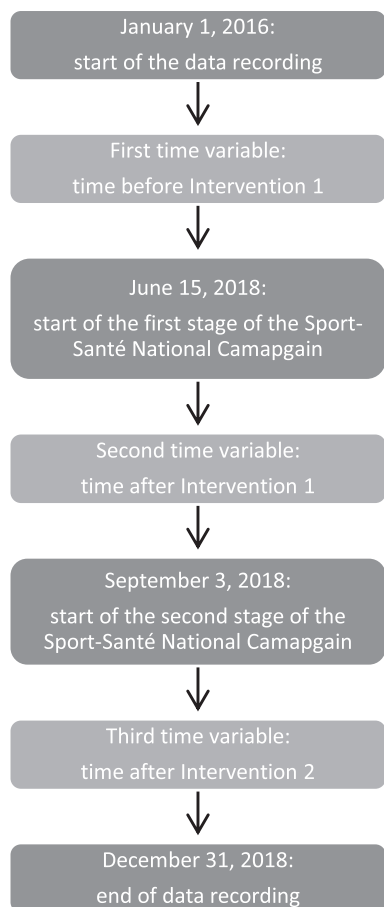


Fig. 1. Timeline of the study.

could take part in up to six HEPA classes per week. The number of participants was monitored by the instructors of HEPA classes and then collected by a board member of the ALGSC. When several regional HEPA classes took place on the same day, the number of participants in these classes were summed. The monitored participants were current members as well as newcomers, but they were not tracked separately. The participations in the HEPA classes were collected from January 1, 2016 to December 31, 2018.

2.4. Secondary outcome

The daily number of visits to the Sport-Santé website (www.sport-sante.lu) which was promoted by the campaign was collected. A JavaScript tracking snippet sending browsing data to Google Analytics was added to each website page during the development phase of the Sport-Santé website. With this tracking snippet, we collected precisely several metrics concerning the website. Google Analytics was used to collect website usage information from January 1, 2016 to December 31, 2018. Before exporting data for statistical analysis, a country filter was applied to the data. The daily number of visits to the entire website was thus searched for the Grand-Duchy of Luxembourg only. The daily number of visits may include several visits from the same website user. The number of visits per day was considered as a marker of the visibility of the website.

2.5. Statistical analysis

Segmented regression analysis was used to estimate the impact of the Sport-Santé National Campaign on the participation in the

Phase III cardiac rehabilitation. Segmented regression analysis is a powerful statistical method for estimating the effects of one or more interventions in interrupted time series studies [20]. Durbin-Watson test for the error's autocorrelation and Dickey-Fuller test for the seasonality were carried out to ensure the quality of the coefficients of the estimated parameters. We also controlled for the presence of lagged effects of interventions in the Sport-Santé National Campaign to avoid incorrect specification of the impact of interventions on the dependent variable by estimating the autoregressive parameters of the models. The same procedure was applied to evaluate the effect of the Sport-Santé National Campaign on the number of visits to the Sport-Santé website. A p-value of 0.05 was considered significant. Statistical analyses were performed mainly using the AUTOREG procedure of the SAS 9.4 software (SAS Institute, Carey NC).

3. Results

Fig. 2a presents the cumulative daily number of participants in the HEPA classes of the Phase III cardiac rehabilitation from 2016 to 2018. Table 2 presents the estimates of the changes in the number of participants associated with the Sport-Santé National Campaign by controlling the autoregressive parameters using the segmented regression model. The number of participants in HEPA classes just before the start of the observation period, measured by the intercept variable, was 29.96 ($p < 0.0001$). The trend in participation in HEPA classes before the Intervention 1 did not change in the day-to-day ($p = 0.1036$). After Intervention 1, an increase of 10.79 participants per day was observed ($p = 0.0267$) following the implementation of stage 1 of the Sport-Santé National Campaign. The time following Intervention 1 showed an estimated negative coefficient, which suggests a decrease in the trend of change in the average number of participants (p -value for trend change < 0.0001). After Intervention 2, an increase of 18.42 participants per day was observed ($p = 0.0030$) following the implementation of stage 2 of the Sport-Santé National Campaign. The time after Intervention 2 showed a significant positive change in the trend in the average number of participants (p -value for trend change < 0.0001).

Fig. 2b presents the cumulative daily number of visits to the www.sport-sante.lu website from 2016 to 2018. Table 2 shows also the results of the Sport-Santé National Campaign on the number of visits to the www.sport-sante.lu website by controlling autoregressive parameters. The number of daily website visits just before the start of the observation period, represented by the intercept, was 11.83 ($p < 0.0001$). The slope of the number of visits before Intervention 1 indicated no significant change from day-to-day (p -value for baseline trend = 0.1863). After Intervention 1, an increase of 20.28 daily visits was observed ($p < 0.0001$). The time after Intervention 1 showed an estimated negative coefficient, which suggested a downward change in the trend of the average number of website visits (p -value for trend change < 0.0001). After Intervention 2, an increase of 15.10 daily visits was observed ($p = 0.0002$). The time after Intervention 2 did not show a significant day-to-day change in the slope of the number of visits ($p = 0.0546$).

4. Discussion

Our strategy to promote HEPA offer was in line with the World Health Organization recommendations concerning (i) the best practice communication campaigns for the multiple health benefits of regular HEPA and (ii) the implementation of patient assessment and counselling on increasing HEPA within primary and secondary health care [21].

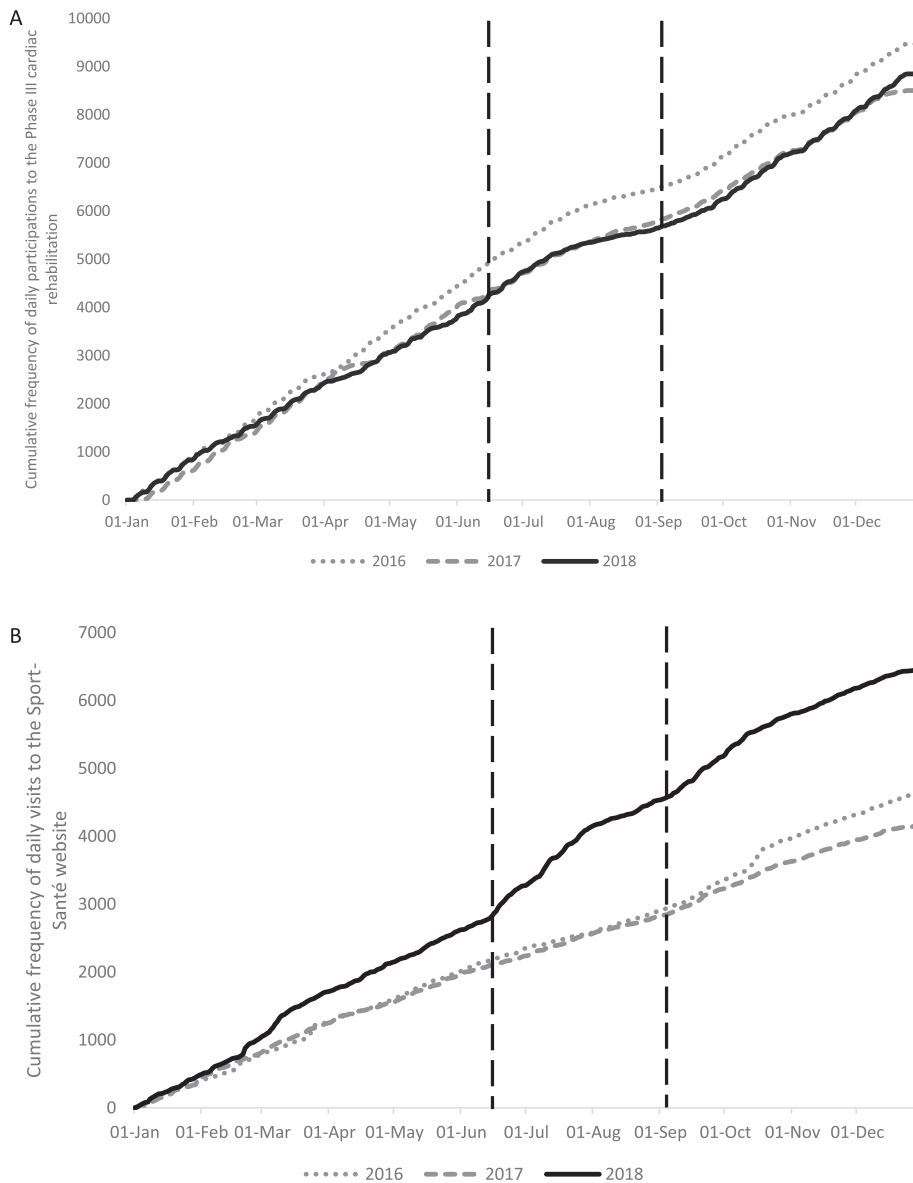


Fig. 2. Cumulative frequency of daily participations in the Phase III cardiac rehabilitation (panel A) and of daily visits to the Sport-Santé website (panel B) observed in 2016, 2017 and 2018. The vertical dashed lines indicate the starts of the first and second stages of the Sport-Santé National Campaign implemented in 2018.

Table 2

Estimates with p-values of the changes associated with the interventions on the number of participants in Phase III cardiac rehabilitation and to the visits to the Sport-Santé website while controlling for autoregressive parameters.

Variables	Participations in Phase III cardiac rehabilitation		Visits to the Sport-Santé website	
	Estimates	p-values	Estimates	p-values
Intercept	29.9632	<0.0001	11.8298	<0.0001
Time before Intervention 1	-0.0049	0.1036	0.0025	0.1863
Intervention 1	10.7937	0.0267	20.2822	<0.0001
Time after Intervention 1	-0.4186	<0.0001	-0.3102	<0.0001
Intervention2	18.4217	0.0030	15.1050	0.0002
Time after Intervention 2	0.5634	<0.0001	0.1549	0.0546
Autoregressive 1	-0.4728	<0.0001	-0.4044	<0.0001
Autoregressive 2	0.2425	<0.0001		
Total R-Square	0.2336		0.2703	
Durbin-Watson	2.1061		1.9819	

The effectiveness of the Sport-Santé National Campaign appeared to be somewhat limited. The increases in the daily number of participants in the HEPA classes of Phase III cardiac rehabil-

itation following the first and the second stage of the Campaign were 11 and 18 participants, respectively. In 2014, the instructors of the HEPA classes were asked to evaluate the maximal number of

participants in the classes without altering its quality or security. They answered that it would be possible to double the number of participants [8]. Before starting the intervention, 30 cardiac patients participated in the daily HEPA classes of the Phase III cardiac rehabilitation. Therefore, the increases observed after the two stages of the Campaign did not reach the maximal capacity of the classes nor did they lead to open new classes. Moreover, the time effect was negative after the first stage of the Campaign despite the broadcasting of the advertisements until the end of July 2018. We could expect an upward trend in the participation beyond that date. The negative time effect suggests therefore a mitigated effect of the intervention, which could be however induced by the summer holidays. The second stage of the Campaign had a delayed effect on the participations, as suggested by the raw data and the significant positive time effect. It could be explained by the fact that the medical doctors received the letter in early September and needed a certain time to discover its content and to disseminate it to their patients.

Both stages of the Campaign increased spectacularly the daily number of visits to the website. Indeed, before the Campaign the daily number of visits was 12 and the increases were 20 and 15 additional visits after the first and the second stage of the Campaign, respectively. The important media coverage of the press conference launching the Sport-Santé National Campaign on June 15 (with the participation of the Ministers of Health and Sport) as well as the broadcasting of the TV and radio clips explained this spectacular increase after the first stage of the Campaign. After the second stage of the Campaign, the increase in the website visibility could highlight an interest of the healthcare professionals and their informed patients to discover the HEPA offer. However, we cannot conclude on any causality between the website visibility and the participation to the HEPA offer. Firstly, the website can be visited by everyone, i.e. patients with a chronic disease but also by their relatives and healthcare professionals. Secondly, the participation of patients with chronic diseases in HEPA classes will have to face several barriers [22–24]: structural (e.g. availability of the offer according to the patient's need), clinical (e.g. eligibility to the offer), attitudinal (e.g. stage of the behavioral change) and demographic and socioeconomic (e.g. income, location, etc.) barriers.

Our study may contribute to choose the best strategy of public health campaigns promoting HEPA for patients with chronic diseases. So far, there is no consensus on the effectiveness and cost-effectiveness of mass media campaigns promoting HEPA [25,26]. In their modelling cost-effectiveness study, Cobiac et al. [26] proposed to conduct a mass media campaign following a field intervention program. Therefore, the first stage of our campaign should have been released after the implementation of more structural actions to promote HEPA offer, such as exercise referral scheme (which is not yet implemented in Luxembourg) [27]. Our strategy to involve the healthcare professionals in the second stage of the Campaign may also be effective to promote cardiac rehabilitation [28–30]. However, our strategy was not sufficiently embedded and lacked synergy for a better effect on participations. A promotional campaign focusing more on cardiac patients and cardiac care would likely have a better impact on the participation in Phase III cardiac rehabilitation.

Our study is not without limitations. The independent variables entered in the model explained 23% of the participation variability in the Phase III cardiac rehabilitation (Table 2). A recent systematic review identified intrapersonal (e.g. age, gender), clinical (e.g. smoking, body mass index, functional and exercise capacity, diabetes), interpersonal (e.g. marital status), logistics (e.g. transportation), and health system (e.g. lack of referral) factors to influence the participation in the cardiac rehabilitation [31]. Some of these variables (which were not available in our study) could have been tested and included in the model to better explain the participa-

tion. Moreover, we do not know if the participants in the Phase III cardiac rehabilitation were new members, former members who resumed their activities, or current active members with a higher participation frequency. The short period of evaluation of the number of participants does not allow to measure the medium- and long-term effects of the national campaign. The first stage of the campaign was released just before and during the summer holidays which is probably not the optimal time for a national public health campaign (a clear seasonal variation can be observed in the Fig. 2a and b). The political agenda of the Ministers was responsible for this choice. Moreover, the Sport-Santé National Campaign and the Sport-Santé website did not exclusively focus on Phase III cardiac rehabilitation as it promoted all HEPA offers for patients with chronic diseases in Luxembourg. Therefore, the number of visits did not concern only visitors with a cardiac-related interest. The variability of the visits to the website (27%), which was explained by the independent variables entered in the model, could also be explained by other factors. The modifications of the website content (e.g. updates, articles, etc.) during the evaluated period could have changed its referencing on the search engine and influenced consequently its visibility. Moreover, the website was insufficiently responsive, and its use was not user friendly via smartphones and tablets which may have discouraged visitors to explore it and visit it again. In 2020, the website was totally renewed with the use of a responsive design. These limitations should be considered while designing new promotional strategies.

5. Conclusions

The Sport-Santé National Campaign was correlated to the participation in the Phase III cardiac rehabilitation and to the visibility of the website displaying this HEPA offer. Nevertheless, we cannot conclude to a direct causality. A more integrated and synergized approach, which may include brief interventions as well as exercise prescription and referral, should be developed and implemented to better promote HEPA to patients with chronic diseases.

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Declaration of competing interest

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