

Physical activity on prescription by general practitioners in type 2 diabetes mellitus patients, practice and barriers in French Guiana.

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Research article

Keywords: Adapted physical activity, Type 2 diabetes, Prescription, General Practitioner, French Guiana

Posted Date: December 10th, 2019

DOI: <https://doi.org/10.21203/rs.2.18391/v1>

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Abstract

BACKGROUND General practitioners (GPs) are the major first-line care players of the management of type 2 diabetes, in France. In addition to a well-balanced diet, physical activity (PA) appears as a necessary non-medicinal therapy in its own right. However, GPs emphasize several obstacles to its prescription, in particular due to their lack of knowledge on its practical modalities. The aim of this study is to evaluate the practices, the barriers and the factors favoring the prescription of physical activity in type 2 diabetic patients by GPs in French Guiana.

METHOD: A cross-sectional descriptive study was conducted in the form of a questionnaire, designed to interview 152 French Guiana GPs, to describe their practice in prescribing physical activity (PA) in type 2 diabetic patients.

RESULTS: The oral or written prescription of physical activity as a non-medicated therapeutic choice in the management of type 2 diabetes is practiced by 74% of the French Guiana GPs, on an oral mode, for most of them. However, only 37% of doctors responded to apply the content of the recommendations of the French National Authority for Health and decree, indeed only one third knew about it. GPs convinced of the interest of PA and aware of its recommendations in this area, prescribed more PA than others. The majority of physicians are interested in PA training, but only 11% are actually trained in this practice. The lack of structure adapted to the practice of PA and of awareness of the interest of PA in their patients' metabolic pathology appeared as the main obstacles to the prescription. According to 55% of physicians surveyed, a compensation by social security of the costs related to the prescription would improve the adherence to the practice of PA.

CONCLUSIONS: It appears important to develop the training of the GPs, reception facilities adapted to where to refer patients, and collaborations between the various actors within the framework of a sport-health device. In addition, therapeutic patient education (TPE) is to be developed in order to improve patient compliance and adherence to sport-health programs.

Background

Type 2 diabetes is a serious world public health concern, as it is in France, and the department of French Guiana is no exception. On the contrary, the prevalence of diabetes mellitus treated pharmacologically in 2015 in French Guiana was 8%, i.e. 1.6 times higher than the national rate (Source SNIRAM-Public Health 2015, database which contains data on all reimbursed healthcare expenditure for the entire population living in France¹), with this number not taking into account diagnosed but untreated diabetic patients, and persons not having French social security cover¹. Diabetes-related morbidity is 1.9 times higher in French Guiana than in mainland France². A westernized lifestyle increases sedentarization, physical inactivity as well as associated chronic conditions such as diabetes and obesity³. Being overweight or obese are recognized as main risk factors for the development of type 2 diabetes, with prevalence curves increasing in parallel. In 2014, an 18% prevalence of obesity was observed in French Guiana against 12% in mainland France². According to the World Health Organization (WHO) Report 2009, 27% of type 2 diabetes cases are associated with physical inactivity, whereas the beneficial effects and impacts of physical activity (PA) in type 2 diabetic patients are widely recognized^{4 5}. Since 2011, the French National Authority for Health has promoted PA by including it as a non-medicinal therapeutic choice as an integral part of the type 2 diabetes care pathway to contribute to the control of risk factors, and to prevent metabolic diseases. The law to modernize the health care system, by decree n° 2016 - 1990 dated 30 December 2016,

implemented on 1st March 2017, recommends that a general practitioner (GP) may prescribe adapted physical activity (APA) as part of the care pathway for patients with long-term health conditions. The stakeholders authorized to provide APA are paramedical health professionals: masseur-physiotherapists, occupational therapists and psychomotor specialists, as well as accredited professionals in the field of APA called adapted physical activity teachers (APAT). Other sports educator stakeholders (and other holders of prerogatives) are authorized to provide APA, but only with patients without severe physical limitations. The role of the stakeholder is to enable the patient, safely, progressively and in a personalized manner, to adopt a physically active lifestyle, in order to reduce risk factors and functional limitations related to the patient's chronic disease. The goal is to empower the patient in terms of practicing PA. The inter-ministerial instruction of 3 March 2017 defines the areas of expertise of the different supervisors, who will intervene according to the level of impairment of the patient's functional capacities.

Despite these measures, the prescription of PA and its practice are still insufficiently developed. The French Overseas Departments' health barometer 2014 emphasized that only 36% of the Guyanese practiced a regular PA, in accordance with the recommendations⁶. Type 2 diabetic patients, in particular those with obesity, present additional challenges to the sustainability of a physically active lifestyle⁷. Many studies highlight the obstacles to prescribing PA by GPs leading to a low prescription of PA and low practice by patients^{8 10}. In our overseas department and region, with 296 711 inhabitants (National Institute of Statistics and Economic Studies, INSEE 2019), the low medical density, the low number of specialist doctors, and the large size of the territory (83 856 km²) all play a part in the difficulties to accessing healthcare. On the basis of these data, promoting the prescription of PA and its practice emerges as a major objective and challenge in our department for diabetic patients. One of the goals of the National sport-health strategy 2019–2024 is to deploy sport-health centers throughout the national territory: 100 sport-health centers by the end of 2019 and 500 by 2022. However, the Minister has not defined in which measure the French social security, the Ministry of Health, of Sports and other stakeholders, should invest financially. It should be noted that the Ministry of Sports is investing up to 20 million euros for the construction and the renovation of sports facilities in deprived areas in 2019 as a priority. It is also noted that certain complementary insurance companies finance costs related to prescribing PA for patients in Long-Term Disease (LTD). There is not yet a sport-health center in French Guiana. Nevertheless, some programs have already been developed but only within hospitals:

- the Diabetes Association-French Guiana-Obesity of Cayenne Hospital. Andre Rosemon has set up an APA program for diabetic patients as part of TPE (Therapeutic Patient Education).
- the medicine department of the Medical Center in western French Guiana. Franck Joly (in Saint-Laurent du Maroni) has a day hospital proposing sports support as part of TPE for diabetic patients.
- private establishments in French Guiana joined together to form the "French Guiana Health" Group in 2017, which since 2018 has proposed, in the Saint-Paul Clinic, PA for patients with LTD who have a prescription from a GP.

Methods

The primary objective of this study is to evaluate the application of the decree allowing the prescription of PA for patients with type 2 diabetes and secondary objective is to analyze the barriers which contribute to limiting PA on

prescription by GPs, and the factors limiting its adoption by patients.

This was an observational, descriptive, cross-sectional study. In coastal communities, it is mainly private GPs who follow these patients. In inland communities (composed of communities of Guyana with difficult access since there are no vehicular access land routes unlike coastal communities), a regional particularity may be found, that of the physicians employed by the Delocalized Centers of Care and Prevention of Cayenne Hospital to ensure monitoring of these patients. Given our problematic and with the aim of having a representative panel of physicians caring for and monitoring patients with type 2 diabetes in French Guiana, priority was given to these two groups of physicians.

All the GPs included are:

- either installed privately, registered at the County Council of the Medical Association of French Guiana and/or registered in the French Guiana yellow pages,
- or private locum practitioners registered at the County Council of the Medical Association,
- or Delocalized Centers of Care and Prevention of Cayenne Hospital during the inclusion period.

The physicians excluded are those who do not practice general medicine as defined by the inclusion criteria.

A questionnaire was carried out, by way of electronic mail, with a preamble explaining the project and the context by: the County Council of the Medical Association for private general practitioners and locum practitioners, as well as a telephone contact by the investigator inviting them to take part in the study via the contact details obtained both: through the electronic directory for private practitioners of the Medical Board for locum practitioners, and through the delocalized centers of care and prevention pole at Cayenne Hospital for delocalized centers of care and prevention practitioners. Two or even three reminders were made by telephone and/or written messages and/or e-mail, to physicians who had not yet replied.

The questionnaire was sent out between 17 May and 31 August 2019 by electronic mail via a Google platform form. Data was collected anonymously in .xls format using the Google form; this was to allow an objective analysis and limit bias.

The questionnaire was developed from data in the literature in compliance with quality criteria. The drafting of questions was based on the recommendations of the American Diabetes Association, French National Authority for Health, and the French Society of Diabetology as well as questionnaires from previous studies¹¹. The questionnaire was then transcribed into the Google software form. The questionnaire was tested beforehand using a sample of 10 individuals from the medical community or not, to ensure correct formatting and understanding of the survey, as well as the clarity of the questions. The time to answer was on average 5 to 10 minutes. Response options for the multiple-choice questions were presented randomly to avoid an over-representation of answers appearing in first line. The final questionnaire contained a preamble and four chapters, with a total of 36 closed questions, dichotomous or multiple choices or by Likert scale, as well as an open response "free-form comment".

The statistical analysis was carried out by using XLStat software on Excel, and the graphical charts using Microsoft Office software (Word or Excel). A univariate descriptive analysis of data was initially performed,

followed by a secondary bivariate analysis using the Chi² independence tests and Fisher's exact test on contingency tables. All statistical tests were conducted using a significance level of 5%.

Ethics and Consent to Participate

The need for ethics approval is deemed unnecessary according to national regulations

In the opinion of the Data Protection Officer of Cayenne Hospital and the National Commission for Data Protection and Liberties (CNIL), this study does not allow the collection of either health data or personal data according to the CNIL; consequently, it does not need to be declared with the CNIL, and does not justify conducting a Privacy Impact assessment, nor being registered in the register of data processing at the Hospital Center, in compliance with the Data Protection General Regulation.

However, the interviewed physicians were informed of the anonymous nature of the data collected, the period of conservation of these data which is limited to the length of the study, and their right of access, rectification and deletion of their personal information through a simple request to the study investigator, as well as the identity of the body in charge of processing these data, which is the Clinical Investigation center of Cayenne Hospital.

Results

152 GPs were interviewed, 104 physicians established in French Guiana practicing general medicine, 25 delocalized centers of care and prevention physicians and 23 locum physicians.

81 responses were obtained for our study, of which 8 were excluded, as they concerned physicians who did not ultimately meet the required inclusion criteria.

The response rate was 45% in the established physicians' group, 52% in the delocalized centers of care and prevention physicians' group, and 56% in the locum physicians' group: the overall response rate was 48%. The sample was made up of 42 (57.5%) men and 31 (42.5%) women. The mean age of the physicians was 46 years old (from 27 to 73 years), with a median of 43 years. The under-40 years of age represented 44% of the sample and the over 60 years of age 23.3%. Regarding the type of practice: 47 physicians were established (64%), 13 physicians were in delocalized centers of care and prevention (18%), and 13 physicians were locums (18%). 45% of physicians saw on average between 20 to 30 patients per day, 36% over 30 and 18% between 10 and 20. One physician responded seeing less than 10 patients per day. 58 (79%) said they practice PA themselves, and 36 (49.3%) claimed that they reached WHO's objectives regarding regular PA. 4 (6%) had a sports medicine diploma and 11 (15%) a diploma in diabetology (Table 1). Regarding their general practice, all physicians responded by recommending PA and 98.6% think that a real benefit was expected from PA as a non-medicinal therapy. Concerning the recommendations, 36% were aware of the existence of the "French National Authority for Health Guide 2018" on the promotion, consultation and prescription of PA and sport for health among adults, 34% the existence of the "French National Authority for Health reference 2018" on the prescription of PA and sport in type 2 diabetic patients, and 26% are aware of decree n° 2016-1990 dated 30 December 2016 on the "dispensing conditions of adapted physical activity prescribed by general practitioners for patients with a long-term condition". Slightly more than a third, 37%, said they applied the content of these recommendations. 66.6% of physicians who applied the recommendations felt comfortable versus 34.7% of those who do not apply the recommendations ($p=0.008$). A statistically significant link was found between the fact of being convinced that

their recommendations had an impact and the use of PA as a non-medicinal therapeutic choice ($p=0.002$). 81% of physicians convinced that the recommendations had an impact used PA as a non-medicinal therapeutic choice against 30% of those who did not believe in this impact (Table 2). Concerning the analysis according to the methods of exercising medicine: a significant statistical link was found between the methods of exercising medicine and prescription of PA ($p=0.028$): 76.6% of self-employed/private physicians prescribed PA vs. 46% of employed physicians. As far as type 2 diabetic patients are concerned, 71% of physicians said that they had already prescribed PA for patients with type 2 diabetes. However, the most commonly used mode of prescription was predominantly oral advice (95%), followed by the provision of health professionals' contact details (23%), and the handing out of documents (18%). Written prescription, on the other hand, represented only 13% of cases. One of the physicians had a university degree in diabetology and none in sports medicine. Four physicians added the following items: "give advice to join a club", "use physiotherapy to reactivate PA after a long period of inactivity", "sometimes show exercises and work on motivation", and "need to repeat hygiene and nutrition rules in consultation". On average, 25% of physicians said that they devoted over 5 minutes per consultation to prescription, between 2 and 5 minutes for 41% and less than 2 minutes for 29% of respondents. 5.5% said they did not devote any time to prescribing PA. A significant statistical link was found between the time spent prescribing and the physicians' age ($p=0.006$). 47% of physicians over 60 years and older dedicated more time to the prescription of PA versus 9.4% of physicians under 40 years old. Only three physicians said that they held consultations dedicated to the prescription of PA with their type 2 diabetic patients. It is noted that two of them had a university degree in diabetology and, in their opinion, practiced PA themselves, in line with the WHO recommendations. A statistically significant link was found between the application of recommendations and the time spent on prescribing ($p<0.0001$). The physicians who applied the recommendations hardly ever took less than two minutes to prescribe PA, that is 3.8% versus 46.5% among physicians who did not apply the recommendations. It was noted that a correlation exists between the practice of regular PA by the physician and the view that his recommendations had an impact ($p=0.001$). All the physicians who practiced regular PA thought that their recommendations had an impact versus 70% of physicians who did not practice regular PA.

74% of physicians declared using PA as a non-medicinal therapeutic choice in the care of a type 2 diabetic patient. 57.5% said that they evaluated the level of practice and follow-up of PA of their type 2 diabetic patients. The means used in preference were interview for 98% of respondents, followed by physiological markers (weight, BMI, blood pressure, heart rate etc...) in 24% and the PA notebook/journal in 19%. In the "Other" category, a physician had added the item "motivational interview".

86.3% of physicians assumed that their recommendations had an impact on their patients, yet almost all believed that over 50% did not follow their recommendations.

Concerning the obstacles and factors favoring the prescription of PA, the responses went from 0: "No barrier" to 4: "Very important barrier". For physicians, the five most important barriers were the lack of structure (average = 2.47), the patient's foreseeable non-compliance (average = 2.08), inadequate supports in French Guiana (average = 1.80), lack of supports (average = 1.75) and lack of training/knowledge (average = 1.74) (table 3). 52% of physicians felt isolated in the prescription of PA for type 2 diabetic patients.

For the question concerning the means implemented to help physicians prescribe, the responses went from 0: "No help" to 4: "A lot of help". The most useful help was: collaboration between the physician and medical-sport educator/physiotherapist/sports doctor (average = 3.16), a sport-health network (average = 3.07), the

implementation of patient information forms (average = 2.74), media communication campaigns (average = 2.71), training about PA prescription (average = 2.45) and compensation of patients' registration fees (average = 2.41). According to physicians, the five main causes of reluctance to practice PA among type 2 diabetic patients in French Guiana were in descending order, respectively: lack of interest/motivation (84.9%), lack of knowledge on the correlation between sport and managing their diabetes (78.1%), few local structures and/or remoteness of these structures (68.5%), presence of physical limitations and comorbidities (63%), and the financial cost of PA (49.3%) (Fig. 1). On the other hand, 84% of physicians thought that compensation of the costs linked to PA on prescription would improve patient adherence, and 55% thought that the French social security should play a part in this financing as a priority. For almost all the physicians, it was important to have a structure to guide patients with type 2 diabetes in the context of PA (example: a sport-health network). However, 79.5% of them were not aware of such structures in French Guiana. 57.5% of physicians were not aware of the profession of APA teacher, yet 98.6% of physicians were ready to refer their patients to these players. With regard to training on prescription: 46% of physicians thought they were qualified to feel at ease prescribing PA whilst only 11% had already had training on PA prescription. However, 90% of physicians wished to have training in this field. 97% of physicians thought general practitioners should be the main players of the management of type 2 diabetes and 90% thought it would be of interest to introduce a sport-health module during the specialty diploma in general medicine studies.

Discussion

In our study 79.5% of physicians said that they practice PA of which 49.3% report reaching WHO recommendations with regard to regular PA, that is 150 min/week of moderate-intensity PA or 75 min/week of high-intensity PA¹². The results are close to the French national average of 42,5% regular PA according to the nutrition health barometer 2008⁶, but lies just above that of the inhabitants of French Guiana according to the DOM health barometer 2014 where 75% practiced PA, of which 36% on a regular basis⁶. Few data on the practice of PA by GPs are to be found in the literature. A recently published study in 2019 by Alameh and al. described that only 27% of physicians engaged in regular PA¹³. In our study the physicians who practiced regular PA believed more often than others that their recommendations would have an impact. The review of the Lobelo and al. literature, in 2016 found that the physicians who engage in regular PA are more likely to advise effectively and to prescribe PA to their patients and are more convincing because they themselves exercise¹⁴. Several studies support this notion^{9 15 16 17}. Furthermore, the MOBILE study^{18 19} demonstrates that regular PA by physicians has a strong influence on the glycemic control of their patients by a positive correlation with the level of the patient's PA. In 2005, Rogers and al. even demonstrated that the introduction of a PA program with medical students was significantly associated with changes in terms of their PA guidance to patients²⁰. The promotion of practicing PA with physicians is also a point for reflection. The second observation is the lack of training in this subject; indeed, two-thirds of physicians were not aware of the French National Authority for Health 2018 guide and frame of reference about the prescription of PA and diabetes, and three-quarters are not aware of the 2016 decree. No significant statistical link was found between the knowledge of recommendations/decrees and the characteristics linked to physicians. It was observed in our study that physicians who apply the recommendations responded that they more often felt competent to prescribe PA than those who did not apply the frame of reference, and they also spent more time doing so. The low level of training observed in our study of GPs concerning the fields of sport (5.8%), diabetology (15%) but also in sport-health training (11%) might explain on the one hand this finding of poor knowledge of the recommendations. It is known that physicians having knowledge of the

recommendations more often advise and prescribe PA. Thus, Rogers and al., 2006 in the USA demonstrated that greater training and confidence concerning PA recommendations were associated with more frequent advice²¹. However, Cogneau and al., 2007 asserts in his study that even though physicians were aware of the best practice recommendations for type 2 diabetes, they failed to adhere to them, in particular through a lack of communication with patients, which could be resolved by working closely with other paramedical professionals involved (dietitians, APAT, nurses)²². It also outlined that the recommendations barely addressed the subject of PA, which, in his opinion, explained the gap between the frame of reference and physicians' practices. The majority of physicians assumed that their recommendations had an impact on their patients, yet almost all estimated that more than 50% of their patients did not follow their advice. And yet, a review of the literature shows that the advice of physicians is associated with an increase in the adherence of patients²³. Vallée, and al. in 2017 even demonstrated that a piece of advice, even minimum, addressing PA during a consultation favored the practice of PA²⁴. Its recommendation is logically associated with nutritional advice²⁵. The systematic review of Hébert and al. literature found that physicians were not sure of the effectiveness of their recommendations in view of the barriers that they met²⁶.

Indeed, in our study we found that physicians convinced that their recommendations had an impact prescribed PA more frequently and used it more often as a non-medicinal therapeutic choice. To be persuaded of the value of PA was not found as a strong factor favoring prescription, and yet this factor had an influence on the prescription and the practice of patients. Lanhers and al, 2015 found that the more a GP had barriers to prescription, the more the patient would have barriers to practice and as a consequence would have a lower level of PA²⁷. The interest of PA is now well established in terms of primary, secondary and tertiary prevention as is detailed in prerequisite²⁵²⁸⁻³¹, and yet some physicians may still be sceptical about its utility, as is reported in the qualitative study by Persson and al. in Sweden³². The Mandic and al. study 2018 in the United States found that being convinced of the interest of PA and its practice by physicians, was associated with a better perception of the impact of PA recommendations on their patients³³.

Very few physicians were in favor of written prescriptions and yet a review of the literature has demonstrated the effectiveness of this method on the increase in levels of practice of PA³⁴.

Equally, as demonstrated by Little and al. 2004 the association of different means (written prescription, oral advice and delivery of documents) lead to a significant increase in the practice of PA by patients³⁵. Our study shows that the physicians who applied the recommendations hardly ever spent less than two minutes prescribing. In the study of Duclos and al. 2015, 50% of physicians spent less than five minutes to prescribe PA¹⁹. On average, a medical consultation lasts 18 minutes (Drees 2012 data³⁶), however there are no precise data concerning the time required to prescribe PA. The French National Authority for Health's recommendation is for a PA medical consultation to take on average 30 minutes, but it may take place over different consultation times³⁷. More than one-half of respondents said that they evaluate the level of practice and follow-up of PA in their type 2 diabetic patients. The means employed in preference were interview for 97.6 of respondents, as found in Gerin and al⁹.

The use of other means as movement meters such as the pedometer demonstrated an improvement in the patient's motivation and practice of PA. Yet also as demonstrated by the Canadian program SMARTER, its association with a simple medical prescription of a number of daily steps increased PA, and had an impact on the insulin sensitivity of type 2 diabetic patients³⁸. Evidence of its direct effectiveness on HbA1C was still not

found³⁹. The integration of this mechanism might be possible considering that according to studies it seems to be generally accepted by both the patient and the physician^{40 41}.

The collection of the level of PA by a questionnaire and/or journal and/or activity notebook also has its advantages, indeed its integration as a vital sign recorded in the patient's medical file around two or three questions, as well as the other parameters during a consultation is considered as an innovative key action. The paper by Sallis and al. explains that different electronic medical software has already integrated this parameter, and have observed an increase in medical advice, and a consequence on weight loss and HbA1c⁴². In the face of the emergence of connected objects in our societies, new ideas are appearing regarding the utilization of these means to favor the evaluation, monitoring and practice of PA⁴². Our results concerning the obstacles to the prescription of PA, the adherence of patients and the factors favoring the prescription of PA, are very similar to the data in the literature such as the studies of Duclos and al.¹⁹, Gérin and al.⁹, or the ENTRED study⁴³, aside from one significant point which is "lack of time". Indeed, this was not found to be one of the main obstacles to the prescription of PA in our study, whereas it was in other works in the literature^{8 9 15 16 44}. A single study has however found a result comparable to ours, that of Oloo M. published in 2019, which found that the time factor was not considered as an obstacle and that the main obstacle was the lack of support/teaching resources in Kenya⁴⁵. It is assumed that even if the GPs in French Guiana had more time, the prescription of PA would not be more frequent when considering all the other obstacles highlighted including above all the lack of networks and structures, which are the most lacking in our department. According to practically all the physicians in the study, it seems to be important to have a structure to guide type 2 diabetic patients in the context of PA. The lack of structure was the first obstacle to the prescription of PA by GPs, but also an obstacle to the adherence of patients for 68.5% of physicians. The development of sport-health networks was the second measure requested by physicians to help prescription. The structures and sport-health networks provide orientation adapted to the patient, in appropriate places, and thus facilitate the maintaining of and commitment to practicing PA. For physicians it serves as a relay structure, which enables other health professionals to work together. Indeed, in our study, one-half of physicians felt alone in the face of integrating the prescription of PA and the majority of physicians were not aware of structures towards which they could refer their patients.

We do not have a regional sport-health center in French Guiana although some hospital programs exist which we have outlined previously. However, this does not meet all the needs of the territory in order to reach our objectives. As far as the teaching of PA is concerned, just over half of physicians (57.5%) are not aware of the profession of APAT, but nearly all are ready to refer their patients to these actors. The collaboration between health professionals was the first factor favoring prescription of PA voiced by the GPs in our study. Recognition of the APAT is already well established and integrated in the health systems of many countries, such as Europe, the United States and Australia. However, in some countries, like China, it is not yet recognized by the state¹⁹. In France, as outlined previously, the APAT is a professional, trained in PAA, accredited and currently at the core of each sports device on developed prescription. The evaluation of different methods has demonstrated the effectiveness of programs in terms of patient adherence and the change towards an active lifestyle, with an increase in their level of experience. A review of the literature by Bullard and al. showed a 77% average rate of adherence to programs⁴⁶. As an example, the experience of the Biarritz Côte Basque Sport Health program showed that 90% pursued the practice of PA in a sports association after stopping the program⁴⁷. With the final goal being to empower the patient, few studies have yet been conducted to observe the long-term impact of these

methods. The French Society of APA Professionals created an online directory in 2018 identifying private APAT, however no APAT from French Guiana are listed.

Some physicians believe that it is not their role to prescribe PA, as it was reported in the qualitative study of Persson and al. 2013, where Swedish physicians preferred to delegate prescription to other health professionals³². Indeed, in some countries, health professionals other than physicians are authorized to prescribe PA. In Sweden, for example, trained physiotherapists and nurses can prescribe PA. Other countries are discussing the possibility of collaboration with other medical and paramedical professionals to help prescription of PA: with pharmacists in the United States, or with nurses in Canada^{48 49}. Some health professionals are more accessible to the population, and with appropriate training they could increase patients' awareness to the practice of PA. According to physicians, the first causes listed as obstacles to patient adherence are principally factors intrinsic to the patients: lack of interest/motivation of the patient is the first factor. The patient's foreseeable lack of compliance was found to be an obstacle to prescription from average to very important by more than 50% of GPs. This demonstrates the difficulty physicians have with the motivational interview. One of the explanations is probably the lack of training in this area of competence. The second factor is the lack of patient knowledge about the correlation between sport and the management of their diabetes. This element illustrates the need to increase training in TPE in order to improve patients' knowledge and to increase their adherence to care and treatments. The 2007 ENTRED study highlighted the need expressed by patients for information about their condition⁴³. Physicians also identified the presence of physical limitations and comorbidities (4th factor), which was the main barrier identified by GPs in the MOBILE study¹⁹. Additional care given by paramedics and APAT, offers exactly a framework of practice supported by trained professionals, authorized to provide APA to patients with functional limitations, even when these limitations are severe. Other intrinsic factors (fear of hypoglycemia, fear of failure/prior failure) or non-intrinsic (absence of family or neighbors, lack of personnel and lack of time) which help patient adherence, were less relevant to physicians. The absence and/or remoteness of structures was the 3rd factor cited by physicians. According to the DOM health barometer 2014, 12% of Guyanese declare having forsaken care or examinations because of transportation issues to access the structures⁵⁰. To address this obstacle, the French National Authority for Health recommends encouraging the practice of PA outdoors, possibly assisted by the enrichment of sports facilities in communal areas (first aspect of the National Sport-Health Strategy 2019–2024)³⁷. Some countries like Australia are studying the possibility of development of APA programs at home which appear to be accepted by patients⁵¹. The ethnocultural aspect considered as a factor of resistance to practice by patients by one third of physicians is to be addressed. As demonstrated by the Quebec study in the dissertation on physical activity by Ouimet I.: "the perception of physical activity and the obstacles to its practice vary depending on ethnocultural origin and sex". It is therefore necessary to consider this aspect in order to "develop culturally appropriate interventions"⁵². Reviews of the literature support this aspect by finding ethnocultural differences related to beliefs and perception of the disease, in line with cultural standards, immigration, religion, and bio-anthropological data^{53 54}. This is an important concept in French Guiana, where the population is ethno-culturally very heterogeneous. Finally, the financial cost of PA was mentioned as the 5th obstacle to patient adherence in this study and for 53.4% of physicians the compensation of patient costs appeared to be a very important measure to help prescription.

Indeed, since the implementation of the decree in 2016, reimbursement of patients has not been foreseen when prescribing APA in the context of an LTD, whereas 83.6% of physicians in the study believed that the compensation of costs related to PA on prescription would improve the adherence of patients. Half of them

believed that the French social security should take part in its financing in priority, unlike the IFOP survey conducted amongst a representative sample of 603 GPs in 2015, where almost 50% of physicians thought that the patient should finance it in priority and then the French social security 25%⁸. It has been demonstrated that the socioeconomic context of the patient has an impact on the level of patients' practice^{53 54}. The DOM health barometer 2014 found that 30.9% of Guyanese had stopped seeking medical care for financial reasons⁵⁰.

Furthermore, an analysis of the ENTRED study concerning the DOMs observed a prevalence of diabetic patients receiving significantly higher universal health cover (35% in West Indies-French Guiana, versus 12% in mainland France), which is a reflection of a more economically disadvantaged population. This component accentuates our need to think about the costs linked to the practice of PA by patients in French Guiana. The medico-economic study of Da Costa Correia and al., 2008 demonstrated that the responsibility of the TPE network "Auvergne Diabetes on health" resulted in a saving of 1 088 Euros/patient/year of health care expenditure⁵⁵. The Montpellier study of Brun and al., 2008 also showed lower health care costs during medical rehabilitation prescribed for type 2 diabetic patients⁵⁶. Future medico-economic studies which will result from recent French sport networks on prescription will support the issue, as does the National Health-Sport Strategy 2019–2024 and will highlight the benefit represented by the practice of financed PA, not only directly impacting the reduction in costs linked to the management of diabetes and its complications, but also improving patients' quality of life.

Since the 2016 decree, no dedicated pricing system has been planned for prescribing physicians. Yet the physicians in our study did not consider that it would be an important aid to favor their prescription, nor was a significant constraint. In some programs physicians even accept voluntary actions, for example in the United States as in the program "Walk with doc", where the local physician organizes and practices walking sessions in public places, open to all⁴². However, the results of the study, showing that self-employed physicians were more inclined to view compensation of physicians as a factor supporting prescription, justify reflection on this issue. In the 2007 ENTRED study, 53% of specialist physicians considered the non-remuneration of PA on prescription as an obstacle⁴³. In France, despite the implementation of Public Health Remuneration in line with Objectives, the system of health care payment per consultation is not very indicative according to the report of the French National Authority for Health regarding the prescription of non-medicinal therapies. The Ministry of Health envisages a reform of the French healthcare system and different concepts are to this day under consideration with the aim of enhancing the quality of patient care, whilst improving cooperation between health professionals and empowering the patient. Different models of payment exist elsewhere, however each has its own drawbacks. In Switzerland, medical pricing balances time/cost effectiveness by pricing by capitation (basic charge per 5 minutes of consultation). Several countries have adopted the concept of "disease management" which encourages health insurance funds to better manage the care of patients with long-term diseases. In the United States, it's a combined pricing system which consecutively associates within the consultation process, a flat fee and profit-sharing. In Germany, exists a main payment by social security contributions, combined with a fixed payment by the health insurance, financial incentives and packages for chronic patients. In England, a performance-pricing system has been introduced⁵⁷.

Currently, a hybrid model, which combines the different modes of payment appears to be more suitable to satisfy health professionals, patients and the state in a common goal of improving the quality of care of chronic diseases. Although almost all physicians believe that the GP is the main player in the management of PA on prescription in type 2 diabetes patients, it should be noted that nearly half of physicians think they do not have the

appropriate skills to comfortably prescribe PA. A possible explanation may be the lack of teaching related to the prescription of PA during the earlier medical curriculum. Moreover, the integration of a sport-health module in general medicine training seems interesting for almost all physicians. Indeed, the New Zealand study of Mandic and al., 2018 showed that access to a PA learning module raised awareness and knowledge among medical students of the current recommendations on PA and improved their confidence and their skill perceived in providing guidance on PA³³. A desire for training was also expressed by the majority of the Guyanese physicians. Indeed, only 11% of them were already trained, in accordance with the study by Lesage C., where 8.7% of physicians were trained with 89% expressing a wish for training⁴⁴. In our study, training was a measure considered as being important to very important to help prescription by half of the physicians (5th factor) and also represented an obstacle to their prescription (5th factor) in the case of its absence. In the 2007 ENTRED study, physicians expressed their willingness to train and to upgrade their knowledge in the management of type 2 diabetic patients⁴³. To meet the demands of medical training and with the goal of promoting and facilitating PA on prescription, the French National Authority for Health produced in September 2018 a guide to promote PA on prescription³⁷, as well as a specific frame of reference for PA on prescription in the context of type 2 diabetes. It would be interesting to develop a scheme in French Guiana adapted to our territory with a list of approved APAT to whom each GP could refer his patients after issuing a prototype prescription, and to set up mobile APAT. These would be located near to patients in this vast territory, which would enable an appropriate professional to evaluate patients by promoting PA outdoors in those isolated communities which have fewer sports infrastructures and thus envisage sport-health collaborations with sports clubs which already exist on the territory. Furthermore, concerning the study, the extension of its duration would probably improve the response rate in order to ensure a better representativeness of the sample on age data. Concerning our study, some questions were subject to social desirability bias leading to an overvaluation of positive responses compared with reality. In order to limit this, responses were anonymous. The method of recruitment by self-administered questionnaire was chosen to reinforce the sense of anonymity thereby limiting social desirability bias and providing the possibility of responding at the most suitable time for GPs.

A response and formulation bias may though appear. The very nature of the data, declarative and, for some, subjective with the absence of standardized definitions of terms employed, might have influenced the outcomes. Furthermore, we did not collect the mixed activity of physicians in the questionnaire, whereas analyses between employed and self-employed physicians were carried out, with a small base of the employed group.

Conclusions

Many perspectives result from the analysis of this study. Indeed, despite its importance in the therapeutic management of type 2 diabetes, PA on prescription by GPs is by no means satisfactory and several barriers have been highlighted. The obstacles that we found, and which have often been described in the literature, can in many cases be avoided. Thus, it would appear a key to improve the training of GPs, like the development of therapeutic education in particular by paramedical healthcare providers, with the cooperation between different professionals. The establishment of sport-health infrastructures and the introduction of ranked health systems in type 2 diabetes associating caregivers and sports educators would be a major asset in the patient care pathway.

Abbreviations

General practitioner (GP)

Physical activity (PA)

Adapted physical activity (APA)

Adapted physical activity teachers (APAT)

Therapeutic Patient Education (TPE)

Long-Term Disease (LTD)

National Commission for French Data Protection and Liberties (CNIL)

Declarations

Ethics approval and consent to participate

The study was a survey of health professionals, which under French Law (which is The French Health Policy) does not require ethical clearance.

Consent for publication

All survey participants agreed that the survey results would be published and communicated to them.

Availability of data and materials

The datasets used and analysed during the current study available from the corresponding author on reasonable request

Competing interests

The authors declared that they have no competing interests.

Funding

No funding was obtained for this study

Authors' contributions: DS, LM, TL, DM, SN developed the design of the study. DS and SN carried out data collection and analyzed data; PR performed statistical analysis; LM, TL, DS, DM contributed to the development of the manuscript. All the authors made corrections and approved the manuscript.

Acknowledgements: We wish to thank the general practitioners who agreed to answer the survey as well as the Regional Union of Private Doctors, Pr Nacher for his advices and Dr Chow Chine who helped us in the circulation of the questionnaires.

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Tables

Due to technical limitations, tables 1-4 are only available as a download in the supplemental files section.

Figures

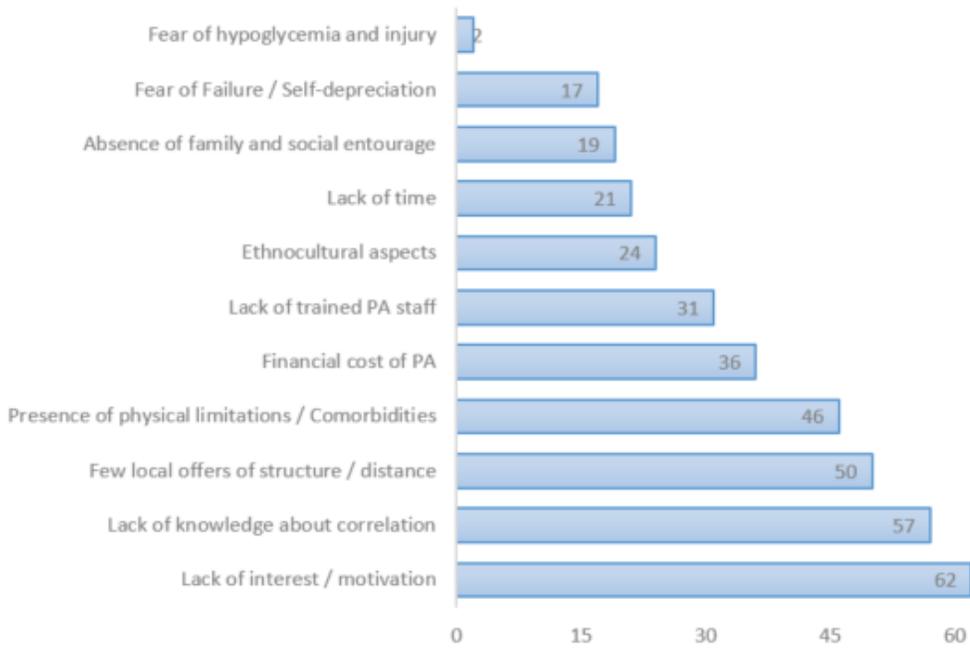


Figure 1

Causes of reluctance to practice PA by patients, according to GPs

Supplementary Files

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