The Consult Station® innovation for primary care: a proof-of-concept study for the generalisation of teleconsultation devices

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Abstract

Background: Telemedicine technology is a growing field, especially in the context of the Covid-19 pandemic. Consult Station® is the first telemedicine device enabling a complete remote medical consultation including clinical parameter collection in a single space-time.

Objective: Here, we report the multisite urban and suburban implantation of Consult Station® for primary care and its contribution to healthcare pathways in medical low-density areas.

Methods: In a proof-of-concept multisite prospective cohort study, 2034 consecutive patients having a teleconsultation were included. Consultation characteristics were analysed from the patient and the practitioner perspectives.

Results: In this study, the main users of Consult Station® were young patients consulting for seasonal infections of low severity. Interestingly, hypertension, diabetes and preventive medical consultations were almost absent, while they represent almost 50% of consultations with a GP. We showed that in the whole territory where the Consult Station® was implanted, the number of consultations increased when GP density decreased. The study of practitioner characteristics showed their motivation to work with this device, while continuing to live in metropolitan areas with a high level of technical acceptability.

Conclusions: Multisite implantation of Consult Station® booths is relevant for primary cares but it also could meet the challenge of medical deserts. In addition, further studies should be addressed to evaluate its possible contribution to limit work absenteeism.

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The Consult Station® innovation for primary care: a proof-of-concept study for the generalisation of teleconsultation devices

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Abstract

Background

Telemedicine technology is a growing field, especially in the context of the Covid-19 pandemic. Consult Station® is the first telemedicine device enabling a complete remote medical consultation including the collection of clinical parameters and a video in a single space-time.

Objectives

Here, we report the multisite urban and suburban implantation of Consult Station® for primary care and its contribution to healthcare pathways in low-density medical offer areas.

Methods

In a proof-of-concept multisite prospective cohort study, 2034 consecutive patients having had a teleconsultation were included. Consultation characteristics were analysed from both patient and practitioner perspectives.

Results

In this study, the main users of Consult Station® were young women, consulting for seasonal infections of low severity. Interestingly, hypertension, diabetes and preventive medical consultations were almost absent, while they account for almost 50% of consultations with a GP. We showed that across the whole territory where the Consult Station® was located, the number of consultations increased as GP density decreased. The study of practitioner characteristics showed their motivation to work with this device while continuing to live in metropolitan areas, with a high level of technical acceptability.

Conclusion

The multisite implantation of Consult Station® booths is relevant for primary care, but it also could meet the challenge of "medical deserts". In addition, further studies should be performed to evaluate its possible contribution to limiting work absenteeism.

Funding: none

Keywords

Telemedicine booth, primary care, cost-benefit, absenteeism from work, health-care system

Introduction

Over the past two decades, alongside the development of the Internet and connected tools, an increasing development of e-Health technologies has been observed, facilitating remote communication between patients and caregivers [1, 2]. This technical advance meets the increasing need for more patient-centred medicine. Geographical, temporal, financial, cultural and digital access issues are at the heart of these changes. Thus, several digital communication systems and devices have been reported, e.g. interactive voice response, text messages, e-mails, interactive video, home-based web-cams, personal monitoring devices, and personal health records [1, 3-5].

However, telemedicine is not yet ubiquitous and is the centre of on-going debates, raising the question of how it could really improve the quality of patient care, and this is particularly true for teleconsultations [6, 7]. Questions of cost effectiveness are emerging, while some practitioners are still sceptical regarding the impact of telemedicine on health outcomes and care, and its usefulness for people with chronic conditions or the young healthy population. For example, in France, the national health insurance has reimbursed teleconsultation since 2019, under specific conditions linked to the standard healthcare pathway for primary care and GPs [8], and its use was still limited in late 2019. Before the pandemic, many other barriers to adopting teleconsultations worldwide have been identified, including barriers related to staff and programmers, to patients themselves (age and levels of patient education), to practitioners (training, resources, types of device, ethics, confidentiality, and accountability) [6, 9].

The year 2020 was seriously impacted by the emergence of the Covid-19 pandemic and this provided opportunities to promote new health care and a reorganization of telemedicine [10-13], alongside expectations on the part of patients for broader access. [14]. The unstructured and opportunistic implementations of many telemedicine devices or protocols during the pandemic

have cast light on the urgent need for standardization [15, 16]. In France, the Covid-19 pandemic has accelerated the use of telemedicine, with better and wider reimbursement, not only for GPs and specialists, but also for nurses, speech therapists and midwives [17, 18].

To date, none of the telemedicine technologies reported has involved a single space-time for patient and physician with a global measurement of health parameters. In 2009, Consult Station®, a French telemedicine booth, was created and developed by the company H4D to meet the growing needs for telehealth, combining remote consultations, measurement of medical parameters and diagnostic tools in a single space-time, alongside a dedicated training program for physicians.

Here, in a proof of concept study, we report a multisite implantation of the Consult Station® booth for primary care in France and its contribution to health-care pathways in the context of a generalisation of telemedicine devices.

Methods

Study design and population

This was a multisite prospective observational cohort study which consecutively included all patients ≥ 18 years who had a teleconsultation via Consult Station® in France from 09/16/2019 to 01/31/2020, with no exclusion criteria and no patient exclusion in the data analysis.

Informed consent was obtained from the patients before inclusion (local ethics committee approval CLEA-2018-019). Data extraction was anonymized.

Description of Consult Station®

H4D® is a company specifically dedicated to clinical telemedicine (https://www.h4d.com/), and it created the Consult Station® booth in 2009. This European class-2 certified autonomous medical device [19] has many functions dedicated to the automated measurement of several medical parameters (weight, height, body mass index, and measures of pain , temperature, blood pressure,

cardiac frequency, and oxygen saturation), and including several diagnostic tools (pain scale, electrocardiogram, stethoscope, dermatoscope, audiometry, capillary glycaemia, and otoscope). It has a video interface enabling remote consultations with a physician (Supplementary Figure 1). There are two modes of teleconsultation: a self-performed check-up, and a clinically assisted teleconsultation (deployed in the present study). A team of 15 physicians was specifically trained for the Consult Station® booth before their implantation. The physicians' training program was funded by H4D®. Systematic cleansing, adapted to the COVID-19 pandemic, was performed by a trained dedicated hostess between each patient. New booths are to include a UVC lamp, which shortens the process to less than 3 minutes.

Access to Consult Station®

Consult station® booths were implanted in the premises of large firms and/or town halls, and employees were informed of the availability and free access to the device. When patients were willing to have a teleconsultation, they had to connect to an appointment booking website provided by H4D®, applying approved privacy and confidentiality rules. In accordance with the French law on teleconsultations, an appointment was to be given to the patient within 48 hours. If necessary, a distant care manager helped the patient to schedule the teleconsultation. There was no restriction on the use of the device, and there was no need to be referred by a practitioner to have an appointment.

GP and patient characteristics

GPs were recruited on a voluntary basis and systematically trained. The GP characteristics collected for this study were demographic data (age, gender), medical speciality, location of daily private

practice and time devoted to teleconsultation per week.

For each patient, data was collected by the physician during the consultation: demographic data (age, gender), date and geographical area of consultation (i.e. Paris, Paris suburbs or French regions), reasons for consultation, and consultation diagnosis classified according to the International Classification of Disease for primary care (ICD-10).

Statistical analysis and GP density indicators

Categorical data was expressed as numbers and proportions, and continuous data as means and standard deviation (SD) or medians and interquartile range (IQR) as appropriate.

The number of teleconsultations was assessed according to the local GP density per 100,000 inhabitants [20], and then according to the Localized Potential Accessibility (LPA) to a GP for cities and rural administrative areas [21]. LPA is a composite indicator that considers both GP proximity and GP availability and it is summarized as the ratio of the number of consultations to the available consultations per inhabitant. A LPA value < 2.5 is used by the French ministry of health to define the so-called "medical deserts" [22].

The data was analysed, and graphics were generated using R statistical software (version 4.0.0, R Foundation for Statistical Computing, Vienna, Austria; http://www.rproject.org).

Results

Teleconsultation characteristics

A total of 2134 consultations were carried out from September 16th 2019 to January 31st 2020. The teleconsultation days were distributed as follows: Mondays 419 (20%), Tuesdays 450 (21%),

Wednesdays 411 (19%), Thursdays 454 (21%) and Fridays 400 (19%). The Consult Station® measures used were the following: weight (n=344, 16%), height (n=344, 16%), BMI (n=344, 16%), temperature (n=1450, 68%), blood pressure (n=1351, 63%), cardiac frequency (n=823, 38.5%), oxygen saturation (n=823, 38.5%), electrocardiogram (n=14, 0.6%), stethoscope (n=896, 42%), dermatoscope (n=156, 7%), and otoscope (n=924, 43%). A tele-prescription was issued for 1567 patients (73%). A sick leave certificate was issued for 42 patients (3%). The reasons for teleconsultation were available for 1746 (82%) patients with complete data. Ninety-eight per cent (1715/1746) of the teleconsultations were conducted in full. 31 teleconsultations were abandoned as a result of connection issues. Figure 1 shows the distribution of the reasons for teleconsultation. Cough, pains, joint diseases, and rhinitis were the most frequent reasons.

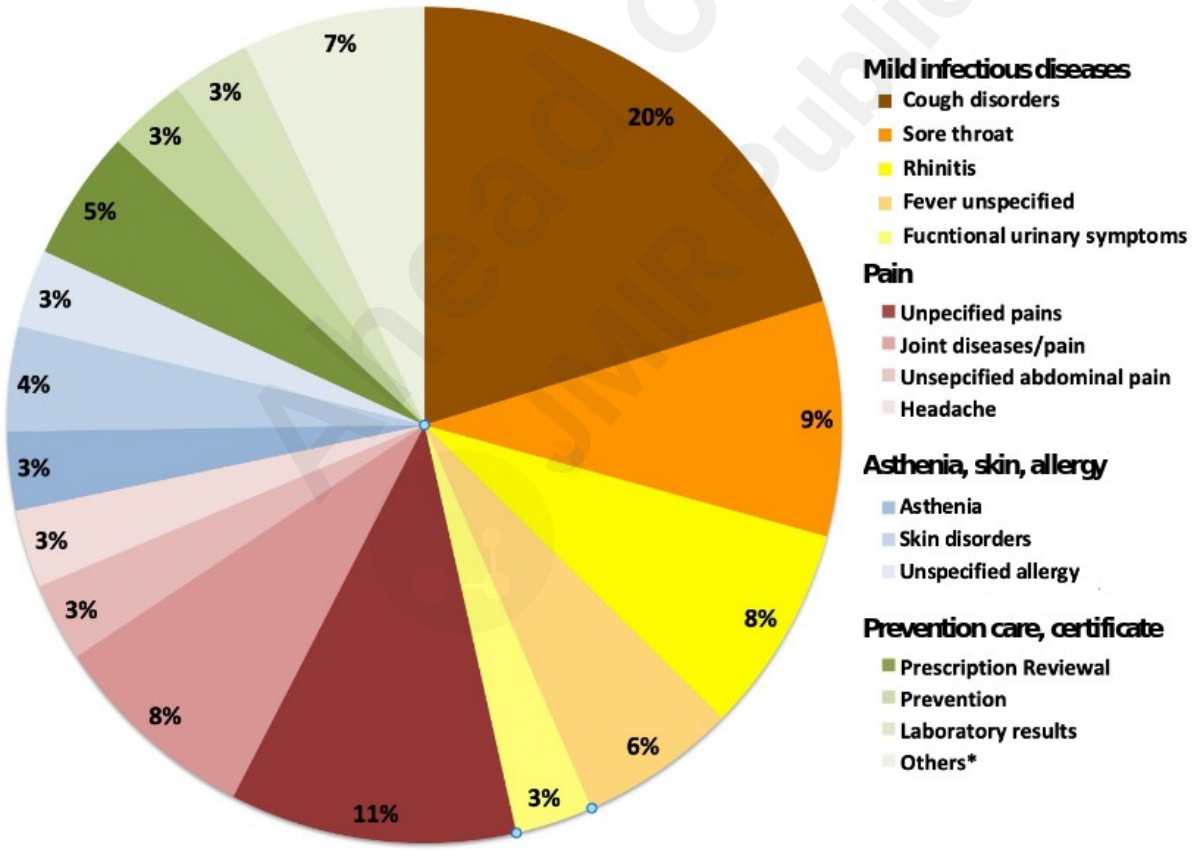

Figure 1: Distribution of the reasons for teleconsultation.

The pie chart shows the reasons for teleconsultations among 1715 consecutive patients. Others* includes unspecified visual disorders (n = 19), gynaecological disorders (n= 17), unspecified vertigo (n = 17), pregnancies (n = 16), unspecified screening (n = 15), nausea or vomiting (n = 14), unspecified sleep disorders (n = 8), myalgia (n = 8), psychological demands (n = 7).

Women do use the Consult Station®

The main users of Consult Station® were young women with a mean age of 38.7 years (range 20-77). Table 1 shows the patient characteristics. The mean teleconsultation duration was 18 minutes. Overall, otorhinolaryngology, osteo-articular pain and normal clinical examinations were the diagnostic domains most often observed, with no difference between women and the overall cohort. Prevention advice (vaccination, laboratory results and addiction counselling) concerned only 2% of the patients. None of the patients consulted for hypertension or diabetes follow-up. Fifty-eight per cent of the consultations were not followed by referral.

Table 1. Characteristics of 1715 consecutive patients with teleconsultations

	Whole cohort (n=1715)		**Women (n=1230)**	
Variables	**N**	**(%)**	**N**	**(%)**
Age (y):				
20-39	948	(56)	722	(59)
40-59	723	(42)	488	(40)
≥ 60	34	(2)	20	(1)
Gender:				
Women	1230	(72)		
Men	475	(28)		
Diagnostic domains for teleconsultation:				
Otorhinolaryngology	756	(44)	555	(45)
Osteo-articular	189	(11)	129	(10.5)
Normal clinical examination	187	(11)	111	(9.0)
Pneumonology	112	(6.5)	77	(6.3)
Dermatology	77	(4.5)	66	(5.5)
Urology	77	(4.5)	58	(5.0)
Gastroenterology	52	(3.0)	33	(3.0)
Ophthalmology	45	(3.0)	27	(2.2)
Abnormal laboratory results	35	(2.0)	27	(2.2)
Neurology	35	(2.0)	28	(2.3)
Prevention	34	(2.0)	25	(2.0)
Gynaecology	29	(2.0)	24	(2.0)
Cardiovascular/High Blood Pressure	26	(1.5)	13	(1.1)
Psychiatry	18	(1.0)	15	(1.2)
Asthenia	12	(1.0)	9	(0.7)
Dental	10	(0.5)	8	(0.6)
Endocrinology/Diabetes	6	(0.3)	4	(0.3)

Sexually transmitted infection	6	(0.3)	4	(0.3)
Missing data	8	(0.5)	7	
Consultant recommendations:				
No orientation	994	(58)	716	(58)
General practitioner	387	(23)	273	(22)
Complementary examination	159	(9.0)	115	(9.5)
Specialist	104	(6.0)	70	(5.8)
Other health professional	53	(3.0)	42	(3.5)
Emergency department	10	(0.5)	7	(0.6)
Missing data	8	(0.5)	7	(0.6)

Consult Stations® was mainly deployed in low-to-moderate GP density areas

A total of 31 Consult Station® booths were implanted on French territory for primary care management, mainly in the premises of large companies (≥ 5,000 employees) and local authorities, with one of them set up inside a town hall (Figure 2). Twenty-four booths (77%) were implanted in the Île-de-France region (i.e. Paris and its suburbs). The GP density of the implantation areas ranged from 96/100 000 to 248/100 000 inhabitants, with a mean value of 149.7 ± 27. We classified GP density in tertiles as follows: low density (96-137); moderate density (138-159); and high density (≥ 160), and we observed that the Consult Station® booths were located mainly in moderate-density areas (52%) or in low-density areas (35.5%).

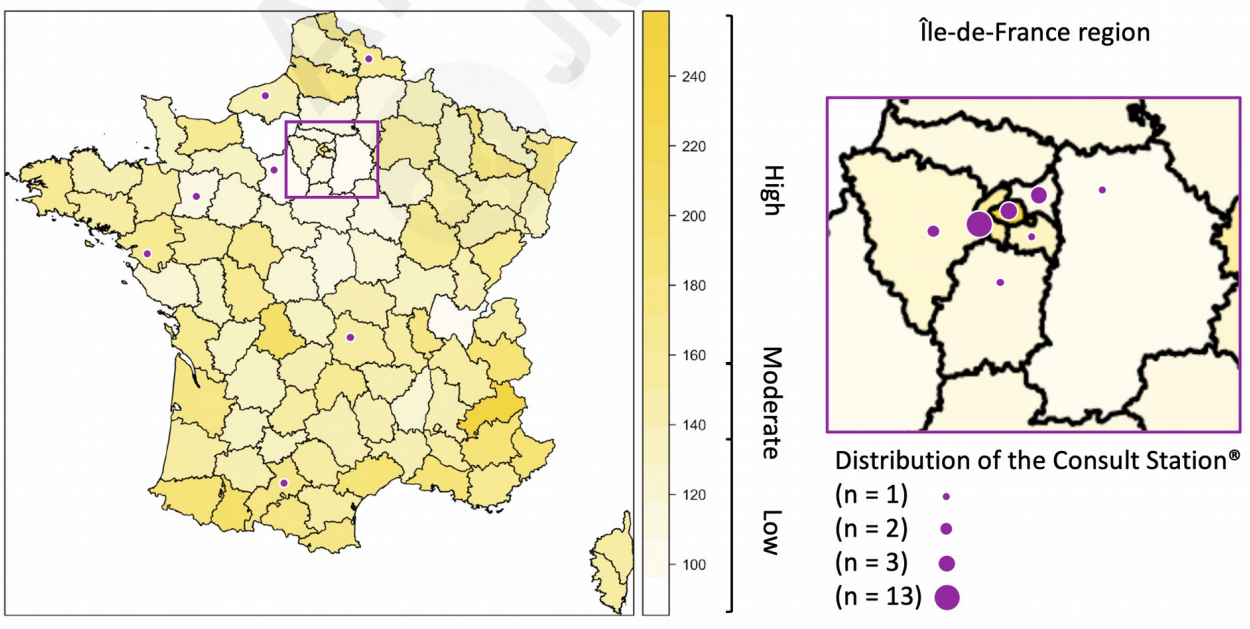

Figure 2: Implantation of Consult Station® booths on French territory according to GP density (left panel), and in the Île-de-France region (i.e. Paris and its suburbs) (right panel).

We then considered a French composite indicator for access to a GP, namely Localized Potential Accessibility, LPA, which provides the real number of GP consultations per patient in relation to the number of available GP consultations. Medical deserts are defined by a LPA value under 2.5/year, which concerns 5.1% of the French territory, while the national LPA value is 3.7 (ranging from 1.4 to 12.1). Using this threshold of 2.5, none of the Consult Station® booths was located in a medical desert. We then classified LPA into tertiles as follows: low (2.5-3.2); moderate LPA (3.3-4.0); and high LPA (≥ 4.1). This showed that 19% (n=6/31) and 55% (n=17/31) of the Consult Station® booths were implanted in moderate or low LPA areas respectively, both in the Ile-de-France and in other administrative regions.

Consult Station® could improve access to practitioners

Table 2 shows the number of teleconsultations recorded for 28 Consult Station® booths according to local GP density and the national French indicator for accessibility to a GP (LPA).

Table 2. Number of teleconsultations with the Consult Station® according to GP density and access to consultation (LPA)

Area	N (%)	Mean GP density	C/D	Mean LPA
Paris (center)	222 (10)	High (248)	0.9	High (4.5)
Regions	660 (31)	Moderate (148)	4.4	High (4.6)
Paris suburbs	1252 (59)	Low (124)	10	Moderate (3.3)

GP density in numbers per 100,000 inhabitants in France. C/D ratio = Number of consultations/Mean GP density per 100,000 people. N/LPA ratio = Number of consultations/Mean LPA (Localized Potential Accessibility to GP)

The number of teleconsultations was high in the Paris suburbs where GP density is low (124

GPs/100 000 inhabitants) and the LPA value was moderate (3.3 consultations/year). Across the whole territory, the number of teleconsultations increased as GP density decreased (Figure 3A). In contrast, access to teleconsultation also increased as the LPA indicator increased (Figure 3B). This suggests that the possibility of a routine GP consultation was not a hindrance to the use of teleconsultations.

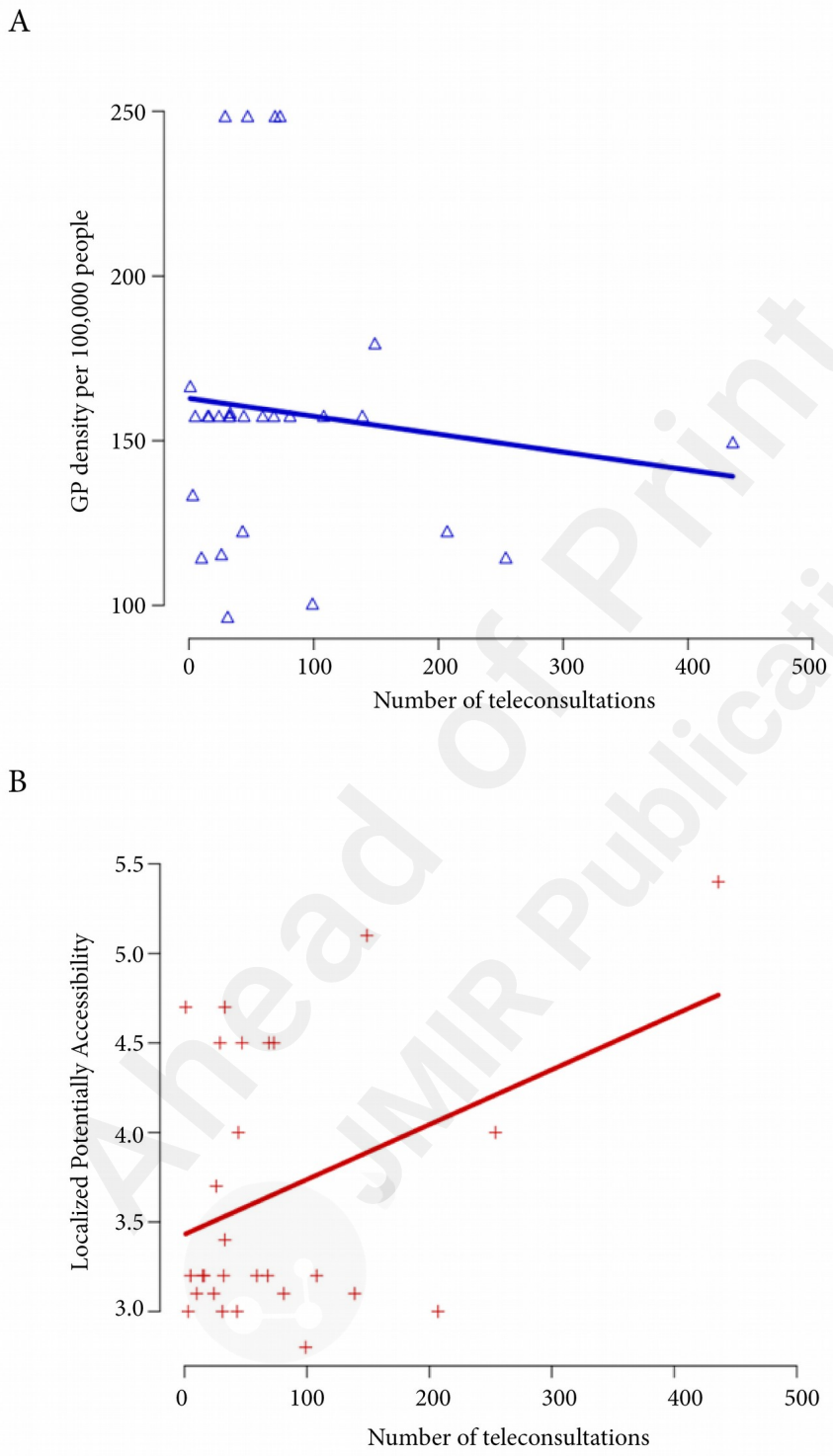

Figure 3: Scatter plot of the number of consultations according to GP density (A) and Localized Potentially Accessibility/LPA (B).

The mean age of the 15 practitioners was 39 ± 8.5 years (min-max = 30-60) and ten of them (80%)

were working in high LPA areas. The number of years since graduation ranged from 3 to 35 years. 57% of them had a mixed activity, in private practice (45% in group practice) and hospital. None had been previously trained for teleconsultations but 3 of them reported occasional experiences in teleconsultation. Reasons provided by the doctors for their choice to practise telemedicine were: the innovative aspect of this device, collaborative work, the diversification of their activity and provision of care to medical deserts. For 71% of them, the Covid-19 pandemic had not influenced their perceptions of teleconsultation and 85% would recommend teleconsultation to other colleagues. It is worth noting that they were urban practitioners, as none of them was working in a low LPA area (Supplementary Table 1).

Discussion

The Consult Station® booth is the first innovative telemedicine device enabling a complete medical teleconsultation in a single space-time, while teleconsultations are often limited to a phone call consultation [23-25]. With a real-time measurement of several medical parameters, the use of diagnostic tools and video consultations, Consult Station® is a good option when face-to-face consultations are not possible [25]. The COVID-19 pandemic contributed to an acceleration of tele-consultation acceptability and to the organisation of pre-existing devices or tele-healthcare pathways. The Consult Station® for its part is a particularly original device appropriate for further standardization of care.

In our study, seasonal infections of low severity were the main reason for consultations occurring among young patients. Interestingly, hypertension, diabetes and preventive medical consultations were almost absent, while they amount to almost 50% of consultations with a GP in France [26]. It appears that Consult Station® could thus offer a new, convenient healthcare pathway for young patients with non-severe health needs. Further studies are required to determine whether this new,

convenient, primary care pathway could help reduce visits to hospital Emergency Departments [27, 28]. Overall, our study feeds the debate on concerns about the cost-effectiveness in rich countries. Interestingly 11% of the patients used the device for a normal clinical examination. Although our proof-of-concept study was not designed to determine whether the teleconsultation was linked to chronic diseases or more routine conditions, the Consult Station could be of great interest for systematic yearly check-ups, particularly in low-density areas. Furthermore, a recent study shows that patients with chronic conditions are in fact open-minded towards alternative modes of telemedicine [11], including their use for mental conditions [29].

Most of the patients were young working women of childbearing age. We do not have an explanation for this gender-balanced result, although women are overrepresented in the use of internet and telemedicine [11, 15], but it is known that time-saving is a major factor for telemedicine usage [30]. In our study, offering an appointment within 48 hours and convenient healthcare access in line with primary care in private practice, and the flexibility of the Consult Station® healthcare system could contribute considerably to patient satisfaction and acceptability, as reported with other telemedicine devices [31, 32]. Furthermore, it could help limit absenteeism from work for health reasons, if, as in our study, most of the booths are directly implanted in the workplace [33, 34]. Indeed, in a recent study, the authors found that the rate of absenteeism from work was 3 % among 5,465 employees, with 56% women [34]. The rates of sick leave reached 28%, and 76% for young women. In 2018, the annual mean cost of absenteeism from work was estimated at 4,059 € per individual in France [35], where it concerns 3.6% of a company's employees. For a large firm of at least 5,000 employees it would amount to a cost of 730,000 €. On the other hand, the minimum annual cost of a Consult Station® booth would be 43,320 €. This amount includes the booth (80,000 €), annual maintenance fees (10,000 €), the annual cost equivalent of a full-time technical agent (i.e. 21,892 €) to clean the booth between each patient (3 minutes), and an

amortization of the booth over 7 years (11,428 €/year). This advantageous financial operation for companies in fact contributes to preventing work absenteeism. The question of work absenteeism should be addressed in a dedicated study including social and economic patient characteristics.

In another perspective, with the emergence of SARS-Cov-2, Consult Station® could help manage patient flows in compliance with barrier measures [36, 37].

With a multisite implantation, we believe that Consult Station® booths could contribute to meeting the challenge of the medical deserts despite the fact that in our study they were largely implanted inside business premises, and none of them in medical desert areas. However, there was no real bias linked to the geographical distribution of Consult Station® in our study, since 35.5% were implanted in low GP density areas.

From the patients' perspective, the device offers easy access to doctors even in low-density areas. This implies a willingness among practitioners to respond to this challenge, while continuing to work and live in metropolitan areas. In fact, our study results showed a high level of technical acceptability among practitioners, and our teleconsultation device responded to several of the barriers previously identified by e GPs for the use of telemedicine. With the acceptability of both patients and GPs, this kind of teleconsultation device provides proof-of-concept of the generalizability of these health-care pathways , and could in particular succeed where public health policies have failed to address the growing problem of access to care in under-populated rural areas [35]. While our study was not designed to evaluate the impact of our device on vulnerable populations, we do believe that it does not constitute a limitation to health care access for vulnerable people, as the health care system organisation in France now enables the reimbursement of tele-consultations for all patients.

Conclusion

The multisite implantation of Consult Station® booths is relevant for primary care, but it also could meet the challenge of medical deserts. While various types of telehealth or telemedicine facilities were already available in early 2020, the Covid-19 pandemic has highlighted the need for video teleconsultations that are performed using different devices including remote tools in the Consult station ®. In addition, further studies should be conducted to evaluate its possible contribution to limiting work absenteeism.

Funding

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H4D paid for the English language revision.

Ethics Approval

Informed consent was obtained from the patients before inclusion. Data extraction was anonymized. This non-interventional study obtained the approval of local ethic committee for collecting and analysing data (Avicenne hospital, number CLEA-2018-019; 020-019).

Conflicts of interest

GF, GB, IR, SM and FP have no conflict of interest to report

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Authors' Contributions

Conception or design: GF, GB, AW, FB, FP

Data acquisition: AW, VF, AB, CG

Analysis: GF, GB, AW, FP, IR, SM

Interpretation of data: GF, GB, AW, IR, SM

Drafting or revising the manuscript: GF, AB, AW, VF, AB, CG, FB, FP, IR, SM

Final approval: GF, GB, AW, VF, AB, CG, FB, FP, IR, SM

Agreement to be accountable for all aspects of the work: GF, GB, AW, VF, AB, CG, FB, FP, IR, SM

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Figure legends (Supp)

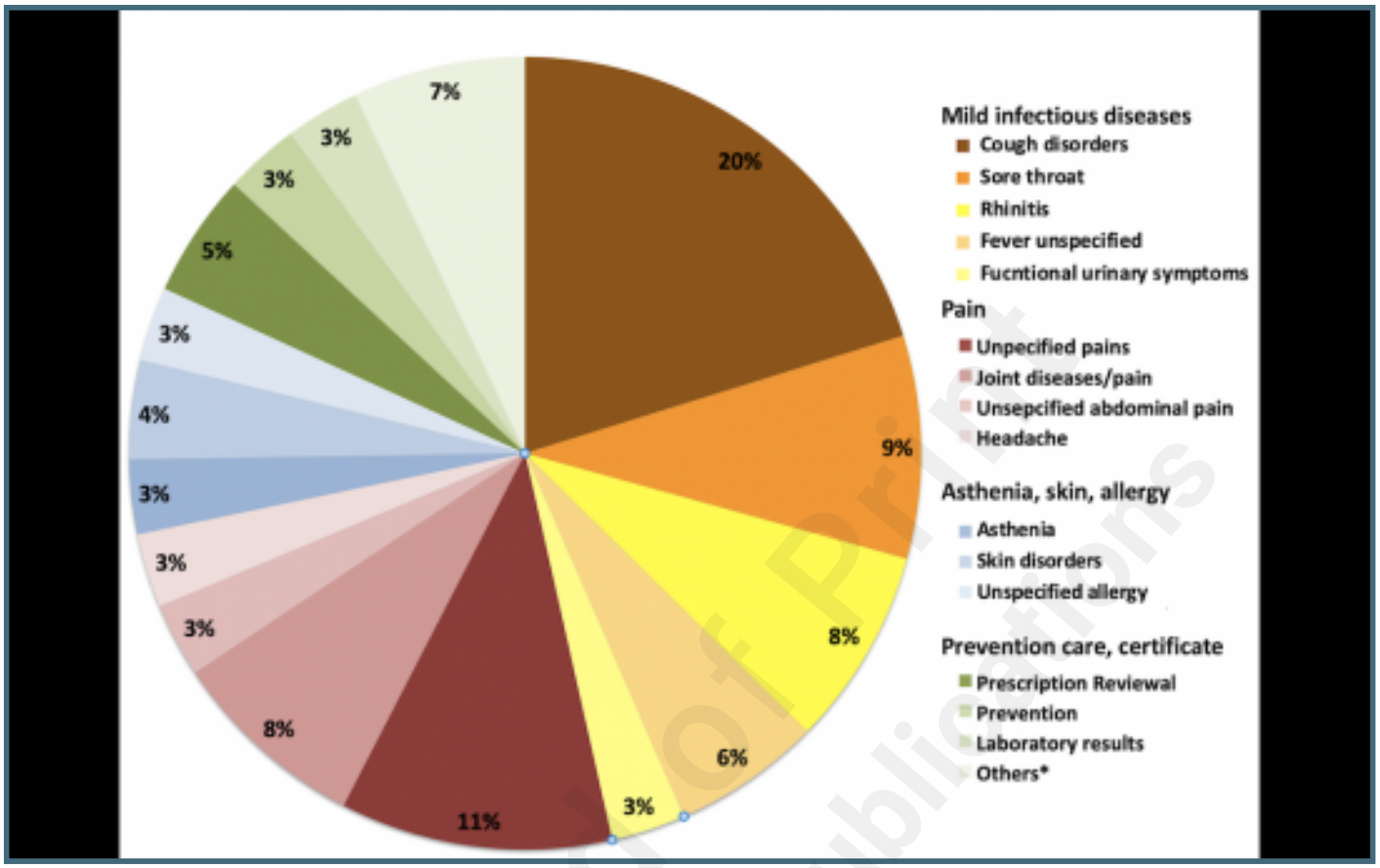
Supplementary Figure 1: The Consult-Station® booth

Supplementary Files

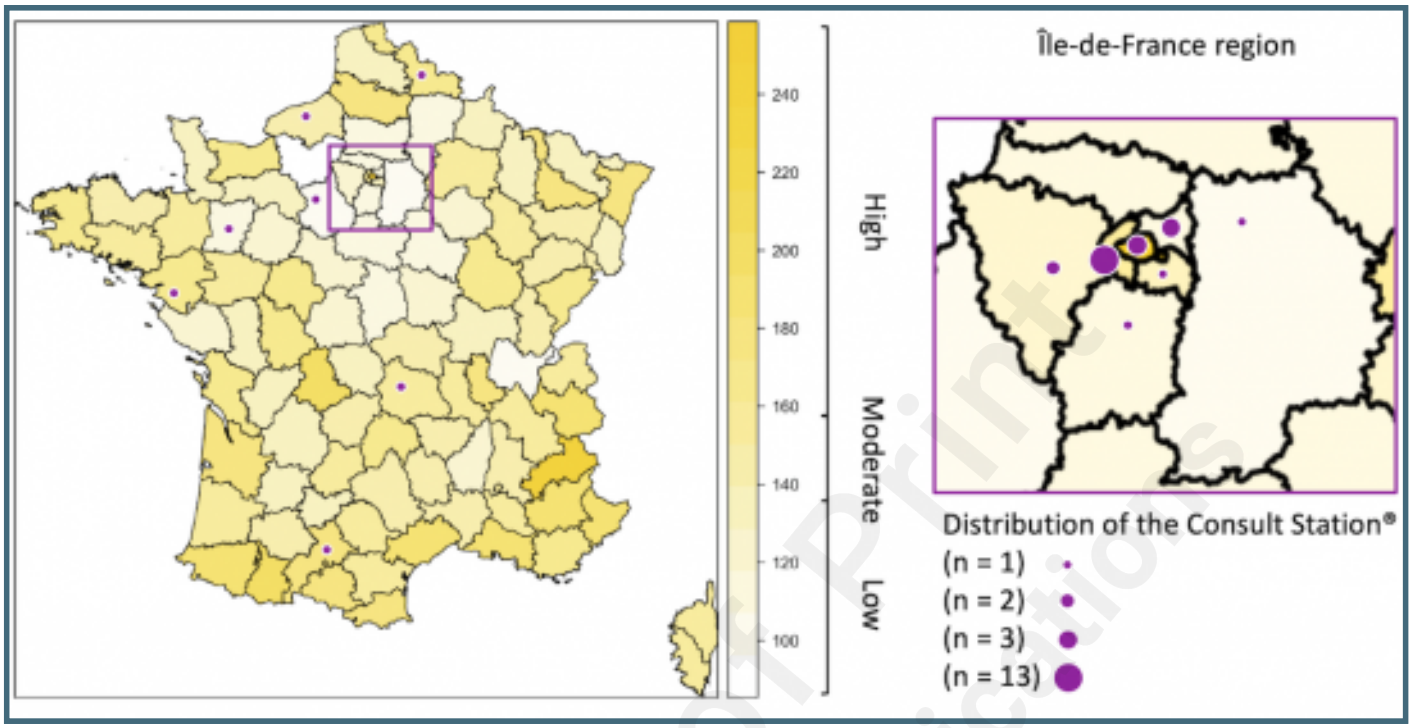
Untitled.

Figures

Distribution of the reasons for teleconsultation.



Implantation of Consult Station® booths on French territory according to GP density (left panel), and in the Île-de-France region (i.e. Paris and its suburbs) (right panel).



Scatter plot of the number of consultations according to GP density (A) or Localized Potentially Accessibility/LPA (B).