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Perceptions and satisfaction of patients with chronic heart failure when using a remote monitoring web application named Satelia® Cardio



Perceptions et satisfaction des patients insuffisants cardiaques chroniques lors de l'utilisation de la solution de télésurveillance Satelia® Cardio

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RÉSUMÉ

Introduction. – L'utilisation de la télésanté, telle que la télésurveillance des patients, pour l'insuffisance cardiaque chronique (ICC) a un impact sur le parcours du patient. L'importance accordée au patient dans la gestion des maladies chroniques est précieuse. Bien que la télésurveillance soit recommandée dans la pratique, l'évaluation de la satisfaction des patients a été limitée jusqu'à présent. L'objectif de cette étude était d'évaluer les perceptions et la satisfaction des patients souffrant d'ICC lorsqu'ils utilisent la télésurveillance.

Méthodes. – Une enquête déclarative volontaire a été menée auprès des utilisateurs de Satelia® Cardio, une application web de télésurveillance de l'ICC qui a été incluse dans le programme expérimental en France « ETAPES » organisée par le ministère français de la santé. Le suivi était basé sur les résultats déclarés par les patients (sept questions sur les symptômes, une question sur le poids) auxquels ils répondaient en ligne (pour les patients ayant une bonne maîtrise du numérique) ou par téléphone avec une infirmière (pour les patients ayant une mauvaise maîtrise du numérique). L'enquête comprenait des questions sur l'utilité perçue, la facilité d'utilisation et l'impact sur la qualité de vie.

Résultats. – Au total, 87 % des 825 patients étaient satisfaits de la surveillance numérique de leur insuffisance cardiaque. Les patients ont trouvé que l'application était facile à utiliser (94 %), qu'elle ne posait pas de problème (95 %), qu'elle fournissait des notifications au bon moment (98 %), qu'elle était facilement accessible (96,5 %), compréhensible (89 %) et qu'elle ne nécessitait pas un temps déraisonnable pour répondre aux questions (99 %). La plupart des patients ont estimé que la télésurveillance aidait les médecins à fournir de meilleurs soins au cours de leur suivi (70 %, score moyen : 7,98/10) et 45 % des patients ayant des connaissances numériques ont indiqué une amélioration de leur qualité de vie.

Conclusion. – Les patients qui maîtrisent mal l'outil numérique peuvent avoir besoin de la télésurveillance humaine ou assistée. Les patients suivis quotidiennement pour l'ICC grâce à la télésurveillance ont exprimé une grande satisfaction et une bonne acceptation.

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Abbreviations: CHF, Chronic heart failure; ETAPES, Expérimentations de Télé médecine pour l'Amélioration des Parcours En Santé; GP, General practitioner; HCP, Healthcare professional; MOH, Ministry of Health; QoL, Quality of life; RPM, Remote patient monitoring

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A B S T R A C T

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Introduction. – The use of telehealth, such as remote patient monitoring (RPM), for chronic heart failure (CHF) impacts patient pathways. Patient-centricity in chronic disease management is valuable. Even though RPM is recommended in practice, the evaluation of patient satisfaction has been limited to date. The objective of this study was to assess the perceptions and satisfaction of patients with CHF when using RPM.

Methods. – A voluntary declarative survey was conducted with users of Satelia® Cardio, an RPM web application which was included in an experimental model program in France funded by the ETAPES program initiative sponsored by the French Ministry of Health. Monitoring was based on patient-reported outcomes (seven questions on symptoms, one question on weight) which were answered online (digitally literate patients) or by phone with a nurse (patients with poor digital literacy). The survey included questions on perceived usefulness, ease of use and impact on quality of life (QoL).

Results. – Overall, 87% of the 825 patients were satisfied with having their CHF digitally monitored. Patients found that the application was easy to use (94%), problem free (95%), provided well-timed notifications (98%), easily accessible (96.5%), understandable (89%), and did not require an unreasonable amount of time to answer questions (99%). Most patients felt that RPM helped physicians provide better care during their follow-ups (70%, mean score: 7.98/10) and 45% of the digitally literate patients indicated an improved QoL.

Conclusion. – Poor digitally literate patients may need human-based or assisted RPM. Patients monitored daily for CHF through RPM expressed strong satisfaction and acceptance.

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1. Introduction

Patient-centricity in chronic disease management is increasingly encouraged [1–3]. In chronic heart failure (CHF), patient-centered care reduces the risk of acute and long-term complications [4,5]. Telehealth tools, such as remote patient monitoring (RPM) plays a role in allowing patient empowerment and is growingly being used by healthcare professionals (HCPs).

Despite supporting evidence for the effectiveness of RPM in the management of CHF, its subsequent hospitalization rate, efficiency of care and mortality rates, studies about patient satisfaction and experiences towards such innovative tools in medicine has been limited [6,7].

Since the digital literacy of patients can affect the way telehealth is applied in the care pathway. Evaluating patient satisfaction for RPM may better allow the understanding of patient preferences and consequently the design of models of care that rely on patient reported outcomes [8,9]. The objective of this study was to assess the perception and satisfaction of patients with CHF using an RPM solution using two cohorts (digitally and poor digitally literate patients).

2. Patients and methods

A voluntary declarative survey was conducted with users of a RPM web application named Satelia® Cardio (referred to as the RPM program) between November 12, and December 1, 2020 and between March 19, 2021, and April 29, 2021. The web application was included in the ETAPES program (*Expérimentations de Télémedecine pour l'Amélioration des Parcours En Santé*) which is a national experimental funding model initiative for telehealth solution providers in France in 2018 and was expected to end on December 31, 2021 [10]. The purpose of ETAPES was to test funding models for RPM for various chronic diseases including CHF. The Minister of Health (MOH) listed all providers that participated in the program and met with the prerequisites. ETAPES has funded RPM on a per patient/per semester basis taking into consideration various inclusion and exclusion criteria, in which the RPM solution is centered on: i) a monitoring physician (primarily a cardiologist or general practitioner (GP) with a post-graduate diploma in heart failure), ii) a therapeutic education program with at least three sessions during the first six months, and iii) a solution provider. Patient monitoring must include a minimum of one daily reading of the patient's weight and also include a medical algorithm that triggers alerts in case of potential early decompensation based on these two types of data.

Satelia® Cardio is a web-based application and is accessible to common digital devices with an internet connection (smartphones, laptops, computer and tablets) with no need for any downloading or software installation [10]. Its monitoring is entirely based on patient-reported outcomes collected online on a “medical device-classified” application accessible via a link sent by text message (SMS), or directly collected by telephone with a nurse. The RPM program in this study consisted of providing patients with seven questions related to symptoms and one regarding weight. A patient was included to use RPM by a physician's recommendation and then contacted by a nurse to explain the process. Further information about the web application used, including screenshots of the user interface are available at Pages et al. [11].

The web application followed French guidelines for therapeutic education and had this component including the following five themes adapted to each patient need: i) signs of complications and medical treatments, ii) weight measurement, iii) treatment compliance, iv) food and salt intake, and v) physical activity. Satelia® Cardio followed three steps for providing its therapeutic educational

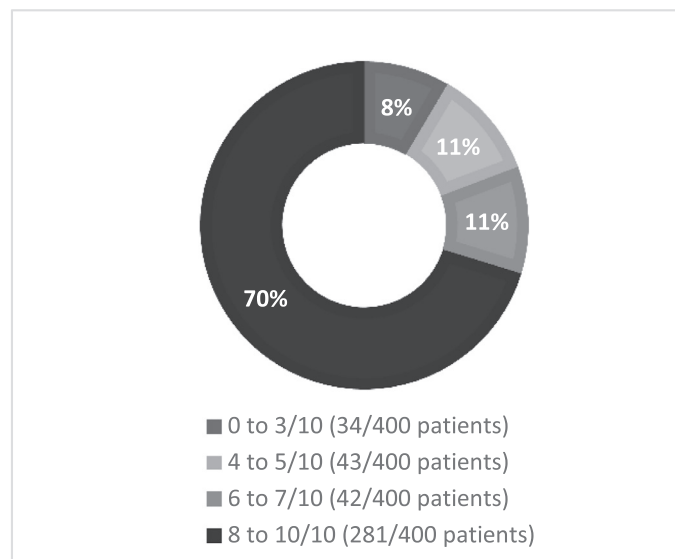


Fig. 1. Overall satisfaction rate of 400 digitally literate patients with chronic heart failure (CHF) using a remote patient monitoring web application Satelia® Cardio.

Table 1
Satisfaction results of 400 digitally literate patients using a remote patient monitoring web application (Satelia® Cardio) to monitor their chronic heart failure (CHF).

Question	Response of digitally literate patients with CHF, n = 400	
	Answers	Results n, (%)
What did you think of the welcoming call from the nurse ?	I still have questions to ask	14, (3)
	I never received a call from the nurse	74, (18)
	I did not understand why the nurse called me	6, (2)
	The call was useful to me	306, (77)
On a scale of 0 to 10, do you think Satelia® Cardio is easy to use ?	Mean score	9.44
	Patients declaring a score between 7 and 10	375, (94)
On a scale of 0 to 10, once connected here is it easy to access the questionnaires for monitoring your CHF ?	Mean score	9.6
	Patients declaring a score between 7 and 10	386, (96.5)
On a scale of 0 to 10, do you think the questions on the application are understandable ?	Mean score	9.2
	Patients declaring a score between 7 and 10	355, (89)
On a scale of 0 to 10, do you feel that you are paying more attention to your symptoms because you are using Satelia® Cardio ?	Mean score	8
	Patients declaring a score between 7 and 10	276, (69)
On a scale of 0 to 10, do you better understand CHF because you are using Satelia® Cardio ?	Mean score	7.5
	Patients declaring a score between 7 and 10	258, (64.5)
On a scale of 0 to 10, did your quality of life improve since you started using RPM ?	Mean score	6.2
	Patients declaring a score between 7 and 10	180, (45)
On a scale of 0 to 10, are you better taking your pills since you started using Satelia® Cardio ?	Mean score	6.4
	Patients declaring a score between 7 and 10	209, (52)
On a scale of 0 to 10, do you feel the lives of your relatives has eased since you started using RPM ?	Mean score	5.55
	Patients declaring a score between 7 and 10	160, (40)
On a scale of 0 to 10, do you think that RPM may help your physician to better monitor your health ?	Mean score	7.98
	Patients declaring a score between 7 and 10	281, (70)
On a scale of 0 to 10, are you satisfied of your monitoring with Satelia® Cardio ?	Mean score	8.47
	Patients declaring a score between 7 and 10	308, (77)
Did you already reply to the monitoring questionnaire by yourself without receiving a link ?	I did not know I could do that	127, (32)
	No	190, (47)
	Yes	83, (21)
	Acceptable	398, (99)
How do you judge the time spent to answer the questionnaire ?	Too long	2, (1)
	Yes	8, (2)
Are you satisfied with the duration receiving the SMS and/or email ?	No	392, (98)
	No, never	240, (60)
Have you ever missed to answer to your monitoring questionnaire ?	Sometimes, from time to time	33, (8)
	Rarely	116, (29)
	Often	7, (2)
	Very often	4, (1)
	Yes	339, (85)
	No	61, (15)
Did you ever read the questions and answers (FAQ) section ?	Yes	336, (84)
	No	64, (16)
Have you ever faced any problems with Satelia® Cardio ?	Yes	21, (5)
	No	379, (95)
Have you ever called technical support ?	Yes	73, (18)
	No	327, (82)
Did the technical support solve your problem ? On a scale of 0 (not at all) to 10 (yes, very well)	Mean score	8.01
	To you, Satelia® Cardio is...	Three most prevalent words Monitoring Reassuring Simple

CHF, chronic heart failure; RPM, remote patient monitoring.

component: an educational diagnostic, therapeutic sessions per theme and definition of an objective for the patient to follow up with until the next session.

Approximately 20% of all Satelia® Cardio patients were described in this study. The two cohorts were grouped as digitally literate patients using the application by themselves, and patients with poor digital literacy who responded via telephone with a nurse. Both groups had access to the same application and features. The poor digitally literate group did not have to phone the nurse on a daily basis, rather the nurse called the patient when it was relevant.

The survey comprised of 21 questions focusing on perceived usefulness, ease of use and impact on quality of life (QoL). The survey was directly and consecutively sent via the application to the first cohort. For the second cohort, the questions were reduced to 19. Access to the survey was available for one week after the link was sent. A sample size calculation was not made nor predefined in relation to the size, sex, age, and NYHA class. The scoring system was comprised of Likert scale, binary or scaled 0 to 10. The survey

questions for the digitally literate patients are detailed in [Supplementary Table 1](#) and the questions provided by telephone to the patients with poor digital literacy are in [Supplementary Table 2](#).

The survey results were described with mean and percentages (%). No statistical tests or comparisons were performed. In accordance with French regulations, no ethical declaration was required for the application and approval of patient satisfaction data use and the study conformed with the principles outlined in the Declaration of Helsinki [12]. Patients explicitly gave their consent for the anonymous use of their data.

3. Results

In total, 825 patients were included in this study with 400 being digitally literate and 425 being patients with poor digital literacy. For digitally literate patients, most were satisfied using RPM (77%, n=306) (Fig. 1), found it easy to use (94%) and considered it useful for the management of their CHF (97%) (Table 1). Similarly, patients with

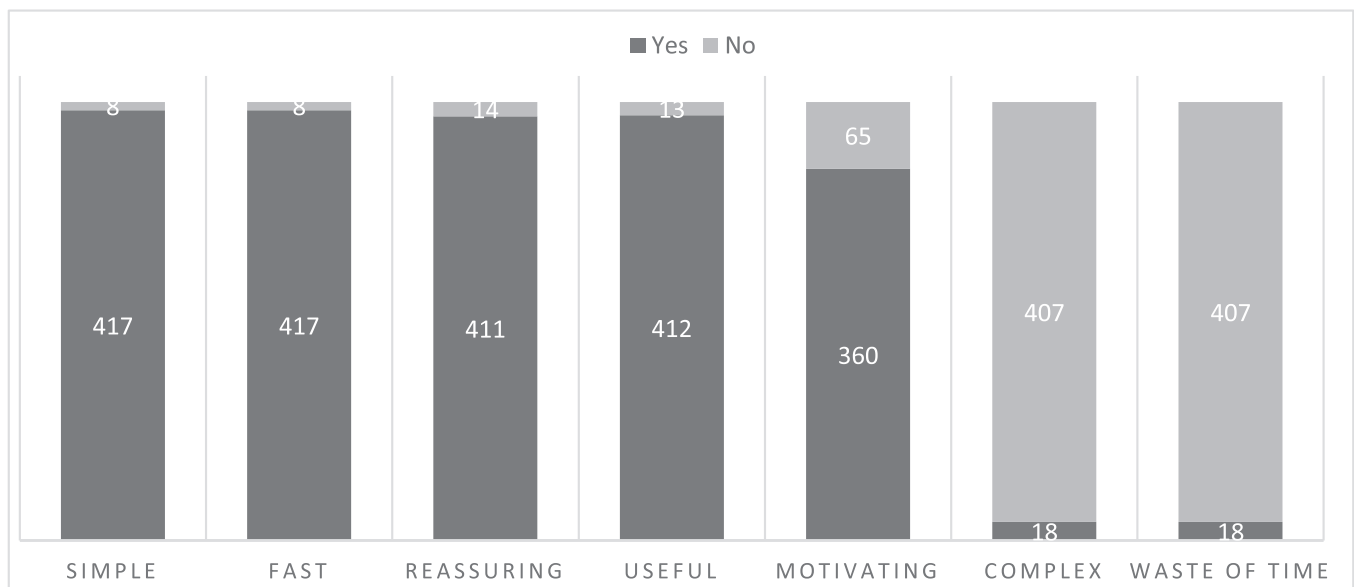


Fig. 2. Perception and acceptance of 425 CHF patients with poor digital literacy when using a remote patient monitoring web application (Satelia® Cardio).

poor digital literacy responded at 97% ($n=411$) (Fig. 2), 98% and 97% respectively for the same criteria (Table 2).

Both patient groups felt that RPM by Satelia® Cardio helped physicians to provide better care during follow-ups at 70 and 78% respectively (mean score: 7.98/10 for digitally literate patients). They also stated that RPM allowed them to pay more attention to their symptoms (69%) and have a better understanding of their health (52 and 64.5% respectively). In total, 85% of the digitally literate patients read the integrated Q&A section (FAQ) and 84% responded to have watched the provided educational videos (Table 1 and Table 2). The use of the web application also was reported to have allowed patients to learn how to better adhere to their treatment regimens (40% and 52% respectively).

Both digitally literate patients and patients with poor digital literacy with CHF stated that their QoL was improved (37% and 45% respectively) and that the RPM had a positive impact on their lives (37% and 40% respectively). The three most prevalent words from the free-text question asked to digitally literate patients were: monitoring, reassuring and simple to use (Table 1).

4. Discussion

Our study showed that regardless of one's digital literacy, patients expressed a high satisfaction rate and perception for an RPM web application to monitor their CHF. These findings were similarly found in two other studies by Picard et al. (2021) and Berry et al. (2021), however the impact on QoL or that of their caregivers were not perceived the same way [13,14]. The high number of patients with poor digital literacy may have been due to their age, not owning a smart phone, living in off-grid areas or because they were unable to manage to use the application on their own and required assistance.

Patients with poor digital literacy reported a lower percentage related to the understanding their disease and symptom awareness when using RPM. This finding may be explained more so by the profiles and age groups within this population rather than the distinction between the method used for the two cohorts. In Lahroz et al. (2021), the availability of educational videos was reported to be a positive feature in patient satisfaction in the United States [15]. Digitally literate patients may have also been more proactive in monitoring their disease and have had better access to the therapeutic educational

component compared to the latter which may have influenced these results.

The high overall satisfaction of patients with poor digital literacy may have been due to the human interaction component of the RPM that was presented to them. This parallels the findings in Prescher et al. (2002) which stated that RPM devices that provide regular contact between the patient and physician can achieve high satisfaction and long-lasting adherence [16]. Improving patient adherence in CHF is clearly a hard-to-reach goal [17–19]. The declared impact on observance was limited which could have been related to the fact that the web application did not focus on treatment and did not include questions or scores related to patients' adherence to their treatment. This subject was, however, covered in the educational videos with the purpose of improving overall adherence during a patient's use of RPM despite the lack of methodology to monitor it [20]. The acceptance towards the role of a nurse in RPM were aligned with Gupta et al. (2021) which indicated a positive impact of advanced nursing practices for patients with heart related diseases including CHF [21]. This was also shown in Ordóñez-Piedra et al. (2021) which assessed the impact of nurse practitioners and digital health interventions [22].

To our knowledge, this is the first study that evaluated the satisfaction of reimbursed patients with CHF using RPM in real-life settings. The importance of measuring QoL for patients with CHF was previously described in literature [23,24] and particularly in Seppehrvand et al. (2020) from the Alberta HEART cohort where differences in QoL were observed over time for different categories of patient severity [25], however, in our study, the diversity of the practical questions asked concerning patient satisfaction, RPM quality and QoL were additional. Other strengths of this study relied on the participation rate and the methods used to compare patients with differing digital literacy.

The main limitations of this study were the declarative and voluntary basis of the survey which may have caused selection bias and/or healthy participant effect bias which may have skewed patients answers from those that were mostly satisfied with the intervention. A bias may have been also formed for patients with poor digital literacy because the questionnaire was administered by a nurse. There was also no randomization of the study sample which could have limited the interpretation of the results. Missing

Table 2

Satisfaction results of 425 patients with poor digital literacy using a remote patient monitoring web application (Satelia® Cardio) to monitor their chronic heart failure (CHF).

Question	Response of CHF patients with poor digital literacy, n = 425	
	Response Answers	Results n, (%)
Do you think the questions frequently asked by the nurse are understandable ?	Not at all	1
	A little	2
	Moderately	6
	Perfectly	416, (98)
Do you feel that you are paying more attention to your symptoms since being contacted by the nurse ?	Not at all	49
	A little	24
	Moderately	57
	Perfectly	295, (69)
Do you better understand your disease since being contacted by the nurse ?	Not at all	58
	A little	51
	Moderately	93
	Perfectly	223, (52)
Did your quality of life improved since being contacted by the nurse ?	Not at all	116
	A little	53
	Moderately	100
	Perfectly	156, (37)
Are you better taking your pills since being contacted by the nurse ?	Not at all	188
	A little	27
	Moderately	41
	Perfectly	169, (40)
Do you feel the life of your relatives is easier since being contacted by nurse ?	Not at all	118
	A little	49
	Moderately	58
	Perfectly	200, (47)
Do you think that Satelia® Cardio may help your physician to better monitor your health ?	Not at all	19
	A little	24
	Moderately	52
	Perfectly	330, (78)
Are you satisfied of the monitoring from the nurse ?	Not at all	1
	A little	2
	Moderately	11
	Perfectly	411, (97)
Did you already call the nurse by yourself ?	Yes	140
	No	258, (61)
	I did not know I could do that	27
	Acceptable	421, (99)
What do you think about the time required to answer to the nurse ?	Too short	3
	Too long	1
	Yes	395, (93)
	No, never	404, (95)
Are you satisfied with the hour of the day you are called by the nurse ?	Sometimes	6, (1)
	Rarely	15, (4)
	Yes	411, (97)
	Yes	412, (97)
Have you ever voluntarily ignored the nurse call ?	Yes	18, (4)
	Yes	18, (4)
	Yes	360, (85)
	Yes	417, (98)
Is this RPM application reassuring you ?	Yes	417, (98)
	Yes	417, (98)
Do you think this RPM application useful ?	Yes	417, (98)
	Yes	417, (98)
Is Satelia® Cardio complicated to use ?	Yes	18, (4)
	Yes	18, (4)
Is using this RPM application a waste of time ?	Yes	18, (4)
	Yes	18, (4)
Is Satelia® Cardio motivating you in your care ?	Yes	360, (85)
	Yes	417, (98)
Is Satelia® Cardio easy to use ?	Yes	417, (98)
	Yes	417, (98)
Is Satelia® Cardio quick ?	Yes	417, (98)
	Yes	417, (98)

RPM, remote patient monitoring.

patient characteristics could have posed a limitation. Furthermore, the nurses who conducted the survey for the second cohort was also the RPM nurse for the first which may have induced an answering bias from patients to express their perception. Despite this, the inherent trust established between the nurse and the patients was considered to be a priority.

Comparing the findings in this study with other RPM solution providers authorized in ETAPES as well as with patients in hospital settings that do not need to use RPM could be conducted in the future in order to support the design of care pathways for CHF in France [26]. Moreover, the generalization and validity of questionnaires used to conduct surveys to assess RPM in studies should be considered to be standardized in the future to reduce limitations and allow comparisons [27,28].

In conclusion, the satisfaction rate expressed by patients in this study and their perception towards better monitoring of their disease

needs through RPM should be matched with a clinical effectiveness survey of the web application in real-life settings in relation to medical and cardiovascular outcomes. The perceived impact of QoL of Satelia® Cardio could have the same amplitude as usual therapies used in CHF.

Ethics approval

Not applicable.

Author's contributions

P. Jourdain, N. Pages and S. Nisse-Durgeat contributed to the writing of the manuscript.

P. Jourdain, N. Pages, S. Nisse-Durgeat, C. Bedel and L. Betito contributed to the writing of the questionnaires.

C. Bedel and L. Betito : reviewed the manuscript.

P. Jourdain, F. Picard, P. Maribas, S. Lafitte, H. Lemieux, F. Barriault, MF. Seronde, J. Ph. Labarre, H. Chaouky : usage and inclusion of patients in SATELIA® Cardio.

Declaration of Competing interests

The authors (P. Jourdain, F. Picard, P. Maribas, S. Lafitte, H. Lemieux, F. Barriault, MF. Seronde, J. and Ph. Labarre) declare no competing interests in relationship with this manuscript. N. Pages is founder and CEO of NP Medical. L. Betito and C. Bedel are employees of NP Medical. S. Nisse-Durgeat was an employee of WeHealth™ *Digital Medicine*/Servier at the time of the study.

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Supplementary materials

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