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ATRIAL FIBRILLATION SCREENING BY INNOVATIVE DEVICE: APPLE WATCH. A PARADIGM SHIFT IN PROPAEDEUTICS?

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Abstract: Atrial fibrillation (AF) is a type of supraventricular tachyarrhythmia that is characterized by disorganized electrical activation of the atria. AF is very prevalent in the clinic, and its consequences overwhelm the public health system. Therefore, its early diagnosis is very important so that the therapeutic approach is efficient and avoids future damage. The Apple Watch series4® (AW4) watch detects AF. With it, it is possible to obtain an electrocardiogram from a lead in just 30s. This research aimed to detect individuals with AF, through the AW4, and thus evaluate its use and viability as a method ofscreening. As well as showing the importance of its introduction in basic health care. For this purpose, a total of 100 patients attended at public health units in Indaiatuba, aged over 65 years, were examined with the watch and a questionnaire related to care and basic health habits was applied to them. The electrocardiograms with AF found by the watch were confirmed with a traditional electrocardiogram. Of the total, 3% had AF and, of these, 66% did not know they had the condition. Also, 66% of them had hypertension controlled by medication and fasting blood glucose was above 120 mg/dl, but only 33% declared themselves diabetic. The findings in this paper have shown that the AW4 is a powerful AF case finding tool and a very important screening method in primary health care, since it is easy, effective, and feasible for doctors to use to diagnose AF.
Keywords: Atrial fibrillation; electrocardiogram; clock

INTRODUCTION

Atrial fibrillation (AF) is a type of supraventricular tachyarrhythmia that is characterized by disorganized electrical activation of the atria. It is a growing medical concern and its consequences translate into a great burden for the public health system worldwide, as it increases medical care costs and unexpected costs for patients (YOUNG, 2019).

The prevalence of AF increases with age due to the aging of the population and the increase in risk factors such as obesity, smoking, diabetes mellitus, sedentary lifestyle, among others (LAU et al., 2017). Patients with cardiac pathologies such as myocardial infarction, heart failure, rheumatic heart disease and valvular disorders are more prone to AF. As well as those who have hyperthyroidism (REDDY et al., 2017) and hypertension (KALLISTRATOS; POULIMENOS; MANOLIS, 2018).

Many people have AF but don't know it because they don't have symptoms. Asymptomatic cases or subclinical AFs are the most worrisome and may go unnoticed in the medical evaluation, as a 12-lead electrocardiogram (ECG) is required for its diagnosis. However, submitting all patients to a traditional ECG to look for this disease becomes impracticable and highly costly, and would require a lot of time. In view of this, screening methods are increasingly viable within medicine as a quantitative methodology for scanning a large population, with lower costs and the speed of a pre-diagnosis (BENJAMIN, 1994).

In the context of the public health system (SUS), the search for a more efficient system that involves greater quality with lower costs has been a constant premise among managers. Thus, disease prevention is sought with the primary aim of saving lives, reducing sequelae and reducing resources spent (IBAÑEZ; VECINA NETO, 2007).

Within the guidelines created for care, for example, conducts are instituted in propaedeutics that precede a clinical consultation, such as measuring blood pressure in order to better understand the patient to be treated and also as a method of

screening for hypertension. Also part of this context are other assessments such as the glycemic index, BMI, pulmonary and cardiac auscultation, search for pathologies with absence or subclinical symptoms (if detected early they can save lives or reduce sequelae and costs for the health system), among other assessments (ROSSANEIS et al., 2011).

However, the search for atrial fibrillation is not part of this screening in the SUS because time, resources, availability of qualified personnel, in addition to special equipment (electrocardiogram), make it unfeasible to submit all patients to a 12-lead electrocardiogram. For this reason, until then, there was no equipment available that could change this reality and be incorporated by health professionals in their routine care without greatly increasing their care, requiring a professional with extra qualification and at a viable cost (SPOSATO et al, 2015).

PerHowever, the recently launched Apple Watch series 4® (AW4) by Apple has the potential to serve as an AF detection screening method, as it made it possible and affordable to perform a single-lead ECG in just 30 minutes. seconds and with its specific software to show the presence of atrial fibrillation without the need for a cardiologist for the result.

This watch can be a powerful tool in the search for new cases of AF, as it has the necessary characteristics for this methodology of being non-invasive, having high specificity and sensitivity, ease of use, speed and low cost. The ability of the ECG application to accurately classify between an ECG recording into AF and sinus rhythm was tested in a clinical trial of approximately 600 subjects and demonstrated a specificity of 99.6% with respect to classification of sinus rhythm and a sensitivity of 98.3 %, for classification of AF in sortable results (APPLE, 2018a)

This device was created with the propinitial purpose of diagnosing the user of the watch, but it has the potential to be used by the doctor in all his consultations as a screening method in an initial assessment of patients treated at an outpatient clinic, making it part of his propaedeutics, being yet another instrument evaluation, considerably expanding the screening of patients with AF, who are often asymptomatic and who go unnoticed in the clinic, thus increasing their diagnostic power, their accuracy in care and possibly the discovery of other heart diseases. The ECG produced by the device can be viewed right after it is performed and in a digital format that is easily shared between doctors (APPLE, 2018b).

In addition to the doctor in the consultation, other professionals such as nursing technicians and nurses who are part of the clinical care circuit in the basic units, the so-called patient classification, can incorporate this tool into their routine, as different from the traditional ECG, which needs extra qualification and demand. of great time for preparing the patient, performing the exam and evaluating the doctor for detection, with the AW4 the execution takes 30 seconds and the result is revealed instantly.

The great ease of execution, low cost and the benefit of an early diagnosis that otherwise would not occur reinforces the great importance of incorporating this therapeutic approach to patients with AF and thus avoid the harmful consequences of this disease in the largest number of patients (PLASEKA; TABORSKY, 2019). Undoubtedly, the introduction of the Apple Watch in primary care, which is responsible for most consultations in Brazil, can significantly facilitate this diagnosis in a large number of patients.

OBJECTIVES

This work aims to detect individuals with atrial fibrillation, and with that, to evaluate

the profile of patients suffering from AF in the region of the city of Indaiatuba, as well as to verify the viability of the clock (AW4) as a screening method and thus, to demonstrate its importance in primary health care.

METHODOLOGY

This research was carried out from December 2019 to February 2020 in the basic units of Indaiatuba, inviting patients who sought care in these units to the ECG exam with the AW4. The research was carried out with people who fit the age category, and who agreed to participate in the research, with the signing of the free and informed term. Exclusion criteria included age less than 65 years. The protocol was approved by the ethics committee (079966/2020). The patients completed a questionnaire with questions related to health disorders, age, sex, race and other relevant information to establish epidemiological data and factors listed in the literature as predisposing or causative indicators of AF. Patients pressed the crown of the watch for 30 seconds for the reading to be recorded at the end of atrial fibrillation, sinus rhythm (SR) or inconclusive. Simultaneously, a PDF of the waveform was generated in the Apple Health app. ECGs were generated and visualized according to the instructions provided by Apple (APLLE, 2018b). The sensitivity and specificity of AF detection were calculated with an interchangeable correlation matrix, with repeated measurements (GENDERS; SPRONK; LESAFFRE, 2012). Statistical analyzes were performed on a total of 400 patients. The sensitivity and specificity of AF detection were calculated with an interchangeable correlation matrix, with repeated measurements (GENDERS; SPRONK; LESAFFRE, 2012). Statistical analyzes were performed on a total of 400 patients. The sensitivity and specificity of AF detection were calculated with an interchangeable correlation matrix, with repeated measurements (GENDERS; SPRONK; LESAFFRE, 2012). Statistical analyzes were performed on a total of 400 patients.

RESULTS AND DISCUSSION

AW4 is capable of detecting AF (DÖRR et al., 2019; MARCUS, 2020; TISON et al., 2018). For the device to record the ECG, patients who placed the watch on their wrist were instructed to press the crown of the AW4 for 30 seconds to read the ECG. At the end of that time, atrial fibrillation (AF), sinus rhythm (SR) or inconclusive results were recorded (Figure 1). The AW4 provides 2 mechanisms for rhythm assessment: an ECG waveform notification/ watch display and a downloadable pdf.

Age is the most important risk factor for AF, being more prevalent in people over 65 years old (KORNEJ et al., 2020). For this reason, the patients chosen for this study were in this age group.

Of the possible heart rhythm assessments, 4% were recorded as inconclusive, 3% FA and 93% RS. All patients who had RS as a result reported that they were never diagnosed with AF. This means that there were no false negatives. In those with inconclusive results, further attempts were made to assess the rhythm, but even so, they remained inconclusive. One of the limitations of the device is that for the detection of AF, the patient's heartbeat cannot exceed 120 ppm and in some situations the reading of the tracings would not allow the conclusion without other derivations. However, the results showed that in most cases, 97%, there was a conclusive reading.

Among the people detected with AF (Table 1), 66% of them had not been diagnosed, until that moment, with fibrillation. For these patients, a 12-lead ECG was performed (Figure 2) (KHURSHID et al., 2020) to

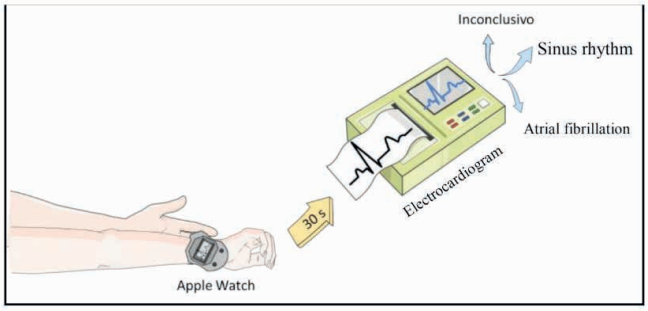

Figure 1: Schematic representation of the use of the Apple Watch in the electrocardiogram

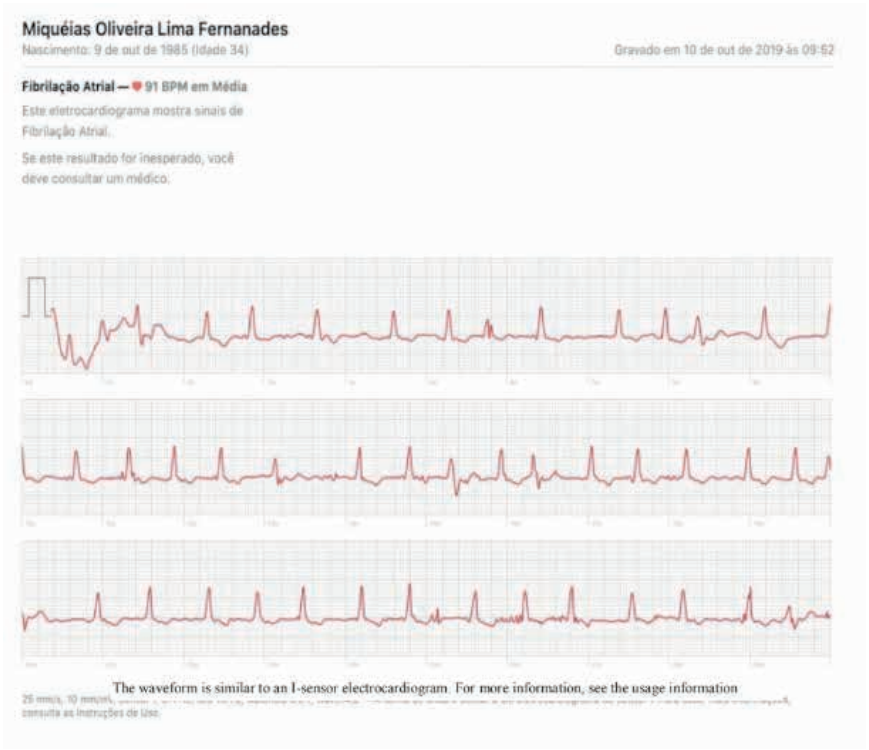

Figure 2: One of the examples of the report produced by the watch at the end of an evaluation.

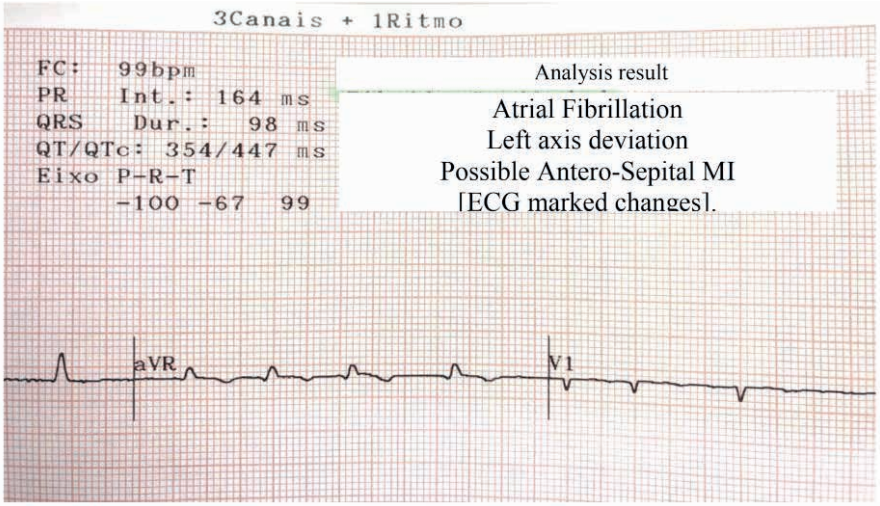

Figure 3: One of the examples of an electrocardiogram for confirming the diagnosis using the watch

confirm the AFs detected by the AW4 (Figure 3), and in all cases the confirmation was positive, fulfilling the screening role that it is the previous diagnosis and then confirmation by gold standard examination. In fact, studies have reported the success of this device for diagnosing AF, showing that this screening method is sensitive and specific (SESHADRI et al., 2020). In addition, these results show the importance of this method as a screening method in basic health care, as it alerted patients who were not aware that they were suffering from AF to seek help from a specialized health professional and thus,

In the present study, a fact that drew attention was the high glycemic level of the analyzed patients. Of the total number of patients, 31% had fasting blood glucose above 120 mg/dl and, of this group, 40% said they were not aware of having diabetes mellitus (DM). It is known that DM is correlated with an increased risk of AF (WANG et al., 2019) and that higher blood glucose levels are also associated with an increased risk of AF (HUXLEY et al., 2011).

Among the patients who had AF detected by the watch (Table 1), 65% had fasting blood glucose above 120 mg/dl and were unaware of having DM. The others diagnosed with AF (34%) claimed to have DM but were in the group of people diagnosed with AF but who did not know they had this hyperglycemic condition at that time. Of this group of detected patients, 66% were unaware that they had AF and the disclosure of this condition in all patients was a reason for surprise and concern about the condition, encouraging them to seek specialized care. Once again, one can see the importance of an early diagnosis of AF, and how important it is that this is done quickly, easily and accurately, as with the use of the AW4.

A recent review (WANG et al., 2019) was able to establish a correlation between DM and AF, showing that uncontrolled DM can trigger the onset of fibrillation symptoms and increase the risk of cardio and cerebrovascular events. They established the pathophysiology through electrical autonomic remodeling of the heart by glycemic fluctuation generating oxidative stress, which associated with inflammation would cause this electrical remodeling at first with perpetuation through cardiac structural remodeling. These findings corroborate the results found as a high rate of patients detected at the time of the assessment did not have their glycemic index under control and that AF is associated with DM (MENA-VILLALBA et al., 2014).

High blood pressure significantly contributes to the incident of AF (ALLAN et al., 2017; KRIJTHE et al., 2013). Among those diagnosed with AF (Table 1), 63% reported having high blood pressure controlled by medication and of these, 25% had blood pressure above the recommended level at the time of the assessment. Patients who reported hypertension control did so with medication, however, as they were diagnosed with AF at the time of the research, it is not possible to determine whether AF was present before or after AF.

Although antihypertensive treatment can reduce the risk of morbidity and mortality, there is controversy regarding the incidence of AF due to its use, but the study showed that some classes, such as calcium blockers, in the 75 years or older group, mainly in women, statistically showed were protective against AF and diuretics were shown to be protective in all hypertensive patients. Of the patients diagnosed with AF, arterial hypertension and using hypertensives, 20% used the diuretics class, however, as these patients were included in the group of those who were not aware of AF, it is not possible to associate the protective factor or not because it is not known. the primarity of hypertension or AF (MENA-

VILLALBA et al., 2014).

All patients diagnosed with AF without being aware of their condition, because they had not been diagnosed previously (either because they did not have symptoms or for other reasons), would be unlikely to seek a health professional for this disorder and, probably, their health condition would deteriorate and seeking help could be too late. Again we can see the contribution to the use of a quick, easy and effective method to detect AF as is the case with AW4.

	Patients with AF (%)
I didn't know they had FA	66
Glycemia > 120 mg/dl	65
diabetes mellitus	34
Hypertension	63
using diuretics	20

Table 1: Percentage of AF patients with risk factors

FINAL CONSIDERATIONS

This work was able to achieve its objectives insofar as it showed the feasibility of using the AW4 within the context of basic health units, with its incorporation by the care team being perfectly possible in patient assessments. The results achieved show the diagnostic potential and screening capacity of the device in atrial fibrillation screening where, in a considerable percentage of the findings, patients were not aware of their fibrillation and would not be diagnosed otherwise.

The application technique proved to be very simple in practice, with a very satisfactory total approach time to the patient, which contributes to adherence to incorporation into the routine of health workers, inside the propertyIn terms of patient care when dealing with an asymptomatic patient for AF, no diagnostic method is recommended, therefore, by incorporating this screening mechanism, we will be facing a break in the paradigms of approaching asymptomatic patients for AF.

Therefore, the findings in this work showed that the AW4 is a powerful tool in the search for AF cases and a method ofscreening is very important in basic health care, since its use is easy, effective and feasible for doctors to diagnose AF.

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