Pregled utjecaja obrazovanja na usvajanje pametnih tehnologija za detekciju fibrilacije atrija

A Review of the Impact of Education on the Adoption of Smart Technologies for Atrial Fibrillation Detection

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SAŽETAK: Cilj je ovoga preglednog članka bio istražiti ima li obrazovanje utjecaja na pojavu fibrilacije atrija (AF, prema engl. *atrial fibrillation*), kao i implementaciju pametne tehnologije za otkrivanje ove bolesti. Prikupljeni su podatci o povezanosti razine obrazovanja i pojave AF-a, te o pametnim uređajima za njegovu detekciju. Niža razina obrazovanja povezana je s povećanim rizikom od AF-a. Imajući to na umu, jednostavno je razumjeti jasnu korelaciju između razine obrazovanja i AF-a, kao i usvajanje detekcije pametnim uređajima i kako to može poboljšati prognozu bolesti. Ljudi s višom razinom obrazovanja razumiju i prihvaćaju pojam uporabe pametnih uređaja za otkrivanje i sprječavanje AF-a; oni također imaju smanjenu prevalenciju AF-a od onih s nižim stupnjem obrazovanja.

SUMMARY: The main objective of this review was to investigate whether educational attainment has an impact on the occurrence of atrial fibrillation (AF) as well as the implementation of smart technology to detect this condition. Data on the relationship between education level and the occurrence of AF were collected, as well as data on smart devices for detecting AF. A lower level of education has been linked to an increased risk of AF. With this in mind, it is easy to explain the clear correlation between education level and AF, as well as the adoption of smart device detection and how it may improve illness prognosis. People with a higher level of education understand and embrace the notion of employing smart devices to detect and prevent AF; they also have decreased AF prevalence compared with those with a lower level of education.

KLJUČNE RIJEČI: fibrilacija atrija, pametni uređaj, detekcija, aritmija, edukacija.

KEYWORDS: atrial fibrillation, smart device, detection, arrhythmia, education.

Uvod

Fibrilacija atrija (AF, prema engl. *atrial fibrillation*), supraventrikularna tahiaritmija, nastaje kao rezultat nepravilne električne aktivnosti atrija i neučinkovitih kontrakcija atrija.[1,2] Niži socioekonomski status (SES) povezan je s lošijim tjelesnim zdravljem već stotinama godina.[3-5] Ovaj se pregledni članak usredotočuje na utjecaj SES-a na obrazovanje i na prevalenciju AF-a. Nadalje, prikazani su podatci koji upućuju na kliničku važnost AF-a, otkrivanje bolesti pametnim uređajima i jaku vezu između obrazovanja i kardiovaskularnih bolesti (KVB), posebice AF-a, kao i utjecaj obrazovanja na otkrivanje AF-a pametnim uređajem.

Introduction

Atrial fibrillation (AF), a supraventricular tachyarrhythmia, is defined by erratic electrical activity of the atrium and resulting ineffectual atrial contractions.[1,2] Lower socioeconomic status (SES) has been linked to poorer physical health for hundreds of years.[3-5] In terms of SES, this review focuses on its impact on education and on the prevalence of AF. Furthermore, data indicating the clinical relevance of AF, smart device detection of AF, and a strong link between education and cardiovascular disease (CVD), particularly AF, is described herein, as is the influence of education on smart device detection of AF.

AF je primarni uzrok mortaliteta i morbiditeta u mnogim zapadnim industrijaliziranim zemljama. Klinički se može pojaviti kao bolest bez simptoma, ali i kao moždani udar (MU).[6] AF je jedna od najčešćih aritmija u odraslih osoba.[7] Ovaj poremećaj ritma srca povezan je s lošijom kvalitetom života, većim rizikom od zatajivanja srca, embolijskim događajima i 30 % većim rizikom od smrti.[7,8] AF pogađa 1 – 2 % populacije.[9] Predviđa se da će učestalost ove aritmije rasti tijekom sljedećeg desetljeća kako populacija stari i čimbenici rizika rastu.[9] Procjenjuje se da će AF utjecati na 14 – 17 milijuna osoba u Europskoj uniji do 2030.[10]

Rano prepoznavanje i prevencija ključni su čimbenici koji jasno utječu na zdravlje, a potom i odgovarajuća terapija. Za potvrdu dijagnoze AF-a prijeko je potreban 12-kanalni elektrokardiogram (EKG).[11] Novi uređaji kojima upravlja bolesnik poput narukvica, pametnih telefona i pametnih satova (nakon kojih slijedi verifikacija EKG-om) mogu otkriti AF, koja je obično paroksizmalna ili bez simptoma. Nekoliko istraživanja koje su u tijeku također ispituju prednosti ranoga prepoznavanja AF-a i utvrđuju poboljšava li to ishode bolesti.[12]

U cijelome svijetu gotovo 20 milijuna pojedinaca koristi se mobilnim zdravstvenim uređajima, a taj se broj svakim danom povećava.[13,14] Prema istraživanju, 27 % ljudi starijih od 65 godina u Europi posjedovalo je pametni telefon u 2014. godini.[14] Ovakvi pametni uređaji i softveri povećavaju izglede za bržu dijagnozu i praćenje AF-a, što je stanje koje najčešće pogađa starije osobe i koje je u porastu. Posljedično tomu, AF se može ranije identificirati, što omogućuje rano uzimanje lijekova i, samim time, smanjenje komplikacija i ukupnih troškova liječenja.

Ovaj pregledni članak istražuje utjecaj obrazovanja na uporabu pametne tehnologije za dijagnosticiranje AF-a i općenito na njegovu pojavu, a smatra se da oni s nižim obrazovanjem imaju veću vjerojatnost za razvoj AF-a. Imajući sve ovo na umu, lako je razumjeti jasnu korelaciju između razine obrazovanja i AF-a, kao i shvatiti koristi od detekcije pametnim uređajima i način na koji to može utjecati na ishod bolesti.

Klinička perspektiva fibrilacije atrija

Fibrilacija atrija velik je problem za zdravstvene sustave diljem svijeta jer je riječ o vrlo raširenoj aritmiji koja je povezana sa znatnim pobolom i smrtnošću te o glavnom uzroku MU-a.[15,16]

Zbog nepravilna električnog provođenja preko atrioventrikularnog (AV) čvora i ventrikularnog odgovora koji definiraju AF, vremenski niz RR intervala i ventrikularni odgovor su nepredvidljivi.[17,18] RR intervali tijekom epizoda AF-a mogu se modelirati probabilistički, pa stoga nisu posve neočekivani.[19] Dokazano je da se RR intervali mogu rabiti za otkrivanje događaja AF-a, a predloženi su brojni pristupi.[18] Ti pristupi primarno ovise o izdvajanju obilježja iz vremenskih serija RR intervala, koje predočuju nepredvidljivu prirodu otkucaja srca.[18]

Iako se može činiti jednostavnom, primjena ove ideje u kliničkoj praksi pokatkad može biti teška. Jedno od bitnih obilježja AF-a jesu nepravilni RR intervali, a, da bi se ono otkrilo, mora biti očuvano AV provođenje. Ako se P-valovi pojavljuju u više odvoda EKG-a u isto vrijeme i imaju istu morfologiju, AF nije vjerojatna dijagnoza. Naprotiv, promjena morfologije P-valova i varijabilni intervali između uzastopnih P-valova upućuju na mogućnost AF-a.[1,2]

AF is the primary cause of mortality and morbidity in many Western industrialized countries. It occurs clinically as silent heart disease and stroke.[6] AF is one of the most common arrhythmias in adults.[7] This cardiac rhythm disorder is linked with worse quality of life, higher risk of heart failure, embolic events, and a 30% increased risk of death.[7,8] AF affects 1-2% of the population.[9] The incidence of this arrhythmia is projected to rise over the next decade as the population ages and risk factors increase.[9] It is estimated that AF will affect 14-17 million individuals in the European Union by 2030.[10]

Early identification and prevention are crucial factors that clearly affect health, followed by the appropriate use of therapy. The application of an electrocardiogram (ECG) is essential to confirm the diagnosis of AF.[11] New patient-operated devices such as wristbands, smartphones, and smart watches (followed by ECG verification) may also be used to detect AF, which is typically paroxysmal or quiet. Several ongoing studies are also examining the benefits of early AF identification and whether it improves disease outcomes.[12]

Worldwide, almost 20 million individuals use mobile health devices, and the number is growing every day.[13,14] According to research, 27% of people over 65 in Europe possessed a smartphone in 2014.[14] These smart devices and software provide strong prospects for faster diagnosis and monitoring of AF, which is a condition that most frequently affects the elderly and is on the rise. Consequently, AF can be identified earlier, enabling early introduction of medication and, consequently, a decrease in complications and total treatment costs.

This review investigates the influence of education on the use of smart technology for AF diagnosis and on AF occurrence in general, given that those with less education are more likely to acquire AF. With all of this in mind, it is easy to explain the clear correlation between education level and AF as well as smart device detection uptake and how it might influence disease outcomes.

A clinical perspective on atrial fibrillation

Considering that it is a highly prevalent dysrhythmia and the main cause of strokes, and is linked to considerable morbidity and death, AF poses a serious problem for healthcare systems throughout the world.[15,16]

Owing to the erratic electrical conduction via the AV node and ventricular response that define AF, the RR interval time series and ventricular response are unpredictable.[17,18] The RR intervals during AF episodes may be modeled probabilistically, and are therefore not entirely unexpected.[19] It has been demonstrated that RR intervals may be used to detect AF events, and numerous approaches have been suggested.[18] These approaches primarily depend on the extraction of characteristics from an RR interval time series that represent the unpredictable nature of the heartbeat.[18]

Despite perhaps appearing simple, applying this idea in clinical practice can be difficult at times. Irregular RR intervals are one of the essential characteristics of AF, and AV conduction must be preserved for them to be detected. If P waves appear in multiple leads at the same time and have the same morphology, AF is not a likely diagnosis. On the contrary, changing P morphology and variable intervals between the successive P waves indicate possible AF.[1,2]

Ono što je počelo kao jednostavni ektopični otkucaji može, zbog višestrukih čimbenika rizika (kao što su obrasci ponašanja i komorbiditeti), napredovati do formiranja krugova ponovnog ulaska koji kulminiraju u AF-u.[20] AF karakteriziraju iznimno varijabilni valovi ekscitacije koji se nalaze u objema pretklijetkama. Kaotični impulsi ometaju normalan proces depolarizacije i repolarizacije srca, onemogućujući normalnu, ritmičnu kontrakciju stijenki atrija. Kao rezultat toga, ventrikuli su aritmični i primaju izuzetno neredovitu stimulaciju iz atrija kroz AV-čvor. U rasponu od 60 do 130 otkucaja u minuti, pojavljuju se vrlo nestalne frekvencije klijetki. Palpitacije nastaju kada srce preskoči otkucaj i izgubi sinkronizirano djelovanje kao rezultat AF-a.[21,22]

Fibrilacija atrija i moždani udar

Fibrilacija atrija kao najčešća perzistentna aritmija srca uzrokuje kliničke manifestacije i značajan porast troškova.[23] Između jedan i dva posto osoba pati od ovog poremećaja srčanog ritma.[24] Zabilježeno je da je oko 6 milijuna osoba u Europi doživjelo ovu aritmiju, dok je globalno pogođeno oko 30 do 100 milijuna osoba. Osobe starije 65 i više godina najviše su pogođeni ovim stanjem.[25] U sljedećih deset godina, predviđa se da će prevalencija AF rasti kako stanovništvo stari i čimbenici rizika rastu.[24] Očekuje se da će se do 2030. u oko 15,5 milijuna osoba u Europskoj uniji razviti AF. Svake se godine očekuje 120 000 do 155 000 preliminarnih dijagnoza.[26]

Ishemijski MU potencijalno je smrtonosna posljedica AF-a.[27,28] Smatra se da je AF čimbenik koji pridonosi pojavi oko 20 % MU.[2] Klinički alat poznat kao CHA_2DS_2-VASc bodovna ljestvica stvoren je za procjenu rizika od ishemijskoga MU u bolesnika s AF-om, kao i za usmjeravanje primjene oralnih antikoagulacijskih lijekova (OAK), za koje se pokazalo da smanjuju rizik od ishemijskog MU.[2,27,29]

Liječenje tromboembolijskoga MU čini znatan dio zdravstvenih troškova povezanih s AF-om, koji ukupno iznose više od jedan posto zdravstvenih troškova Ujedinjenoga Kraljevstva.[30] U općoj populaciji AF je povezana s četiri do pet puta većim rizikom od MU-a, a smatra se da je glavni uzrok 15 % svih MU. Važno je napomenuti da se taj postotak naglo povećava s godinama.[20,21] U usporedbi s bolesnicima s MU bez AF-a, oni s ishemijskim imali su mnogo veću prevalenciju AF-a (gotovo 25 %). To je bilo povezano s duljim bolničkim liječenjem, većim pobolom, povećanim stopama recidiva i višim stopama smrtnosti.[31,32] Primjetno je da izostanak određenih simptoma (kao što je lupanje srca) ne odražava smanjeni rizik od tromboze. Bolesnici s paroksizmalnom ili perzistentnom AF imaju jednaku vjerojatnost da će doživjeti MU kao i oni s trajnom fibrilacijom atrija.[30]

Detekcija fibrilacije atrija s pomoću pametnih uređaja

Pametni uređaji temeljeni na EKG-u ili fotopletizmogramu često se uporabljuju u zdravstvenoj industriji. Oni se mogu pojaviti u obliku kućišta za pametni telefon, narukvice, pametnog sata ili čak samo kao dodatni algoritam i softver mogu transformirati trenutačni hardver pametnog telefona u alat za detekciju AF-a.[33,34] Od svih ovih uređaja, pametni je sat onaj o kojemu se najčešće govori u medicini i predmet je istraživanja pametnih uređaja za detekciju AF-a.[35]

What started as simple ectopic beats may, due to the multiple risk factors (such as behavioral patterns and comorbidities), progress to the formation of re-entry circuits that culminate in AF.[20] AF is characterized by extremely variable excitation waves found in both atria. The chaotic impulses disrupt the normal process of cardiac depolarization and repolarization, making it impossible for the normal, rhythmic contraction of the atrial walls to occur. As a result, the ventricles are arrhythmic and receive extremely erratic stimulation from the atria through the AV node. At a range of 60 to 130 beats per minute, very erratic chamber frequencies occur. Heart palpitations are experienced when the heart skips a beat and loses its synchronized action as a result of AF.[21,22]

Atrial fibrillation and stroke

Clinical occurrences and costs have significantly increased in correlation with the most commonly persistent cardiac arrhythmia, AF.[23] Between one and two percent of people suffer from this cardiac rhythm disorder.[24] Around 6 million people in Europe alone have been reported to experience this cardiac arrhythmia, and around 30 and 100 million people are thought to be impacted globally. Most of the time, those 65 years of age and above are the population group that is most afflicted by this condition.[25] Over the following ten years, it is anticipated that the prevalence of this cardiac arrhythmia will rise as the population ages and risk factors increase.[24] By 2030, around 15.5 million individuals in the European Union are expected to develop AF as a result. Every year, 120,000 to 155,000 preliminary diagnoses are anticipated.[26]

Ischemic stroke is a potentially lethal consequence of AF.[27,28] AF is thought to be a contributing factor in about 20% of strokes.[2] A clinical tool known as the CHA_2DS_2-VASc score was created to evaluate ischemic stroke risk in patients with AF and to direct the administration of oral anticoagulation (OAC) medication, which has been shown to reduce the risk of ischemic strokes.[2,27,29]

The treatment of thromboembolic stroke accounts for a sizable portion of the healthcare expenses related to AF, which total more than one percent of United Kingdom healthcare expenditures.[30] In the general population, AF is linked to four to five times increased risk of stroke, and it is thought to be the root cause of 15% of all strokes. Importantly, this percentage rises sharply with age.[20,21] When compared to patients with stroke but without AF, patients with ischemic stroke had a considerably greater prevalence of AF (nearly 25%), which was associated with lengthier hospital stays, more morbidity, increased rates of stroke recurrence, and higher fatality rates.[31,32] Notably, certain symptoms being absent (such as palpitations) did not reflect a decreased risk of thrombosis. Patients with paroxysmal or persistent AF were just as likely as those with permanent AF to suffer a stroke.[30]

Detection of atrial fibrillation using smart devices

Electrocardiogram or photoplethysmogram-based smart devices are often used in the healthcare industry. These may be in the form of a smartphone case, wristband, smartwatch, or even only as an additional algorithms and software that can transform current smartphone hardware into a tool for AF detection.[33,34] Of all these gadgets, a smartwatch is the one that is most frequently discussed in healthcare and the subject of smart device research for the detection of AF.[35]

U kasnim 90-im godinama prošloga stoljeća, podržavanjem *quantified self* pokreta, pametni su satovi postali popularni kao dio kategorije nosivih tehnologija i pametnih zdravstvenih sustava.[36] Spomenuti pokret nastojao se usredotočiti na bolesnika u procesu pružanja zdravstvene skrbi. Nosiva tehnologija, poput pametnih satova, koja korisnicima omogućuje kontinuirano praćenje podataka o svojem zdravlju tijekom normalnih aktivnosti ili čak i tijekom spavanja, bila je jedan od instrumenata koji to omogućuje.[36] Štoviše, uporaba takvih pametnih uređaja pruža mogućnost dugotrajnog bilježenja vitalnih znakova izvan bolničkog okruženja.[37]

Općenito, pametni uređaji mogu promijeniti način na koji se zdravstveni podatci isporučuju prevladavanjem svakodnevnih ograničenja s kojima se suočavaju pružatelji zdravstvenih usluga i primjenom tehnika koje mogu otkriti događaje koji se ne pojave tijekom osobnih posjeta.[38,39] Razvojem pametnih uređaja, kardiologe posebno zanima mogućnost kontinuiranoga praćenja ritma, otkucaja srca i trajnih neinvazivnih aritmija.[40,41] Usto, usvajanje pametnih satova i drugih pametnih naprava za dijagnozu AF-a imat će koristi od dolaska 5G tehnologije i odgovarajuće povećane povezivosti.[36]

Neka od ograničenja uporabe pametnih uređaja za identifikaciju AF-a jesu: trajanje baterije pametnih satova je ograničeno i često ih je potrebno puniti svaki dan. Kao rezultat toga, manje se vremena provodi u nošenju i nadziranju. Na primjer, može biti teško otkriti kratke i asimptomatske događaje jer većina postojećih metoda za otkrivanje AF-a s pomoću pametnog sata zahtijeva aktivno sudjelovanje bolesnika.[42,43] Zbog činjenice da su pametni satovi još uvijek relativno nove tehnologije, da bi se osigurala povjerljivost snimljenih zdravstvenih informacija, potrebno je prevladati nekoliko pravnih problema koji se tiču sigurnosti podataka.[43,44]

Socioekonomski status i njegov utjecaj na pojavu i identifikaciju fibrilacije atrija s pomoću pametnih uređaja

Općenito je utvrđeno da je veći rizik od KVB-a povezan s nižim SES-om.[45] U nekoliko je istraživanja zaključeno da oni s boljim SES-om imaju manju učestalost AF-a.[46,47] Unatoč tomu, veći dohodak i razina obrazovanja bili su povezani s nižim rizikom od razvoja AF-a u mladih ljudi, ali je veza slabjela odmakom u dobi i gotovo nije postojala u starijih demografskih skupina.[48]

Proučavanje socioekonomskih čimbenika za nastanak AF-a nudi priliku za poboljšanje zdravlja bolesnika s AF-om. Na identifikaciju, procjenu, liječenje i kontrolu AF-a uvelike utječu socioekonomske varijable, etnička i rasna pripadnost, financijska sredstva, područje stanovanja i ruralnost, poznavanje jezika, zdravstvena pismenost i socijalna podrška i sve su to čimbenici koje treba uzeti u obzir.[49]

Kao što je već navedeno, zagovara se češći nadzor nad bolesnicima, a kontinuirani je nadzor najbolja metoda prevencije MU-a i AF-a.[27] Pametni su uređaji savršen alat za rješavanje ovoga problema.[35] Također postoje uvjerljivi dokazi o digitalnom jazu među ljudima s različitim etničkim i rasnim podrijetlima, kao i povezanosti s dobi, prihodima, zanimanjem, razinom obrazovanja i SES-om.[50] Na primjenu pametnih uređaja i digitalnih tehnologija općenito utječu svi ovi aspekti, a to se, naravno, odnosi i na uporabu pametnih uređaja za detekciju AF-a.

In the late 1990s, spurred by the "quantified self" movement, smartwatches became popular as part of the category of wearable technologies and smart health systems.[36] The "quantified self" movement sought to focus on the patient in the process of providing healthcare. Wearable technology, such as smartwatches, which allow users to continually track their health information during normal activities or even sleep, was one of the instruments that would have made that possible.[36] Moreover, using these smart devices enables prolonged vital sign recording outside of the hospital setting.[37]

In general, smart devices may alter how health data is delivered by overcoming the everyday constraints faced by healthcare providers and using techniques that can detect occurrences that do not take place during in-person visits.[38,39] Cardiologists are particularly interested in the ability to continuously monitor heart rhythm, heart rate, and persistent non-invasive arrhythmias, thanks to the development of smart devices.[40,41] Additionally, the adoption of smartwatches and other smart gadgets for the diagnosis of AF will benefit from the arrival of 5G technology and the corresponding increased connection speed.[36]

The following are some restrictions on the smart devices used for the identification of AF: the battery life of smartwatches is limited, and they frequently need to be charged every day. As a result, less time is spent wearing the device and being monitored. It might also be difficult to detect brief and asymptomatic events of dysrhythmias, for instance, because the majority of existing methods for the detection of AF using a smartwatch require the patient's active participation.[42,43] Due to the fact that smartwatches are still relatively new technologies, several legal concerns relating to data security still need to be overcome to secure the confidentiality of the recorded health information.[43,44]

Socioeconomic status and its influence on atrial fibrillation occurrence and identification using smart devices

It has been generally established that a higher risk of CVD is linked to poorer SES.[45] Several studies concluded that those with better SES had lower incidences of AF.[46,47] Nonetheless, higher income and education levels were linked to a lower risk of developing AF in young people, but the connection weakened with advancing age and was nearly nonexistent for the older demographic.[48]

Studying the socioeconomic factors of AF offers a chance to improve the health of patients with AF. The identification, assessment, treatment, and management of AF are heavily influenced by socioeconomic variables: ethnicity and racial background, financial means, area of residence and rurality, language proficiency, health literacy, and social support are all factors to consider.[49]

As was already noted, more frequent patient monitoring is advised, and continuous monitoring is the best method for preventing stroke and AF.[27] Smart devices are the perfect tool to tackle this issue.[35] Nonetheless, there is also compelling evidence of a digital gap across different ethnic and racial backgrounds, as well as intersections of gaps in age, income, occupation, education level, and SES.[50] The usage of smart devices and digital technologies in general are influenced by all of these aspects, and this of course applies to the use of smart devices for AF detection as well.

Utjecaj edukacije na pojavu i prepoznavanje fibrilacije atrija s pomoću pametnih uređaja

Nekoliko je istraživanja pokazalo da je obrazovanje utjecalo na udio identificiranja AF-a pametnim uređajem, kao i da su osobe s višim obrazovanjem imale smanjenu pojavu AF-a, dok su one s nižim obrazovanjem imale veću pojavu AF-a.

Mnoga istraživanja pokazuju kako su pušenje cigareta, dislipidemija i arterijska hipertenzija čimbenici rizika za KVB, te da je to povezano s razinom obrazovanja.[51-53] Prema nalazima jednog od tih istraživanja, ponašanja koja utječu na čimbenike rizika za KVB višestruka su i dobro uspostavljena, a često su ojačana tradicijom, kulturom i kontinuiranim marketingom.[51] Također se ukazuje da na njih vjerojatno neće znatno utjecati samo glavni mediji. Osim toga, pojedinačna poduka i poticanje imaju dugu evidenciju neadekvatnosti, osobito kada je riječ o dugoročnim promjenama u navikama prehrane i pušenja.[51] Nadalje, postoji pesimizam u pogledu potencijala javnog obrazovanja da promijeni zdravstveno ponašanje. Sve to dovodi do zaključka da je stvarna razina obrazovanja temelj poznavanja i spremnijega prihvaćanja izbora zdravog načina života.[51,54]

Štoviše, učestalost KVB-a, kao što je to AF, uvelike ovisi o brzom terapijskog unosu. Napredak u farmakološkoj terapiji uvelike je poboljšao ishod bolesnika s KVB-om u posljednjim desetljećima.[55,56] U osoba s AF-om primjena novih OAK-a smanjila je rizik od MU.[55,57,58] Da bi liječenje bilo učinkovito, bolesnici moraju redovito uzimati lijekove.[59-62] Oni koji stalno uzimaju lijekove razlikuju se od onih koji ih ne uzimaju u pogledu drugih čimbenika rizika za smrtni ishod.[63-66] Redovito uzimanje lijekova također je povezano sa stupnjem obrazovanja, pri čemu će oni s višim stupnjem obrazovanja vjerojatnije prepoznati potrebu za redovitim uzimanjem lijekova i to i učiniti.[64-66]

Pametni su telefoni na rubu preuzimanja naših svakodnevnih zadataka u osobnom i poslovnom životu.[67-69] Nadalje, istraživanja pokazuju da su oni s višom razinom obrazovanja skloniji uporabi pametne tehnologije.[70,71] Pametna tehnološka rješenja razvijena su i testirana kako bi se povećalo pridržavanje lijekova i praćenje bolesti u širokom rasponu demografskih skupina bolesnika.[72-75] Ova su rješenja definirana uporabom tehnologije, uglavnom pametnih telefona, tableta i računala, za daljinsko praćenje i poduku bolesnika kako bi se povećali njihova adherencija i praćenje.[75,76] Niska cijena ovakvih sustava, kao i primjena postojeće tehnologije i jednostavnost uporabe, sve su to prednosti njihove primjene.[55,77,78]

Zaključak

U osoba s višom razinom obrazovanja i SES-om manja je vjerojatnost nastupa AF-a i vjerojatnije je da će se one koristiti pametnim uređajima. Kao rezultat toga, veća je vjerojatnost da će te osobe biti identificirane i dobiti brzo liječenje, izbjegavajući sve izazove koje donosi asimptomatska AF. Više razine obrazovanja također su povezane sa smanjenom učestalošću AF-a, vjerojatno zbog veće informiranosti, višega stupnja obrazovanja i prihvaćanja zdravijeg načina života. Ako više osoba bude upoznato s prednostima uporabe pametnih uređaja za otkrivanje AF-a, više će ih to učiniti, povećavajući mogućnost ranog otkrivanja AF-a i sprječavajući smrtne slučajeve i morbiditete povezane s moždanim udarom.

Impact of education on atrial fibrillation occurrence and identification using smart devices

Several studies found that education influenced the proportion of AF identified with a smart device, as well as that patients with higher education levels had a decreased incidence of AF, while patients with lower education levels had a higher incidence of AF.

Many studies demonstrated that cigarette smoking, dyslipidemia, and hypertension are all risk factors for CVD, and how this is related to education level.[51-53] According to the findings one study, the behaviors that impact risk factors for CVD are multifaceted and well-established, and they are frequently strengthened by traditions, culture, and continuous marketing.[51] Thus, the authors suggest that they are not likely to be considerably impacted by mainstream media alone. Additionally, face-to-face training and exhortation have a lengthy record of inadequacy, particularly when it comes to long-term changes in eating and smoking habits.[51] Furthermore, there is pessimism regarding the potential of public education to modify health behavior. All of this leads to the conclusion that overall education level is the foundation of understanding and being more receptive to embracing healthy lifestyle choices.[51,54]

Moreover, the incidence of CVD, such as AF, highly depends on regular therapeutic intake. Advances in pharmacological therapy have greatly improved the outcomes of patients with CVD in recent decades.[55,56] In people with AF, new OACs have lowered the risk of stroke.[55,57,58] In order for treatment to be effective, patients must take their medications on a regular basis.[59-62] The patients who take medications consistently differ from those who do not in terms of other risk factors for death.[63-66] Regular medication intake is also associated with education level, with those with a higher level of education being more likely to recognize the need for taking medicine regularly and doing so.[64-66]

Smartphones are on the verge of taking over our everyday tasks in both our personal and professional lives.[67-69] Furthermore, research has shown that those with a higher level of education are more inclined to use smart technology.[70,71] According to this study and others, smart technology solutions have been developed and tested to increase medication adherence and disease monitoring across a wide range of patient demographics.[72-75] These solutions are defined by the use of technology, mostly smartphones, tablets, and computers, to remotely monitor and train patients in order to increase their adherence and monitoring.[75,76] The low cost of these systems, as well as the use of existing technology and ease of use, are all benefits of employing them.[55,77,78]

Conclusion

Individuals with higher education levels and SES are less prone to AF and more likely to use smart devices. As a result, AF in these individuals would be more likely to be identified and receive prompt treatment, avoiding all the challenges brought on by silent AF. Higher levels of education are also associated with a reduced incidence of AF, probably due to being more informed, being knowledgeable, and healthy lifestyle acceptance. If more people are made aware of the advantages of utilizing smart devices for AF detection, more people will do so, increasing the possibility that AF will be detected early and preventing all of the fatalities and morbidities related to stroke.

A Review of the Impact of Education on the Adoption of Smart Technologies for Atrial Fibrillation Detection

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