Poster

Using Artificial Intelligence to Measure and Optimize Adherence in Patients on Anticoagulation Therapy

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Abstract

Background: The introduction of direct oral anticoagulants (DOACs), while reducing the need for monitoring, have also placed pressure on patients to self-manage. Suboptimal adherence goes undetected as routine laboratory tests are not reliable indicators of adherence, placing patients at increased risk of stroke and bleeding.

Objective: To evaluate an artificial intelligence (AI) platform that visually confirms medication ingestion on smartphones in elderly stroke patients on anticoagulation therapy.

Methods: A randomized, parallel-group, 12-week study was conducted in adults (N=28) with a recently diagnosed ischemic stroke. Patients were randomized to daily monitoring by the AI platform (intervention) or to no daily monitoring (control). The AI app visually identified the patient and the medication and confirmed ingestion. Adherence was measured by pill counts and plasma sampling in both groups.

Results: For all patients (N=28), mean age was 57 (SD 13.2) years and 53.6% were female. Mean cumulative adherence based on the AI platform was 90.5% (SD 7.5%). Plasma drug concentration levels indicated that adherence was 100% (15 of 15) and 50% (6 of 12) in the intervention and control groups, respectively, and mean cumulative pill count adherence was 97.2% (SD 4.4%) and 90.6% (SD 5.8%), respectively.

Conclusions: Patients, some with little experience using a smartphone, successfully used the technology and demonstrated a 67% absolute improvement in adherence to DOACs based on plasma drug concentration levels. Real-time monitoring has the potential to increase adherence and change behavior, particularly in patients on DOAC therapy.

ClinicalTrial: Clinicaltrials.gov NCT02599259; https://clinicaltrials.gov/ct2/show/NCT02599259 (Archived by WebCite at http://www.webcitation.org/6n6GS3vQ3).

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KEYWORDS

artificial intelligence; smartphone; adherence; stroke; medical informatics; mobile-phone app

This poster was presented at the Connected Health Symposium 2016, October 20-21, Boston, MA, United States. The poster

is displayed as an image in Figure 1 and as a PDF in Multimedia Appendix 1.



IPROCEEDINGS

Figure 1. Poster.

ACKGROUND	Pigure 1. Al Platform Used in the Study					Adherence Measures • Mean jatendard deviation (SCI) cumulative adherence rates based on visual confirmation of drug ingestion				of drug ingestion	A total of 21 subjects were deemed adherent (77.8%), based on drug concentration levels (warfarin and DOACa), Within the control group, 6/12 (20%) subjects were marked as adherent, compared to 15/15 (100%) for subjects using the AP Justeinen, Amorg subjects on DOAC beaps only, 13/14 (36) were adherent; 39			DISCUSSION
The ALT ALL ALL ALL ALL ALL ALL ALL ALL ALL						Memory				2% (K.4%) Ive a similar 1.003, suggesting	B. St. Herner and State Sta		 general de la contra de la cont	 The strain of the strain of the
Los healthcare protessionals must rely on less effective monitoring or no monitoring at all. The Sai Intelligence (A) Platform (KCare, New York, NY) uses antificial intelligence to insulty confirm unition ingestion (Figure 1) using software that care be downloaded as an application onto any mobile is. Software applications dwertly the platest, the drug, and confirm ingestion. Encrypted data are were to software applications.													33.30%	
oud based dashboards for real-line monitoring and interventory, missed doses, late doses, or incorrect age immodiately trigger alorts.	Early terminated, no1 Al Platlane, n=15 Control = 273		0 100 1010 100 2000 2000						CONCLUSIONS					
TUDY OBJECTIVES while the use of an efficient relations glattom in mesuring and increasing mediation activeness by simplement an articlogulation through compared to simplement during the metry advectory analysis. The shaft was established by a costs, if system advectors about a state of the shaft was established by a costs, if system advectors about a cost but in the balance state and metric advectors by advectors of the states was as the life to balance of the simplement and comment of ingregation using the system advectors and the life to balance of the simplement and the states of the states of the simplement of the simplement and the simplement of the simplement advectors and the life the simplement of the simplement of the simplement of the simplement advectors and the simplement of the s	Substantiants and the series areas that the resultants of the series of				Adherence Based on Plasma Drug Concentration Lewis A total of the plasma service were difficult (or particle of the plant) were difficult. In plasma serging were made at non-complex of the go constraint in which were before the minimum maked the temport, impact (Dob 3). Table 2. Adherence based on plasma drug concentration lewit				he ninimum	ACure Control AUXer Control AUXer Provide Control AUXer Control AUXer Provide Control AU		Theopy only nd post-study questionnairs. In the new cood' when asked to rate the	Elsky make patients, many with this reportions using a remote/how, who used an introduct intelligence application on a servariability in transition and mean ad mean ower 12 weeks, attendential as 15 million and the servariant of the advance of the lesses on patient responsibility of the advance advance and the advance of the servariant of the servariant of the advance of the advance of the advance - Continuous municipations (as the potential a luminose ad means, change patient behavior and reduc- tion direct own entercompares).	
ploation "topp," (i) soit reported does via the "toit report" button on the app (no staud confirmation; ii) di-reported does wort the phone to the dualy coordinate, ii) missed does, and 5 dues taken in chick. Any ser not visually confirmed using the app triggers a meti-time stert on web-based dealhoards to allow for anywarbork, ether by 5MS tot or ophone.					Patrice and	Operating Control A/Cyre (n=28) (n=12) (n=12) Sobjects within therapeutic range (n=12) (n=13)			questionnaire, this increased to 88.0% (Figure 1).			ACKNOWLEDGEMENTS		
RIAL DESIGN	smartphones usage were o	ompanable between t	he two randomiaed g	poupe.		(warfarin & D	OACs)	21.07 (77.8%)	21/07 (77.8%) 6/12 (50%) 15/15 (100%)		Tigate at the constant with managements			Funding was received from the National Center for Advancing Transistional Sciences (HCATS), grant number: ISH4 H000873-62 Sciences by ACure, New York, NY.
gie role, rendomized, parallel gerup, 12 week study was conducted at the Stern Binder Center, who Madaial Centre, Borns, MY, from Oktober 2015 is April 2019. Adults with a woorthy diagnoaed mic stolaw, with or without preceding transient lactivities attack (p.28) and taking any one of the without and the conduct medications: which is Centerfully, Nasewatahan in a conduct medications: which is Centerfully and taking any one of the	Table 1. Baseline Demographic Characteristics Overall Control AlCure (n=20) (n=12) (n=13)				District within transposed large (\$1515 (\$1.6%) 5.9 (\$3.2%) 15112 (\$1504) District with Pigure 3. Divergence in adherence livels according to monitoring method used				10/10 (10/36)	100% 100% 97.3%			Presented during the Connected Health Symposium, October 20-21, 2016, Booter, MA. Study NOTIOSS68259	
Ito?), and aploaban (Eliquie?). Eligible patients were age 18 years or older and had a score between 1 (2) on the NH Struke Soak AM SS) at admission and your envolvemt at discharge from the index asion to the hospital or at that encounter in the outpatient stroke center. Its andonizadi to the ACLere programs the AI application to monitor medication adherence utilizing	Age, y	Median Median	820 (13.17) 59 30.70	55.5 (16.55) 57 30.73	58.3 (9.79) 61 36.71	100.0%	W-20% 800.00%		92.62%					
If a Platform via a tablet or smartphone. The smartphone application was installed with Health and Postpating and Accountability Aut HMAND compliant. At software that was able to identify and mit the subject, the medication and reparition of the medication Plazare TL. Subjects in the AdCare group.	5m, 1 (N)	Permie	15-(53.6)	9 (89.2) 4 (20.8)	6-(40.0) 9-090.01	80.0%					100% of subjects thought the AI Platform would make	100% of subjects thought the At Platform would help patients	97.3% of subjects thought the AI Platform would	Daniel Labovitz and Deepti Vernani are employees of the Stern Stroka Center, Montefore Medical C Brons, NY.
and hermakes taking the study medication on the smarphone application each time they took their allow. When it was time to also their medication, the indivate provided a medication netrinder and it the subject through administration. In addition, they needed 2 holow-op notifications if the dose is not taken, and is further notification prior to the end of the dosing time window.	Race, n (N)	White Diack	3 (10.7) 13 (46.4)	0 (23.1) 4 (30.8)	0 9-(00.0)	60.2% ·				185	It easier for patients to take their medication property (correct dose, correct time)	beffer communicate with their doctor, be better informed about their medication, and help them address any	reduce the number of times patients forgot or chose not to refill their prescriptions	To preventine a solidation de con-evolution operatorial to interception prevade con only. Consider, pre-palaration or entragonal exempli de la prevadencia de constante e any politica de la prevadencia de la pre
aptured wave encrypted and transmitted to secure centralized web-based dashboards, accessible by zee workers. If the medication was not taken or was not taken connectly, the healthcare worker was through the dashboard as well as by email or \$846 taxt. The Allure pathtom enables interventions.	Subject Disposition, n (%)	Hispanic Completed	12 (42.9) 27 (98.4)	0 (40.2) 12 (92.3)	E-(40.0)	40.8%						oncerns or beliefs they have about their medication		
It based on read-firme adherence data. Healthcare workers intervene with subjects directly through hboerd. Ince was also measured by pill counts for all patients at Weeks 4, 8, and 12. Plasma samples were		Did not complete Warfarin	1 (2.6) 8 (28.6)	3 (23.1)	8 (33.3)	20.8%								
annaire at Weeks 4 and 8, as well as a pre- and post-test usability and feasibility questionnaire. story, hypothesis-generating analyses were performed for all randomized subjects who took at least	Medication Type, n (h)	Aposaban Rivarosaban Dakisakan	7 (25.0) 3 (10.7)	5 (28.5) 3 (23.1) 2 (15.4)	8 (20.2) 4 (20.7) 1 (0.7)	0.2%	ACure		Control					
In for all subjects at baseline, Weeks 4, 8, and 12. Subjects in the ACure group completed a usability tomaire at Weeks 4 and 8, as well as a pre- and post-test usability and feasibility questionnaire, instrum, hypothesis-generating analysis was participated for an innonneed subjects who took at least team and includes that there will be 12. Adversarial scalar bits follow. A stratement adversarial statement and and a stratement and a statement and weeks the terms and stratement and and a stratement adversarial statement.	Medication Type, n (b)					0.9%	10.00		Contra 1					

Multimedia Appendix 1

Poster.

[PDF File (Adobe PDF File), 1MB-Multimedia Appendix 1]

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