

APPLE HEALTH'S APPROACH TO PATIENT SELF-REPORTED DATA – **A GAME CHANGER OR JUST MORE NOISE?**



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Apple's Health App, a native app on all iPhones, is a localized personal health record aggregating tracking, fitness, and health related information from a growing number of applications and devices. Since 2018 with the release of iOS 10, the Health app has been able to download data from a patient's health-system medical records using the persons active patient portal as validation and conduit. The iOS 15.x upgrade now enables the patient to select items in the Health app to share with their physicians. Physicians are then able to open an Apple Designed and maintained Physician Dashboard in their electronic record. This functionality opens many clinical, regulatory, financial, and management questions.

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O INTRODUCTION

Apple's native iPhone Health app is a personal health record enabling a user to passively collect and aggregate data from an ever-expanding number of tracking apps and connected devices into one source for the user to review. Since 2018, the health app has been able to connect with healthcare systems and reference laboratories to pull in clinical information, labs, test results, and office-based measurements. The only requirement was the patient had an active portal account with the source and the healthcare system had enabled the download capability, which over a thousand had done so in the United States. User satisfaction with this capability was quite high in at least one report.

With iOS 15 and higher, people could now begin sharing select data in their Health App to share with other people and their physicians. Some feel this may be the sleeper hit of iOS 15.² Simultaneously, Apple released application programing interfaces ("APIs") that enabled providers in health-care organizations to open a Physician's Dashboard to view the patient's self-reported information found in the Health app. The current version includes three views of the patient: a summary of data over the last year (Figure 1); a more detailed wellness view (Figure 2); and a lab view (Figure 3).

Figure 1. iOS 15.x Summary View in the Physician Dashboard



Figure 2. iOS 15.x Wellness View in the Physician's Dashboard

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lotifications					
Heart Notifications & ECGs	Occurrences in Past Year				
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· man		• •			
t memorylite					
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JUL 10 - 16, 2022		L II	15.000		
		10.00	10,000		
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Malasha					
weight					
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AA 10, 2022 AB 10, 2022			570		
			160		
Average BMI			140		
23.7 23.6			130		
Diagonal Deservices			Chicar		
Latest Blood Pressure	Systolic O			Liteer Recorded Avg	
Latest Diou Plessure	0,01010 0		200 160	User Recorded Avg	
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Sleep					f
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JJL 10 - 16, 2022				met sieep ooal	
JUL 10-16, 2022 Average Time Asleep			5		
JR. 10 - 16, 2022	JUL 2021	12W		LAST 12W PRIV 40W	

2 Fitzpatrick A. Why Apple's Health App Could Be the Sleeper Hit of iOS 15. *Time.com*. September 2021:N.PAG. Accessed July 21, 2022.

Figure 3. iOS 15.x Lab View in the Physician's Dashboard

A B B B S S 1005 - 0	0 4						
•			SUMMAR	'	WELLNESS	LABS	SCRATCHPAD
All institutions (1) $\qquad \lor$	Metabolic Panel Penel might not include all lab results					· = •# ×	B Scratchpad
 All Labs Out of Range Labs 		JUN 27, 2022	MAY 3, 2019	MAY 29, 2018	SEP 12, 2014		^
	Glucose	-	-	-	-		
Metabolic Panel	Sodium	-	-	-	-		
CBC Panel	Potassium				-		
Coagulation Panel	Chloride	-	-	-			
Lipids Panel	Total Carbon Dioxide						
	BUN						
	Creatinine		-	-	-		
	eGFR - Low Range Esti		-	-	-		
	eOFR - High Range Esti		-	-	-		
	BUN/Creatinine			**	-		
	Calcium		-		-		
	Total Protein	***		-	**		
	Albumin				-		
	Total Globulin				-		v

The summary view provides a high-level view what's happened to the patient over the last year and has tiles that contain notifications, most recent labs, historical medications, and immunizations if the connected person chooses to share those items with their physicians. The Wellness section contains notifications, activity, steps, heart rate, weight, blood pressures, sleep, and menstrual cycles. Finally, there's a lab section that will show all labs the person has received from any healthcare system or reference lab into which they have an active, connected portal account. This information can be very useful in helping patients with their chronic conditions since most chronic conditions have a large lifestyle component and many patients with chronic conditions receive medical care from disparate healthcare systems, physicians, and reference labs dependent on their insurance plans.

Surprisingly, this capability has not been widely advertised and many patients and physicians are totally unaware of this type of connectivity. This is true even for organizations, like the one I work in, where most physicians do not even thing to look or select an item called "Self-Reported Data" when reviewing a chart in preparation for a patient visit. Every physician sees a growing number of iPhone patients are using many lifestyle and activity related apps and even wearing devices and have devices at home that track a variety of activities, record weights, blood pressures, blood sugars, and sleeping patterns that would be extremely useful in managing their patient's chronic diseases but are often totally blind to the type of devices their patients are seen using in the exam rooms. Likewise, very few iPhone using patients are aware of the native Health app, let alone its ability to connect with their physician's healthcare system.

Smart phones are the predominant connectivity device most patients use. This is especially true at University Health Kansas City, one of Missouri's safety net hospitals serving both the Kansas City inner core and eastern Jackson County. A large percentage of our patients are underserved on several levels and nearly half of our patients either have no insurance or covered by Medicaid. Yet very few patients we see do not carry with them a smart phone. Seventy-six percent (67 percent) of University Health Kansas City's active portal accounts are reached using mobile devices and 50 percent of those users are using Apple's iPhones with the remainder using one of many types of devices running one of several Android software versions. (Figure 4)³ We have also seen a growing number of patients wearing Apple watches that significantly enhance the data available in the Health App for sharing.

Figure 4. Google Analytics for University Health Kansas City

								Acquisition				
				Mobile Device Info			Users	• •	New Users 📀	Sessions 🤄		
							% of To	5,601 (6,006)	4,315 % of Total: 85.62% (5,040)	9,875 % of Total: 82.03% (12,038)		
	Acquisition			1	1.	Apple iPhone	3,53	63.07%)	3,025 (70.10%)	6,149 (62.27%)		
Device Category	Users 🕘 🗸	New Users	Sessions ()		2.	Samsung SM-A326U Galaxy A32 50	8	(1.46%)	54 (1.25%)	143 (1.45%)		
	6.886	36 5.040 12.038		3.	Motorola Moto G Stylus 5G	8	(1.45%)	54 (1.25%)	120 (1.22%)			
	% of Total. 100.00% (6,886)	% of Total. 100.00% (5,040)	% of Total. 100.00% (12,038)		4.	Samsung SM-G991U Galaxy S21 5G	6	(1.09%)	36 (0.83%)	113 (1.14%)		
1. mobile	5,500 (79.91%)	4,238 (81.09%)	9,721 (80.75%)	1	5.	Apple iPad	5	8 (0.95%)	48 (1.11%)	83 (0.84%)		
2. desktop	1,282 (18.63%)	725 (14.38%)	2,163 (17.97%)	1	6.	Samsung SM-N986U Galaxy Note20 Ultra 50	4	6 (0.82%)	27 (0.63%)	73 (0.74%)		
3. tablet	101 (1.47%)	77 (1.53%)	154 (1.20%)		7.	LG LM-Q730 Stylo 6	4	5 (0.00%)	26 (0.60%)	90 (0.91%)		
					8.	Samsung SM-A526U Galaxy A52 50	4	(0.73%)	28 (0.65%)	96 (0.97%)		
					Q.	Samsung SM-A136U Galaxy A13 50	4	0.71%)	28 (0.65%)	67 (0.68%)		
					10.	Samsung SM-G960U Galaxy S9	4	0 (0.71%)	25 (0.58%)	75 (0.76%)		

Over the last year we have introduced many patients to the Physician's Dashboard and the sharing capabilities of the Health App. It's not unusual for most patients to say they were neither aware of the app, nor its ability to get daily feeds from their healthcare providers. Many also were not aware this app, a native iOS app on all iPhones, could be configured to communicate with many other applications and devices they were using including fitness trackers, watches, scales, thermometers, home blood pressure monitors, and other consumer devices. Often, when these applications were installed, the default setting was to connect with the Health app and were already populating the Health app with data. Most patients that could turn on the sharing feature of the Health app (i.e. those with active portal accounts) were pleasantly surprised at how much information they could see without having to do any further customization.

Additionally, most of the patients, even some that were using the app were not taking advantage of its ability to download a host of information from over thousands of hospitals, clinics, and labs if the user has an active patient portal that has been connected to Apple Health. They usually express surprise and relief at not having to log into their portal accounts in order to review their most recent labs.

This lack of knowledge on both the patients and the physicians contributes to the inefficient and time-consuming interactions that are crammed into ever decreasing office visit schedules.

Over the last year most iPhone touting patients introduced to this capability have turned this feature on. For those with existing active portal accounts, this process takes just a few minutes and then enables the physician and the patient to

³ Google Analytics for University Health Kansas City, accessed 7/20/2022.

look at a very simple dashboard that has the potential to greatly enhance the office visit experience. This has led to some very interesting anecdotes.

For example, recently, a normally healthy patient presented to the clinic complaining of vague headaches and mild disorientation and came to us for diagnosis. Fortunately, this patient had turned on sharing and had religiously worn his Apple Watch. The Physician Dashboard was brought up on the examination room computer. Immediately both the patient and physician noticed a fall notification that correlated with the onset of a headache which the patient had totally forgotten (Figure 5).

Figure 5. Fall detection



This led to a quick diagnosis of post-concussion syndrome that otherwise might have been missed. Additionally, the physician's dashboard showed other life-style changes including a change in sleeping patterns and activity following this episode including one episode of atrial fibrillation that changed the follow-up of this patient with potential optimizations of future care.

First, accuracy and integrity. The majority of tracking apps, sleep monitors, and other sundry devices that can be connected to the Health app do not fall into any of the 3 FDA health monitoring classes with only 10 percent of monitoring equipment achieving the most stringent Class 3 approval.⁴ Many consumer devices do not even attempt to obtain FDA approval yet will connect and send data to the Health app. Some of these, like wrist or finger-based blood pressure cuffs have a much larger variation in results than upper arm cuffs. The same can be said for temperature monitors, many of which are contactless. These variations are offset by the ease at which many measurements can be taken

so volume of data does mitigate some errors in individual measurements.

Secondly, lack of monitoring. The Health app and Physician Dashboard is not designed to provide remote monitoring services, where there is a monitoring agency that alerts clinicians to abnormal values requiring interventions. There is no Apple provided list of patients who have enabled sharing. Even when lists of patients are created, there is no guarantee the patient will not turn off sharing. In fact, this has been the case among my own patients. I did maintain a list of patients that had at one time or another turned on sharing. I stopped maintaining this list of more than 20 patients when nearly a 3rd had already turned off sharing after a few months. Does even having access to this information at the patient level increase a physician's liability? Are patients fully instructed and reminded this data is not being monitored? Or will they assume that since their information appears in the chart there is some type of monitoring? Should we be obtaining consent forms from patients who share their information?

Third, while Apple is known for its data privacy, this cannot be assumed for the many apps a patient may use to feed the Health app. This elevates a person's privacy risk and has been documented for some time now.⁵ Misappropriation of a person's health data and lack of access has also been constant issue, even though the Health app may mitigate some of the person's lack of access to their own data.⁶

Fourth, financial stability. Unlike physician-ordered Remote Patient Monitoring, physicians cannot charge for reviewing this data under most regulations. The 2021 Medicare Physician Fee Schedule expanded time-based billing for patient visits that allows time spent reviewing patient-derived information, but only on the day of the visit.⁷ Unlike Remote Patient Monitoring or Chronic Condition Management, the current regulations are not clear about billing for time spent reviewing and responding to this information between encounters, even though this treasure trove of data is much more robust and comprehensive than most Remote Patient Monitoring services. Will the availability and upcoming enhancements to the Health app sharing undermine current Remote Patient Monitoring and Chronic Condition Management services that, at least for Medicare Beneficiaries, are reimbursed at financially sustainable levels?

4 PR Newswire. Wearable Consumer-Grade Health Monitors May Work, Yet Diagnostic FDA Approved Devices Still Gold Standard for Heart Arrhythmia Diagnosis. *PR Newswire US*. August 25, 2021. Accessed July 21, 2022. https://search.ebscohost.com/login.aspx?direct=true& AuthType=sso&db=bwh&AN=202108250905PR.NEWS.USPR.UN85793&site=eds-live&scope=site.

5 Owen Trip. Risks of Mobile Health Apps. Benefits Magazine, March 2015

6 Choe EK(1), Kim Y(2), Lee B(3). Investigating data accessibility of personal health apps. *Journal of the American Medical Informatics Association*. 26(5):412-419. doi:10.1093/jamia/ocz003.

7 https://www.cms.gov/medicaremedicare-fee-service-paymentphysicianfeeschedpfs-federal-regulation-notices/cms-1734-f last accessed 7/21/2022.

Fifth, time. The electronic medical record used by most physicians contains an overwhelming amount of information on patients that should be reviewed and reconciled on each visit according to standard best practice recommendations. But this task, done properly, would exceed the time allocated to office visits. Even medication reconciliation can be very time-consuming and complicated, particular when the patient is being seen by multiple physicians and also consuming over-the-counter medications. Nearly 100 percent of charts contain errors; 50 percent of which are errors of omission and equal 50 percent errors of commission. (Figure 6)⁸

Community & Family Medicine Error Ra	te in Electronic Medical Record D ployees of a Community Hospita	Data in Dr. Devid Voran, Dr. Aaron Nelson, Dr. Andrew Wheelsy, Dr. LYin Lan, Dr. Stephen Taki Department of Community and Family Medidine University of Mesouri Marses City
Background Ence abound in the Electronic Medical Records we use daily and many of these are not benigh. Schward Schward and the Electronic Advisor Advisor and the second and the data and the second and the second action of the second action	Results and Discussion	Conclusions
of Ophthalmology's 2014 Annual Meeting on an investigation that found less than half of the electronic medical records were complete and free from errors (Puller, 2014).	Number of Frrors By Chart	Errors of commission (incorrect information was entered) were as common as errors of omission (information not entered).
Healthcare does not have embedded systems of data entry validation and reconciliation-write banking, bigingle, and other bankerses. Recent inguinations has encouraged and a stylety, exerging slighte providers to portion medication encouralisation with each face-to-face encourses, and have no reasonation stat underest the to said to inconciling diagnose, publish ISA, weight and measurements, dinical notes, and the hundreds of other components of the EMR that no reasonates and an encourse.	20 mm 9 mm 8 mm	Active reconciliation of multiple sections of the chart with the study participant present was effective method for identifying errors in the medical record. Every chart reviewed had errors of variets have and reconclude. The most
We are beginning to see the importance of accurate information in the medical records as we migrate from a volume to a value-based onindumement system. In value-based systems, existing disputs receives and problem table are being used to shreq quality measures that have direct.		common type of error overall was in the Problem List, but the most common severe errors were in Family History.
repercussions on healthcare reinfoursement. Petient engagement is a critical component of health and disease management. (Coulter, <u>n.d.</u>) A	4	The most common sources of error wore inaccurate problem lists, family histories, demographics, and medication lists.
key component is improving parent engagement is access to the indication score trendy more like the parent provides and characteristic text are associated by the provides and characteristic parent paren	2 0 5 10 15	It is the responsibility of both patient and providers to ensure accuracy in documentation.
This study is designed to engage the patients at TMC-Lakewood who are clinically trained	Error type Errors by Type (All Errors) Errollers Ltd. 55	
(vurses, physicians, theregists, etc.) who already have access to the medical record to help recordia, validate and update the medical record. It seeks to answer the question; can patient direct access and management of their own record ingrove the accuracy and reduce the cost of	Allergies 1 Earnity History 12	Recommendations:
maintaining an accurate medical record?	Prof Surger Disbory 8 Demographics 12 Medications 12	Dedicated time should be given yearly to active reconciliation of the EHR in order to improve error rates—which is likely to have an effect on both quality and cost.
Objective To evaluate the type and magnitude of entris in medical charts of employees of a community hospital in order to show that direct patient management improved accuracy and decreases cost of examples and technology back Report	Social Weitzery 6 Pregranegy History 3 Immunitations 1 Readh Maintenance 1	Patients should be encouraged and given the option to be active participants in the management of their medical information.
Study Dasign and Mathod	List of Inventions Insurance from Errors by Severity	Areas of further study would be to randomize participants into self-managed and clinician managed charts and to compare error rates after a given amount of
This project used a refrospective chart review model to address the specific research question.	Policy December 2010	time.
Study Population: This study utilized chart data from employee-patients active on the patient portal system of a community hospital.	IIS III IIII IIII IIII IIII IIII IIII	References
Methods and Procedure for Data Collection:	Kantomany Delegisteriore 44%	Coulter, A. Patient Engagement What Works? Journal of Ambulatory Care Manager, 35 (2),
Roview each section of the chart from demographics through notes Record every error instance in detail Categorize the errors	Propulsionary loss and consultant	over, Extends P. (n.d.). NOVE Consumer Empowerment Workgroup Tealmony July 2013. Reviewed from Keathill gov: https://www.healhilt.gov//RCAStoalendar/2013/07/15/policy- consumer empowerment workgroup
Anticipated Problema: - Current policies discourage access of individuals to their own records - WIMA exclusionstrations		Hibbanti, J. H. (2004). Development of the Patient Activation Measure (PMM). Conceptualizing and Measuring Activation in Patients and Consumers. Health Services
Defined EHR roles may prevent patients from performing certain Leadership resistance	Acknowledgements:	Meseanth, 39 (4)1, 1005-1028. Kappel, R. (2009, April), EMR Entry Error: Not So Senige. Retrieved May 2016, Iron AHRQ
Outcomes Data: Number and type of errors both in aggregate and by chart.	Many thanks to Hollin McKinney, Gwen Sprague, and all the employees who agreed to participate in our study.	(Agency for Instances research and Quality): https://genet.ahm.com/webmm/case/199 Pylies, L. C. (2014, November 6). Numan Ever Seepe Into Electronic Medical Records.

Figure 6. Poster on Error Rates in the EHR

Correcting these errors is very time-consuming and, for the most part, can only be done with the physician and patient together. Will adding access to another whole layer of data that may open up a Pandora's Box of new sources of error add to the inaccuracies that already exist in the record due to the lack of time to review, manage, and reconcile this data?

Physicians experience a wide scope of training that enables them to see and treat most conditions patients present. We Physicians are life-long learners and are well trained to locate and learn from the scientific literature. What we are not trained to do is extract information from our EHRs and haven't embraced using social media "big data" to enhance our ability to answer questions our patients may have. We are even less aware of nor have been trained to utilize an ever-expanding source of information derived from apps, trackers, other wearables, and even data from the patient's beds. The ability to do so is in the hands of patients in the Apple ecosystem but will certainly advance to all platforms and may wind up being one of the more important resources available to us. In addition to paying very close attention to patients during our exams, it is also important that we pay attention to the types of devices a patient is wearing and using. They may be one of the most potent tools in our diagnostic armament soon. However, this type of patient-controlled information has the potential to overwhelm physicians, even more than they are now and raises many concerns.

Will this wind up being a game changer providing information that can be used to educate, motivate, and instruct patients to improve their management of their health and of their chronic conditions? Or will this but tool but one more layer of complexity that winds up being flotsam in the wake of our lives?

Correcting these errors is very time-consuming and, for the most part, can only be done with the physician and patient together

⁸ Aaron Neison, Andrew Wherley, LiYin Lan, Stephen Taki & David Voran. Error Rate in Electronic Medical Record Data in Employees of a Community Hospital. Poster presented at the Annual Scientific Exhibit, 2019.

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