



헬스 패스포트: 신뢰할 수 있는 의료 정보를 전 세계 어디서나 오른쪽에 전달하는 분산형 개인 의료 기록 플랫폼

백서



**Emrify Inc.**  
[www.emrify.com](http://www.emrify.com)  
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## 동기

오늘날 의료 기술은 그 시스템이 망가졌습니다. 미국의 캐나다, 영국, 독일 또는 사설 병원 시스템에 있는 정부 기반의 보편적 보건 적용 범위는 상관 없이 현재 운영 중인 보건 정보 기술은 하드웨어 및 소프트웨어 아키텍처의 모든 다른 산업에 비해 최소 10년 정도 뒤쳐져 있습니다. 응급 의료 기록(EMR)의 개시 이후로, 개인 의료 정보는 환자의 안전, 보안 및 사생활을 위협에 빠뜨릴 수 있는 혼란 상태에 있었다. 1996년의 의료 보험 이동성 및 책임 법은 20년 이상 되었으며 업데이트의 흔적이 보이지 않는다. 한편, 병원과 보험 시스템은 수백만명의 의료 기록이 손상된 채 헤드 라인 뉴스를 장식하며 계속해서 공격을 받고 있다. 가장 최근의 것은 150개 이상의 나라에서 수천대의 컴퓨터를 잠가 놓은 워너크라이 랜섬웨어 소프트웨어의 역사상 가장 큰 것입니다.[1]

설상가상으로, 우리가 병원과 의사들에게 주는 많은 돈에 대한 중요한 건강 데이터는 결국 서로 다른 시스템에 걸쳐 분산되고 분열되어 있다. 문제가 너무 심각해서 같은 전자 진료 기록(HER2)의 응급 구조 기관도 있다. 병원 내에서 운영되는 에픽(Cerner)제작자는 서로 의사 소통하고 상호 운용할 수 없다. 이 이면에 있는 한가지 주요한 이유는 2009년에 경제 및 임상 보건을 위한 보건 정보 기술의 도입이었다. 이 법에 따라, 미국 보건 복지부는 "365억달러에 달하는 비용을 들여 전국적인 전자 보건 기록 네트워크를 구축하고 있다. 현재 약 1100개의 공급 업체가 EHR를 제공하고 있으며, 4년 전에 비해 의료 정보 기술의 무제한 확장으로 인해 데이터 상호 운용성에 있어 정보 기술 역사상 최악의 재앙이 발생했습니다.

의료 분야에서 이중 지출이 많은 강력한 경우가 있어 재정 지원 사례가 위축될 수 있다. 혈액 검사와 MRI검사와 같은 중복 검사는 의료 산업에 매년 수십억달러의 손실을 가져온다. 이 불필요하고 비싼 검사들은 낭비이며, 그것들은 환자를 위협에 빠뜨린다. 처방 사기 또한 유사한 문제에 직면해 있다. 미국은 현재 역사상 최악의 아편성 전염병에 시달리고 있다. 통일된 기록이 없는 한, 중독자들은 더 많은 의사들이 처방하도록 하기 위해 주 경계선과 국경을 넘어 이 제도를 악용할 허점을 발견했습니다.

오늘날, 우리는 개인 의료 기록의 혁명을 목격하고 있습니다. 바로 센터에 있는 사람과 함께 개인이 생성한 건강 데이터의 증가입니다. 향후 5년에서 10년 내에 의료 서비스는 소비자에 의해 주도되는 큰 변화를 겪게 될 것이다. 어떻게 해서든 의료 서비스에 지장이 오고 있다. 미래의 클리닉은 환자의 가정에 있다. 원격 모니터링, 원격 의료, 의사 진행 및 인구 보건과 같은 새로운 의료 제공 서비스와 결합되어, 새로운 플랫폼이 전 세계 어디서나 의료 정보 교환을 개방적이고 유연하며 안전하게 조정해야 합니다.

블록체인은 마지막으로 건강 관리 분야에서 중추적인 위치를 차지하고 있다. 이더리움 네트워크의 고유 속성은 처음으로 개인에 의해 데이터가 소유되고 제어되도록 한다. 한편으로, 합의 알고리즘은 원장의 분산 메커니즘을 가능하게 하여 사람들에게 힘을 분배할 수 있게 한다. 반면에, 가장 좋은 암호화 컴퓨터 과학은 사생활과 보안을 보호하기 위해 신원을 보호하기 위해 사용될 수 있다.

아마도 마침내 때가 왔을 것입니다 의료 산업은 전에는 보지 못 했던 수준의 관심을 받으며 블록스 하인을 하고 있다. 이 단계는 스타트업이 새로운 가치 제안을 제공하여 현상 유지를 방해하도록 설정되어 있다. 그것이 개인적인 것이든 공립적인 것이든 간에, 최고 경영진들은 그들의 고통 지점을 해결하기 위해 분권화된 해결책에 기꺼이 귀를 기울일 것이다. 미국 의료 산업이 한계에 도달했습니다

GDP의 20%. 모든 사람들이 더 이상의 수입 없이 더 열심히 일하고 있습니다. 산업이 가치 기반 관리로 전환됨에 따라, 이해 당사자들은 관리의 연속성을 개선하면 비용을 절감하는 동시에 시장에서 관련성과 경쟁력을 유지할 수 있다는 것을 깨닫게 되었다. 이것이 정밀 의료와 그 이상의 방법으로 이익 극대화를 향한 새로운 길을 향한 유일한 길을 향하게 할 것이다.

규칙은 우리 편입니다. 2018년부터 의미 있는 사용 3단계가 모든 참가자에게 의무적으로 부여된다. 요구 사항 중 하나는 의료 조정을 개선하기 위해 건강 정보 교환을 증가시키는 것을 포함한다. 이것은 실제 변화에 결정적인 시기가 될 수 있는 연방 정부의 가장 전도 유망한 신호입니다.

지방 분권은 전 세계 시스템들 사이의 건강 정보 교환을 중재하기 위한 가장 희망적인 길을 제공한다. 누구든지 상태 데이터를 집계하기 시작하여 디지털 토큰을 사용하여 ID가 있는 모든 당사자에게 즉시 공유할 수 있습니다. 보건 데이터의 신뢰성과 무결성의 중요성을 간과해서는 안 된다. 당신의 생명을 구할 수 있는 민감한 건강 정보가 위험에 처해 있다. 데이터 트랙과 빵 부스러기는 이제 보편적으로 신뢰 받는 데이터베이스 안에 잠길 수 있습니다.

궁극적으로 의료는 빅 데이터 및 기계 학습 알고리즘을 기반으로 질병을 치료하고, 질병을 예방하고, 결과를 개선하는 근거가 되는 정보 과학 과제이다. 이것은 오직 전 세계 75억 이상의 사람들의 협력으로 진정으로 존재할 것이다. 우리는 모르는 게 많아요. 답은 우리 모두에게 있어요. 우리가 세계화라는 큰 틀 속에서 더욱 밀접해 짐에 따라, 에마리프는 국민들과 국민들에 의해 구동되는 새로운 플랫폼에 대한 비전을 제시합니다. 혁명에 동참하여 여러분의 건강을 지키는 최고 경영자가 되십시오. 지금은 의학의 환상적인 미래에 대한 약속을 이행할 때입니다.

<sup>1</sup> <http://www.npr.org/sections/thetwo-way/2017/05/15/528451534/wannacry-ransomware-what-we-know-Monday>

<sup>2</sup> <http://www.washingtonpost.com/wp-dyn/content/article/2009/05/15/AR2009051503667.html>

<sup>3</sup> <http://www.practicefusion.com/brown-wilson-black-book-rankings/>

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# 1. Emrify의 비전

Emrify는 수 가지 다운로드 수와 플랫폼상의 수 명의 사용자를 대상으로하는 PHR (Personal Health Record), Drug Facts 및 Clinical Trials 모 일 용 프로그램을 통해 의료 업계의 혁신을 도 해 왔습니다. Emrify는 새로운 을 선보일 여러 의 리로 건강 해커 의 한계를 어 고 있습니다. Emrify는 오르는 제에 대한 은 이해를 으로 신 기술을 합니다.

사로서, Emrify는 상호운용성 제의 성배를 해결하기 위해 의료 산업의 열을 임없이 고 있습니다. Emrify는 블록 체인이 거인을 리 강력한 이라고 진정으로 습니다. 분산 모 은 의료 서비스의 전체 연속체에 있는 모든 이해 관계자의 점이 되었습니다. 더 중요하게, 그것은 사람들에게 그들의 건강 공 자로부터 더 많은 것을 요구하도록 에 지를 공 했다. 다음 하위 에서는 생태계 구축을 위해 HIT 토큰을 사용하여 전히 새로운 건강 기록 플랫폼을 시작하기 위한 Emrify의 계 에 대해 설명합니다

## 새로운 HIT 디지털 통화

단계는 새로운 가상화폐인 상태 정보 전 는 상태 정보 토큰 (HIT)을 생성하는 것입니다. 토큰은 건강 데이터를 리 경제를 조장할 유 리 토큰입니다. 건강 정보는 분 을 위한 더 많은 데이터로 더 많은 가치를 으면서 강력한 네트워크 과를 나타 니다. Emrify는 모든 건강 이해 관계자와 소비자가 처음부터 생태계에 참여하고 기여할 수 있도록 HIT의 근 가치를 립합니다.

## 생태계 구축

어려블이 발적으로 증가하고 게 시 싱이 점차 증가함에 따라 의료 데이터는 의료 기관, 보험, 고용 , 연구원, 정부 및 의약 을 포함한 모든 의료 관계자의 의를 고 있습니다. 지 년 동안 IMS Health와 은 사는데 의약 에 알고리즘을 적용 하여 의료 데이터를 부하게 들었습니다. [4] 현재 IBM 및 구 Verily 프로 트 베이스라인과 은 요 업체는 큰 건강 데이터의 증가하는 가치의 대표적인 예입니다. [5] 최근 설 조사에 따르면, 임상 의와 임원 다 환자 생성 데이터가 향 5년 동안 구 데이터보다 유용 할 것이라는 데 동의합니다. 작년에 ONC에 제출 된 우 중 하 나인

<sup>4</sup> <http://fortune.com/2016/02/09/ims-health-privacy-medical-data/>

<sup>5</sup> <https://www.technologyreview.com/s/604224/googles-massive-health-study-seeks-10000-volunteers-to-give-up-their-medical-secrets/>

<sup>6</sup> <https://www.healthcare-informatics.com/news-item/analytics/survey-five-years-genomic-patient-generated-data-will-be-more-useful-claims-data>



## 2. 히트 가상화폐

### 목적

Emrify is introducing an open source cryptographic token called HIT. HIT will be the unit for all transactions within the ecosystem. HIT will serve as the basis of interoperability with other digital cryptocurrencies. Similarly, units of HIT are fungible and transferable with the ability to trade on cryptocurrency exchange.

HIT is a utility token valuable to both consumers and stakeholders for use in everyday services. For health data buyers, HIT represents the cost to pay network fees and pay users for their data. For consumers, HIT has value for paying transaction fees to share data to transfer and access medical records when needed such as for school vaccinations, for work purposes, for legal matters, for personal uses, for family related health records, and for third-party dapps.

### Health Miners

For the first time ever, consumers can contribute health data for rewards and payments on the network just like Bitcoin miners. Users will never have to pay fees to aggregate data from all sources for storage on the network. Users will have the power to set their own prices and compare market rates. On the flip side, anyone can be a health buyer. As a marketplace, buyers will have the option to set prices and bounties for certain data types and health conditions. At first, wearables data from Fitbit, smart scales, blood pressure, sleep trackers, glucose meter, and other devices will be synced by the users for sale. The reason is that these sources can be validated through API services. As more health companies and providers are validated overtime, more data such as lab results, scans, prescriptions, and complete medical records can be up for sale by the user. Collectively, health miners can shift the focus of healthcare to revolve around the individual by offering the industry the highest quality health data available.

### Ethereum and ERC20

HIT will be implemented on the public Ethereum blockchain as an ERC20 token.[12] The Ethereum blockchain is currently the industry standard for issuing custom digital assets and smart contracts. The ERC20 token interface allows for the deployment of a standard token that is compatible with the existing infrastructure of the Ethereum ecosystem, such as development tools, wallets, and exchanges. Ethereum's ability to deploy Turing-complete trustless smart contracts enables complex issuance rules for cryptocurrencies, digital financial contracts, and automated incentive structures. These advanced features and active ecosystem make Ethereum a natural fit for HIT.

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<sup>12</sup> ERC20 is the Ethereum token standard. <https://github.com/ethereum/EIPs/issues/20>

## 3. Building the platform

### Emrify personal health record

Emrify Personal Health Record is one of the most popular mobile apps ranking #4 in top apps according to AppAnnie.[13] Currently, the app is available for both iOS and Android with thousands of registered users and hundreds of downloads every month. For the past two years, users have enjoyed using the app based on the reviews. Here’s what people are saying about it.

Device: iPhone | 
  Country: United States | 
  Date: Jun 13, 2017

Top Apps for **personal health record**

Export: CSV, XLSX

#	App	674 Results	Star Rating
1	Healthspek - Personal Health... Healthspek, LLC		★★★★☆ 4.0
2	Capzule PHR - Your Personal ... Webahn		★★★★☆ 4.0
3	OpenTreatment Personal Hea... OpenTreatment, LLC		N/A
4	Emrify - Personal Health Reco... Emrify Inc.		★★★★☆ 4.5
5	Axilla PHR - Personal Health ... CodeMonkee d.o.o.		N/A
6	Medelinked - Personal Health... Medelinked		N/A
7	Ma Mémoire Médicale – Your... MV SANTE		N/A
8	Health Tracker & Manager for... XLabz		★★★★☆ 4.0
9	drchrono Patient Portal - onp... drchrono Inc		★★★★☆ 3.5
10	FollowMyHealth® Allscripts		★★★★☆ 4.5

Rating	Reviews
★★★★★ 5.0	<b>Retired by Margo3252</b> New to site. So far so good.
★★★★★ 5.0	<b>Mrs smowwolf06 by Snowwolf06</b> Just downloaded so still learning the app
★★★★☆ 4.0	<b>mrs by cookiemutch</b> This is a great app, I am able to have all the information at the touch of a finger. I am able to go to a Dr's appointment and go through all things that needs to be discussed including meds without for getting something, the customer support are awesome, always there to help with quick service and always there to lend a hand. I encourage anyone that has alot going on to get this app it does wonders :)
★★★★★ 5.0	<b>Apple needs to Feature this App by ImSchmacked</b> Great job team.
★★★★★ 5.0	<b>Finally an all in one healthcare app by DSkyline</b> Finally an all in one healthcare app with potential!
★★★★★ 5.0	<b>Great app by Bdc63</b> Easy to use and very helpful
★★★★★ 5.0	<b>Patients have power in one EHR by AF615</b> I struggle to track down my medical history between doctors in 3 different cities where I've lived. Now I can aggregate all that information in one secure place... and right on my smartphone. Great first release and looking forward to more updates and cool features.
★★★★★ 5.0	<b>Easy to use by SlickGeek</b> Simple to use than other ones.
★★★★★ 5.0	<b>Great job to Emrify by S. Steve Samudrala MD</b> Happy we finally have an option to be the 'Mint' of Our Healthcare Records ;)
★★★★★ 5.0	<b>Excellent personal health tracker/aggregator by Stoves</b> Finally a quality app that allows me to keep all of my personal health info in one place. Great feature set for a first release. Looking forward to even more features in the future!

<sup>13</sup> As of 6/14/17 – App Annie Keyword Results



What makes Emrify PHR app powerful and different from the others is the web portal that enables the user to share their health data with anyone they choose by using a regenerative access code.[14] With these two tools, Emrify has successfully laid the foundation to allow health data to flow across any boundaries.

Emrify is uniquely positioned in the marketplace as a PHR to lead the industry towards a new blockchain based system. The size of the user base and the ongoing visibility in the app store gives Emrify a unique competitive advantage in onboarding users to blockchain.

## Health Passport

With the introduction of blockchain, Emrify will rebrand the PHR as the Health Passport to demonstrate a truly interoperable personal health record that's an international portal to aggregate lifelong health information and put them in the right hands at the right time. At first, the Health Passport will be accessible as a mobile responsive webapp to allow quick iterations and flexible experimentations. As Ethereum improves and more tools become available, the Health Passport will be the first native iOS/Android PHR app available worldwide.

## Health Registry

In order to identify the healthcare identity in the ecosystem, a registry must be in place to validate actors making transactions on the network. Although users are free to share data with any anonymous recipients, Emrify will provide validations to attest that certain health stakeholders and health professionals are trusted party. This will create a safer community for health information exchange. Emrify will work with government and private organizations such as the American Medical Association to validate identity. Overtime, the Emrify Registry can be the main directory for all health decentralized applications moving forward.

## Health Portal

Emrify will introduce a new blockchain health portal for stakeholders to access shared data at the new dedicated domain name.[15] Through this interface, hospitals and other parties can spend HITs to transact with users who want to sell their data. This is where the ecosystem will come to life to connect everyone who wants to be involved with health data. This will also be a great opportunity to reinvent and modernize health User Interface to the 21<sup>st</sup> century of fluid and dynamic designs. This will become a constant battleground to set the standards for health data structure and visualizations. Everyone from doctors to nurses to patients are fed up with the cluttered and fatigue inducing legacy health UI that are affecting health outcomes and putting lives at risks. The Health Portal represents a golden opportunity for Emrify to make a bold statement and lead the way.

<sup>14</sup> Web Portal - <https://chart.emrify.com>

<sup>15</sup> New Web Portal - <https://www.mychart.io> (not live)

## Health dApp Store

In order to expedite the new age of health designs, Emrify will open the platform up to third party developers to create decentralized products and services including themes, apps, widgets, virtual reality, augmented reality, bots, and voice interfaces such as Alexa Skill and Google Assistant. While doing so echoes the community strength of blockchain, it is also a smart choice that other companies such as Apple have shown to be wildly successful and profitable. Apple offers a handful of stock apps such as phone, mail, calendar, and camera while inviting developers of all kinds to contribute their ideas. Along the same line, Emrify will kickstart the ecosystem with some default dapps such as medications, appointments, directory, labs, and images. Once the initial traction is successful, outside developers and startups are welcome to build more dapps to attract users with flexible monetization models to earn HITs. By being open to innovations, Emrify can continue to be the preferred platform for health information collection to remain at the forefront of the competitions.

## PillSync

It has been said that medication record is the tip of the sword for healthcare disruption. While the scope of information is simple, the problem today is that each EHR stores only a snapshot of the patient's history. This is a model use case for blockchain. As the MedRec team has pointed out, "But with blockchain, each prescription is like a deposit, and when doctor discontinues a medication, they take a withdrawal. Looking at a blockchain, a doctor wouldn't have to comb through all the deposits and withdrawals—they would just see the balance."<sup>[16]</sup>

With PillSync, Emrify has access to one of the most comprehensive drug databases powered by the US National Library of Medicine. For the past five years, the Drug Facts app has attracted thousands of both consumers and healthcare professionals to lookup drug information. The most popular feature is the ability to upload a pill photo to be identified. To date, PillSync has identified and indexed 1300+ pills to accumulate one of the largest pill image databases on the web.






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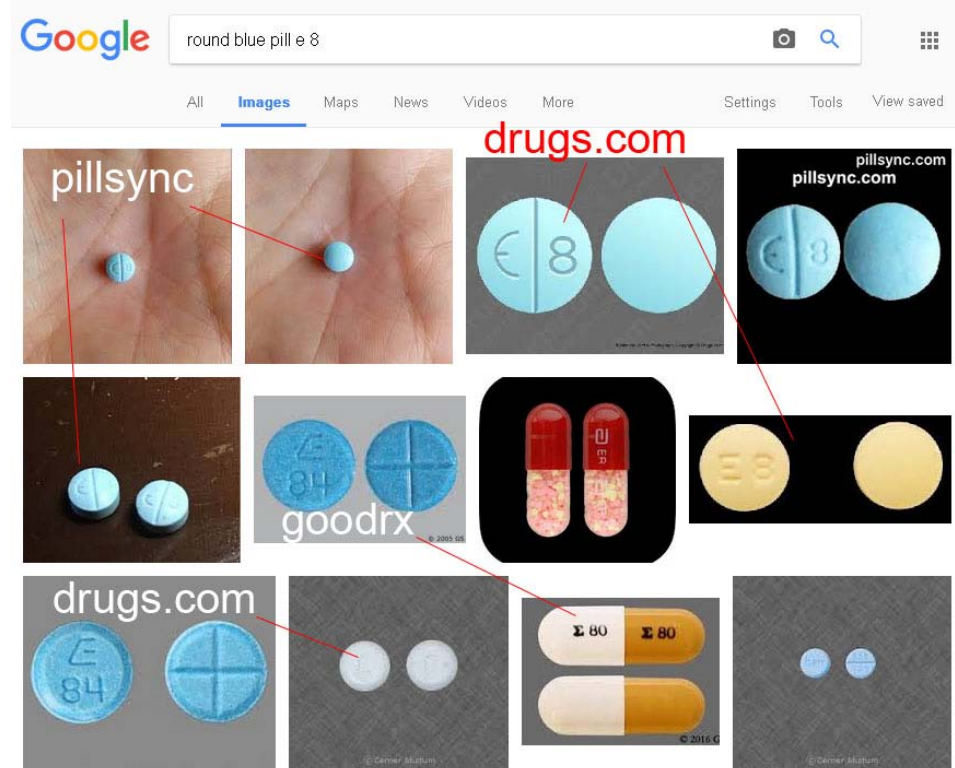
<sup>16</sup> <https://www.wired.com/2017/02/moving-patient-data-messy-blockchain-help/>

For the one of the most search terms “pill identifier”, the app is ranked 3<sup>rd</sup> right next to Drugs.com.[17] For Google Images, most common pills search will show PillSync’s results rivaling the largest players such as Drugs.com, WebMD, and GoodRx.[18]

iPhone United States

Top Apps for pill identifier

#	App	292 Results
1	 Pill Identification visions	
2	 Pill Identifier by Drugs.com Drugs	
3	 Pill Sync Drug Facts Interactions Identifier Scanidme Inc	
4	 iPharmacy - Drug Guide & Pill Identifier SigmaPhone LLC	
5	 Pill Identifier and Drug List Mobixed LLC	



In addition, PillSync has recently launched the Drug Barcode Scanner Pro app with the largest drug barcodes lookup system using a user friendly snapchat interface to expand the user base.[19] This is a unique app with the latest computer vision technology to demonstrate the ongoing commitment to innovations. PillSync is also available on Alexa with the skill named “Drug Facts” with projects in the pipeline for Facebook Bots and Google Home assistant.

With strong market penetration in major platforms and commanding web presence, PillSync represents a key crucial resource that will strategically drive users to Emrify to ensure a steady growth path. At the same time, Emrify will have access to the intellectual property of PillSync with the powerful drug database and identification system to create the best medication module as one of the default dapps to jumpstart the ecosystem.

<sup>17</sup> As of 6/14/17 – App Annie Keyword Results

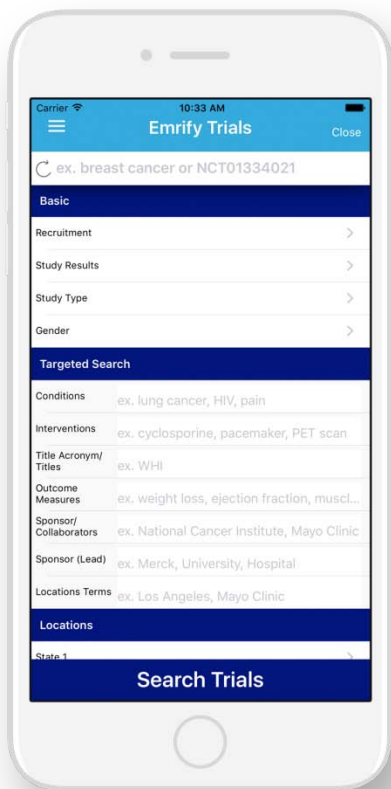
<sup>18</sup> As of 6/14/17 – <https://www.google.com/search?q=round+blue+pill+e+8&source=lnms&tbm=isch>

<sup>19</sup> <http://www.pillsync.com/scanner>

## Clinical Trials

The clinical trials industry is ripe for disruption. Here are some shocking numbers:

- 85% of clinical trials finish late due to difficulties enrolling participants [20]
- Nearly one-third of trials never begin after failing to recruit a single participant [20]
- Only 3% of cancer patients participate in trials, with 80% not even aware of their clinical trial options [21]



All of these challenges lead to a drug development process that takes 10-15 years.[22] This industry represents the path of least resistance for health data to flow naturally. Global industry reports forecast revenue of \$22 billion by 2021 with 7.5% compound annual growth rate.[23] This is a key target market for the growth of Health Passport.

Currently, Emrify Trials app puts the power of ClinicalTrials.gov search in your hands.[24] The app enables both consumers and clinicians to be informed of new studies. In doing so, this establishes a firm foundation as Emrify offers more functionalities to secure partnerships. For example, one of the first use cases is to register and collect consent from participants together with the study on the blockchain. This could prevent “hidden outcome switching”, which is the practice of secretly changing the focus of a clinical trial to fit the results. A study last year of 137 trials found 60 reported on outcomes they were not looking for, according to their original protocol.” [25] This is a major pain point that will drive much of the early traction for the ecosystem.

<sup>20</sup> <https://www.foundationforpn.org/research/clinical-trials/>

<sup>21</sup> <http://www.forbes.com/sites/judystone/2015/01/06/how-can-we-encourage-participation-in-clinical-trials/#14e3d9376dd5>

<sup>22</sup> <http://www.cancerresearchuk.org/about-cancer/cancers-in-general/cancer-questions/how-long-does-it-take-for-a-new-drug-to-go-through-clinical-trials>

<sup>23</sup> <https://www.mordorintelligence.com/industry-reports/global-clinical-trials-market-growth-trends-and-forecasts-industry>

<sup>24</sup> <http://www.emrify.com/trials>

<sup>25</sup> <http://www.economist.com/news/science-and-technology/21699099-blockchain-technology-could-improve-reliability-medical-trials-better>

## 4. Emrify Labs

### Overview

The Emrify Platform is an ecosystem of consumers and stakeholders using the HIT cryptocurrency to exchange health data. The purpose and mission of Emrify Labs is to promote and support research, development, and education to accelerate the decentralized protocols for health. In order to fulfill its mission, Emrify Labs will dedicate resources to three specific goals related to development, outreach, and research as follows:

#### Development goals

The Labs will fund the development of tools to create and maintain a sustainable ecosystem for all parties to create value for one another. The Labs will be fully transparent by supporting open source projects that can be improved by the community. All comments from participants will be heard and considered in the development process.

#### Outreach goals

The Labs will dedicate resources to fund educational and marketing campaigns to increase the healthcare industry adoption of blockchain. While most resources will be used for products development, outreach is a mandatory step to propagate disruptions on a global scale.

#### Research goals

The Labs will invest heavily in research by working with developers to create new dapps and test new ways to advance health informatics. The age of big data and AI can move at a swift pace. Only by staying true to a culture of moving fast and breaking things can we hope to take healthcare to the next level. There's a lot of catching up to do.

### Location, location, location

Emrify Labs is strategically located in Nashville, Tennessee. This fast growing city is home to hundreds of healthcare companies including the 15 major publicly traded companies that are based here. Three of the five largest investor-owned hospital operators, Community Health System (CHS), Hospital Corporation of America (HCA), and Lifepoint Health, together control more than one-third of the investor-owned hospitals across the country.[26]

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<sup>26</sup> <http://www.tennessean.com/story/money/industries/health-care/2015/08/18/how-big-health-cares-economic-impact-nashville-388b/31564125/>

Along with Ascension Health and Vanderbilt University Medical Center, the leaders have banded together to form the Center for Medical Interoperability.[27] This new initiative is a powerhouse for changing healthcare with major purchasing power to influence changes from the inside. Emrify Labs has been invited to collaborate closely with the center to use the Health Passport as the gateway to solve interoperability between the major health systems. This puts Emrify in a unique position at the epicenter of ground zero to disrupt healthcare.

## Awards

Emrify Labs is proud to be the home of pioneers who push the limits of innovations for health. Here are some relevant accomplishments to showcase our passion and commitment:

### **Patient Generated Health Data Proposal – ONC\* Data Provenance**

*June 2017 – Finalist*

Using the Public Blockchain: Data Provenance for Patient Generated Health Data for more use in Healthcare

- <https://www.cccinnovationcenter.com/challenges/provenance-challenge/>

### **Health Passport – GE Health Cloud Innovation Challenge**

*May 2017 – Honorable Mention*

Health Passport as Clinical Applications that helps healthcare providers improve clinical outcomes to positively impact care throughout the patient journey

- <https://devpost.com/software/emrify-health-passport>

### **Emrify Health Recorder – Choosing Care Challenge**

*April 2017 – Honorable Mention*

Emrify Health Recorder leverages the latest in Voice and Vision AI technology to lower the barriers to health literacy and increase access to improve outcomes

- <http://thehealthcareblog.com/blog/2017/04/24/finding-care-can-be-easy-check-out-the-rwjf-choosing-care-challenge-finalists/>

### **Health Passport – ONC\* Blockchain Code-A-Thon**

*Mar 2017 – 1<sup>st</sup> place*

Health Passport as Data Aggregation and Sharing for Health using blockchain

- <https://digitalchamber.org/events/dc-summit-2017.html>

### **Blockchain Hackathon – Distributed: Market**

*Feb 2017 – 1<sup>st</sup> place*

DeadMansBlock is a decentralized fail-safe trigger that releases digital wills to beneficiaries after you die.

- <https://digitalchamber.org/events/dc-summit-2017.html>

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\* Office of the National Coordinator for Health Information Technology who are the main federal agency leading health IT efforts for the entire US health system. <https://www.healthit.gov/newsroom/about-onc>

<sup>27</sup> <http://medicalinteroperability.org>

## Interoperability

Interoperability among health systems represents the single biggest barrier to a better more efficient healthcare that “could save taxpayers more than \$30 billion a year on wasteful spending”.<sup>[28]</sup> There’s no evidence based medicine without the complete single source of evidence. In order to fix it, there are two distinct phases that must be overcome over a gradual extended period of time.

The first phase is to create a trusted network and standards for Health Information Exchange. Each time data is synced, there is an opportunity to facilitate interoperability. To date, pockets of consortium and private networks have been created to mediate exchanges using outdated protocols. Blockchain is a superior method that is uniquely designed to facilitate a highly trusted and secured exchange. Indeed, there are discussions among these existing networks to adopt a private blockchain for their members. While this is a step in the right direction, it cannot be accepted for exchange within the larger context of the world. Emrify must exist at the center as the independent public blockchain with the highest decentralized network to enhance trust and protect data provenance.

The second phase is the adoption of a universal standard for the structures and formats of the data for use once it has been transferred. If the data cannot be integrated directly into the recipient’s EHR system, interoperability cannot truly be achieved. The productivity of employees and health staff can be hindered if time is spent on navigating multiple interfaces to aggregate data from different sources. Currently, healthcare lacks data standards in three areas: clinical, personal wearables, and research. Clinical data is the furthest along with the establishment of Fast Healthcare Interoperability Resources (FHIR). Emrify will support FHIR and advance its adoption. At the same time, Emrify will work with stakeholders to set and implement standards for patient generated data such as wearables and introduce common standards for research results to be collected and shared.

## Long term goals

In order for Emrify Labs to carry out its mission and solve interoperability to fix healthcare for good, a long term commitment must be established. If Emrify wants to be the leading light for healthcare, it must follow the footsteps of Facebook and Google to fully take advantage of network effects to grow its ecosystem. This is why the support from users around the world is key to the existence and survival of the platform. As the custodian of the token reserve, Emrify Labs will control the supply allocation to accomplish this mission. Methods will be used to prevent buyouts from large health systems and big pharmaceuticals to overtake the platform. Rest assured, Emrify Labs will always remain loyal to the people at all costs. There will be tough decisions ahead and we are stronger if we stick together.

<sup>28</sup> <http://www.healthcareitnews.com/news/system-interoperability-provides-massive-benefits>

## 5. Technical Considerations

This section discusses the general technical considerations as Emrify builds out the platform on the public Ethereum network.

### HIPAA compliance

Before going into details, it is important to remember that HIPAA is an old law that does not offer the best practices today. Systems are not safe under these outdated requirements. Since the Health Passport is an independent PHR on behalf of the user, it is not required to be HIPAA compliant. For more details, this document by HHS has clearly defined the health app use scenarios that are exempt.[29] Emrify will be using the latest and safest protocols without being held back by compliance headaches. This is a key position to allow Emrify the flexibility to innovate as fast as other industries. Once data is transferred, it is up to the recipient to be compliant if it is considered a covered entity.

### Platform limitations

The Ethereum network currently operates on a Proof of Work blockchain and is therefore limited in bandwidth. Future versions of Ethereum based on Proof of Stake will work toward enhanced throughput and scalability. The current average block confirmation time is approximately 17 seconds. For technical reasons, the block time will marginally increase but will nevertheless be smaller than 30 seconds before August, 2017.[30]

Although health data transactions are low in frequency, the Ethereum transaction confirmation times can result in significant delays that can affect usability. Given these barriers, Emrify will initially implement a semi-centralized hybrid with on-chain and off-chain services for better user experience and scalable interactions. At the core, transactions will be settled on the Ethereum public blockchain. However, Emrify will develop cloud servers to temporarily store and cache data to improve latency and avoid unnecessary network fees.

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<sup>29</sup> <https://hipaaqsportal.hhs.gov/community-library/accounts/92/925889/OCR-health-app-developer-scenarios-2-2016.pdf>

<sup>30</sup> <https://www.ethnews.com/vitalik-buterin-on-ether-price-affecting-the-metropolis-update>



## Identity

Within the decentralized application, a new method for user identity is required to interact with the ecosystem. This becomes an important issue to establish a consistent identity across services and third-party dapps. Currently, many users are introduced to decentralized services through wallets for storing cryptocurrencies such as Bitcoin. Emrify Labs will try to support as many third-party identity and wallet services as possible to keep the onboarding process simple. One promising project that Emrify strongly supports is the user friendly self-sovereign identity uPort. They are removing a lot of the friction for new users to manage identity and blur the lines between a regular application and a dapp. Another interesting identity service is Civic to secure and protect user identity that can be validated. Emrify Labs will be collaborating with the teams to help advance mainstream adoption of blockchain.

## Encryption

Data encryption becomes an important issue when health data is placed on the public Ethereum network. There are a few methods that can be used to achieve encryption with blockchain. The simplest way is to create one master key that Emrify can use to encrypt the data before hashing the file for storage. Upon retrieval of the file, the same key pair can then be used to decrypt the file for display and download after permissions are validated. Since Emrify is the sole custodian of the key, the process is easy to implement and can be done today. However, this means that all access must go through Emrify for decryption. Ideally, this does not fit with our ethos for a truly decentralized ecosystem. The better and more complex method requires a Public Key Infrastructure where the sender can encrypt the file with the recipient's public address so that only the recipient can decrypt it with their private key. Since only the selected recipient can decrypt the file, permission is natively integrated into the keys management layer. Given this limitation, Emrify will slowly transition encryption methodology as the ecosystem gains maturity. This is only a matter of time.

Thank you for checking out this draft.

The final version will be released soon with more details regarding the token sale.