DuraChain

A Decentralized Electronic Health Event Environment

We outline a practical application of an electronic health event environment implemented using distributed ledger technology. Such an environment will allow providers of durable medical equipment to more efficiently provide care to their patients and reduce delivery times for equipment. We also provide details about how electronic health events can be further developed so as to allow for use of our technology in all areas of healthcare delivery. With the right tool and proper deployment, electronic health events have the potential to radically transform the management of healthcare data.

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Brandon JP Scott

Chief Technology Officer

DuraChain, LLC

`xcesiv@durachain.io`

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Chief Technology Officer
`DuraChain.io`

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Abstract

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Contents

1 Introduction

We describe DuraChain, a decentralized electronic health event (EHE) environment. Using the Matrix Spec, [1] we will change the infrastructure of healthcare record-keeping by providing an approach that is faster, more secure, and more accessible. We adopt the position that healthcare data is a living entity that mandates a dynamic, sustainable environment in order to thrive and best serve the needs of patients. Following on from that, providers and other stakeholders in the healthcare industry need an efficient and intuitive way to access this data in real time. To address this issue, we outline a comprehensive solution, propose our implementation, and provide a brief analysis of the current state of the market.

1.1 Problem

While many problems exist in the healthcare industry, we prioritize durable medical equipment (DME) at our current stage of development. At present, it takes most DME providers approximately six months from initial contact with a patient to deliver necessary equipment that improves their quality of life. In large part, this lag is due to the poor availability and/or quality of software that DME providers use to facilitate the flow of information throughout the DME sales order life cycle. In our view, six months is entirely too long.

Many DME providers use five or more separate softwares that suffer from poor integration and cost in excess of $15,000 per month), not including labor costs. Many patients and most small-scale healthcare organizations (HCOs) are unwilling to adopt new technology that has the potential to replace their current tools—mainly because of an unwillingness to carry the cost of such services. Larger HCOs, however, seem to be more receptive to new ideas and implementations.

Thus, we believe that an adequate implementation of technology that simultaneously addresses the needs of HCOs and patients requires a wholesale rethinking of patient data management so as to make it accessible to those parties who can rapidly impact the market.

1.2 Solution

We believe that the confounds lay in the ongoing trend toward patient-forward technology. (A prime example is the increasing frequency with which health systems are adopting “patient portals,” which are almost universally slow and lack intuitive or accessible design.) Far from believing that a patient should not have ready access to and control over their health data, we argue that such an aim requires that technology for the stakeholders who routinely access, maintain, and transmit such information be improved first.

Indeed, this technology is doomed to fail if conceived and developed in a vacuum—the needs of the patient must be front-of-mind. Our solution stems from an approach that focuses on the provider and generates, updates, and transmits a patient’s profile in a virtual representation of an exam room. Implementation of the Matrix Spec securely decentralizes patient data while offering an intuitive remedy to well-documented user interface issues in healthcare technology (HCT).

2 Background

DuraChain is a team with more than ten years of experience in the durable medical equipment and software engineering industries. In addition to being leaders in our industries, we have each been directly affected by the slow pace at which the healthcare industry moves. We have a particular sensitivity to patients who suffer from a lack of mobility and believe that our drive and subject matter expertise gives us a distinct edge.

2.1 Durable Medical Equipment

For most people, discussion of healthcare will probably trigger associations with hospitals and doctor's offices. Fewer people will draw connections to medical supplies and equipment that providers order for everyday or extended use. These products support the patient by providing mobility and independence.

Durable medical equipment (DME is the set of products that are used on an ongoing basis to support a medical need and include hospital beds, oxygen concentrators and tanks, wheelchairs, crutches, commodes, ambulatory aids, blood glucose testing devices and supplies, and myriad other items. [2]

2.1.1 Importance

Durable medical equipment plays a crucial role in the modern healthcare system. Without the technology and supplies that make up DME, fatalities because of serious disease, complications, and even sleeping problems would surely rise. The National Association for Home Care reports that over 12 million people in the United States receive home care and values the industry at more than $40 billion USD. [3] [4] With many populations around the world containing increasingly elderly cohorts, the trend indicates continued growth. From the emergency department and urgent care to assisted living facilities and even inside the home, DME is present at every stage in the process of delivering healthcare.

2.2 Distributed Ledger Technology

Distributed ledger technology (DLT) replicates data across multiple devices based on consensus. These devices can be owned and operated by any person or institution so long as they have access to the network. Since there is no central locus of control over the data, both a peer-to-peer network and a robust consensus algorithm are necessary to ensure the accuracy and integrity of the data. [5]

2.2.1 Misconceptions

Distributed ledger technology and blockchain technology are frequently confused as synonyms. Given the rapid onset of these technologies and how they took the attention of the media and the public by storm, such confusion is understandable. Mere mention of a blockchain immediately points people's thoughts to financial transactions, speculative trading, imperfect markets defined by their volatility, and overnight millionaires.

However, notions like these fail to capture the true scope and potential of DLT. To resolve any ambiguity, the only thing being recorded and transmitted across a distributed ledger is data. Any form of data storage can theoretically be retooled to use DLT.

The notion that DLT is an all-or-nothing model for software development is also a misconception. Numerous hypotheses circulate that claim DLT is the harbinger of unprecedented change and disruption to many industries. Over the long run, this may very well prove to be the case. There are, however, far more practical use cases ripe for implementation that will likely serve as stepping-stones since they can be realized quickly and with relative ease.

In the healthcare domain, another persistent myth states that use of a distributed ledger requires a radical redesign of how patient data is handled. While the current models are unequivocally ineffective, it is important to cultivate an awareness of what users are able to adapt and use, which can ultimately result in a practical application.

2.2.2 Importance

Forecasting the impact of a new technology on any particular industry is a challenging task. That being said, it may be prudent to frame the DME-DLT interface as membrane: While the positive effects of DLT on the DME space are easy to see, implementation of distributed ledger technology in a flagship industry like DME and healthcare data may provoke a sea change in a number areas.

Potential improvements in security alone provide a compelling reason to test solutions. What's more, the ability to generate, manage, and transmit records (healthcare or otherwise) with a greater focus on the customer is a non-trivial benefit and could put early adopters of such technology years ahead of the rest of their field.

2.3 Combining DME and DLT

At the moment, DLT and DME exist in relative isolation. Data handling in DME is demonstrably weak and healthcare is opaque to leaders in DLT. A marriage between the two fields is sure to be profitable for the technology, healthcare stakeholders of all types, and a potentially limitless number of other domains.

What we propose here is meant to serve as the gateway to a practical understanding and implementation of DLT in healthcare. Our choice to focus narrowly on DME does not reflect a limited scope of thought but rather a calculated targeting of an implementation that is possible, feasible, and promotes an easy transition for customers while cutting their costs.

3 Architecture

The foundation of our technology is data generation, management, and transmission. These cornerstones include novel ways of storing patient data, identifying and providing access to various types of users, and our overall software implementation.

To accomplish these objectives, we have carefully considered the precise target of our solution, our plan for implementation and deployment, and a process to ensure that our software adequately addresses the needs of providers and their patient base.

3.1 Current Model

The most common methods of maintaining a database of patient records are the electronic health record (EHR) and the electronic medical record (EMR). Both EHR and EMR are centralized collections of data pertaining to an individual patient. They may be centralized to a particular system or a single healthcare practice.

3.1.1 Electronic Health Records

An electronic health record (EHR) is a digital record of health information. It contains all of the information found in a typical paper chart—plus a lot more. EHRs include medical history, vital signs, progress notes, diagnoses, prescribed medications, immunization dates, allergies, lab orders and results, and medical imaging data. An EHR may also contain information pertaining to health insurance, demographics, and even data imported from personal devices. [6]

3.1.2 Electronic Medical Records

An electronic medical record (EMR) is a more limited form of health information. It contains all of the information found in a typical paper chart. EMRs include medical history, vital signs, progress notes, diagnoses, prescribed medications, immunization dates, allergies, lab orders and results, and medical imaging data. While EMRs work well within the confines of a single practice, their utility is limited by the fact that they cannot readily travel outside that practice. In fact, a patient's EMR must often be printed and mailed or faxed in order for an outside provider to access it. [6]

3.2 DuraChain Model

The EHR is an enhanced version of the EMR. Despite the apparent movement in a positive direction, implementation and handling of EHRs still impose severe limitations. [7] By standardizing this data and displaying it on a decentralized ledger, a greater number of stakeholders can securely access patient data. DuraChain's approach to data represents each patient and their data in a room analogous to a real life exam room.

The EHR represents a critical and positive shift toward better patient care and we do not intend to alter it. Instead, we insist that the data be stored in a manner that places less emphasis on its monetary value.

We achieve this by regarding the patient as the single most important, invaluable piece of data. As such, no single entity will be allowed to "own" the data about a patient. Through permission-based access and restriction-conscious design, multiple stakeholders in a patient's care may view and update the patient's EHR data appropriate for their position while being made aware of updates made by other parties. We term the action of recording updates to a patient's EHR an Electronic Health Event (EHE).

3.3 Users

The most critical aspect involved in ensuring robust security of data stored in patient rooms is the management of user permissions. Thus, our system only allows users to join a patient's room via an invitation issued by an existing, qualified member of that room. In the event that a patient is new to the system and does not yet have a room built for them, then a qualified, permissioned user associated with the provider making contact with that patient will be able to initiate the creation of a patient room.

Level 0—System Administrator This user group is the root level access user group that designs, updates, and iterates the code that powers the application UXUIs and servers.

Level 1—Facility Administrators This user group is comprised of the leadership of the organizations outside of DuraChain who handle patient data on a global scale. This group may include HCOs, DME suppliers, and insurance providers.

Level 2—Provider/Practitioner Professional I This group is made up of priamry licensed medical professionals, like doctors, who are authorized to write prescriptions or make recommendations for DME.

Level 3—Provider/Practitioner Professional II This group contains the secondary licensed medical professionals, like nurses, who help facilitate the transmission of patient data. This class of user also includes the sales representative of a DME supplier.

Level 4—Patients These are the users for whom a patient room is dedicated. They will be provided with a separate interface to work with and interact the ledger in their room.

3.4 Patient Rooms

Patients are added to the software through the creation of a room dedicated to that patient. EHEs will be posted to this location by the various users and the information shown to them will be a reflection of the group consensus. These rooms contain a running ledger of posted EHEs and discussions about the patient necessary for users to execute their functions.

EHEs posted to the room comprise the available details about a patient. Events posted by and visible to DuraChain include those listed below in table 1:

	Electronic Healthcare Events		
Patient Name	`firstName`	`middleName`	`lastName`
Contact Information	`homePhone`	`mobilePhone`	`homeAddress`
Primary Insurance	`primaryInsuranceProvider`		
Secondary Insurance	`secondaryInsuranceProvider`		
Basic Info	`height`	`weight`	`gender`

Table 1: Electronic Healthcare Events write data to the EHR contained within a patient room. This table shows EHEs currently implemented by DuraChain.

3.5 Facilities and Groups of Patients

Goals for our software extend beyond a reimagination of how EHRs are handled and stored. We also aim to balance these novel data protocols with the most approachable and intuitive UXUI in the industry. To this end, the software allows healthcare facilities to organize and group their patients in a way that allows for facility users to quickly sort through patients they care for.

In order to promote easy navigation of the vast numbers of patient rooms that will be created, we employ the built-in Matrix identifier known as Groups, which is a collection of rooms. This allows patients to be organized according to the facilities that care for them.

A user who is responsible for managing patients within a facility has the ability to create a new patient room—if the patient does not yet have one—and associate it with the facility. Grouping of patient rooms allows for an intuitive way for a facility to organize their patients and our UXUI ensures a streamlined approach to this functionality.

3.6 Electronic Health Events

An EHE is a confirmed update to a patient's EHR that is made verified by an authorized user. An EHE is recorded to the patient room ledger upon the completion of an 8-step action-based consensus algorithm that we call the "Noble Eightfold Hash."

3.6.1 Unverified Electronic Health Event

An EHE must be passed through the Noble Eightfold Hash before it can be posted to the ledger for a room. Until the EHE is verified by this process, it is known as an Unverified Electronic Health Event (uEHE).

3.6.2 Proof-of-Clocking

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3.6.3 The Noble Eightfold Hash

An EHE must be passed through an 8-step algorithmic process before the event can actually occur. Each action triggers a response from either a user, node, or the room, depdending on their power level. See

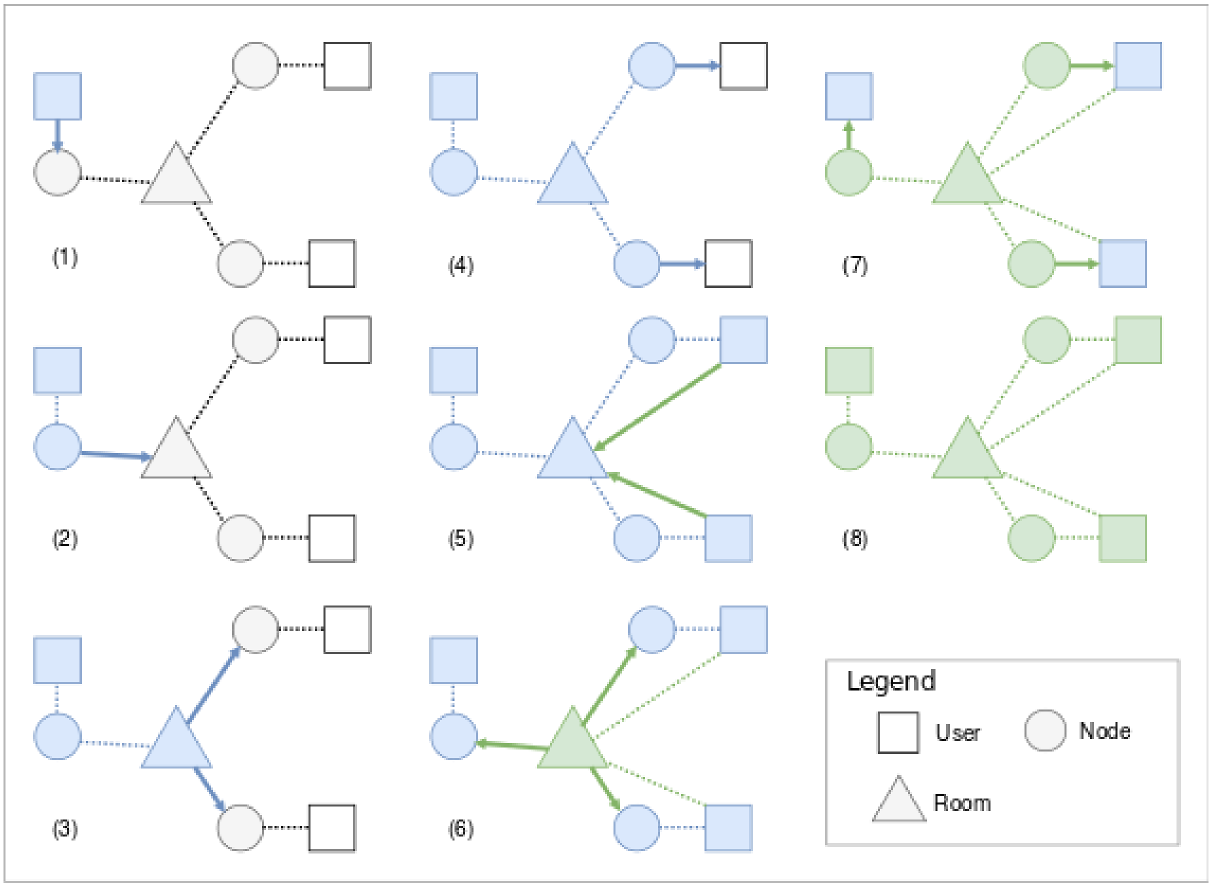

Figure 1: A graphical representation of the process used by the Noble Eightfold Hash for verifiying and transmitting an EHE that updates the ledger in a patient room.

section **XX** for an explanation of power levels. It is only after all 8 actions have occurred that the EHE will be posted to the ledger. This process is known as the Noble Eightfold Hash. Consult figure 1 for a graphical representation of of this process.

Action 1: Initiation Update Request The first action in the Noble Eightfold Hash is the Initiation Request. A user will attempt to update the ledger and, when this occurs, the uEHE and the EHR data to be updated will be sent to the node relative to the user.

Action 2: Request Update Acknowledgement The second action is the Request Acknowledgement. The uEHE will be sent to the room from the node requesting acknowledgement of the request to update the ledger.

Action 3: Request Attention from Verified User Once the uEHE is acknowledged by the room, the room sends a request for a user with appropriate permissions to view the particular data in the patient EHR that the uEHE is trying to update. This request is sent to all of the nodes that are connected to verified members of the room.

Action 4: Post uEHE Verification Request Once the node has the room's request for an appropriate verified user, the node's userbase will be sent through a sorting function that looks for verified users in the room that fit the particular permissions required to verify the uEHE. If successful, a verification request will be posted to the appropriate user, alerting them of the request via a notification.

Action 5: Post EHE Verification Key Once the appropriate verified user has received a request, they must go into the room containing the uEHE, where it is now presented in the room ledger with a warning label indicating that it is unverified. The user must confirm that the EHR data that the uEHE is attempting to update is accurate.

Based on the contents of this data, one user, the majority of users, or, in some cases, every verified user must confirm the uEHE for verification. When this occurs, signature key(s) will be run through an encryption algorithm to confirm their authenticity. Once algorithm determines that the signature key(s) are authentic and owned by the appropriate verified user(s), the verification will be sent to the room to update the ledger and distribute the data. It is at the this point that a uEHE becomes a full-fledged EHE.

Action 6: Post Request for Room Ledger Distribution Once the room has acknowledged verification of the EHE, the EHE will request an update to the ledger for that room. To do this, it will post a request to distribute the new room ledger to the nodes that the algorithm previously determined had appropriate verified associated users. It will also determine if there are any nodes that have verified users associated with the room that may not have been appropriate to sign the verification and post a request to those as well.

Action 7: Stage Update to Room Ledger Once a node has received a request to distribute the new room ledger, it will then stage an updated version of the room ledger for the relevant users in preparation for the next time the user logs in.

Action 8: Distribute Electronic Health Record Data and Room Ledger Until a user signs into DuraChain on a confirmed machine and accesses the room where the staged update is located, they will not have an updated version of the room ledger available to them. Upon sign-in, however, their version of the ledger will update and the EHR data will be accessible to them. Upon seeing a new EHE event in the room ledger, a user will know that this is a confirmed verified update to the Ledger and that the EHR data associated with the patient is the most up-to-date version.

3.6.4 Benefits of Event-Based Distribution

Advances in event-based storage made by Matrix allow us to decentralize both records and conversations about a patient. This permits an unprecedented and patient-forward DME sales order life cycle that will save time and streamline the approach for getting equipment into the patient's home in a timely manner.

Event-based storage also scales readily, allowing for rapid, modular development and implementation of softwares beyond the DME application discussed here.

Using an event-based distribution model, stakeholders can interact in real time without the need to communicate with any of the centralized authorities that presently act as gatekeepers and bottlenecks. The real-time functional and spatial awareness enjoyed by all parties will lead to a greater understanding of where, when, and in what state any given sales order exists in its life cycle.

For our present DME implementation of DLT, our chief concern is providing data about the user(s). Currently, many actors in the DLT space are only concerned with dynamic content posting—live interaction, so to speak. Healthcare, however, is an excellent example of where static content posting is still alive and well.

In this regard, our system allows for a dynamic understanding of change as it acts on "static" content. By transmitting these variables as events, we can track who updates what details about a patient and thus use these data to track who is active inside a patient's room at any given time. The fine granularity offered by event-based information distribution will foster a deeper understanding of the patient care process.

3.7 Implementation

Successful implementation of the DuraChain environment requires active adoption and participation by DME providers, who constitute our main client base.

In order to bring a client into our environment, they must have a copy of our server software properly installed and attached to their domain. From there, they can access our environment via our custom UI and begin creating patient rooms. To join a previously-existing patient room, they must be invited to an appropriately credentialed user inside of that room.

3.7.1 Protected Health Information

Any discussion of healthcare data must obligatorily address the topic of Protected Health Information (PHI). For DuraChain to be implemented properly, compliance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA) [8] is absolutely mandatory for both users and the servers housing patient data.

By placing the server instances within the domain of the DME provider, the client assumes responsibility for creating users, patient rooms, and HIPAA compliance more broadly. As the vendor of the DuraChain software, we assume liability only for performing due diligence on our clientele and extracting an assurance of their compliance with HIPAA.

In this way, the clients assume liability for compliance and removes that burden from us. This is not to a hedge or a dodge. In fact, it is actually the most efficient way to handle HIPAA compliance and liability. Assuming that we only distribute our software to reputable and responsible DME businesses, who already have a HIPAA mandate, then our software remains compliant as long as all server instances are maintained by compliant parties.

4 UXUI

Throughout this paper, we have argued that a wholesale redesign of the EHR is not the optimal strategy for implementing decentralized software in the healthcare industry. Instead, we believe that the element of healthcare data management that cries out most for a radical rethinking is software design. Success in this domain will make great strides in the effort to combat the massive issues facing healthcare stakeholders.

The most radical changes should occur with respect to the user experience and the user interface. Users will benefit greatly from being able to clearly understand what data in an EHR has been changed, the straightforward implementation of our system, the ease with which new users can be trained on the software, and the improvements in accessibility.

4.1 UXUI Overhaul

Rethinking the UXUI of EHR software requires an approach that prioritizes the needs of the people who interact with patient data on a daily basis. We have conducted interviews with several of the leading providers of DME in an effort to determine the best way to implement a UXUI that provides a shorter learning curve than existing software while incentivizing DME companies to make the switch with competitive pricing.

4.2 Accessibility

Software developers are becoming increasingly concerned with ensuring that their products adhere to accessibility best practices. [9] This is particularly important in the areas of user experience and user interface.

The Centre for Excellence in Universal Design [10] promotes two priorities for accessible software designs:

- **Priority 1** requires that "that the application can be used by most people with impaired mobility, vision, hearing, cognition and language understanding, using their assistive technologies."
- **Priority 2** is to "make [software that is] easier to use and will include more people with cognitive impairments or multiple disabilities."

To date, there are very few, if any, healthcare applications that can claim to closely adhere to these principles.

In our research, we found that top-grossing HCOs are laying out increasing amounts of capital to integrate a growing number of inadequate programs into their already-clunky amalgam of slow and underperforming software. By contrast, lower-revenue HCOs are inclined to choose the cheapest products within reach—and even these "standard" options contribute significantly to operating expenses.

In either case, we see a distinct lack of attention paid to accessibility. For this to be the case in an industry where such design concerns are likely more critical than any other, we believe a renewed emphasis on accessibility is an absolute necessity.

4.3 Implementation

A lightweight Javascript application is our vehicle of choice to undertake such a massive overhaul of the prevailing UXUI standards in HCT. The application can be accessed from any modern web browser. Mobile apps for iPhone and Android operating systems will complete our software lineup.

Additionally, we will also implement our UXUI independently of the data that is being accessed. That is, just signing isn't sufficient to begin reading or writing data—a user must also be granted access to a patient room. This is important for security, of course, but also helps us optimize the application's speed.

This Chinese wall is atypical in the software marketed to HCOs today. Indeed, a significant portion of DuraChain's edge is derived from the fact that our implementation will ensure a fast, lightweight application that is also capable of handling the large quantities of data that DME providers need.

5 Market

A thorough assessment of the market is another key component of the success of the DuraChain environment. We are focused on targeting the proper market segment and providing it with an innovative, practical solution.

Software development and deployment does not exist in a vacuum, and it is therefore important to accurately assess the demands of the target segment to develop an understanding of what products they are currently using and have used previously. A fine-grained understanding of these details will allow us to deploy our own environment with maximum efficiency.

We are not the first to envision a world where patient data is transformed into something more useful, practical, and accessible, but we are the first to take an approach that targets DME providers with a data-forward solution—something the segment desperately needs.

5.1 Target Market

We are presently targeting DME providers. We aim to reduce their costs, unify their software environment, and do so with an easy-to-implement solution.

5.1.1 Needs and Wants

Many DME providers are using software that suffers from significant load times and fails to neatly integrate with the rest of their environment. They are hungry for a product that puts the power of existing software into a homogenous environment at a reasonable cost.

In an interview, a potential customer expressed his dissatisfaction that he is paying for access to the metric-tracking system of a particular platform but also has to manually maintain a separate spreadsheet of this data. This unfortunate circumstance stems from the fact that program requires data to be clumsily entered into fields in order for it to actually execute any metrics-tracking tasks.

Gaps like these are where DuraChain will be able to fill the needs and desires of DME providers while simultaneously advancing healthcare data management by leaps and bounds.

5.1.2 DME Provider Groups

Durable medical equipment companies can be sorted into brackets according to their gross revenue. The brackets differ in their approach to providing equipment, typical delivery times, likelihood of adopting the DuraChain platform, and how they might leverage its capabilities.

$0-5,000,000 Gross Revenue This class of DME provider is characterized by:

- manual documentation and billing procedures;
- prolonged documentation times;
- an extended time frame between first contact with the patient and final delivery of their DME; and
- a minimal barrier to entry.

A provider in this revenue bracket will typically spend $2-4,000 each month for their software.

$10-20,000,000 Gross Revenue A DME provider in this bracket will:

- license at least 3 different softwares for business operations; and
- rarely generate documentation manually.

This class of provider spends over $10,000 per month on software to track sales orders, generate and transmit documentation, and bill to insurance carriers.

$25-60,00,000 Gross Revenue DME providers in this revenue bracket are more or less at the top of the food chain. They tend to license 5 to 8 programs for daily use.

DME providers in this top bracket can expect to pay $20,000 or more per month for software that barely allows them to maintain stable sales and production levels.

Because of the extensive use of software in this bracket, human error is greatly reduced, but these providers also routinely suffer from data loss as workflow moves between softwares.

5.2 Competition

Given the unique nature of DuraChain's solution, it is hard to identify any single entity that directly intersects with the full range of what we offer. Generally speaking, we view our closest competitors as software companies broadly specializing in healthcare data or with a particular emphasis on DME.

Notably, we do not perceive vendors of other forms of decentralized technology as direct competitors. In fact, we aim to foster collaboration with these organizations to improve our EHE system while we focus our monetization efforts on our UXUI.

A side-by-side comparison between DuraChain and the competitors listed below can be found in table 2.

5.2.1 Brightree

Brightree is a DME billing system that sold to respiratory company ResMed in 2016 for $800,000,000. Notable aspects of the Brightree platform include a mobile app, MediCare and MedicAid pricing tables, and the ability to connect with referring medical providers. They also work directly with clients to implement custom builds of the Brightree environment.

Brightree falls short in a number of ways, though. The UI is 10 years old and has never been updated. Technically packed with features, the difficulty of using the software means that most DME companies only use Brightree for billing. The software is also very slow and frequently contains outdated data.

Instead of proactively addressing these deficiencies, Brightree has instead spent $140,000,000 in the last 7 years to acquire competitors and corner the market with their 2,300 users.

5.2.2 Lazarus

Lazarus is a patient documentation system created by Orbit Medical. Workflow is usable and it offers a good note-taking system. The system allows patient documentation to be attached to a patient file. It can also track sales representatives, deliveries, and repairs made to DME.

The patient documentation system often contains duplicates, however. Search criteria are limited to `orderNumber`, `firstName`, and `lastName` of the patient. The Lazarus UI is also outdated, having been created sometime before 2010. The UI only allows a single user to naccess a patient file at a time, imposing severe constraints on efficiency. Integration is limited and implementation can take from 6 to 12 months for each DME provider.

5.2.3 Iboss

Iboss is an inventory system for DME providers. It stores products via serial number and tracks each item by manufacturer SKU, but search criteria are limited to serial numbers. Integration with other solutions required by DME providers is limited. For example, Iboss cannot export inventory data to Lazarus. Since Iboss exists in relative isolation to other DME software products, tracking inventory associated with a patient is difficult.

5.2.4 Domo

Domo is a data reporting company that has found great success, raising nearly $700,000,000 in seven years. They have internal messaging, app stores to purchase cards, and a well-designed front-end client for browsers. They suffer from incomplete reporting and a slow system. Additionally, they have a steep fee of $83 per user per month, which adds up quickly in a market where 100 field representatives is not unheard of.

5.2.5 Health Splash

Health Splash is a patient documentation and physician system that states it will be using blockchain technology in 3Q18. They intend to launch a mobile application that connects patients and doctors to check insurance, set appointments, check ER wait times, and chat directly with doctors. A patient will be able view their medical records and send them wherever they choose.

The potential upside of Health Splash is huge, but little is known about how they will be implementing blockchain technology. The information they provide online is questionable—much of it is clearly a restatement of terms and buzzwords easily found with a Google search. Health Splash plans to conduct an Initial Coin Offering (ICO), which may offer more insight into their future goals and ability to execute.

	Company					
Feature	DuraChain	Domo	Health Splash	Iboss	Lazarus	Brightree
Insurance Verification	✓	✗	✗	✗	✓	✓
Bill to Insurance	✓	✗	✗	✗	✗	✓
Patient Documentation	✓	✗	✓	✗	✓	✓
Automated Documentation	✓	✗	✗	✗	✗	✗
Reporting	✓	✓	✗	✗	✗	✗
Inventory	✓	✗	✗	✓	✗	n/a
Provider Presets	✓	✗	✗	✗	✗	✗
Easy-to-use Interface	✓	✗	✗	✗	✗	✗
Mobile App	✓	✗	✗	✗	n/a	✗
Onboard Tutorial	✓	✗	✗	✗	✗	✗
Blockchain or DLT	✓	✗	✓	✗	✗	✗
Rapid Implementation	✓	✗	✗	✗	✗	✗

Table 2: A comparison of capabilities between DuraChain and other HCT products clearly demonstrates DuraChain's edge.

6 Conclusion

DuraChain will help durable medical equipment providers offer more efficient patient care with an innovative, all-in-one solution that decreases costs and the sales order life cycle. We've also discussed how DuraChain can be scaled beyond DME and be used by all participants in the patient care process.

With our focus on providing a fast, accurate, and secure way for providers to interact with patient data, we will fix longstanding problems in healthcare and realize a patient-first paradigm.

6.1 Next Steps

The success of DuraChain and the future we envision hinges on DME providers choosing our environment over our competitors. The ensure that we position ourselves strongly, we will be implementing a test environment that select DME providers will get early access to.

Using the feedback obtained from testing and the selected providers, we will make any necessary changes before deploying on a larger scale.

6.2 Future

While DuraChain's present focus is on fixing issues that face DME, our long term plan is to address healthcare data as a whole and to insert ourselves as an integral part of the patient care process.

We believe that success in this goal relies on placing as much power as possible into the hands of all healthcare providers everywhere. As we've discussed in this paper, DuraChain is well-positioned to catalyze the necessary shift in patient data.

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Additionally, a number of other packages were required to set the document you see here. The packages we used are all included in the 2018 release of TeX Live, which is distributed by the TeX Users Group. Please consult the source code of this paper for more detail on packages we used.

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