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Outvoice: Bringing Transparency to Healthcare

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Honors Thesis

OUTVOICE: BRINGING TRANSPARENCY TO HEALTHCARE

by
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ABSTRACT

OUTVOICE: BRINGING TRANSPARENCY TO HEALTHCARE

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Industries are not incentivized to price reasonably and spend responsibly if consumers do not have the ability to shop around within that industry, and shopping around is not possible without pricing transparency (knowing how much a good or service costs before purchasing it) [1]. But in the healthcare industry, we typically default to whichever clinic or hospital is closest, with no prior knowledge of what costs we can expect to incur at that particular institution. According to a poll published by Harvard University, nine out of ten Americans feel the healthcare industry is too opaque and greater transparency is needed [10].

We are currently standing at a very exciting crossroads of mounting insistence on pricing transparency, and an unprecedented amount of publicly available raw data. The task at hand involves taking the data published by hospitals and formatting it in a way that is informative and consumable to a typical patient, allowing them to make informed decisions as a consumer, ultimately driving an era of reduced waste and competitive pricing in the healthcare industry [3].

ACKNOWLEDGMENTS

Above all, I want to thank my loving and supportive husband for helping me with every step of this project, assisting with everything from refining the original idea to hosting the site to proofreading the final report. He is the smartest person I know and I'm so lucky to have him as a partner. I'm also grateful for all the work that was contributed by my classmates and colleagues, Drex Tanner, Ethan Guinn, and Radley Nelson. They were the accelerants to my spark and I never could have made the progress I did without them. I'm also grateful for the mentorship and guidance of my thesis committee, particularly Dr. Jeff Jenkins and Dr. Bill Tayler. And finally I want to express my appreciation for all the family members and friends in my life who kept me motivated with their enthusiasm, encouragement, and support for this project over the last two years, it made more of a difference than they could possibly know.

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INTRODUCTION

I remember feeling quite shocked when I saw the hospital receipt my sister-in-law received in the mail several weeks after my nephew's birth. He was perfectly healthy, my sister-in-law was perfectly healthy, and the delivery had gone smoothly, yet the grand total was still nearly $11,000. A quick google search revealed that this price was not uncommon, and the predicted prices for labor and delivery were typically presented as ranges spanning tens of thousands of dollars.

Even more shocking than the high grand total was what all the individual charges were for - about $4000 was for taking up a bed in the hospital for 2 nights. It would've been cheaper to spend the same amount of time at a Ritz-Carlton. There were plenty of other charges that seemed ludicrous as well - $35 to switch birthing positions, $8 for a tablet of ibuprofen, etc (see Appendix A). And to top it all off, this still didn't account for any of the money paid directly to their OBGYN, or any of the dozens of pre- and post-natal check ups associated with maternity.

It was unfathomable to me that the exact total and nature of such a massive expenditure was a complete mystery until bills started appearing in the mailbox weeks after the procedure. And while labor and delivery may be an extreme example, as it is a complicated and often unpredictable procedure, there are many other services which are largely routine in healthcare, yet these prices were equally obfuscated by the healthcare industry. An industry without transparency cannot be said to be operating with financial efficiency, and indeed, in

2019 it was estimated that 25% of total spending in the healthcare industry is waste - a staggering $935 billion of waste, and a major driver of that number is pricing failure, accounting for $240.5 billion [9].

I am confident the medical industry will not be incentivized to price their services accurately and eradicate this waste (which will ultimately lower healthcare costs) until consumers are enabled to make educated choices about where to receive medical care [1, 2, 3, 7]. A platform that gives the average patient the ability to search, shop, and compare is absolutely vital in today's digital age if true healthcare pricing transparency is to be achieved [6, 8, 11].

METHODOLOGY

My catalytic experience with pricing in healthcare happened nearly two years ago, and since then my thesis project occurred in three major phases: first, collecting crowdsourced data from individual hospital receipts; second, publishing hospital data that was made available due to recent legislative action; and third, preparing reports on hospital compliance with the recent legislation while concurrently redesigning the website to be more user-friendly. I'd like to take this opportunity to tell you about each of these phases in more detail.

Phase One: Establishing a Platform and Crowdsourcing Data

March 2020 - December 2020

The Origin Story

At the same time that I saw my sister-in-law's surprising hospital bill, I was enrolled in a class on healthcare industry dynamics. In that class, we had frequent discussions as to why publishing pricing in the healthcare industry is so complicated. This largely has to do with the many players who determine the final price paid by the customer or patient. The hospital has a set charge for how much performing a certain service or procedure might cost them, the doctor has a salary that needs to be paid, the insurance company negotiates rates with the hospital, and so on. And as a result, when Googling something like ‘how much will having a baby cost me’, answers can range from $5,000 to over $50,000. And even then, most sites encourage you to check with your insurance provider or search your local hospitals website for more accurate

pricing. This of course doesn't allow for easy comparison if an individual is wanting to shop between insurance providers or is willing to travel to a hospital with more cost-efficient pricing, and as anyone who's ever called their insurance company is aware, it can be a real hassle to get exact information even about your specific insurance plan.

When I brought this issue up to my boyfriend (now husband) in March of 2020, he suggested building a site that reflected individuals specific experiences and costs when receiving medical services. After brainstorming together, we landed on the idea for a platform that would mimic the anonymity and transparency of Glassdoor. For those unfamiliar with Glassdoor's business model, users on the site can access information about salaries, benefits, pros, and cons of working at various positions at a host of different companies. The cost of entry to access this crowdsourced treasure is simply contributing to the communal store of data with information about one's own employer or employment experiences. Consequently, we envisioned a site where users could peruse objective, historical information about the price of various medical services and procedures through the lens of anonymized receipts, as well as reviews left about various hospitals, doctors, and services by previous patients.

Site Security, Data Acquisition, and Mentorship

The site would remain secure and private by allowing for the anonymizing of all data, receipts, and reviews left on the site, while providing contributors with unique encrypted tokens allowing them to access, edit, and even remove any information they had posted on the platform. We even built an in-site redaction tool that would allow users to block out any

personal identifiers from the documents they submitted. The tool would then rasterize the receipt image as a PDF, making the redactions a permanent element of the document, rendering the redacted information completely irretrievable to any potential hackers (see Appendix B). We also did research into the Health Insurance Portability and Accountability Act (HIPAA) to see what expectations existed for a platform such as ours legally. We learned that HIPAA dictates the precautions and procedures that medical professionals must use in order to keep their patients' information private, but it did not extend to medical information volunteered by the patients themselves. However, even though HIPAA itself does not directly apply to the aims or functionality of our website, security is still a high priority to the members of this project and more information can be found on our policy and outlook on information privacy in the security FAQ document included in the appendix (see Appendix C).

Once the framework for a crowdsourced platform of healthcare information had been decided upon, our next important step was to find the data necessary to attract users to the site. This would primarily be in the form of itemized receipts from doctor visits, hospital stays, or other medical procedures. We organized several campaigns to collect receipts from friends and acquaintances, and in some cases individuals were entered into a drawing for cash and prizes in exchange for contributing their data. We received $1,370 from a local entrepreneurship competition to help fund purchasing incentives for these campaigns (see Appendix D). In hopes of limiting the variance in the formatting and contents of receipts, we focused our initial data collection campaign on women who were pregnant or had recently given birth and any receipts associated with medical visits during pregnancy or labor (see Appendix E).

Navigating the complex world of healthcare also led us to seek and meet with multiple different mentor figures such as Chet Loftis, Managing Direct of PEHP Health & Benefits, and Greg Matis, Vice President and Deputy General Counsel at Intermountain Healthcare. These mentors helped us to confirm that the format of our platform was not in violation of any legislation, formulate a strategy on how to define and protect unique elements of our platform, and, perhaps best of all, assured us that they themselves and others they worked with would be very interested in seeing a platform such as ours come to light.

Lessons Learned

During this first phase of the project, I learned a lot about the complications within the healthcare industry, the importance of privacy to prospective contributors to a platform such as ours, and the high variance in the presentation of pricing data from one hospital to the next. There are aspects of the existing platform that still persist from this phase of the project, such as the receipt submission page and the 'Procedures' view currently under development. We also learned about the CPT codes used by hospitals to identify procedures in a standardized way, as well as the HCPCS codes used for a similar purpose to identify drugs and pharmaceuticals. This information would all become extremely important in the next phase of the project. While the data collection effort was not as successful as we would have hoped (we gathered less than 100 receipts in our first 2 months) I still view this as an important phase in the project development and hope one day to revisit the idea of creating a platform where patients can directly and anonymously inform other patients about their medical experiences and costs.

While the future may have looked uncertain for my thesis project last December, a legislative miracle was about to occur that would give the project new life, bringing us into phase two.

Phase Two: Providing Searchable and Shoppable Data

January 2021 - April 2021

Game-Changing Legislation

On January 1st 2021 due to an executive order produced under the Trump Administration, all hospitals in the United States were required to publish their pricing information four up to 300 of the services offered at their hospital, with up to 70 of them coming from a set list of common procedures included as part of the legislation. This was a godsend for the project, as we now had access to literally billions of rows of data regarding pricing on thousands of different procedures and services offered at hospitals all across the country. We no longer were reliant on the donated data from our personal networks but instead could publish the information provided directly by the hospitals in our area. However, this data was not without its problems (see Appendix F).

The Legislation stipulated that hospitals in the United States would need to provide not only a machine readable file with the cash price, inpatient price, outpatient price, and contracted rates with all of the relevant insurance providers for the services offered at the hospital, but also publish that same information in a web-based format that is "searchable,

shoppable, and consumer-friendly". While many hospitals had published spreadsheets and CSV files onto their sites containing at least some of the required information, most of them were completely lacking a web-based interface that could be described as 'shoppable' or 'searchable', let alone 'consumer-friendly'. In fact, we were dismayed to see that even the exemplar of the group in terms of comprehensive data publishing, Intermountain Healthcare (IHC), had essentially just posted an Excel table on to their webpage (see Appendix G). This meant that hospital shorthand was used to describe the procedure (so unless you knew what 'SO BRUCELLA AB' referred to, you might be out of luck attempting to locate a specific procedure on their website), and every possible version of the price was listed out, from Cash to Inpatient Negotiated to Charge, with no explanation of what the differences between the prices were. There wasn't even a search or filter option to quickly identify the prices associated with an individual's particular health insurance provider. Clearly, some sort of solution was needed to bridge the gap between the proposed state of healthcare price publishing and the current reality.

Collecting and Translating the Data

The first important task in the second iteration of the project was collecting and centralizing data for the website. While many hospitals had published some version of their pricing information, there was still quite a bit of processing to be done before it could really be of use to anyone. After locating the data file (which was often tucked away in some obscure

corner of the hospital's website), we had to decode what we were looking at–none of us were medical students, so the long lists of cryptic medical terms, each line accompanied by three different codes and nine different prices, were daunting to say the least. After speaking with various contacts who worked as hospital staff, and a fair amount of googling, we were able to better understand the data and identify the numbers that would be of most interest to patients.

With a clear idea of what data needed to be imported into the backend of our site, we were ready to run our first migration. And it ran. And ran. And continued to run for so long that we assumed it had somehow entered an infinite loop. So we killed the migration and started it over, this time with some checks to print out when it reached specific points in the data. And after over half an hour of allowing the migration to run, it finally hit the first check. That was when we realized that the gargantuan amount of data we were processing was simply too much for our purposes–the Utah Valley Hospital file alone was over one million rows. We needed to make some exclusions if the site was ever going to finish importing the data. We decided to limit the initial migrations to only the 70 core services listed by CMS in the regulation (and even migrating that amount of data took the better part of a weekend) (see Appendix I).

Around the same time, we realized something troubling about the way the data was categorized. Most of the data we had came from hospitals that used CPT codes, which are published and *copyrighted* by the American Medical Association (AMA). These codes are a very helpful way of identifying identical services at different hospitals, but they are not free for anyone to use–anyone wishing to use the codes on their website must pay $17 per user per

year.[1] This could quickly become a staggering amount of money, particularly depending on the definition of 'user'. So while we referenced the codes in order to ensure that we migrated the correct data, we had to be careful not to make any reference to the CPT codes on the site itself.

But this actually turned out to be something of a blessing, because it forced us to divert away from the stilted, jargon-filled definitions used by the AMA for these procedures, and instead do the research necessary to provide lay descriptions for the services on the site. We even took it a step further, searching out YouTube videos and user-friendly articles describing procedures, so that potential patients could truly feel confident that they understood what a specific medical service entailed (see Appendix H). I believe this is actually one of the platform's best features, as it emphasizes the fact that individuals can be empowered to overcome the many barriers to comprehending the healthcare industry.

Creating and Testing the Platform

At the same time that the backend was being loaded with data, the frontend was being designed to offer users easy access to the information we were working so hard to process. The first action users would encounter in the site was a search box where they could enter the name of the service they were interested in (the search box would populate as they typed to help prompt them). From there, they are redirected to a list of hospitals that offer this service, and upon picking their preferred hospital, they are redirected to a list of all the insurance plans that have a negotiated rate for the service in question with the hospital. Upon locating their

[1] https://www.ama-assn.org/practice-management/cpt/ama-cpt-licensing-overview

insurance coverage (or the coverage they are interested in, if they are shopping for a plan), they are finally brought to a page showing the price for their service, as indicated on the hospital's chargemaster (see Appendix J).

We also wanted to build in a browsing functionality that allowed users to simply peruse the data we had stored on the backend, so we added in a hospital browse view, in which patients can explore the hospitals with profiles on our site and the services offered at each. We also included a services browse view, allowing users to see a complete list of all the services documented on our site, what hospitals performed those services and at what price. When possible, we also included information about whether the procedure was invasive, what part of the body it occurred on, typical reasons for needing the procedure, and Youtube videos or medical articles, to help give the user as much information about the service in a digestible way.

Once we had created a functional prototype, it was important to validate that it truly was addressing how difficult finding healthcare prices can be. In order to test this, we had several volunteers attempt to find an exact price for a specific, common service at a given hospital with a given insurance, like an MRI at Utah Valley Hospital using DMBA, first using Google (or the search engine of their choice), and then using our platform. We timed them, giving them up to three minutes to complete each task. Most users could not find the price they were looking for within three minutes using a search engine and hospital websites, but we were pleased to note that the average time to locate the price on our website was about 90 seconds, and this number likely would have been lower if it had not been for a few actions that we realized were unintuitive upon watching friends and family complete the search process.

Even still, it was a proud moment to see that our site could cut the time needed to find the price of a medical service in half.

Establishing a Business

While much of the work done during this period of the project was technical, it was also a period of significant learning about business operations. It was during this time that I drafted my first operating agreement, created a page for an organization on social media for the first time, and formed my first LLC. In addition to the hours spent cleaning data and programming the website, my team also competed in several business competitions, earning $400 in BYU's Student Innovator of the Year competition, and winning the Best in Digital Health award (and $5000) from the Bench to Bedside competition hosted at the University of Utah (see Appendix K). It was exciting to receive so many positive reactions and so much encouragement to continue pursuing the idea.

In an attempt to further the platform's value as a source of information and empowerment in the healthcare industry, we also worked on a blog component where we could explain common concepts and terms they would encounter on the site (such as in-network versus out-of-network), share relatable experiences navigating the healthcare world (like planning for the birth of your first child), and recommending books and other media that help consumers better understand the nuances and complexities of the healthcare industry. We also hoped to use the blog as a means of attracting more visits to the site as users Googled common medical questions that we addressed in our articles.

Lessons Learned

There are several things looking back that I wish had been done differently during this time. For one thing, the tech stack that we chose, while a popular choice right now, was fairly new to all of us, which meant that duties largely got siloed into programming and non-programming, with the stronger programmers taking care of much of the backend work and filtering logic, while other team members handled data collection, cleaning, and augmentation. This isn't inherently a bad thing, but I would've appreciated the opportunity to strengthen my skills as a developer more, especially now that I am the sole person maintaining the project. Additionally, the frontend was built using a JavaScript framework known as Vue.js, which I love, but the components were added using a material design framework known as Vuetify, which I am less fond of–I am reasonably comfortable with frontend design work, and so a building-block style component framework intended for those with little design experience didn't offer much of the customization I wanted for the site, and produced a somewhat confusing experience for individuals navigating the site.

Phase Three: Becoming Consumer-Friendly and Analyzing Compliance

May 2021 - Ongoing

Compliance Report Cards

An exciting discovery occurred in the summer of 2021–my husband discovered a rubric, published by the CMS that detailed exactly what hospitals should have published on

their sites in order to be truly compliant with the legislation (see Appendix L). It explained the expectations about the machine-readable file and the shoppable services (or price estimator tool) in great detail, including criteria such as:

- Does the file include all individual items and services (including service packages) provided by the hospital?
- Can the file be accessed without submitting personally identifiable information (PII)?
- Is the date the information was last updated clearly indicated?
- If your hospital does not offer one or more of the 70 CMS-specified shoppable services, does the display clearly indicate that?
- Is the tool accessible without having to register or establish a user account or password?

This document is essential for understanding the finer points of the legislation, and by its standards, there does not seem to be any hospital that is 100 percent compliant with the executive order (although infraction committed by some of the stronger performers, such as IHC, are rather minimal such as omitting the date of the last update). The next task in the project was to score hospitals on the criteria provided, creating a sort of 'report card' on their compliance with transparency legislation (see Appendix N). While my initial impulse was to use a scale of some sort to allow for some leniency in scoring subjective criteria, (such as 'Is the display posted on a publically available website in a prominent manner?') I ultimately decided to go with a simple scoring method–1 when the criteria was definitely met, 0 when it wasn't. On difficult calls (such as whether a display could be termed 'prominent'), I sought the

opinion of individuals who were not involved with the project in the hopes of obtaining an objective opinion.

While my analysis of how transparent a hospital is was initially based on CMS's checklist alone, the project quickly started to take on a life of its own as I realized that even a hospital that was 100 percent compliant might still offer very little transparency to its prospective patients. So I started asking additional questions about the data, such as 'was I able to find a price even if I don't have insurance', 'did I understand the description of the service', and 'could I tell what was an individual item and what was a service package'. I believe that the answers to these questions will matter just as much to patients as whether the hospital followed the proper file naming conventions.

These scores represent important leverage that could potentially be utilized to encourage some of the hospitals with rather sparse data to strive for greater commitment to pricing transparency. I am hopeful that, once the scores and the methods used to calculate them are publicly available, institutions that are dissatisfied with their score will work to improve it. This could lead to more usable data being published, allowing for the site to expand its coverage to these hospitals and inform consumers of the services and rates offered there.

Rebranding and Redesigning

Another important element of the most recent phase of my thesis has been the rebranding and redesigning of the business itself. To better prepare for this, I have enrolled in a graphic design master class covering Photoshop, Illustrator, and InDesign (completed

November 2021), Google's course on User Experience Design, which not only included two projects going through the entire UX design process, but also emphasized the use of Figma and XD (completed December 2021), and a new venture launchpad through BYU's MBA program (completed December 2021).

The most consequential decision made during this time was likely to change the name of the business and the platform. While 'OkWellThen' may have played well at the university level, prompting some chuckles at various competitions and presentations, it's a bit unwieldy. Ideally, a business's name should be short (one to three syllables), and if possible it should have verb potential (such as Googling or Photoshopped). After experimenting with a plethora of new names, including OWT, Bill'd Well, Wellthy, and The Health Market Co., the winner was outvoice. This name accurately captures the emphasis on both providing detailed pricing information, and speaking out about the need for greater compliance with transparency legislation. It also has excellent marketing potential, naturally giving rise to empowering slogans such as 'Looking for your hospital invoice? Check outvoice!'

This shift necessitated the design of a new logo and brand portfolio, and the eventual purchasing and transferring to a new domain (either outvoice.co or outvoice.health), and updating the look and feel of the site to match the name's aesthetic (see Appendix J). While this process is still underway, the difference between the sites I feel is exemplified in the home page. OkWellThen's homepage can be viewed in the appendix, but the obvious differences include the softer color scheme, the presence of obvious call-to-action buttons in both the nav-bar and the first container on the page (a requisite element of good UX design), and the

clean but modern appearance of the page layout. I've realized over the last six months that I have a passion for good design and I'm excited to make the website as approachable and truly consumer-friendly as possible. I know from personal experience that first impressions of a website can have drastic effects on one's perception of how credible, navigable, and valuable the information it contains is, and the last thing I want is for someone to continue to perceive healthcare pricing as inaccessible after visiting the site.

Lessons Learned

Perhaps the most important takeaway I've had from my experience the last few months is the digital equivalent of 'measure twice, cut once'. That is to say that while I've enjoyed evaluating our site and redesigning the user's journey through it to be more intuitive, I keep kicking myself for not doing a more thorough job of this the first time. Perhaps it was due to the strict deadlines we needed to meet, but most of the decisions about the user experience were made by myself or other team members with very little feedback from individuals who might actually use the site. I am grateful for the insights I have received from the interviews I've conducted with target users of the platform, but I wish I had put in the effort to have those conversations much earlier in the process so I could have saved myself the headache of refactoring highly-complicated filtering queries and other functionality in order to craft a smoother user journey.

PROJECT PRESENTATION

The website I created for my thesis can be found at the following temporary url:

outvoice.autumnpajant.com

DISCUSSION

Questions to Answer

As the business model has developed and especially given the current work on redesigning the website to become more user friendly, additional user testing is needed. For example, as noted in a previous section, most users were able to find a specific piece of information on our platform in 1.5 minutes. While that is significantly faster than attempting to find the same piece of information using a search engine, it is still longer than most individuals will spend looking for something. After revising the price finder to be more instructive and intuitive, it would be helpful not only from an academic perspective but also from a business standpoint to conduct a second series of time trials to see if users really are able to navigate the site and find the information they're looking for in a seamless and frustration-free way.

Another important question that needs to be readdressed is who the target user of the platform is. While the ideal audience was originally those preparing for or considering the possibility of having children, many of the medical services involved in obstetrics are bundled into complex procedures that vary from hospital to hospital, and consequently building out that functionality (and attracting those specific users) will take time. A potential group that could benefit from this site as-is are individuals without health insurance coverage, whether that is by choice or the result of poverty–as of 2020, nearly 10 percent of Utahns are without

health insurance[2], and might find a site such as this one extraordinarily helpful in anticipating out-of-pocket costs for planned medical services. Finally, for those considering elective procedures or services not covered by their insurance, such as bariatric surgery, this site could be a useful reference for determining the most cost-effective way to obtain such services. I am confident that a viable market of users exists, but further research is necessary to determine which groups would benefit most from this platform.

Beyond these somewhat pragmatic questions, there lies a much deeper question: is the platform working? Are individuals actually being empowered to take charge of their medical bills? Are hospitals responding to having their compliance scores prominently posted and working to improve? Is an industry that experiences massive fiscal waste slowly starting to shift towards economic efficiency now that its pricing is no longer opaque? It'll be difficult to say for certain any time soon whether this platform makes a substantial impact, but even if it never does, I'm determined it will not be for lack of trying.

Future Development Work and Features

I could write an essay twice the length of this one describing all the possible features and functionality that I could see being beneficial to this site–location tracking that allows users to see the hospitals in order of how close they are to them (and potentially receive recommendations about a service that would be significantly cheaper if they drove a few extra

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2 https://www.statista.com/statistics/238836/health-insurance-status-of-the-total-population-of-utah/

miles), or a 'procedure' view that shows the bundled price of complex services such as labor and delivery or knee arthroscopy, a system for patients to leave reviews about their experience receiving a specific procedure at a specific hospital, etc. I hope to add all these and more, but in the interest of creating a site that will be obviously and immediately useful to as many people as possible, these are several improvements I intend to make in the coming months.

1. Increasing the hospitals represented on the site - At the time of writing, there are only six hospitals with data on the site, and they are all part of Intermountain Healthcare. Adding more hospitals is a difficult task, because many hospitals have not formatted their data in a usable way or have published incomplete information. However, given an upcoming move to the east coast, it is as good a time as any to consider expanding the hospitals represented on the site to those out of state, most likely focusing on large cities with many medical centers such as New York, Chicago, LA, DC, and the surrounding areas. Assuming data can be found in a semi-consistent format, it would also be worthwhile to write a script that handles importing the data into the website's database in order to save time and work efficiently. This increase in hospital representation on the platform is the most fundamental way to make it useful to a larger number of people–no one is likely to care much what their medical care would cost on the other side of the country.
2. Expanding the services represented on the site–Currently the site really only provides extensive detail for services that are found on the list of 70 core services required in the legislation, and the hospitals on the site do not offer all 70 of those services between the

six of them. Consequently, there are only about 40 services one could find information for, and while they are useful services (such as prenatal checkups and metabolic panels), there are many other common procedures that individuals would likely search for information about. Additionally, there are many of what we have referred to as *adjacent services*–services and procedures that are almost identical to the core 70 stipulated in the legislation, but just distinct enough to be listed under a unique CPT code, and therefore not included in the current iteration of the website. We suspect that with a little digging, the quantity of services listed on the site would increase dramatically, allowing patients with diverse needs to find what they are looking for on the platform.

3. Introducing pricing data for pharmaceuticals–An exciting discovery made during phase two is that while CPT codes may be copyrighted and unusable for our purposes, the common system for categorizing drugs and pharmaceuticals (HCPCS) is available for anyone to use, free of charge. Pharmaceuticals can represent a large portion of a hospital bill, particularly with surgeries, and costs can add up quickly (I was surprised to see on my sister-in-law's hospital bill that each dose of ibuprofen was costing her roughly $8). Adding this in can help patients more accurately estimate the price of complex procedures, and might also expose any pricing that runs far above what one might pay for it at their local pharmacy.
4. Increasing the quantity and quality of instructive material on the site–Many people have spent their entire lives simply living with the idea that healthcare is opaque and

they will have to resign themselves to whatever price the hospital sees fit to send them weeks or months later. I believe that through presenting the information on the site in layman's terms–the descriptions of the procedures, the process for identifying prices, the difference between the prices that are listed, etc.–that users will be empowered to learn more about the healthcare industry, and become involved in calling for fair prices and reduced waste in such a behemothic industry. This will take the form not only of continued blog posts discussing common terms and other resources to learn more about the industry, but also through instructional videos for those who are not literate or, like an increasing number of Americans, simply prefer to learn about something through a video rather than an article. Making the information on the site accessible is a test of whether making knowledge about the healthcare industry accessible is possible.

These are certainly lofty goals, but I believe that once progress has been made on each of them, the platform truly will be capable of providing essential information and incredible value to individuals across the country researching their options for medical care. Improvement in each of these four categories will act as a litmus test of sorts for advancing into a profitable and self-sustaining stage.

Becoming a Viable Business (and Exiting?)

Ultimately, the platform should be profitable enough to sustain itself, either through supporting the costs of hosting services and personnel wages, or at least gathering enough interest to prompt an acquisition by another company. The nature of the platform lends itself to three potential revenue streams, and some combination of them could be employed to maximize profits.

1. Advertising - While not the most artful business model, many websites are able to make a few thousand dollars a month through selling space on their website to advertisers, and the healthcare industry was projected to hit $11.5 billion in advertising costs by 2021.[3]
2. Partnerships With Hospitals - Ideally, I would like to create an interface to the platform that allows partner hospitals to push any changes in their chargemaster directly to our platform. Use of this interface would be available to them as part of a subscription, and would be a tool for allowing them to comply with the web-based requirement in the recent legislation. While this is the preferably business model of the three listed, it is unlikely hospital administrators will be interested in a partnership before the site gains traction.
3. Hospital Profile Updates and Ownership - Similar to the Glassdoor business model, hospitals could pay to have some level of control over their presence on the website, or

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3 https://www.fiercehealthcare.com/hospitals-health-systems/hospitals-spending-big-bucks-advertising-a-look-cost-8-ad-campaigns#:~:text=Healthcare%20providers%20spent%20upwards%20of,reaching%20%2411.56%20billion%20by%202021.

even pay a one-time fee to have administrators at the platform reassess their compliance report card to reflect any changes in their price publishing. This isn't necessarily ideal due to the lack of recurring revenue, but it would likely be a good starting point from which more long-term contracts could be drawn.

While I do hope to see this passion project grow into a successful business, I have also realized that I will not be able to give it my full attention while also pursuing a Ph.D., and so while I intend to use the next eight months before my program begins to truly build it into an effective and impactful platform, I will also need to begin looking for someone who is interested in running it as a company when I have to turn my attention elsewhere. I have already been fortunate enough to already make a few potential contacts through my MBA course who would be interested in running the business with me in the coming months and potentially taking over operations by next fall, allowing me to exit.

That's a bittersweet thought, as the project has taken up so much of my time and thoughts over the past two years, and it's hard to untangle who I currently am from it. But I have felt from the beginning that it should grow to be bigger than just me, and I believe it's important for me to admit that I do not have the business experience to grow it into what it needs to be, at least right now. I'm looking forward to seeing what a fresh perspective brings to the platform, and I hope to see it thrive and influence many lives under the direction of someone who can take the torch and give it their time and attention the way I have.

CONCLUSION

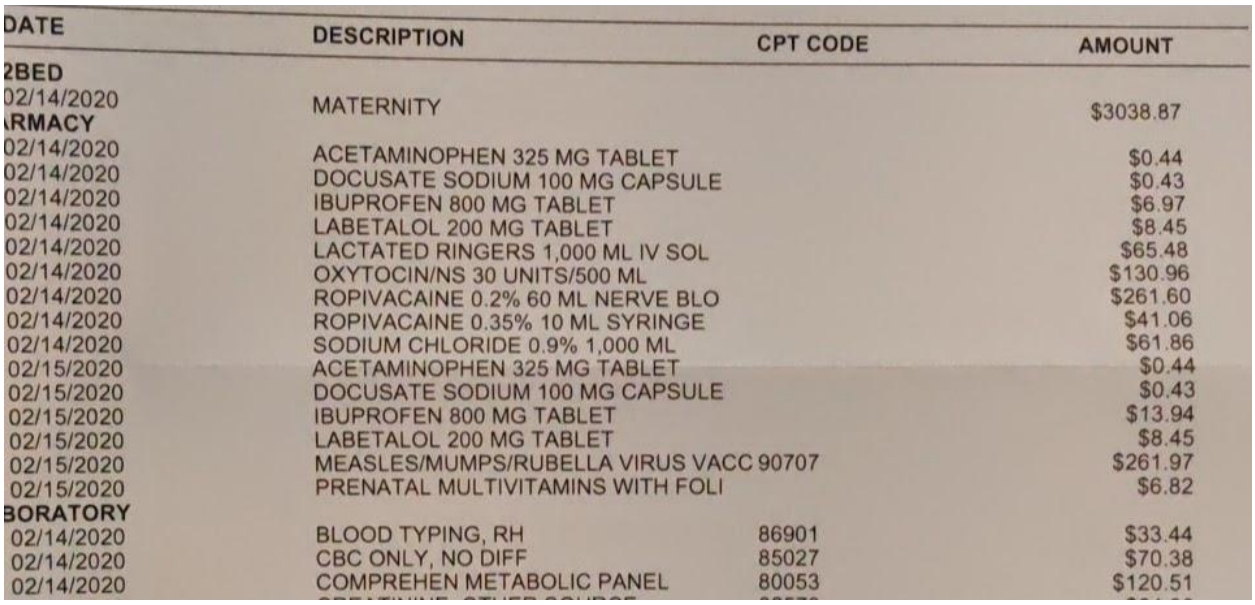
This project represents nearly two years of my life, the culmination of knowledge and effort from over 50 credits worth of classes, and hundreds of hours of work. It's led to thousands of dollars in awards, my two most recent jobs, and my first academic publication. But far beyond any of that in import is this project's potential to help individuals and to impact an industry. I don't expect the website I built to change the way we do health care in America–I expect that will be accomplished by the websites and the apps and the software that come after it, made by people much smarter than me who looked at what I'm trying to do and found ways to improve upon it. I hope that in the coming years and decades, people across the country will develop the same expectations about the transparency of transactions in healthcare as they hold about transactions in housing or transportation–clearly defined, competitive, and agreed upon in advance. I've been fortunate to work on this project during a time when all the elements are combining to create change–the increasing ease and speed with which we can calculate all other major costs in our lives is throwing healthcare's holdout into sharp relief, and we are at a crossroads in which the rising generation will either choose to be complicit, or will begin making strides to untangle the web of healthcare delivery and pricing.

It is my sincere belief that as we as consumers address the waste and pricing failure that plague the healthcare industry, we will do more for putting accessible, equitable healthcare in reach of every American than any other solution proposed thus far, and I am honored to be a part of that movement.

APPENDICES

Appendix A: Exemplar Hospital Receipt

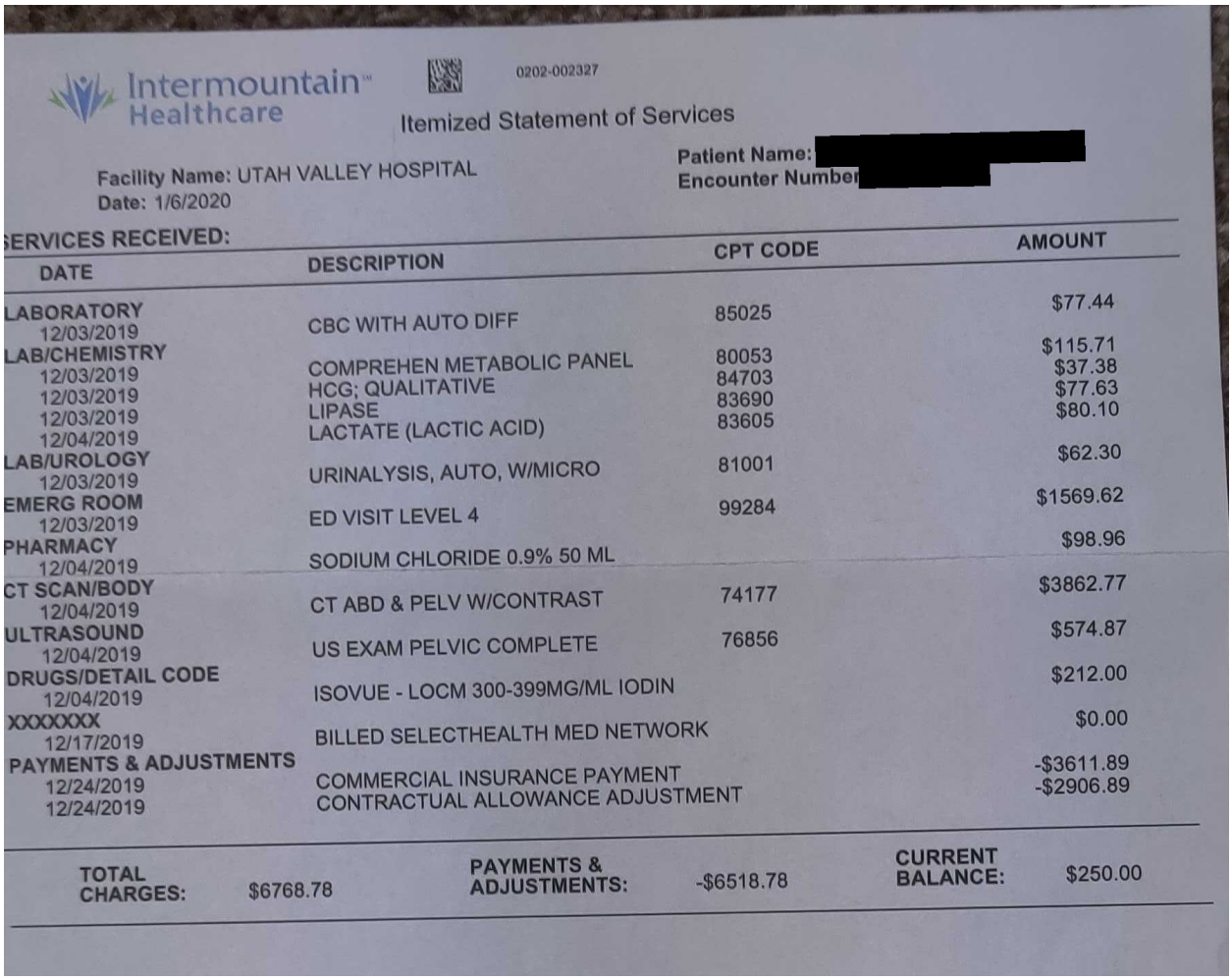
This is a segment of receipt from a labor and delivery procedure, note the $3000 unexplained 'maternity' charge (this did not cover the doctor's payment or the charge for staying in the hospital for two nights), the array of pharmaceuticals applied, and the use of CPT codes for certain services. This was the most common formatting we saw in the receipts collected during our data campaigns in phase one.



DATE	DESCRIPTION	CPT CODE	AMOUNT
2BED			
02/14/2020	MATERNITY		$3038.87
RMACY			
02/14/2020	ACETAMINOPHEN 325 MG TABLET		$0.44
02/14/2020	DOCUSATE SODIUM 100 MG CAPSULE		$0.43
02/14/2020	IBUPROFEN 800 MG TABLET		$6.97
02/14/2020	LABETALOL 200 MG TABLET		$8.45
02/14/2020	LACTATED RINGERS 1,000 ML IV SOL		$65.48
02/14/2020	OXYTOCIN/NS 30 UNITS/500 ML		$130.96
02/14/2020	ROPIVACAINE 0.2% 60 ML NERVE BLO		$261.60
02/14/2020	ROPIVACAINE 0.35% 10 ML SYRINGE		$41.06
02/14/2020	SODIUM CHLORIDE 0.9% 1,000 ML		$61.86
02/15/2020	ACETAMINOPHEN 325 MG TABLET		$0.44
02/15/2020	DOCUSATE SODIUM 100 MG CAPSULE		$0.43
02/15/2020	IBUPROFEN 800 MG TABLET		$13.94
02/15/2020	LABETALOL 200 MG TABLET		$8.45
02/15/2020	MEASLES/MUMPS/RUBELLA VIRUS VACC	90707	$261.97
02/15/2020	PRENATAL MULTIVITAMINS WITH FOLI		$6.82
BORATORY			
02/14/2020	BLOOD TYPING, RH	86901	$33.44
02/14/2020	CBC ONLY, NO DIFF	85027	$70.38
02/14/2020	COMPREHEN METABOLIC PANEL	80053	$120.51

Appendix B: Redacted Receipt

As part of the project, our team employed a redaction tool that not only allowed the user to hide any sensitive information in a document, but also produced a new JPEG file with the redactions baked in so that the sensitive information could not be retrieved if the document ever fell into the wrong hands. Certain file types, such as PDFs, will still retain the data in the document even if it is hidden or covered by another object. This particular receipt is mine from an appendicitis scare I had back in 2019.



Intermountain Healthcare

0202-002327

Itemized Statement of Services

Facility Name: UTAH VALLEY HOSPITAL
Date: 1/6/2020

Patient Name: [redacted]
Encounter Number [redacted]

SERVICES RECEIVED:

DATE	DESCRIPTION	CPT CODE	AMOUNT
LABORATORY 12/03/2019	CBC WITH AUTO DIFF	85025	$77.44
LAB/CHEMISTRY 12/03/2019	COMPREHEN METABOLIC PANEL	80053	$115.71
12/03/2019	HCG; QUALITATIVE	84703	$37.38
12/03/2019	LIPASE	83690	$77.63
12/04/2019	LACTATE (LACTIC ACID)	83605	$80.10
LAB/UROLOGY 12/03/2019	URINALYSIS, AUTO, W/MICRO	81001	$62.30
EMERG ROOM 12/03/2019	ED VISIT LEVEL 4	99284	$1569.62
PHARMACY 12/04/2019	SODIUM CHLORIDE 0.9% 50 ML		$98.96
CT SCAN/BODY 12/04/2019	CT ABD & PELV W/CONTRAST	74177	$3862.77
ULTRASOUND 12/04/2019	US EXAM PELVIC COMPLETE	76856	$574.87
DRUGS/DETAIL CODE 12/04/2019	ISOVUE - LOCM 300-399MG/ML IODIN		$212.00
XXXXXXX 12/17/2019	BILLED SELECTHEALTH MED NETWORK		$0.00
PAYMENTS & ADJUSTMENTS 12/24/2019	COMMERCIAL INSURANCE PAYMENT		-$3611.89
12/24/2019	CONTRACTUAL ALLOWANCE ADJUSTMENT		-$2906.89

TOTAL CHARGES:	$6768.78	PAYMENTS & ADJUSTMENTS:	-$6518.78	CURRENT BALANCE:	$250.00

Appendix C: Security and Privacy FAQ Document

Because there were many questions regarding privacy and security and HIPAA compliance and related issues in the early stages of the project, I drafted a document to address some of the more common concerns about our platform and shared it with mentors, professors, potential users, and posted it on our organization's pages on various social media platforms. The entire article can be found here. Questions addressed include:

- How will you redact personal information from the receipts?
- What information will you keep and what will you redact?
- What will my receipt be used for?
- Who will be able to see my receipt?
- Will I be able to edit or delete my receipt off the site after I submit it?
- Are you HIPAA compliant?

This document also represents our early attempts at establishing our brand, both with the custom letterhead, logo, and slogan, and also through the conversational voice used to convey our policies in this document.

Making healthcare prices available to patients before the visit.

Hey there!

If you're on this page, it probably means you're someone who cares about the privacy of your personal information, and you want to know more about what we plan to do with it, and how it will be protected.

That's awesome! Our founding team consists of four Masters of Information Systems Management students, and a research scientist at a Fortune 500 company, so we're all about the responsibility technologists' have to their clients to keep their information protected.

Below are some of the questions we're guessing might be on your mind, but if we missed any, feel free to reach out to us at support@okwellthen.com.

Thanks for being willing to contribute!

Best,
Autumn, Curtis, Drex, Ethan, and Radley

Appendix D: GetSeeded Award Article

Our team participated in a competition in September 2020 to raise funding for buying incentives that we could use in our data campaign. We were awarded $1,270 to purchase items such as an iPad, AirPods, and a portable pizza oven to use in the giveaway. You can see me pictured in the third row, third column, along with my capstone teammates, Ethan Guinn, Drexler Tanner, and Radley Nelson. The full article can be found here.

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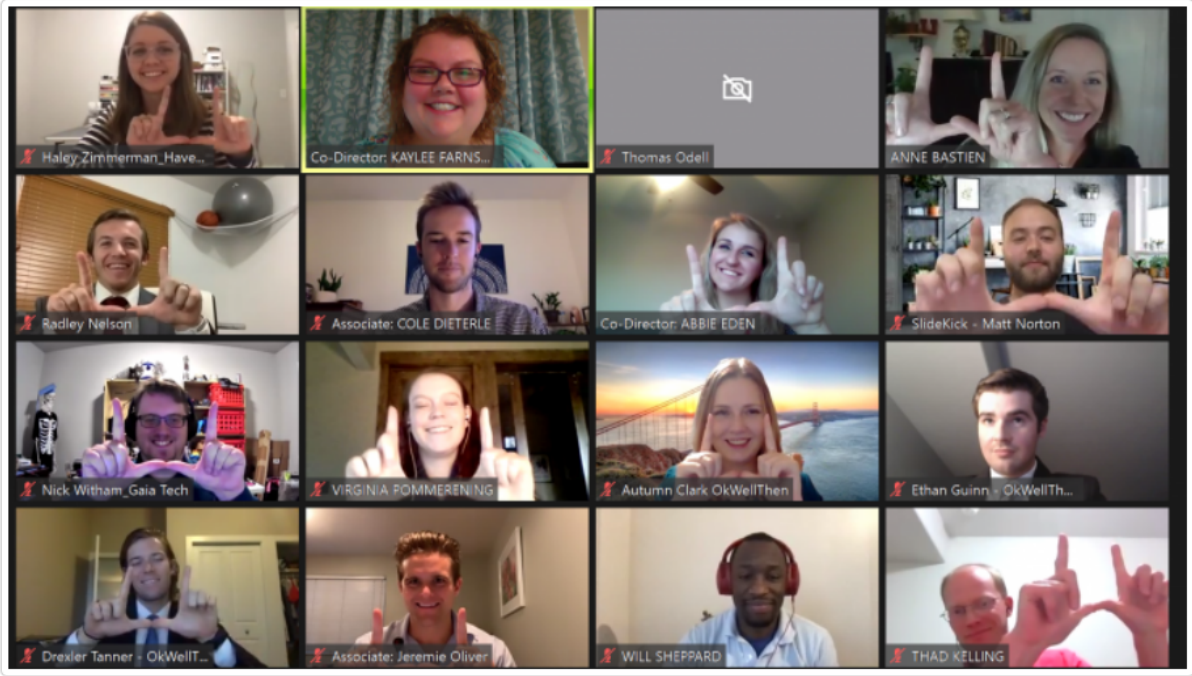
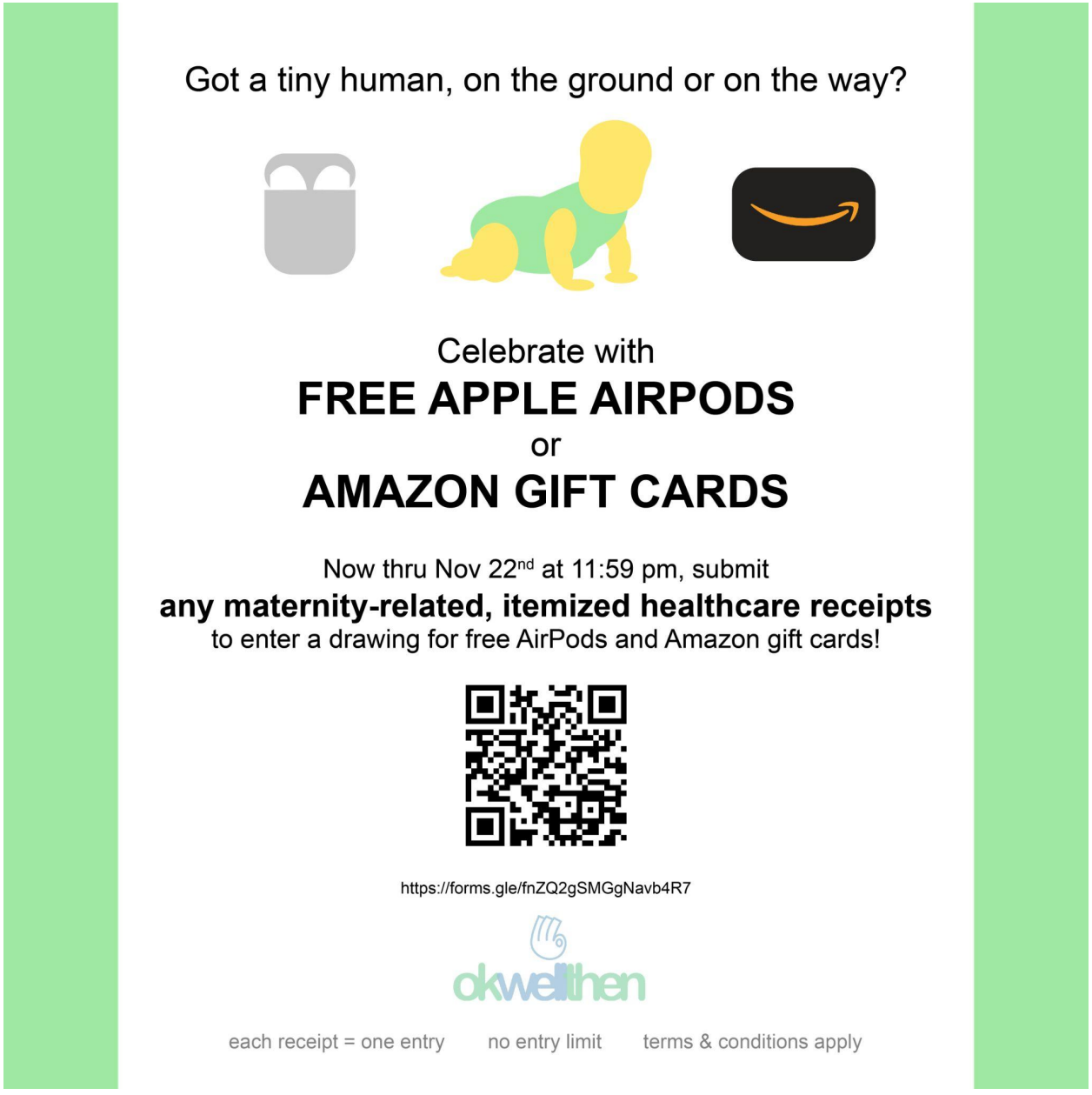


GET SEEDED AWARDS $5,270 IN GRANTS IN SEPTEMBER

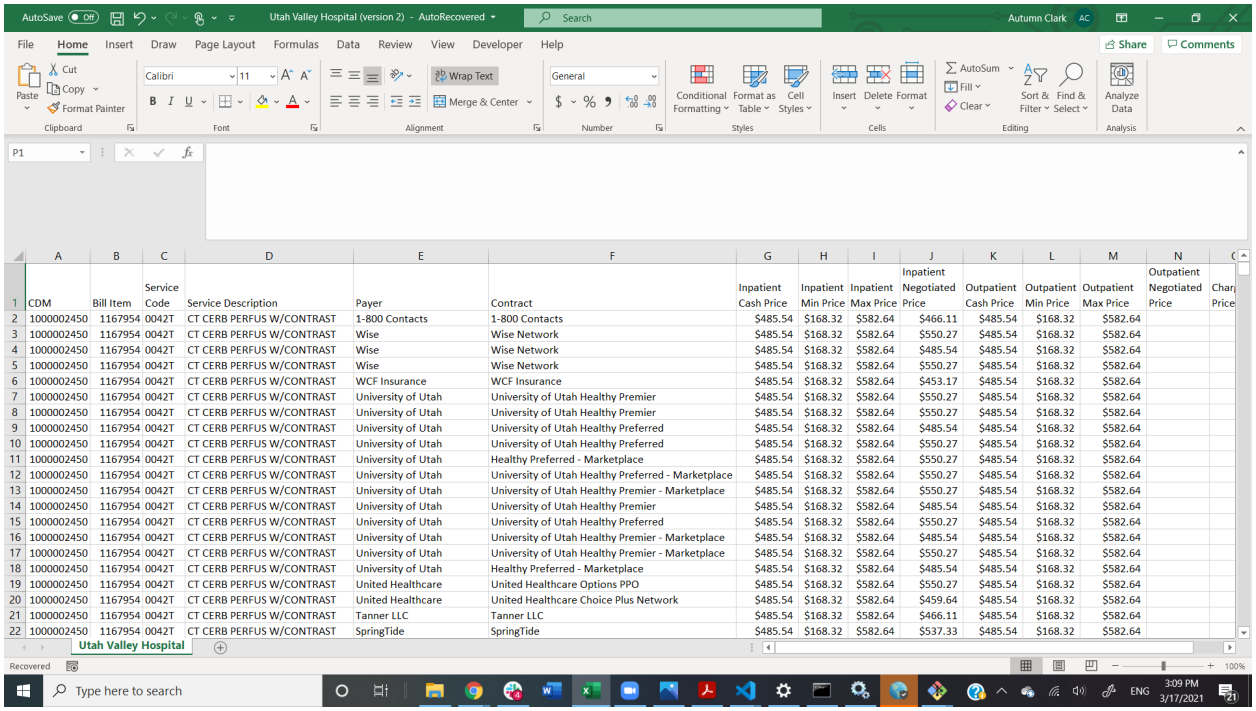
Appendix E: Data Campaign Giveaway Flier

This is a flier we used to promote our data collection campaign. Anyone with a receipt could submit it through the Google form accessed with the QR code. This was distributed to classmates, social media channels, and through our personal networks.



Appendix F: Hospital Data File Exemplar

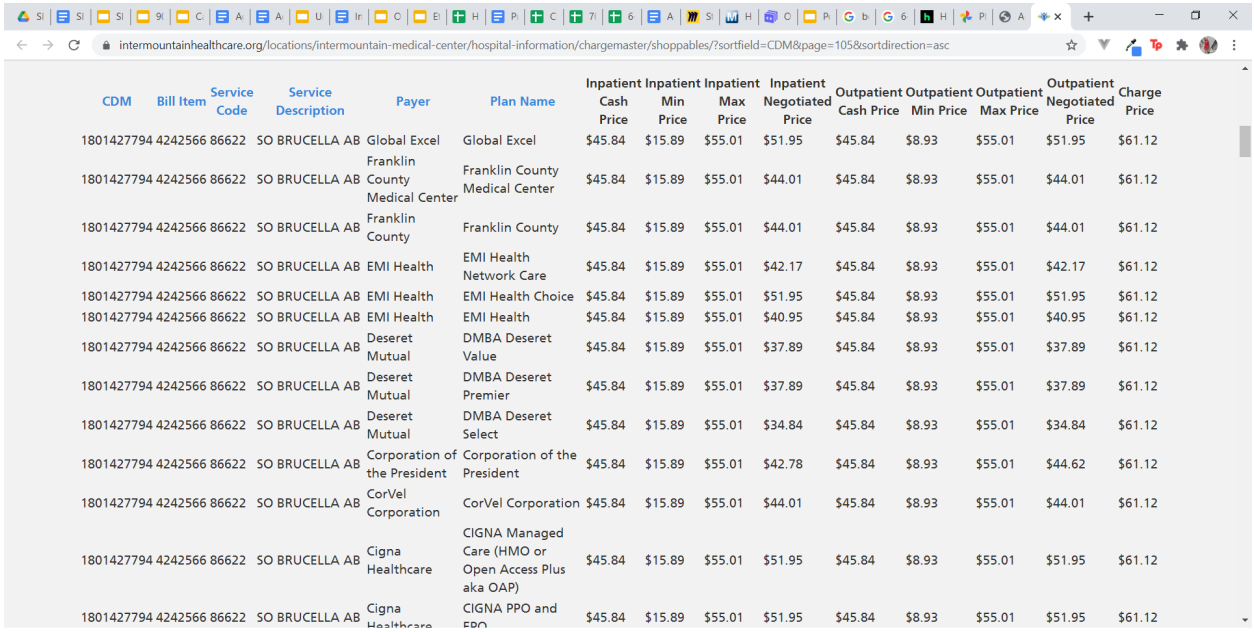
The following is an example of the type of data files we worked with. This particular file is from Utah Valley Hospital, an Intermountain Healthcare hospital located in Provo, Utah. Intermountain hospitals tended to provide the most complete chargemasters and our entity relationship diagram is largely based on how their files are organized. Column C references the industry service code associated with a specified service, column D gives the name of the service in medical shorthand, columns E and F are used to designate the insurance company and specific coverage plans respectively, and the remaining columns list prices, most of which remain constant from one line to the next. The column to watch is J, the Inpatient Negotiated Price. This price and the cash price are the two prices we focus on reporting on the platform.



CDM	Bill Item	Service Code	Service Description	Payer	Contract	Inpatient Cash Price	Inpatient Min Price	Inpatient Max Price	Inpatient Negotiated Price	Outpatient Cash Price	Outpatient Min Price	Outpatient Max Price	Outpatient Negotiated Price
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	1-800 Contacts	1-800 Contacts	$485.54	$168.32	$582.64	$466.11	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	Wise	Wise Network	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	Wise	Wise Network	$485.54	$168.32	$582.64	$485.54	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	Wise	Wise Network	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	WCF Insurance	WCF Insurance	$485.54	$168.32	$582.64	$453.17	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Preferred	$485.54	$168.32	$582.64	$485.54	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Preferred	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	Healthy Preferred - Marketplace	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Preferred - Marketplace	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier - Marketplace	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier	$485.54	$168.32	$582.64	$485.54	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Preferred	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier - Marketplace	$485.54	$168.32	$582.64	$485.54	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	University of Utah Healthy Premier - Marketplace	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	University of Utah	Healthy Preferred - Marketplace	$485.54	$168.32	$582.64	$485.54	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	United Healthcare	United Healthcare Options PPO	$485.54	$168.32	$582.64	$550.27	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	United Healthcare	United Healthcare Choice Plus Network	$485.54	$168.32	$582.64	$459.64	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	Tanner LLC	Tanner LLC	$485.54	$168.32	$582.64	$466.11	$485.54	$168.32	$582.64	
1000002450	1167954	0042T	CT CERB PERFUS W/CONTRAST	SpringTide	SpringTide	$485.54	$168.32	$582.64	$537.33	$485.54	$168.32	$582.64	

Appendix G: Web-Based Price Reporting

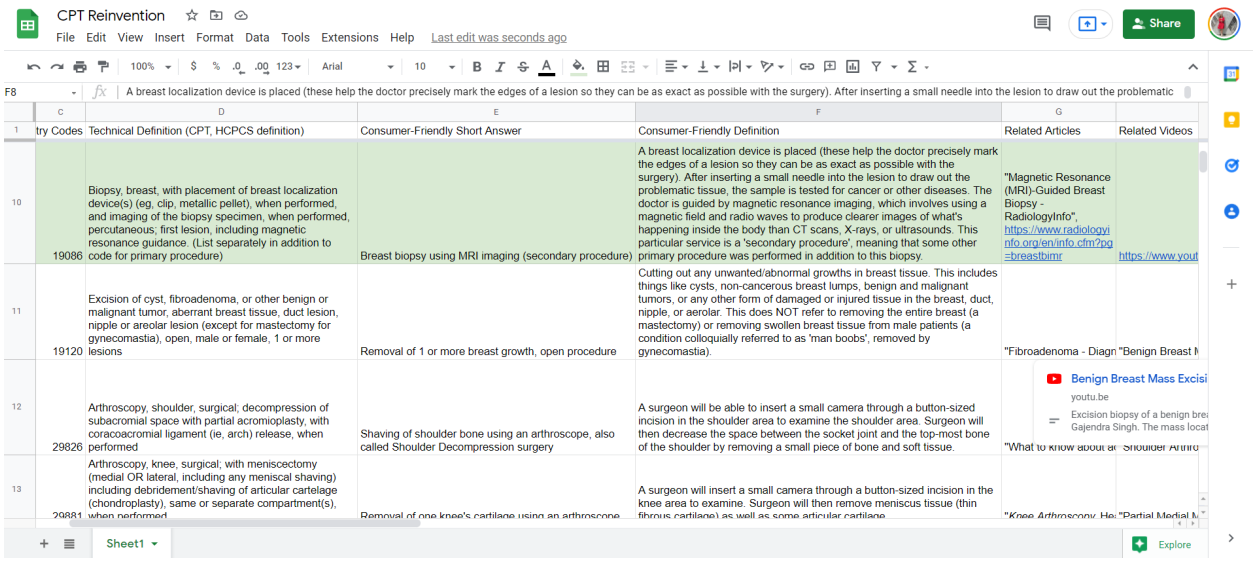
This is an example of the "web-based price tool" we found while searching through Intermountain Healthcare's website. As you may notice by comparing it with Appendix F, this is actually just the exact same format as their CSV chargemaster file. There is no easy way to search for a specific service, the service is still described in unintelligible medical shorthand, and there is no indication given to the patient which price of the nine that are listed applies to their situation. Our site used this as a baseline to improve from.



CDM	Bill Item	Service Code	Service Description	Payer	Plan Name	Inpatient Cash Price	Inpatient Min Price	Inpatient Max Price	Inpatient Negotiated Price	Outpatient Cash Price	Outpatient Min Price	Outpatient Max Price	Outpatient Negotiated Price	Charge Price
1801427794	4242566	86622	SO BRUCELLA AB	Global Excel	Global Excel	$45.84	$15.89	$55.01	$51.95	$45.84	$8.93	$55.01	$51.95	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Franklin County Medical Center	Franklin County Medical Center	$45.84	$15.89	$55.01	$44.01	$45.84	$8.93	$55.01	$44.01	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Franklin County	Franklin County	$45.84	$15.89	$55.01	$44.01	$45.84	$8.93	$55.01	$44.01	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	EMI Health	EMI Health Network Care	$45.84	$15.89	$55.01	$42.17	$45.84	$8.93	$55.01	$42.17	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	EMI Health	EMI Health Choice	$45.84	$15.89	$55.01	$51.95	$45.84	$8.93	$55.01	$51.95	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	EMI Health	EMI Health	$45.84	$15.89	$55.01	$40.95	$45.84	$8.93	$55.01	$40.95	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Deseret Mutual	DMBA Deseret Value	$45.84	$15.89	$55.01	$37.89	$45.84	$8.93	$55.01	$37.89	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Deseret Mutual	DMBA Deseret Premier	$45.84	$15.89	$55.01	$37.89	$45.84	$8.93	$55.01	$37.89	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Deseret Mutual	DMBA Deseret Select	$45.84	$15.89	$55.01	$34.84	$45.84	$8.93	$55.01	$34.84	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Corporation of the President	Corporation of the President	$45.84	$15.89	$55.01	$42.78	$45.84	$8.93	$55.01	$44.62	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	CorVel Corporation	CorVel Corporation	$45.84	$15.89	$55.01	$44.01	$45.84	$8.93	$55.01	$44.01	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Cigna Healthcare	CIGNA Managed Care (HMO or Open Access Plus aka OAP)	$45.84	$15.89	$55.01	$51.95	$45.84	$8.93	$55.01	$51.95	$61.12
1801427794	4242566	86622	SO BRUCELLA AB	Cigna Healthcare	CIGNA PPO and EPO	$45.84	$15.89	$55.01	$51.95	$45.84	$8.93	$55.01	$51.95	$61.12

Appendix H: CPT Reinvention File

A major part of our task was finding ways to refer to the services without using any copyrighted material such as CPT codes and descriptions. Below is a screenshot from a spreadsheet where we tracked our research on services that we had pricing data for. In addition to rewriting the definitions of services to use common vernacular, we took it a step further by directing users to medical blogs describing the service in greater detail and videos that showed the service being performed.



CPT Reinvention

File Edit View Insert Format Data Tools Extensions Help Last edit was seconds ago

Share

F8: A breast localization device is placed (these help the doctor precisely mark the edges of a lesion so they can be as exact as possible with the surgery). After inserting a small needle into the lesion to draw out the problematic

	C	D	E	F	G	
1	try Codes	Technical Definition (CPT, HCPCS definition)	Consumer-Friendly Short Answer	Consumer-Friendly Definition	Related Articles	Related Videos
10	19086	Biopsy, breast, with placement of breast localization device(s) (eg, clip, metallic pellet), when performed, and imaging of the biopsy specimen, when performed, percutaneous; first lesion, including magnetic resonance guidance. (List separately in addition to code for primary procedure)	Breast biopsy using MRI imaging (secondary procedure)	A breast localization device is placed (these help the doctor precisely mark the edges of a lesion so they can be as exact as possible with the surgery). After inserting a small needle into the lesion to draw out the problematic tissue, the sample is tested for cancer or other diseases. The doctor is guided by magnetic resonance imaging, which involves using a magnetic field and radio waves to produce clearer images of what's happening inside the body than CT scans, X-rays, or ultrasounds. This particular service is a 'secondary procedure', meaning that some other primary procedure was performed in addition to this biopsy.	"Magnetic Resonance (MRI)-Guided Breast Biopsy - RadiologyInfo", https://www.radiologyinfo.org/en/info.cfm?pg=breastbimr	https://www.yout
11	19120	Excision of cyst, fibroadenoma, or other benign or malignant tumor, aberrant breast tissue, duct lesion, nipple or areolar lesion (except for mastectomy for gynecomastia), open, male or female, 1 or more lesions	Removal of 1 or more breast growth, open procedure	Cutting out any unwanted/abnormal growths in breast tissue. This includes things like cysts, non-cancerous breast lumps, benign and malignant tumors, or any other form of damaged or injured tissue in the breast, duct, nipple, or aerolar. This does NOT refer to removing the entire breast (a mastectomy) or removing swollen breast tissue from male patients (a condition colloquially referred to as 'man boobs', removed by gynecomastia).	"Fibroadenoma - Diagn	"Benign Breast M
12	29826	Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with coracoacromial ligament (ie, arch) release, when performed	Shaving of shoulder bone using an arthroscope, also called Shoulder Decompression surgery	A surgeon will be able to insert a small camera through a button-sized incision in the shoulder area to examine the shoulder area. Surgeon will then decrease the space between the socket joint and the top-most bone of the shoulder by removing a small piece of bone and soft tissue.	"What to know about ar	Shoulder Arthro
13	29881	Arthroscopy, knee, surgical; with meniscectomy (medial OR lateral, including any meniscal shaving) including debridement/shaving of articular cartelage (chondroplasty), same or separate compartment(s), when performed	Removal of one knee's cartilage using an arthroscope	A surgeon will insert a small camera through a button-sized incision in the knee area to examine. Surgeon will then remove meniscus tissue (thin fibrous cartilage) as well as some articular cartilage	"Knee Arthroscopy, He	"Partial Medial M

Benign Breast Mass Excisi
youtu.be
Excision biopsy of a benign brea
Gajendra Singh. The mass locat

Sheet1

Explore

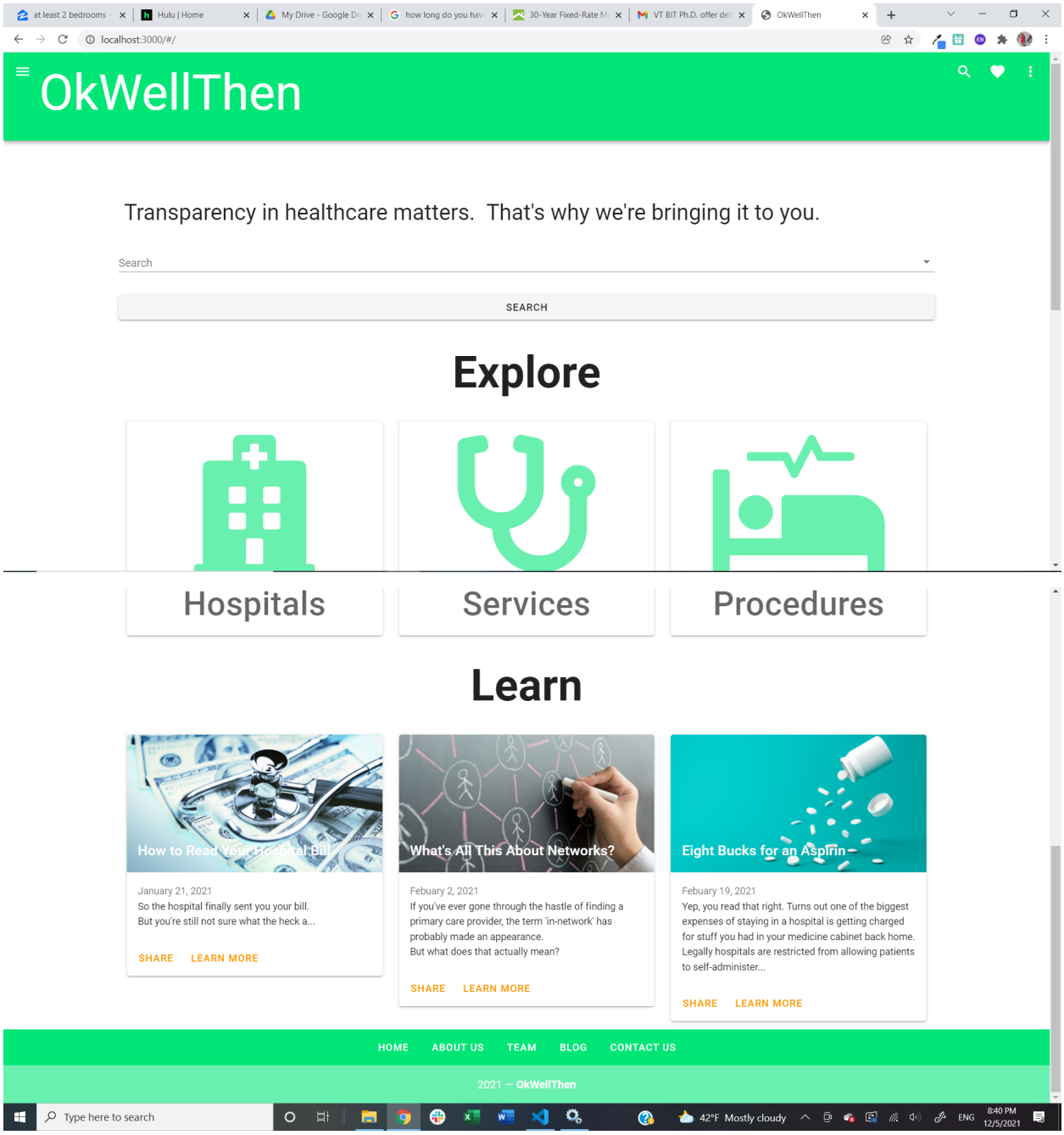
Appendix I: 70 Core Services

As mentioned before, when the legislation went into effect it included a list of 70 services that a hospital had to report pricing for if they offered that service (and if they did not that needed to be indicated). This is a screenshot of the first 30+, the full list can be found here.

Specified Shoppable Service	2020 CPT/HCPCS Primary Code
Group psychotherapy	90853
New patient office or other outpatient visit, typically 30 min	99203
New patient office of other outpatient visit, typically 45 min	99204
New patient office of other outpatient visit, typically 60 min	99205
Patient office consultation, typically 40 min	99243
Patient office consultation, typically 60 min	99244
Initial new patient preventive medicine evaluation (18-39 years)	99385
Initial new patient preventive medicine evaluation (40-64 years)	99386
Laboratory & Pathology Services	**2020 CPT/HCPCS Primary Code**
Basic metabolic panel	80048
Blood test, comprehensive group of blood chemicals	80053
Obstetric blood test panel	80055
Blood test, lipids (cholesterol and triglycerides)	80061
Kidney function panel test	80069
Liver function blood test panel	80076
Manual urinalysis test with examination using microscope	81000 or 81001
Automated urinalysis test	81002 or 81003
PSA (prostate specific antigen)	84153-84154
Blood test, thyroid stimulating hormone (TSH)	84443
Complete blood cell count, with differential white blood cells, automated	85025
Complete blood count, automated	85027
Blood test, clotting time	85610
Coagulation assessment blood test	85730
Radiology Services	**2020 CPT/HCPCS Primary Code**
CT scan, head or brain, without contrast	70450
MRI scan of brain before and after contrast	70553
X-Ray, lower back, minimum four views	72110
MRI scan of lower spinal canal	72148
CT scan, pelvis, with contrast	72193
MRI scan of leg joint	73721
CT scan of abdomen and pelvis with contrast	74177
Ultrasound of abdomen	76700
Abdominal ultrasound of pregnant uterus (greater or equal to 14 weeks 0 days) single or first fetus	76805
Ultrasound pelvis through vagina	76830
Mammography of one breast	77065

Appendix J: Screenshots of OkWellThen and outvoice

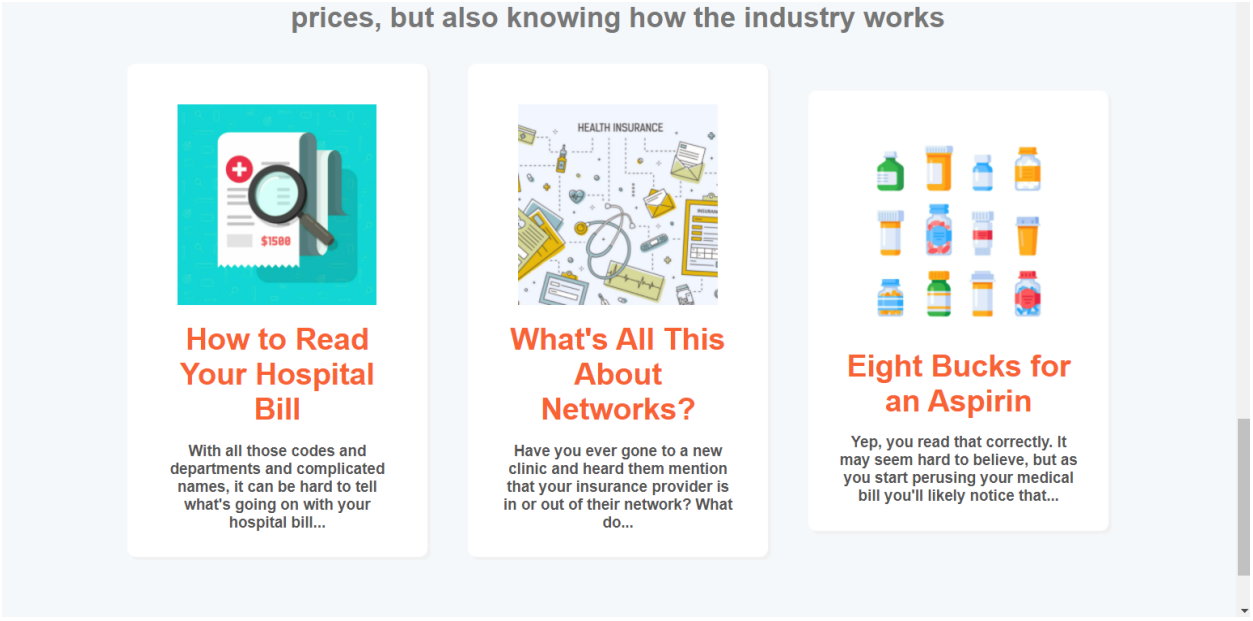
OkWellThen homepage

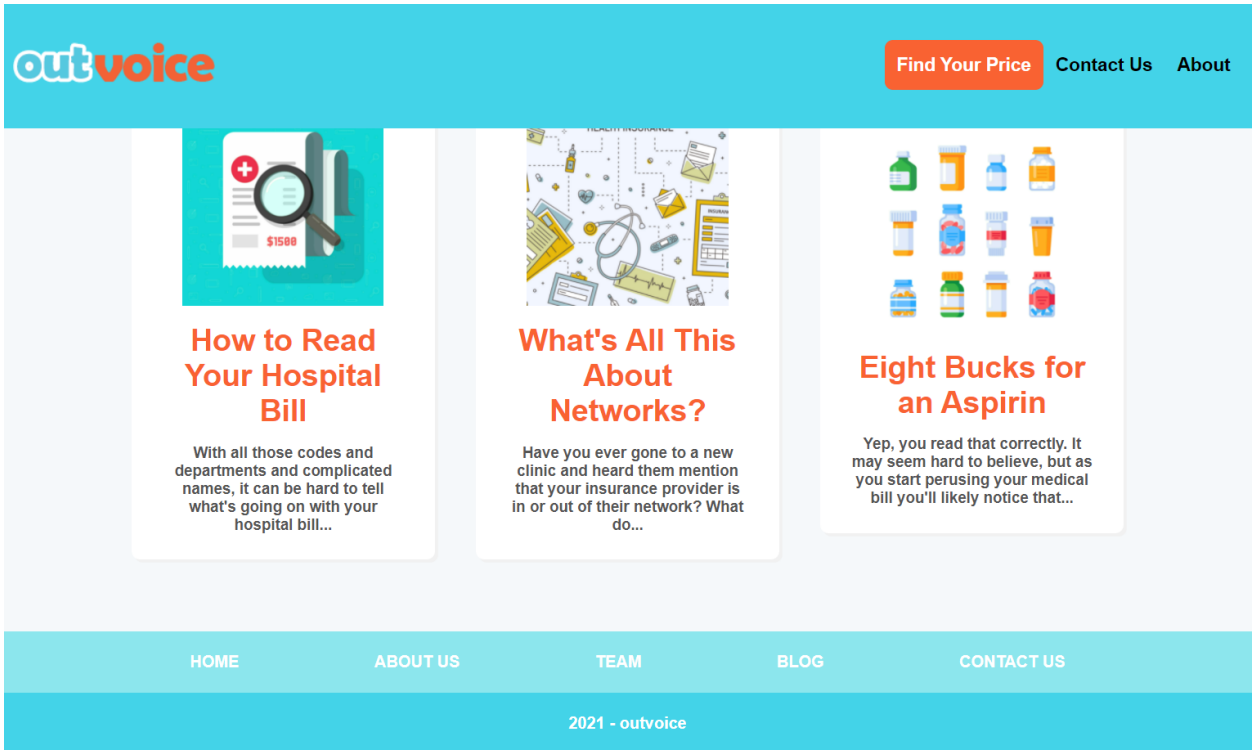


outvoice homepage

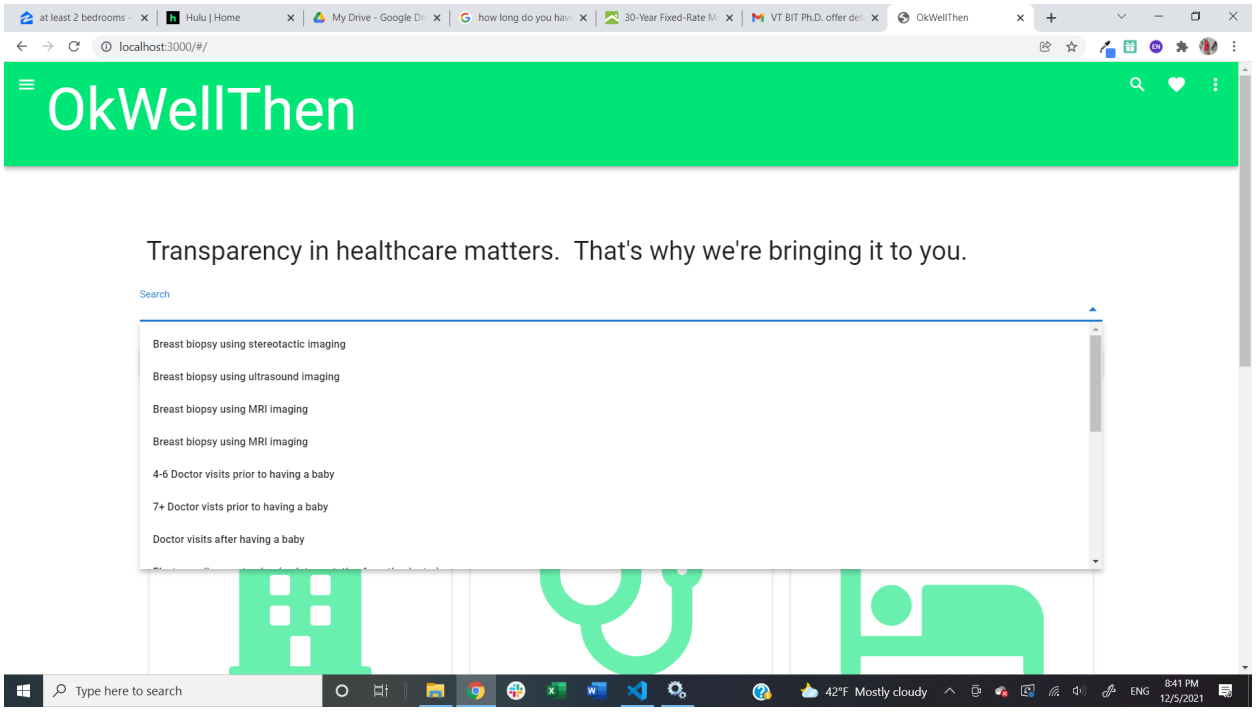
outvoice homepage continued

outvoice homepage continued

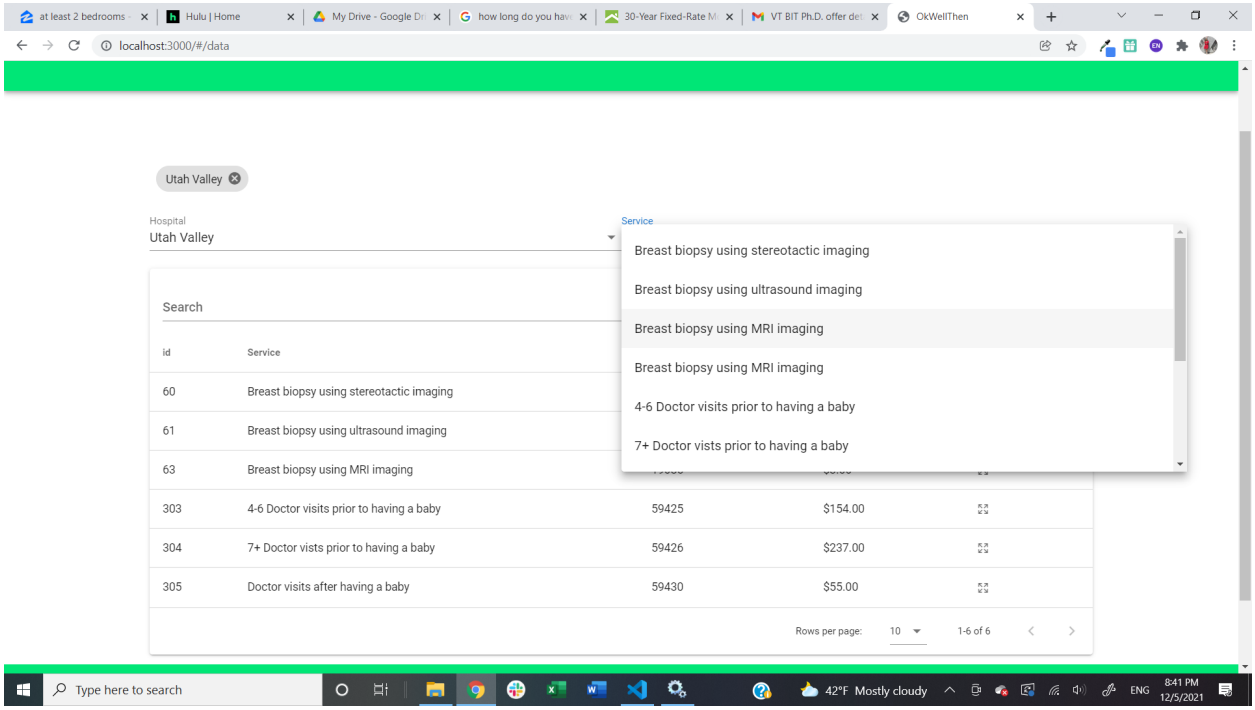




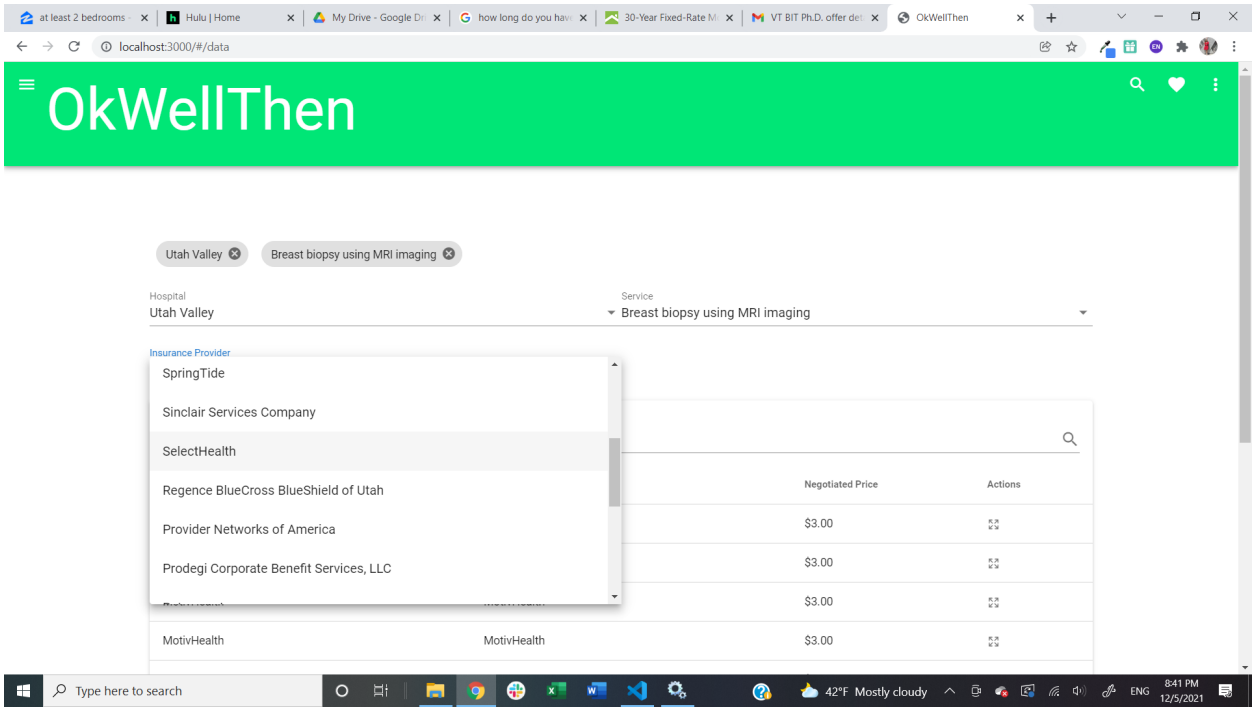
Search functionality



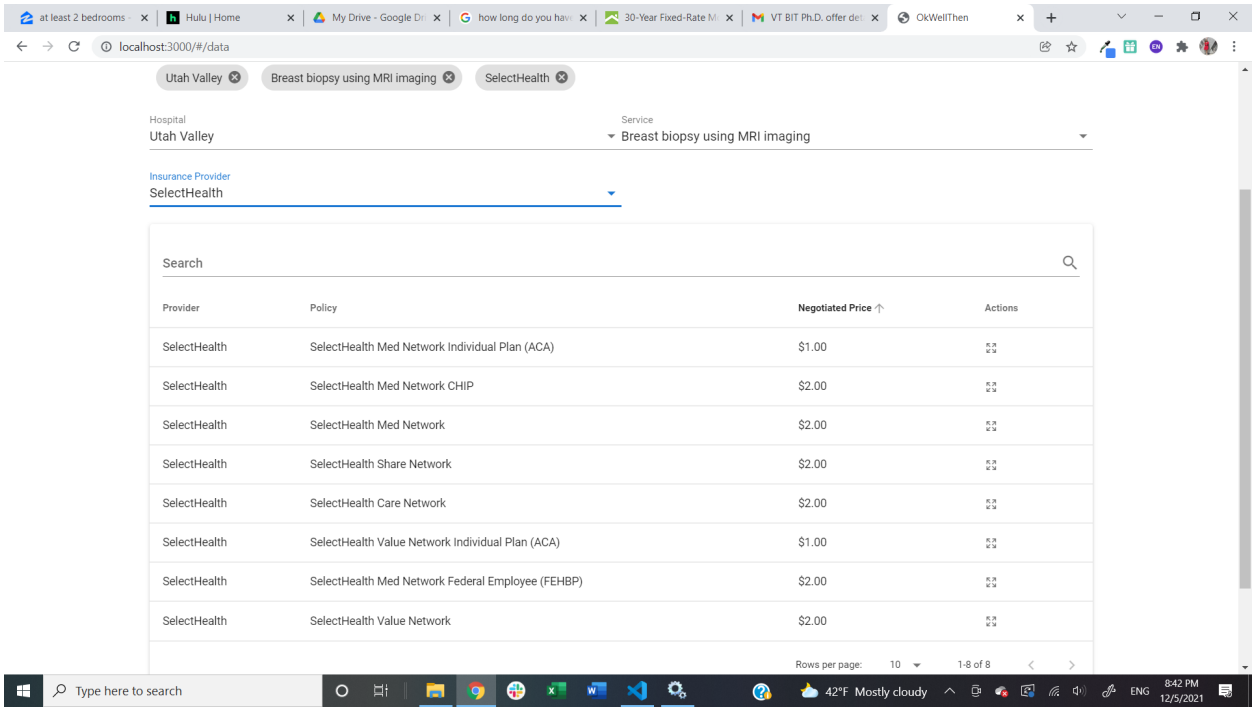
Viewing services offered at Utah Valley Hospital



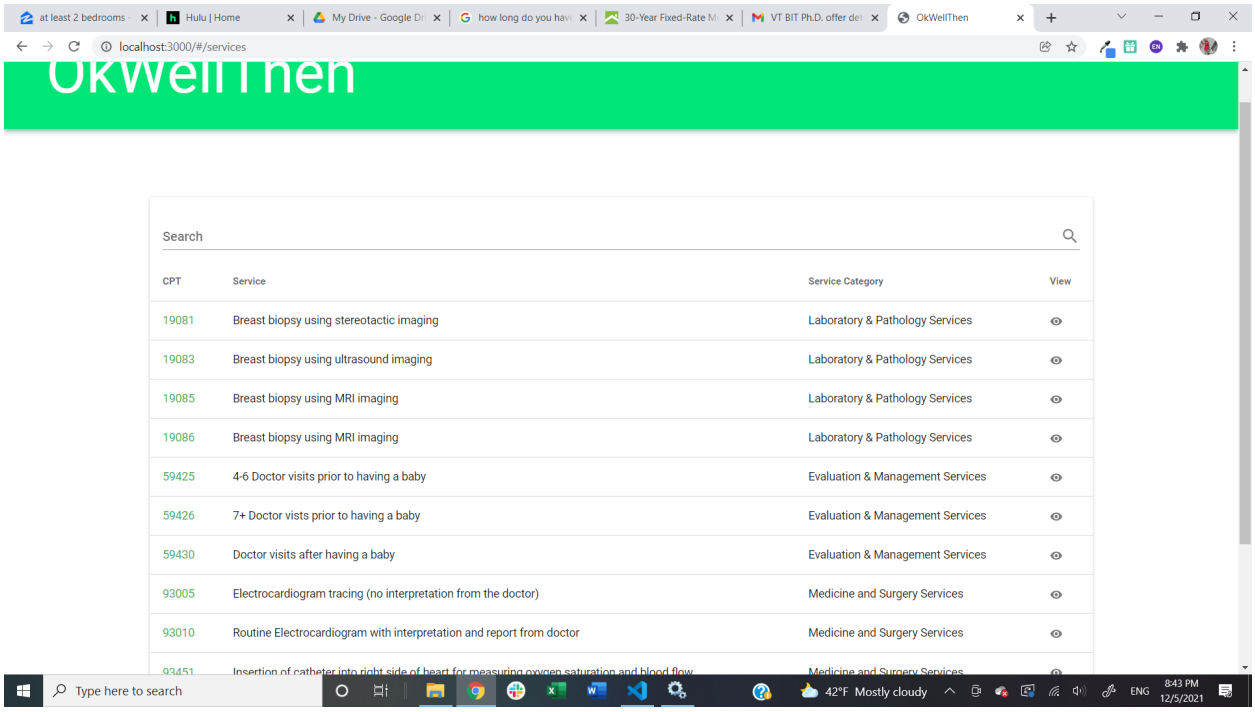
Selecting an insurance coverage for receiving a breast biopsy using MRI imaging at Utah Valley Hospital



Prices for biopsy using MRI imaging at Utah Valley Hospital with SelectHealth Insurance

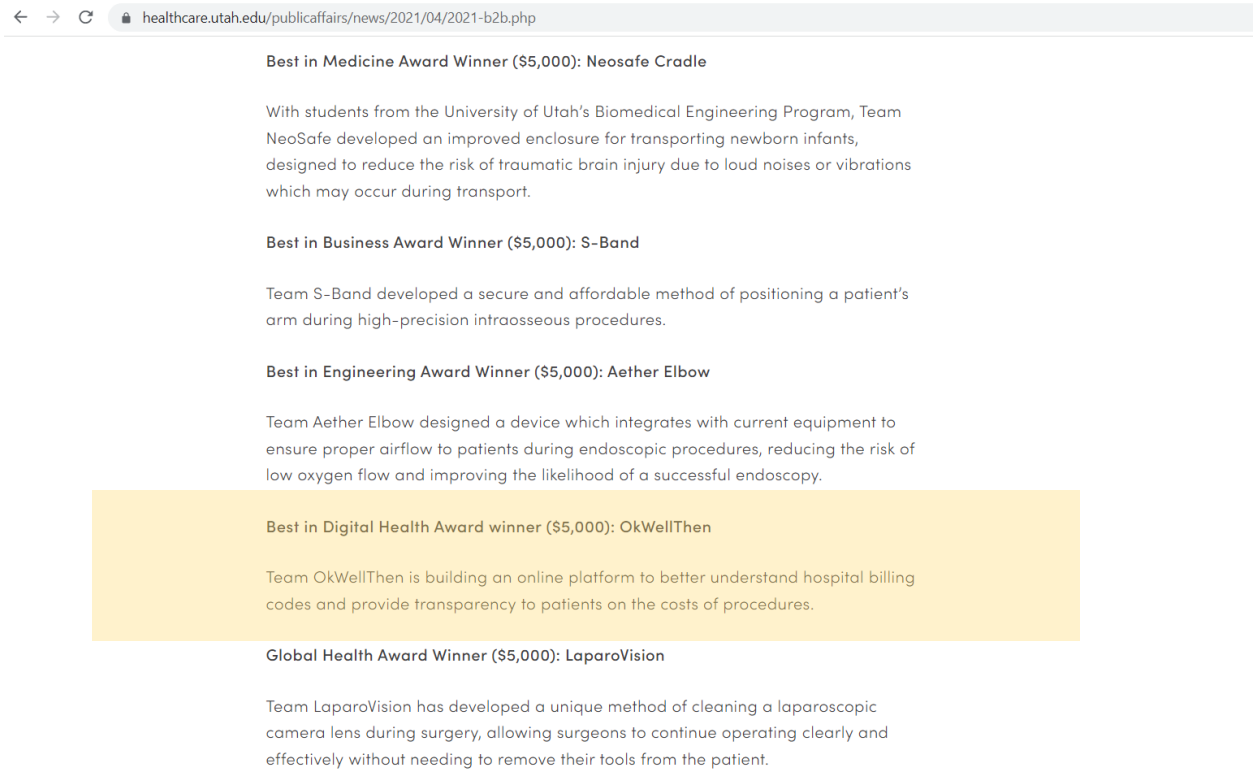


Browsing services listed on the site



Appendix K: Bench 2 Bedside Competition Winner Announcement

In spring of 2021 our team competed in the Bench 2 Bedside competition at the University of Utah. Over 40 teams participated. Our team won Best in Digital Health and was awarded $5000. Details can be found here.



Appendix L: CMS Compliance Rubric

In summer of 2021, we discovered that CMS had published a rubric for evaluating hospital compliance. This was used to generate the hospital 'report cards' mentioned in phase three of methodology. This is a segment illustrating the expectation for machine readable files. The full document can be found here.

Hospital Price Transparency Requirements Quick Reference Checklists

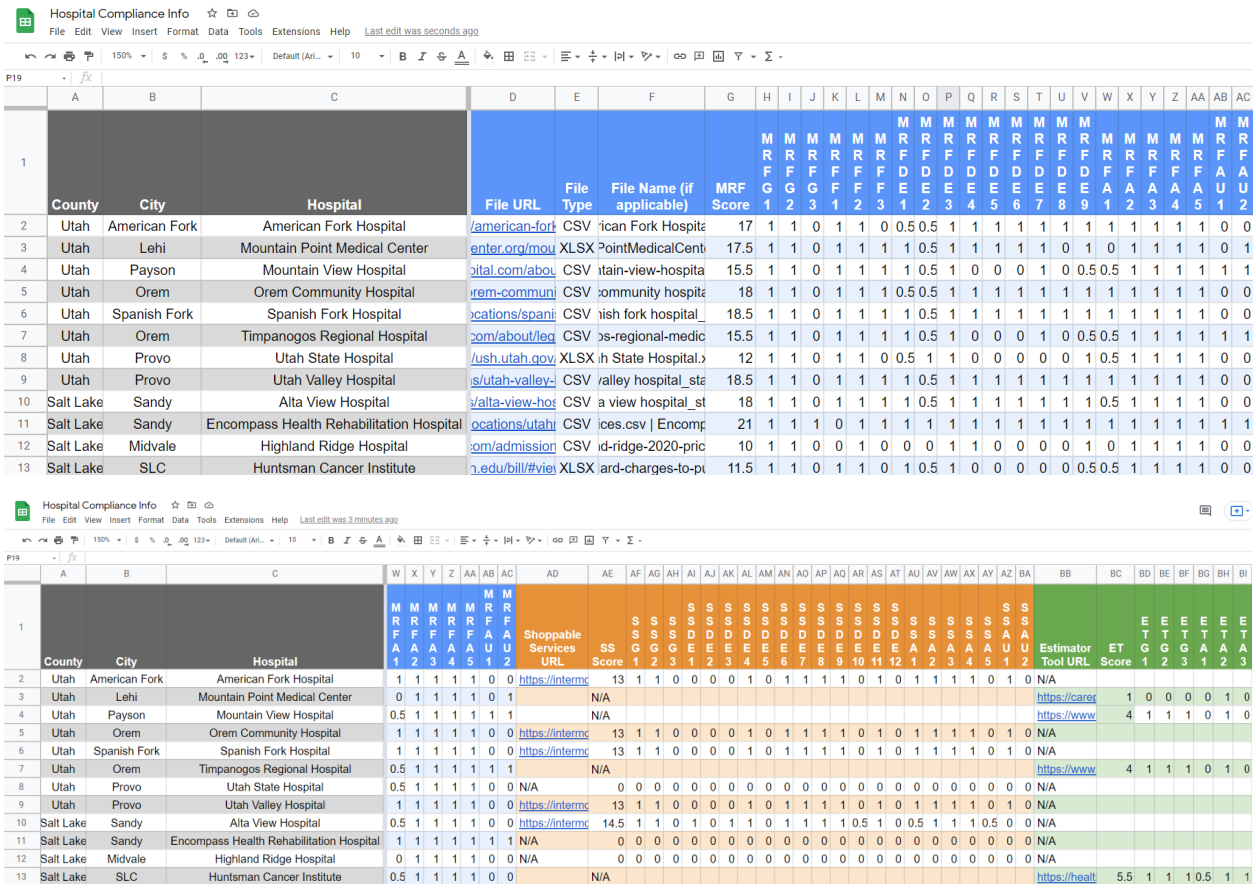
	Machine Readable File
	Data Elements[v] (as applicable)
	Does the file include all individual items and services (including service packages) provided by hospital?
	Does the file include a description for the items and services provided by the hospital?
	Does the file include the gross charge for the items and services provided by the hospital?
	Does the file include the payer-specific negotiated charges with name of the third party payer and plan clearly associated for the items and services provided by the hospital?
	Does the file include the de-identified minimum negotiated charge for the items and services provided by the hospital?
	Does the file include the de-identified maximum negotiated charge for the items and services provided by the hospital?
	Does the file include the discounted cash price for the items and services provided by the hospital?
	Does the file separately list the inpatient setting and outpatient department setting, as applicable, for the items and services provided by the hospital?
	Does the file include any code used by the hospital for purposes of accounting or billing for the items and services provided by the hospital?
	Accessibility
	Is the file posted on a publically available website in a prominent manner?
	Is the file information digitally searchable?
	Is the file available free of charge?
	Is the file accessible without having to register or establish a user account or password?
	Can the file be accessed without submitting personally identifiable information (PII)?
	Annual Updates
	Has the standard charge information in the file been updated within the past 12 months?
	Is the date the information was last updated clearly indicated?

Appendix M: MISM Capstone Awards

Our team was also privileged to receive the following awards from the faculty and consulting professionals that evaluated the capstone projects undertaken by Masters of Information Systems Management students in their culminating semester.

Appendix N: Hospital Transparency Scores

An important task in the most recent phase of this project has been assigning scores to hospitals based on their perceived transparency and compliance with current legislation. The rubric used to explain the scores can be seen in Appendix L.



Hospital Compliance Info

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	County	City	Hospital	File URL	File Type	File Name (if applicable)	MRF Score	MRFG1	MRFG2	MRFG3	MRFF1	MRFF2	MRFF3	MRFDE1	MRFDE2	MRFDE3	MRFDE4	MRFDE5	MRFDE6	MRFDE7	MRFDE8	MRFDE9	MRFA1	MRFA2	MRFA3	MRFA4	MRFA5	MRFAU1	MRFAU2
2	Utah	American Fork	American Fork Hospital	/american-fork	CSV	ican Fork Hospita	17	1	1	0	1	1	0	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	Utah	Lehi	Mountain Point Medical Center	enter.org/mou	XLSX	PointMedicalCent	17.5	1	1	0	1	1	1	1	0.5	1	1	1	1	1	0	1	0	1	1	1	1	0	1
4	Utah	Payson	Mountain View Hospital	pital.com/abou	CSV	ıtain-view-hospita	15.5	1	1	0	1	1	1	1	0.5	1	0	0	0	1	0	0.5	0.5	1	1	1	1	1	1
5	Utah	Orem	Orem Community Hospital	rem-communi	CSV	community hospita	18	1	1	0	1	1	1	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	0	0
6	Utah	Spanish Fork	Spanish Fork Hospital	cations/spani	CSV	ıish fork hospital_	18.5	1	1	0	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	1	0	0
7	Utah	Orem	Timpanogos Regional Hospital	com/about/leg	CSV	ɔs-regional-medic	15.5	1	1	0	1	1	1	1	0.5	1	0	0	0	1	0	0.5	0.5	1	1	1	1	1	1
8	Utah	Provo	Utah State Hospital	/ush.utah.gov	XLSX	ıh State Hospital.›	12	1	1	0	1	1	0	0.5	1	1	0	0	0	0	0	1	0.5	1	1	1	1	0	0
9	Utah	Provo	Utah Valley Hospital	s/utah-valley-	CSV	valley hospital_sta	18.5	1	1	0	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	1	0	0
10	Salt Lake	Sandy	Alta View Hospital	s/alta-view-hos	CSV	a view hospital_st	18	1	1	0	1	1	1	1	0.5	1	1	1	1	1	1	1	0.5	1	1	1	1	0	0
11	Salt Lake	Sandy	Encompass Health Rehabilitation Hospital	ocations/utah	CSV	ices.csv | Encomp	21	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	Salt Lake	Midvale	Highland Ridge Hospital	com/admission	CSV	id-ridge-2020-pric	10	1	1	0	0	1	0	0	0	1	1	0	0	0	0	1	0	1	1	1	1	0	0
13	Salt Lake	SLC	Huntsman Cancer Institute	n.edu/bill/#vie	XLSX	ard-charges-to-pt	11.5	1	1	0	1	1	0	1	0.5	1	0	0	0	0	0	0.5	0.5	1	1	1	1	0	0

Hospital Compliance Info

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	A	B	C	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	County	City	Hospital	MRFA1	MRFA2	MRFA3	MRFA4	MRFA5	MRFAU1	MRFAU2	Shoppable Services URL	SS Score	SSG1	SSG2	SSG3	SSDE1	SSDE2	SSDE3	SSDE4	SSDE5	SSDE6	SSDE7	SSDE8	SSDE9	SSDE10	SSDE11	SSDE12	SSA1	SSA2	SSA3	SSA4	SSA5	SSAU1	SSAU2	Estimator Tool URL	ET Score	ETG1	ETG2	ETG3	ETA1	ETA2	ETA3
2	Utah	American Fork	American Fork Hospital	1	1	1	1	1	0	0	https://interm	13	1	1	0	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	0	N/A							
3	Utah	Lehi	Mountain Point Medical Center	0	1	1	1	1	0	1		N/A																							https://caree	1	0	0	0	0	1	0
4	Utah	Payson	Mountain View Hospital	0.5	1	1	1	1	1	1		N/A																							https://www	4	1	1	1	0	1	0
5	Utah	Orem	Orem Community Hospital	1	1	1	1	1	0	0	https://interm	13	1	1	0	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	0	N/A							
6	Utah	Spanish Fork	Spanish Fork Hospital	1	1	1	1	1	0	0	https://interm	13	1	1	0	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	0	N/A							
7	Utah	Orem	Timpanogos Regional Hospital	0.5	1	1	1	1	1	1		N/A																							https://www	4	1	1	1	0	1	0
8	Utah	Provo	Utah State Hospital	0.5	1	1	1	1	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N/A							
9	Utah	Provo	Utah Valley Hospital	1	1	1	1	1	0	0	https://interm	13	1	1	0	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	0	N/A							
10	Salt Lake	Sandy	Alta View Hospital	0.5	1	1	1	1	0	0	https://interm	14.5	1	1	0	1	0	1	0	1	1	1	1	1	0.5	1	0	0.5	1	1	1	0.5	0	0	N/A							
11	Salt Lake	Sandy	Encompass Health Rehabilitation Hospital	1	1	1	1	1	1	1	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N/A							
12	Salt Lake	Midvale	Highland Ridge Hospital	0	1	1	1	1	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N/A							
13	Salt Lake	SLC	Huntsman Cancer Institute	0.5	1	1	1	1	0	0		N/A																							https://healt	5.5	1	1	1	0.5	1	1

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