| **#** | **Time period** | **Stakeholders involved** | **Attribute description** | **Ease of change** | **Pace of change** | **Cause** | **Effect** | **Source** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Present |  | The US HC system is as large as a nation state | A single thing, e.g., a good idea, a pareto superior solution, some law does not change it | It takes a long time, i.e., the lifetime of many people to change it | “If you were to take all of the healthcare in the United States, all the spending, we do all the hospitals, all the doctors, everything, you’re gonna take the entirety of the US healthcare system, and you were to make it a country, a sovereign nation-state, it would be the fourth largest country in the world; it would be larger than Germany. We spend more on healthcare in the United States than Germany spends. When you have a system that large - I forget, I think the last statistic I saw said one in nine Americans works in the US healthcare system - when you have a system that large, a good idea doesn’t change it. A Pareto superior solution does not change it. A PowerPoint does not change it. A single law, even as big as something like the ACA [Affordable Care Act], doesn’t change it [quote].” | It's difficult to deploy disruptive and innovative technology | CS1\_DI, Pos. 4/76-89 |
| 2 | Present |  | Many perverse incentives |  |  |  | [see Ex\_SystemChar#3] | CS1\_DI, Pos. 4/85-90 |
| 3 | Present |  | Much spending in US healthcare is wasteful (∼30%): fraud, abuse, mistakes, duplicate procedures, unnecessary procedures | Waste could be all eradicated by policy |  | “And the thing about that statement is I just said a third of Germany could be eradicated like that by policy. What would that do? Even if you can accomplish it. Even if you can wave your magic wand and make it all go away, how many, you know, college funds and, you know, people’s livelihoods are supported by this enormous amount of waste that’s so intractably built into our system? [quote]” | Many livelihoods that are supported by this waste would be eradicated [simply changing the entire system is almost impossible] | CS1\_DI, Pos. 4/85-94 |
| 4 |  |  |  |  |  |  |  |  |
| 5 | Present |  |  | Changing the HC system is extremely hard | Changing the HC system is extremely slow | [See Ex\_SystemChar#1] |  | CS1\_DI, Pos. 4/103 |
| 6 | Present | Providers, payers | Healthcare data is siloed i.e., fragmented and spread across the HC system |  |  |  | Anyone looking at healthcare data is trained/assumes that they only see a fraction of that data | CS1\_DI, Pos. 4/60-64 |
| 7 | Present |  | Silos within and across organizations |  |  |  | [See Ex\_TechPerf#12] | CS1\_DI, Pos. 6 |
| 8 | Present | Providers | Medicare makes up the majority of patient flow/over half of reimbursement |  |  |  | See Ex\_SystemChar#9 | CS1\_DI, Pos. 8/151-153 |
| 9 | Present | Providers | Medicare, i.e., a government run agency is an oversized influencer and director of change in healthcare |  |  | Providers are highly dependent on the Medicare patient flow and its cash flow | Medicare, as a slow-to-change, inefficient, and poorly run government agency, acting as an oversized influencer and director of change in healthcare is daunting | CS1\_DI, Pos. 8/153-160 |
| 10 | Past |  |  | Even though there were strong standards, government mandates, enforcement of these mandates, and the commercial industry (payers, providers, health IT vendors) pulling together, payers and providers failed to send claims using the new formats and the standardized code system (i.e., only 15% auto adjudication rate = when the provider sends a claim to the payer, can it be processed by the payer and sent back to the provider without a human ever touching it?) |  | The size of the US HC system | Intermediation through clearing houses, so that a standardized transaction can be received by a system designed to accept that standardized transaction | CS1\_DI, Pos. 12/311-343 |
| 11 | Present | Federal agencies | The government is central to US healthcare, i.e., it is the largest payer |  |  | Between 58% and 64% of every healthcare dollar is spent by the government (Medicare, Medicaid, the federal employees fund, the VA [Veterans Affairs], Indians, railroad workers, state employees, school workers, prisons. This adds up to $4.3 trillion in government spending |  | CS1\_DI, Pos. 18/385-393 |
| 12 | Present |  | Healthcare is the most heavily regulated industry in the US |  |  |  | [See Ex\_SystemChar #13] | CS1\_DI, Pos. 22 |
| 13 | Present |  | There is a tremendous pressure on margin for many organizations  “Now, there are lots of super, super rich companies and super, super rich people in healthcare, I’m not saying otherwise. I’m saying many organizations really struggle with margin. We even have a federal law mandating that the margin for insurance companies can’t be more than X% [quote].” |  |  | [See Ex\_SystemChar #12] | IT budgets for organizations are always under pressure with relatively nominal underfunded IT staff that is constantly dealing with well-intentioned government-mandated upgrades and government-mandated new programs | CS1\_DI, Pos. 22 |
| 14 | Present |  | It often boils down to a few large companies dominating a certain space, such as in health IT Epic, Cerner, etc. |  |  |  | [See Ex\_TechPerf#18] | PYV1\_DI, Pos. 22 |
| 15 | Present |  | The US healthcare system is not state-run but by for-profit companies (despite the government having some control) |  |  |  | [See Ex\_StakeAlign#14] | CS2\_A2, Pos. 8 |
| 16 | Present |  | The US has a very litigious society |  |  |  | Providers, in particular their front office staff, view HIPAA strongly | CS2\_A2, Pos. 34 |
| 17 | Present |  | Organizations figure out what the best situation for them is and find loopholes in government mandates |  |  |  | Creates a lot of mistrust within the HC system | PV1\_DI, Pos. 28 |
| 18 | Present |  | Healthcare is a lucrative field but has very thin operating margins |  |  |  |  | PV1\_DI, Pos. 28 |
| 19 | Present |  | US healthcare represents 20% of GDP |  |  | “Optum is a subsidiary of UnitedHealthcare. And so, they’re an insurance company, but they employ, you know, over 60,000 clinicians and growing, and what they’re doing is they’re taking billions of dollars and just buying whatever private practices are left, and essentially, you have an insurance company that owns these clinicians, and they’re incentivized, if you think about it, they’re incentivizing the doctors to do less because less testing leads to less money that they loose with UnitedHealthcare, right? And so, if they’re able to decrease the testing, they’re able to get profit, and they’re also employing doctors. And so, what they’re doing is they’re making money on both ends, they are making money from the clinicians working, and they’re also making money from the insurance holders [quote].” | Everyone is trying to cut costs (e.g., paying physicians less) without thinking about the downstream effects: Worse patient care | PV1\_DI, Pos. 46 |
| 20 |  |  |  |  |  |  |  |  |
| 21 | Present | Providers | Providers comply with government mandates in such a user-unfriendly way [comply with the bare minimum] |  |  |  | The data on price transparency is useless data | PV3\_ETC2\_DI, Pos. 8 |
| 22 | Present |  | Is built on legacy tools that are extremely private to comply with HIPAA |  |  |  | The HC system created this purposeful walled garden of non-interoperable data that doesn’t make sense unless it’s only within that system | PV3\_ETC2\_DI, Pos. 8 |
| 23 | Present |  | The HC system has been designed to understand the money flow, not the health data flow and patient care flow |  |  |  | [See Ex\_TechPerf#36] | PV3\_ETC2\_DI, Pos. 12 |
| 24 | Present |  | Data is siloed |  |  |  |  | PV3\_ETC2\_DI, Pos. 14 |
| 25 | Present |  | Healthcare is large | To really move something in the space is difficult |  |  |  | PY2\_DI, Pos. 4 |
| 26 | Present |  | Healthcare cannot stop |  |  |  | [See Ex\_PriorTech#5] | PY2\_DI, Pos. 64 |
| 27 | Present |  |  |  | The US healthcare system is not quick to change/it is not quick on rapid innovation |  |  | M1\_DI, Pos. 12 |
| 28 | Present |  | The US healthcare system is a business |  |  |  | Patients are ultimately the product, i.e., every step of the way of the patient journey, there is an opportunity of a dollar exchange | M1\_DI, Pos. 14 |
| 29 | Present |  | Hospitals (non-profit and for-profit) are leading their decision-making through finances and revenues |  |  | They have to keep their lights on |  | M1\_DI, Pos. 14 |
| 30 | Present |  | IT failures are normalized in the industry |  |  |  | There are no major consequences for the leadership team involved [contradiction M1\_DI, Pos. 48] | CS1\_DI, Pos. 24 |
| 31 | Present |  | HC is insular, i.e., it is heavily focused on the inside with their own experts and not on the outside |  |  |  | HC does not really scan what is happening around it and adopt it | CDE2\_FA2\_DI, Pos. 62 |
| 32 | Present |  | Everything is connected |  |  |  | A mistake in one part of the HC system has an impact on the downstream | HITV1\_DI, Pos. 26 |
| 33 | Present | Providers | Everything is done everywhere randomly |  |  |  | [Lots of variability] | HITV1\_DI, Pos. 26 |
| 34 | Present | Providers | Different parts of healthcare are very different, and they all have different workflows with different consent access and whatnots | Each involves a whole sea change |  |  | Everyone has a different viewpoint on how things should be done and how e.g., data should be managed and exchanged | PV2\_CDE3\_DI, Pos. 28 |
| 35 | Present | Federal agencies | State efforts/law and federal efforts/law often work cross-purposes |  |  |  | Tapestry of rules, regulations, requirements, restrictions, confusion on part of stakeholders and data holders | PV2\_CDE3\_DI, Pos. 12 |
| 36 | Present | Patients | Health is so fraught with humanity, i.e., it is very emotional, personal, and private |  |  |  | It has been difficult to bring it into the digital transaction patterns of other industries | PV2\_CDE3\_DI, Pos. 69 |
| 37 | Present |  | The expectation of the industry about technology implementation successes is very low |  | Failed IT implementations (i.e., going back to what there was before) are common |  | They tend not to be career-ending either for the individual employed by the company that made the decision and oversaw the failed effort nor for the vendor who failed to bring the implementation to bear  [contradiction M1\_DI, Pos. 48] | CS1\_DI, Pos. 71-73 |
| 38 | Present | Patients | The system is set up to make money |  |  |  | Not everyone being part of the system cares about the individual’s health | P18\_Q23 |
| 39 | Present |  |  | It takes a tremendous combination of happenstance for the industry to affect major change without a government mandate |  | The perverse incentives |  | CS1\_DI, Pos. 18/428-19 |
| 40 |  |  |  | It takes a tremendous combination of happenstance for the industry to affect major change without a |  | The scale of the change |  | CS1\_DI, Pos. 18/428-19 |
| 41 |  |  |  | It takes a tremendous combination of happenstance for the industry to affect major change without a |  | The need for Medicare as the biggest payer to pave the way |  | CS1\_DI, Pos. 18/428-19 |
| 42 | Present | Providers, payers | There is an openly adversarial relationship between provider and payer: Providers wanting to charge more and payers to pay less |  |  |  | Third parties (e.g., interoperability companies) had to emerge and get involved so that adversarial parties exchange data | CDE1\_A1\_DI, Pos. 36-40 |