Global Insights

Smart Thinking on AI in Healthcare: Part 3 – Health Administration

AI is likely to automate many tasks, relieving staff, reducing costs, and speeding clinical care

25 Apr 2023 12:13:45 ET

Executive Summary

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This is the third report in our series, *Smart Thinking on AI in Healthcare.* Administration accounts for roughly a quarter of all health spending and also contributes significantly to clinician burnout. AI-driven automation could save perhaps 25-30% of admin costs, benefitting staff, improving the patient experiences, and saving time and money. Faster information flows between the various parts of the healthcare system are likely to mean they will become more integrated, focusing more and more on the benefits for the consumer, who should be at the heart of everything. A number of companies – large and small -- are debuting products that offer ambient administration, in which a smart speaker listens to conversations between patients and clinicians, and drafts clinical notes. We're optimistic that as these systems improve, doctors should be able to spend more time helping their patients, and less time on paperwork.

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The third report in a five-part series

This is the third report in our series, *Smart Thinking on AI in Healthcare.* It's focus – health administration – is important because (1) administration is a large part of healthcare that's often underappreciated by outsiders and (2) it's also very inefficient:

- **Excessive cost**: Very roughly ¼ of all spending on healthcare in the U.S. is on administrative tasks – but automation could save perhaps 25-30% of this.[1]
- **Burden on clinicians**: Burnout is an increasing problem in many health systems globally, including in the U.S., and more than 90% of clinicians say excessive admin is contributing to burnout.[2]
- **Industry fragmentation:** Friction in the flow of information means the healthcare system is currently split into distinct entities, e.g., the providers, payers, and government, with little integration between them, and mis-aligned incentives.

"It's easy to think that sorting out health admin isn't that sexy," according to Dr. Avi Mehra, a co-founder of Doctorpreneurs and CSO in IBM's healthtech team. "But there will probably be more improvement in healthcare provision, for less effort by in applying AI to health administration, relative to the clinical side."

More automation is likely to lead to a more integrated healthcare system

AI is already starting to help automate a great deal, and we believe the advent of really good understanding of ordinary language will accelerate this.

"AI presents a large opportunity to help reduce bottlenecks and automate several areas of health admin," says Elliot Jenks, a managing director at Citi's investment bank, responsible for health services. "That means you could make a lot of processes much more efficient and lower cost."

We also believe that in future, faster information flows between the various parts of the healthcare system will mean they will become more integrated, focusing more and more on the benefits for the consumer.

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[1] https://www.mckinsey.com/industries/healthcare/our-insights/administrative-simplification-how-to-save-a-quarter-trillion-dollars-in-us-healthcare#/

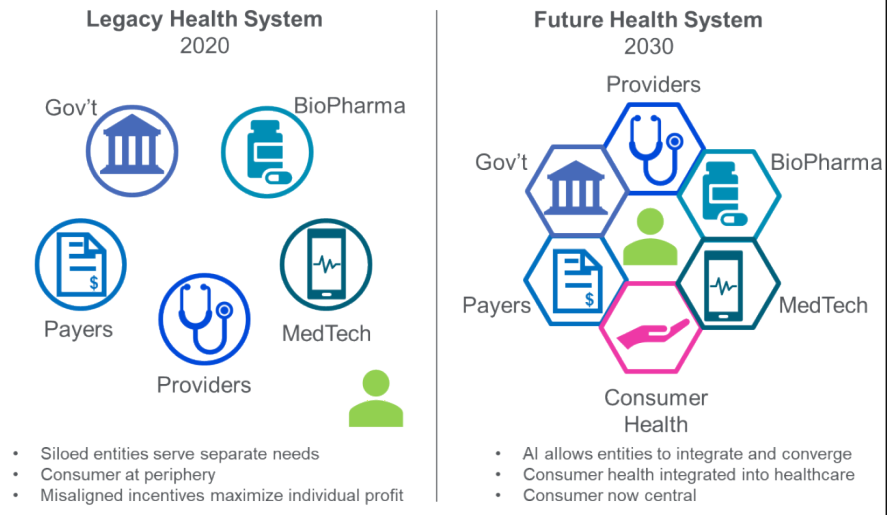
[2] https://discover.oliveai.com/rs/541-CSN-882/images/Report%20Findings%20Summary.pdf

Ambient administration for clinicians

A number of companies are debuting products that offer ambient administration, in which a smart speaker listens in to the conversation between patient and clinician, and provides a draft of clinical notes for the physician to approve. We're optimistic that as these systems improve, doctors should be able to spend more time helping their patients, and less time on paperwork.

In the future, faster information flows between the various parts of the healthcare system will mean they will become more integrated, focusing more and more on the benefits of the consumer.

Figure 1. Healthcare Industry -- Fragmentation and Consolidation



Source: Deloitte Consulting, Citi Global Insights

Many companies – large and small – are getting involved

AI and health administration *is* an exciting area and as a result, many companies are getting involved, both mega-caps like **Alphabet** and **Microsoft**, and some really intriguing start-ups, as we show later in the report.

Oracle is an example of a large tech company that's getting more and more involved in healthcare administration, including with last year's $28 billion acquisition of Cerner (one of the largest providers of EHRs).

Larry Ellison, chairman and founder, says this strategic thrust is partly because of the size of the healthcare industry, but also because there is so much room to use modern data techniques to deal with its complexity.

The HR issues in a hospital, for example, are more complicated than in a large investment bank or a tech firm. According to Mr. Ellison, a "hospital has a very complicated workforce, much more complicated than, say, a company like Oracle or a bank like JPMorgan Chase. Docs often are not employees of Stanford Hospital or employees of UCLA . . . they're often contract workers. And they work a couple of days at UCLA, they work a couple of days someplace else . . . so just scheduling the docs, paying [and] recruiting [them] is much more complicated."[3]

[3] Larry Ellison at the Oracle Future of Healthcare presentation, June 2022

Oracle hopes to use AI to make it easier for clinicians to interact with EHRs[4] - for example, through voice recognition systems. But equally important, the company wants to use AI to integrate unstructured information from many different sources, and use it to allow the different participants in healthcare to work together much more efficiently – whether it's hospitals accessing health records for an individual patient from the other side of the country, or payers being more tightly integrated with providers.

"We're going to see the ability to advance technology like artificial intelligence . . . so that a physician can actually have a patient conversation, and that complex clinical information is captured automatically," says Brenna Quinn, head of the health product at Oracle. "We'll be able to extend that access to the payers. When we do that, not only will we eliminate the friction between patients and providers, but we'll be able to give better transparency of the cost of care to the provider as well as to the patient."

How to find companies using AI in health administration

Please contact the Citi Global Data Insights team for screens of companies exposed to the themes in this report

We have asked our colleagues in Citi Global Data Insights to generate lists of companies exposed to the themes in this report, based on a quantitative analysis both on patents filed and on newsflow.

These screens cover both quoted and unquoted companies. They can be ranked in many ways. For example, it's possible to rank by the number of patents obtained related to AI in health admin, or the quality of those patents, or the percentage of a company's patents that fall in this area.

Please do reach out to the authors, or Helen Krause (helen.krause@citi.com) for more information.

AI will gradually change more and more of the health system

The first report in the *Smart Thinking on AI in Health* series laid out our overall thesis, that AI will gradually but profoundly change more and more of the healthcare industry:

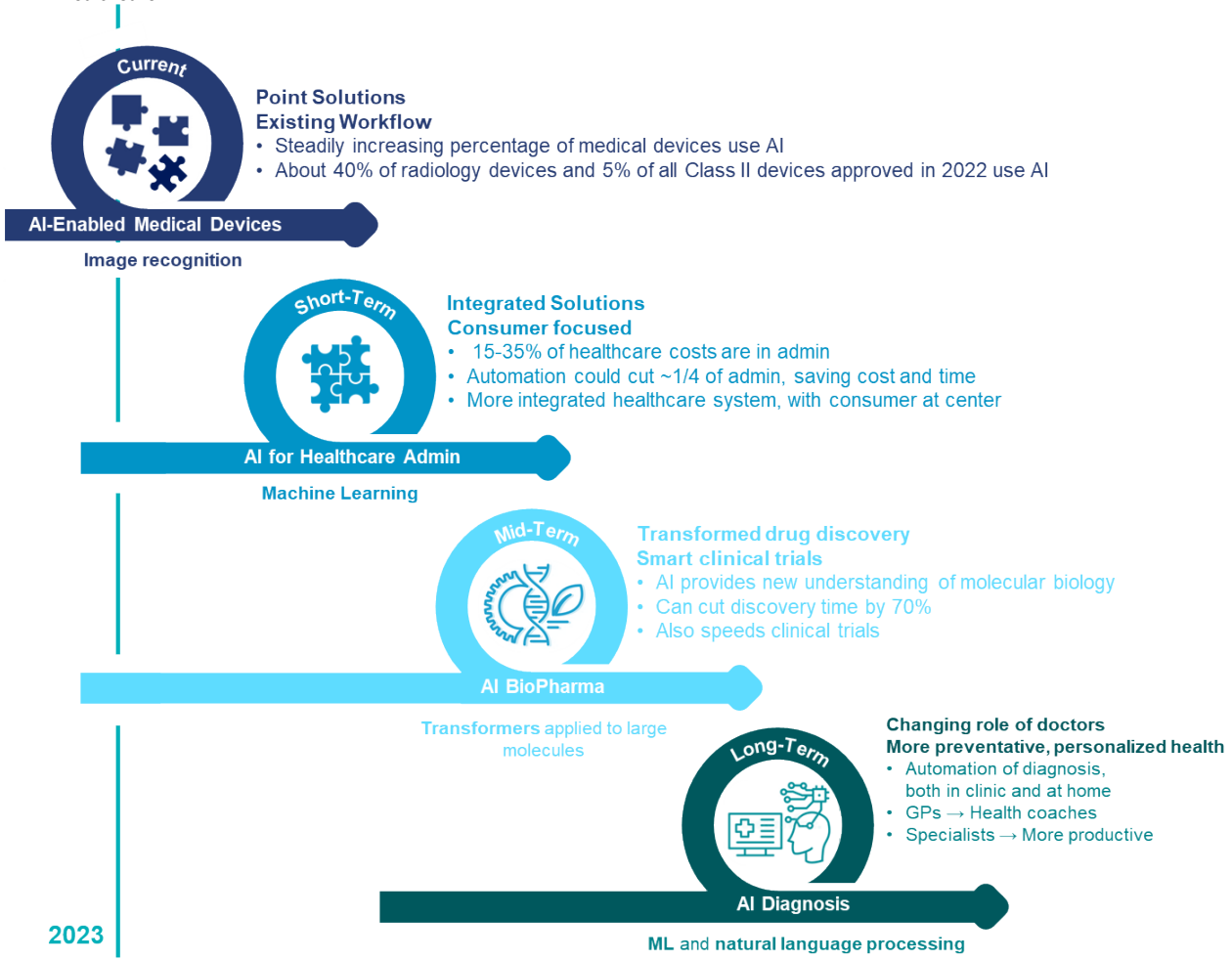
- **So far** AI's impact on healthcare has been relatively modest, with some interesting developments in radiology, BioPharma and in a handful of health-specific admin systems. *These products are mostly point solutions that address the needs of the pre-existing players in their pre-existing workflows.*
- **In the next few years** AI is likely to automate a good deal of health administration, relieving workers of mundane tasks, saving both money and time, and thereby improving clinical outcomes. *This sort of AI will integrate the different parts of the system, for example the payers and providers, much more tightly*.

[4] EHRs: Electronic health records. Sometimes called EMRs or EPRs, where the M and the P stand for "medical" or "patient."

- **We also expect AI to profoundly affect the BioPharma industry.** The transformer technology that can understand ordinary languages (like English), and which is driving innovations like ChatGPT, can also be used to analyze large molecules like DNA and proteins.

- **In the long term** we believe AI will fundamentally change the relationship between clinicians and patients. We believe diagnoses will become increasingly automated. We expect that family doctors will become more like health coaches, and hospital specialists will become more productive, attempting more personalized and ambitious interventions. *We therefore think AI will trigger a significant change in the way healthcare is delivered.*

Figure 2. AI in Healthcare



Source: Citi Global Insights

Figure 3. Reports planned in the Smart Thinking on AI in Healthcare series

Report	Subject	Thesis
1	**Overview**	AI will progressively transform the health system
2	**Medical Devices**	AI devices are already becoming more common, especially in radiology
3	**Health Administration**	AI will help automate a lot of admin, taking over mundane tasks and saving time and cost
4	**BioPharma**	BioPharma will be deeply affected as transformers analyze large molecules
5	**Role of Doctors**	Gradually AI will automate diagnosis and prescription, letting doctors focus on higher tasks

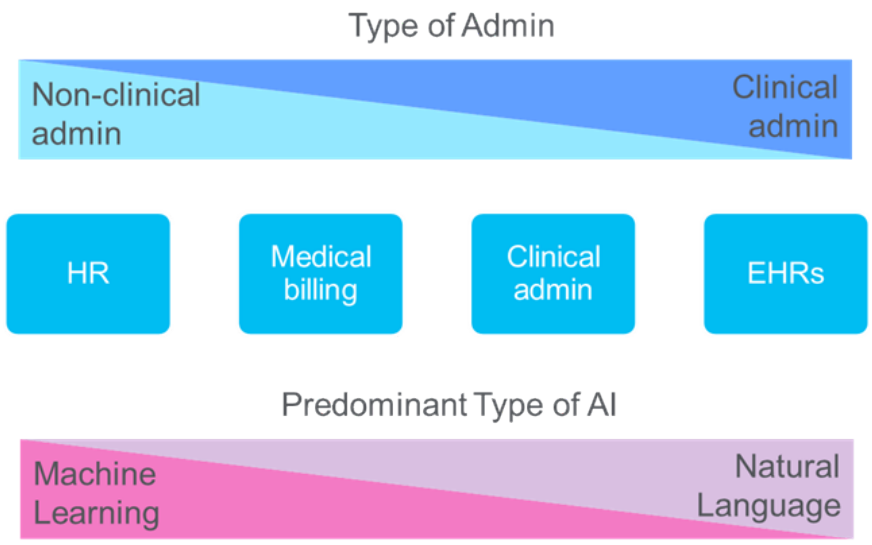
Source: Citi Global Insights

Health admin covers both non-clinical and clinical activities

Health administration covers a spectrum of tasks that range from activities that take place in any organization, like HR and payroll, to activities that are purely clinical, like using EHRs. In the middle are activities that require a certain amount of clinical knowledge, like billing and helping people navigate their way through the healthcare system.

There isn't a clean break between what's clinical administration and what isn't

Figure 4. Non-clinical vs clinical administration in healthcare



The boxes in the middle of this chart are illustrations of the kinds of admin activities in healthcare. They are a long way from forming a complete list.

Source: Citi Global Insights

The most important types of AI are machine learning and natural language processing

AI comes in many forms, as we discussed in AI Time - 10 Ways AI is Getting Real. To simplify, two different types of AI are impacting health administration – machine learning and natural language processing – but they're starting at different ends of the spectrum:

1. **Machine learning** is likely to automate a good deal of the non-clinical side of health administration, relieving workers of relatively mundane tasks, saving both money and time, and thereby improving clinical outcomes. This sort of AI will integrate the different parts of the system – for example, the payers and providers – much more tightly.
2. **Natural language processing** and models like GPT-4 look as if they will be able to reduce the administrative workload, for example, automatically updating EHRs simply by listening in to the patient-clinician conversation.

Of course this division (that ML is for non-clinical admin and NLP is for clinical admin) is a simplification. Even at the clinical end of the spectrum, ML will be relevant; equally, at the non-clinical end, natural language processing will be important. Furthermore, as we've said, there isn't a clean break between what's clinical administration and what's not.

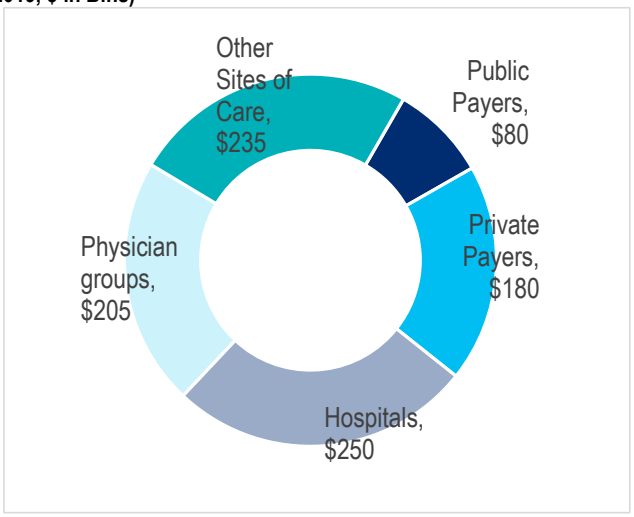
Administration is a big part of healthcare – but automation could eliminate a big chunk

Various estimates suggest that admin accounts for anywhere between 15% and 35% of all healthcare spend in the U.S. One recent McKinsey paper[5] put the cost at $950 billion for 2019, 25% of the total healthcare spend that year ($3.8 trillion).

Figure 5 cuts McKinsey's estimate of spend by stakeholder group, and it shows that about 70% of the administrative spend occurs within the hospitals, physician groups, and the private payment systems.

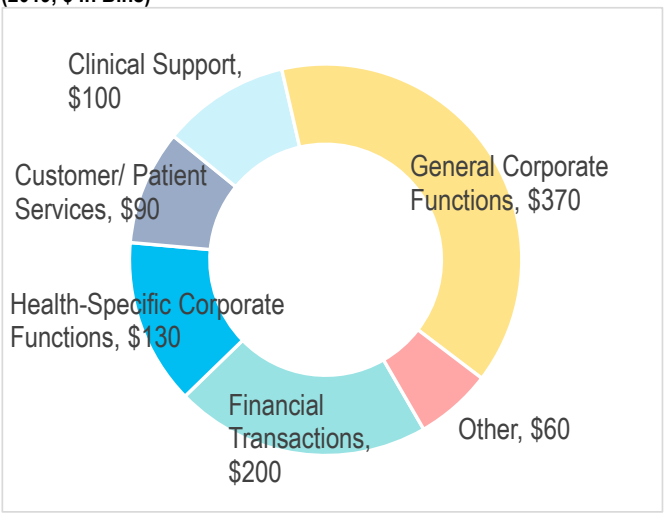
Figure 6 shows the administrative spend by functional area, which we think is more interesting. The key point is that more than half of the admin spend occurs in functional areas that are healthcare specific – including the financial transactions (e.g., claims and processing), patient support, and back-office functions like quality reporting and accreditation.

Figure 5. Admin Costs in U.S. Healthcare by Stakeholder (2019, $ in Blns)



Other sites of care includes dental and nursing facilities and home healthcare
Source: McKinsey

Figure 6. Admin Costs in U.S. Healthcare by Functional Area (2019, $ in Blns)



See Figure 7 for explanation of categories
Source: McKinsey

Figure 7. Explanation of categories shown in Figure 6

		$ bln	
Financial Transactions	Movement of claims and payments	200	21%
Health-Specific Corporate Functions	Back-office functions like enrollment, quality reporting, accreditation	130	14%
Customer/ Patient Services	Activities that help customers, often done via call centers	90	9%
Clinical Support	Activities that need some clinical expertise, e.g., case management	100	11%
General Corporate Functions	Back-office functions that occur in all industries, e.g., HR	370	39%
Other		60	6%
		$950 bln	**100%**

Source: McKinsey

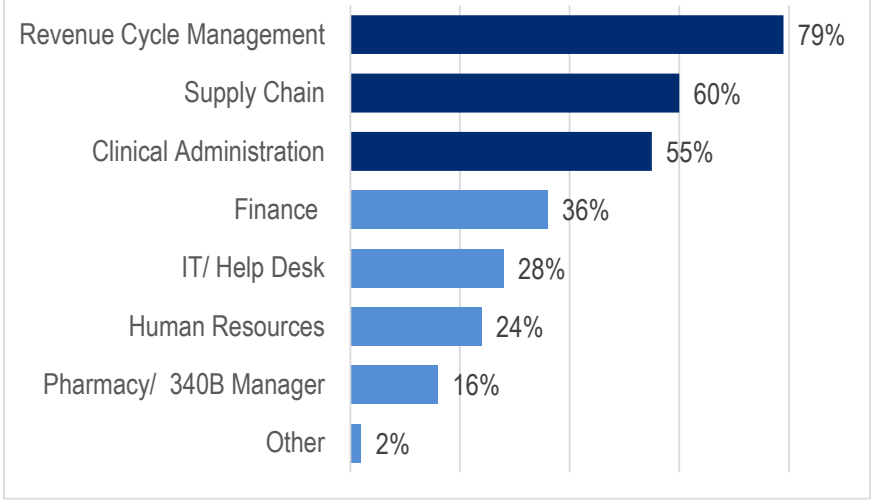
[5] McKinsey 2021: Administrative Simplification: How to save a quarter of a trillion dollars in health

But a big chunk could be eliminated through automation

McKinsey estimates that of the $950 billion spend on healthcare admin in 2019, $265 billion, or 28%, could be eliminated by simplification and automation – and this is something that AI is exceptionally good at. Figure 8 shows that executives believe the opportunities are greatest in revenue cycle management, supply chain, and clinical administration.

AI could help most in revenue cycle management, the supply chain, and clinical administration, health managers believe

Figure 8. Top areas benefiting from AI and automation
Survey of 100 large healthcare organizations in 2020



Source: Sage Growth Partners

And it's a major burden for clinical staff

It is hard to overstate just how burdensome administration is for clinicians. There is unprecedented stress among clinicians following Covid, and poor, disconnected IT is a major factor:

"Clinicians are spending too much time working on admin tasks like pre-authorization scheduling and answering prescription questions that could be automated," says Morgann Carlon, a Health AI leader at Deloitte.

According to one survey of U.S. clinicians[6]:

- 92% of clinicians agree that admin is a major contributor to healthcare worker burnout.
- 36% of clinicians spend more than half their time on administration.

[6] Olive AI: Internet of Healthcare Report 2021

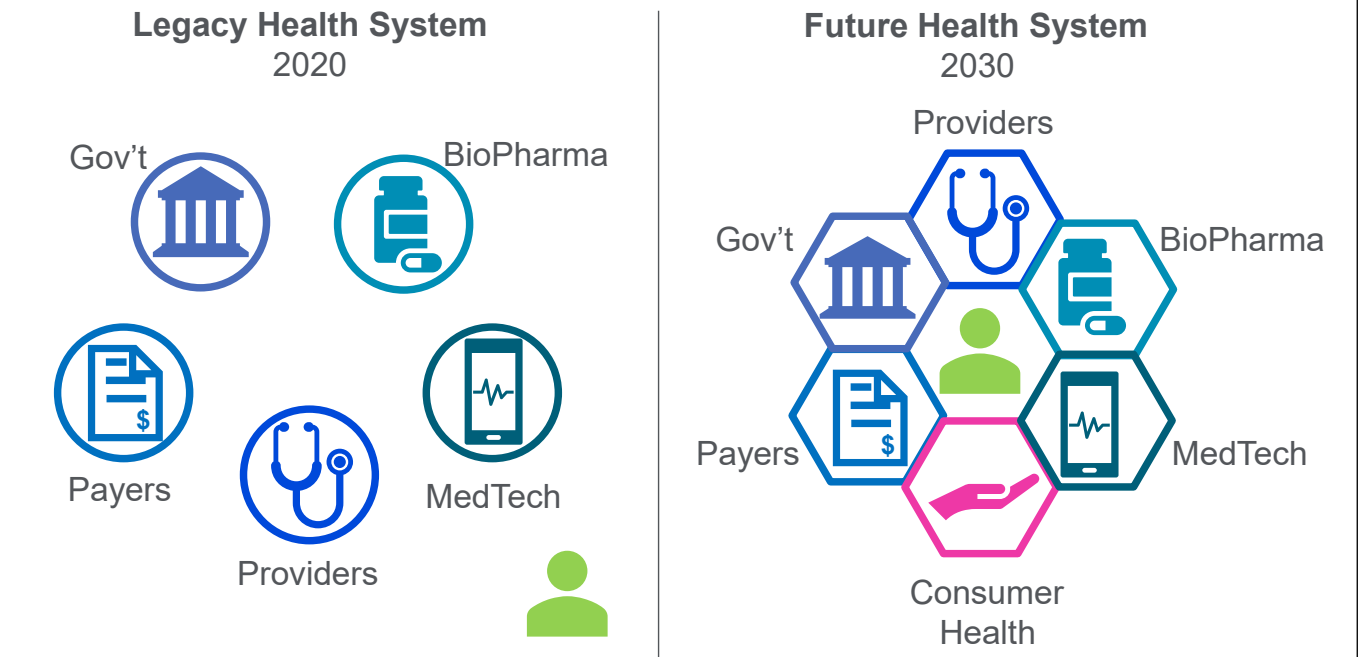
AI is likely to change many business models in healthcare

We believe that in time, AI will lead to a profound change in many business models.

Currently, the healthcare system is split into distinct sub-industries, like providers, payers, and device manufacturers. Faster information flows between these companies mean that in the future they will become more integrated, focusing more and more on the benefits of the consumer. We think business models are likely to gradually converge.

Neal Batra is responsible for the Future of Health at Deloitte Consulting, and he thinks there's a big opportunity to make the overall U.S. healthcare system more efficient. "Far too often at the moment, there's a big gulf between providers and payers and other parts of the healthcare system, like the government – and consumers get rather forgotten," he told us. "But AI will help integrate these things in the future – and the consumers will be central in a way they just aren't now."

Figure 9. Industry fragmentation and consolidation



- Siloed entities serve separate needs
- Consumer at periphery
- Misaligned incentives maximize individual profit

- AI allows entities to integrate and converge
- Consumer health integrated into healthcare
- Consumer now central

Source: Deloitte Consulting , Citi Global Insights

Automation of prior authorizations

One example of how AI could drive a change in administration, saving clinicians time and also integrating payers and providers more tightly, involves the process of applying for, and processing, prior authorizations in the U.S. The current process is extremely burdensome – both to clinicians and payers – but we believe AI will make the entire process easier, saving money and improving clinical care.

The current process is manual and extremely inefficient

When clinicians decide on non-standard approaches to treat their patients in the U.S., they generally have to go through the prior auth process. They need to check if the treatment they are proposing requires a prior auth. If it is required, clinicians must then prepare and submit supporting evidence for the additional treatment to the insurance companies, complete with references to the relevant papers. This all takes a lot of time: American doctors complete 41 prior authorizations each week on average, spending an average of 13 hours doing so.[7] Doctors are therefore spending almost 1½ days of each week on prior authorizations at the moment.

But that's not all: the health plan's physicians then need to review the information, typically taking as much as 10 working days before they get back to the health provider, further increasing the cost of the system and delaying treatments for patients.[8]

As we said, the prior auth process is manual, and extremely burdensome for everyone concerned.

But AI is likely to improve this

It seems likely that in the future, AI will be able to automate a lot of this, saving time and hence money, while simultaneously improving patients' experience.

Earlier this month **Alphabet** illustrated one path forward when it announced an AI-driven tool – which it called its "Claims Acceleration Suite" – to automate both prior authorization and claims processing. The key part is that its AI takes unstructured medical information, which may come from faxes or other images, and turns it into structured information on an open standard. This in turn allows ML analytics and data visualization. The system "enables experts to make faster, more informed decisions and provides additional benefits to health plans by helping them unlock the value of data in this process." [9]

On the submission side, the system checks the prior auth for errors and omissions, calculates out-of-pocket costs, and monitors the status of the application.

On the claims processing side, the system notifies the reviewing physicians of potential issues, and communicates decisions with the necessary documentation in near real time. The company says the system can also suggest ways of simplifying the process of reviewing pre-authorizations.

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[7] AMA prior authorization survey. www.wedi.org says the implied cost of this is $25 billion, based on 1 mln practicing doctors in the U.S., and assuming their time is worth about $35/hour.

[8] https://www.cms.gov/files/document/opd-frequently-asked-questions.pdf

[9] https://www.googlecloudpresscorner.com/2023-04-13-Google-Cloud-Unveils-New-AI-enabled-Claims-Acceleration-Suite-to-Streamline-Health-Insurance-Prior-Authorization-and-Claims-Processing,-Helping-Experts-Make-Faster,-More-Informed-Decisions

It’s not just a problem in the U.S.

The problems with prior auths occur in plenty of other health systems, Mike Sicilia at Oracle says: “We also need to help patients understand whether or not they're going to qualify for a particular procedure or certain pharmaceutical. It can take days, weeks, months to figure out whether or not you're going to get approved. That's true in single-payer systems as well. That's not just a phenomenon in multi-payer systems like we have in the United States.” He concludes, “All of this is ripe for automation.”[10]

Automation of billing

Another area where we believe AI could make a big difference is in billing.

Fathom Health is an example of a startup that addresses this issue. Its AI automatically translates diagnoses, procedures, and medical services into the alphanumeric codes that are used for billing. The company says its ML delivers medical coding automation rates that are 30-50% higher than alternative solutions can offer, saving staff time and money. In addition, the AI reduces denials and frees coders to focus on more complex assignments, the company says, illustrating how AI can help staff focus on increasingly value-added activities.

Conclusion on AI’s impact on business models

Healthcare systems around the world use lots of manual administrative practices – faxes are still surprisingly common in many countries, for example. As we’ve said, the pre-auth process in the U.S. is a good (or bad) example of the inefficient ways in which different parts of the health system interact currently.

However, it is reasonable to expect that over time, AI-enabled systems will automate a lot of work, allowing the system’s focus to move from administration to the consumers who should be at the center of everything.

[10] Oracle Future of Health event, June 2022.

Smart patient management

In the previous section we discussed how AI can help connect different parts of the healthcare system – for example, providers and payers – more tightly. AI can also help the individual parts become much more efficient.

One example is what we call smart patient management, which aims to direct people through the provider side of health care in the best possible way.

Dr. Clare Gerada is President of the Royal College of General Practitioners, the professional body for primary care doctors in the UK,[11] and she says, “A smart triage system that directs people to the right part of the healthcare system would really help. Air traffic control directs planes to the right place – we need the same for patients.”

AI can also help once patients are already in hospitals, such as providing extra information when they are being booked into a ward. Currently, most systems in the area focus on giving predictions of the likely outcomes - for example, providing the potential length of stay for a new patient, or the chances of readmission within 30 days.

“What really matters is whether this sort of AI actually tells you what to do about it,” Morgann Carlon at Deloitte told us. “If a system just says that the predicted length of stay is six days, that’s just another pop-up. But you’re beginning to see systems that can say things like, ‘The predicted length of stay is six days, but with these particular actions then the predicted length of stay would be four,’ – and that prescriptive recommendation really adds value.”

AI to improve the care of oncology patients

Azra AI is an example of a startup using AI to provide smart patient management. It focuses on interpreting unstructured data to identify and triage oncology patients who need treatment and follow-up care. This requires going beyond simple ML algorithms because unstructured data such as clinical notes and documents make up over 80% of patient records.

Improving the flow of cancer patients at HCA

One example of how this can improve clinical performance, help staff, and save money occurred when Azra AI was asked to help cancer patients at HCA in Florida.

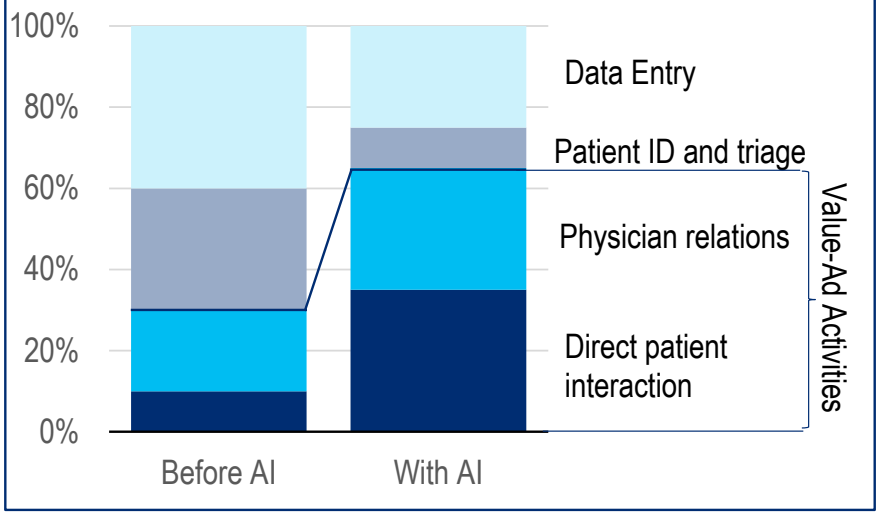
Before Azra was installed, HCA used a labor-intensive system for tracking patients who had been diagnosed with cancer. Care coordinators – known as “navigators” – would have to identify new diagnoses, and then manually comb through the pathology reports and doctors’ schedules to come up with a care pathway. The process was slow and many patients left the HCA system altogether.

[11] In Commonwealth countries, primary care doctors are known as General Practitioners (or GPs). The RCGP, which has 55,000 members, sets the training, professional standards, and the postgraduate licencing exam that newly qualified GPs must pass.

Azra AI was then used to automate most of those tasks, bringing multiple benefits:

- **Clinical**: The average time from diagnosis to treatment was reduced by six days, a significant time when cancer has been diagnosed.
- **For staff**: Before the Azra AI implementation, 65% of navigators' time was spent on non-value-added activities, like reading EHRs or data entry, and only 30% of time was spent on value-added activities, such as interacting with the patients or coordination with doctors. Now 65% is spent on value added activities, as Figure 10 shows.
- **Financial**: Patient retention increased by 50%, boosting HCA's revenue.

Figure 10. Navigators' time spent before and after implementation



Source: Azra AI

Natural language processing is likely to accelerate the change

As AI becomes better at processing ordinary languages, whether English or Spanish or Swahili, then the burden of administration on clinicians should fall further – and we think this will particularly benefit clinicians.

Ambient administration for clinicians

One of the main admin tasks that clinicians face is extracting information from, and adding data to, EHRs.

The dream is to get to effective ambient administration, in which a smart speaker listens in to the conversation between patient and clinician. The AI behind it would both extract the relevant information from the patient's EHR and show it to the clinician, and add whatever notes are necessary, subject to final approval of the clinician. If a prescription or a prior authorization were needed, the AI system would take a first draft at writing those too.

In fact, some very large companies have entered this space via acquisition. We've already mentioned that last year, Oracle paid $28 billion for one of the leaders in EHRs (Cerner) and hopes to use voice recognition AI to allow ambient administration. In addition, Microsoft paid $16 billion for Nuance, which sells voice recognition software, with a particular focus on healthcare, and if anything, its ambitions for AI-powered ambient administration go further.

Microsoft / Nuance

Effective speech recognition software has taken a long time to develop. But back in 2020, Nuance launched Dragon Ambient eXperience (DAX) to help automate the process of documenting patient conversations. DAX takes recorded dialogues between clinicians and patients, transcribes them, and turns them into clinical notes and – after a brief quality control check by a human – presents them to the clinician to approve (or amend) before they are incorporated into the EHR.[12]

DAX is embedded into Nuance's Dragon Medical One platform, which is used by more than 550,000 physicians[13] – equivalent to a bit more than half the total number of practicing physicians in the U.S. Nuance says DAX saves about 7 minutes per consultation (≈half the typical documentation time). The system allows clinicians to use voice commands to pull up relevant information and charts from EHRs, place orders, and set reminders.

[12] https://www.nuance.com/healthcare/ambient-clinical-intelligence.html

[13] https://www.ghacks.net/2023/03/21/microsofts-nuance-launches-ai-powered-clinical-notes-app-for-physicians/

However, Microsoft and Nuance want to take this further. They recently announced an upgraded product that is able to transcribe patient notes in real time because it is powered by OpenAI's GPT-4. "Using a unique combination of conversational, ambient, and generative AI, DAX Express automatically and securely creates draft clinical notes in seconds for immediate clinical review, and completion after each patient visit," the company says.[14] The system will be available for private preview this summer.

Navina

At the other end of the size scale is Navina, an Israeli startup that has raised a total of $44 million. Navina's founders – Ronen Lavi and Shay Perera – formerly led the Israel Defense Forces' AI lab. Its AI takes data from EHRs and other sources, brings what is important to the attention of GPs, and highlights any potential gaps in the data. The founders say they were able to design AI software to do this, because "we did exactly the same thing in another setting: we established the pioneering artificial intelligence unit within the Israeli intelligence." [15]

[14] https://news.nuance.com/2023-03-20-Nuance-and-Microsoft-Announce-the-First-Fully-AI-Automated-Clinical-Documentation-Application-for-Healthcare

[15] https://www.navina.ai/about

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