

HUSKY HEALTH CASE COMPETITION 2019

**Using virtual assistants to
reduce physician burnout
rates**

AI IN HEALTHCARE

HEALTHCARE • BUSINESS • TECHNOLOGY

POWERED BY VITAL

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NORTHEASTERN UNIVERSITY

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**HEALTH SCIENCES
ENTREPRENEURS**
at Northeastern University

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Characters

Voithos (creator of Theo)

- George Behrakis, Partner
- Rajesh Khoury, Head Advisor
- Francine Bouve, Senior Consultant
- Jake Hurtig, Consultant

Husky Healthcare System

- Edward Forsyth, CEO
- Kevin Chang, CFO
- Arindell Speare, COO
- Barbara Gordon, Chief Ethics Officer

Introduction

In March 2019, George Behrakis and his consulting team at Voithos met with their client, Husky Healthcare System to discuss the implementation of Theo, proposed as healthcare's first "active listener". Theo implements a revolutionary artificial-intelligence based system to transcribe healthcare conversations in an effort to tackle problems that plague both doctors and nurses, such as burnout and documentation overload. The first presentation was met with mixed reactions by hospital executive board members, who voiced concerns that needed to be answered before consideration of system-wide outpatient implementation of Theo.

Voithos developed Theo as a solution to combat growing burn-out rates within the healthcare system. Theo utilizes artificial intelligence to alleviate paperwork burdens of healthcare workers. The program can be activated to



record conversations between physicians and patients in an outpatient setting. Care providers “sign-in” to Theo to program the software to the distinct sound of their voice. Throughout conversations, Theo will listen for key points brought up by the healthcare worker in a non-invasive manner that doesn’t deviate from the typical doctor-patient interaction. Designed to only transcribe what the staff says, the staff member can repeat important and necessary patient statements for inclusion into a final, standardized documentation of the conversation.

While Theo simply started as an electronic medical scribe, the system quickly transformed into an elaborate program to take on the multitude of problems within an outpatient setting. While many hospitals and clinics today employ scribes for ease of documentation, communication can often be lost in translation. However, Theo records the doctor’s own words, eliminating any inaccuracies and streamlining the process. Since patients continue to interact face-to-face with healthcare workers, the flow of conversation remains relaxed and uninterrupted while important information is electronically documented. Furthermore, Theo solely records healthcare providers’ paraphrased statements and actively avoids recording a patient’s voice, leaving a degree of separation between the patient and the artificial intelligence system. With Theo, physicians and nurses become the face of artificial intelligence.

History of Voithos

George Behrakis has a personal connection to Voithos, which pushes him to implement Theo across all healthcare systems. Behrakis attended Northeastern University as an undergraduate many years ago and worked several clinical co-ops at a major hospital. As an aspiring pre-med student, he paid close attention to the physicians during his time there, and he quickly realized that the providers were swamped with paperwork. The extensive, yet necessary, documentation system in all hospitals hindered interactions with patients. Healthcare providers must choose to do their paperwork in between appointments or after their shifts. Completing the paperwork between appointments would reduce the amount of time they could devote to each appointment, compromising the quality of care. Leaving the paperwork for the end of the shift would mean staying overtime, sometimes without pay.

This extra work, on top of an already demanding job, put even more stress on providers. Behrakis, over the course of his six-month co-ops, saw many



nurses and some physicians leave and get replaced due to burnout. This issue stuck with Behrakis as he finished medical school, residency, and a fellowship. After working as a physician for five years, Behrakis looked around and realized that something needed to change. He would have a greater impact creating a solution to this burnout problem than remaining as a practicing physician.

Behrakis formed a team to help him tackle the problem of revising the documentation system in hospitals. He quickly realized the potential that artificial intelligence had to streamline and offload excess paperwork. Finding his old friend, Rajesh Khoury, an industry leader in software engineering, the two partnered to flesh out Behrakis' idea and draft something concrete. They hired Francine Bouve and Jake Hurtig to manage the budding company's financials, and the four, now known as Voithos, began hiring in order to build a program that would align with Behrakis' vision. This program later became known as Theo, and after three years of extensive development, testing, and refinement, Voithos firmly believes that Theo is ready to be deployed. The team has all agreed that the next step with Theo is to implement the software in a real life setting where it can learn and improve using a constant stream of incoming data. Therefore, they have contacted Husky Healthcare System, one of Boston's largest healthcare providers, to pilot Theo in an outpatient facility.

How the software works

Theo was designed as healthcare's first "active listener". It employs artificial intelligence to ease the burden of medical documentation and optimizing healthcare staff time. Through EMR database integration and loaded data from over a thousand medical visits, Theo is constantly changing to include and learn patient conversations. The aim for this technology is to document during the conversation to reduce the workload of healthcare staff and prevent burnout.

During the initialization process, the system will ask the user to speak several preset phrases into the microphone for voice recognition. This ensures that the software can only be accessed by that particular provider. In addition, during the conversation between a provider and their patient, the microphone will only pick up the words that the provider speaks and not what the patient says.

Healthcare providers can ensure that Theo will pick up every pertinent detail by simply repeating the patient's statements, something that is already commonly done during the normal doctor-patient conversation. Theo will pick up



phrases for inclusion in documentation for a standardized format. Voithos designed algorithms to learn context clues to extract medical action items. For example, a physician saying “You’re going to need an MRI” will be recorded by Theo as “Order MRI”. Theo can be adapted to specific EMR platforms across different healthcare systems. This information can be accessible via the healthcare systems for coordination between healthcare staff.

HIPAA compliance is also weaved into the development of Theo’s algorithms. Patient data is always confidential, and privacy is preserved. Recordings are encrypted and transcribed on HIPAA compliant platforms through the secure hospital wifi network, accessible only by the providers. Patients must opt in for the use of Theo in their appointments.

With the repetition of patient statements, healthcare providers practice affirmation behavior, confirming that they understand and address all patient concerns. At the end of the visit, the healthcare provider must confirm the documentation. This ensures that staff assume responsibility of documentation accuracy. Healthcare staff may manually edit any mistakes made by Theo, which will also be learned by the virtual assistant.

There are significant costs in the development of Theo. The fixed costs for initial prototype and development, including EMR integration and pilot costs, totaled \$5 million. The yearly overhead totals \$500,000 a year with employee wages, maintenance, server storage, domain, etc.

Pilot Implementation Plan

After Theo was debugged, it was implemented in a smaller suburban PT clinic for a span of a year. This setting was important to mimic the outpatient conversation setting that would be the bigger picture in Husky Hospital. This setting would supplement the initial data needed to fuel Theo.

Current Healthcare Climate

Note: Assume that the current healthcare climate is as outlined below. These statements have been simplified to allow for a clear understanding of the case for all teams. Assume that topics not explicitly specified below are what you know to be accurate currently.



With the rapidly growing field of technology today, medical documentation has experienced revolutionary changes in the digital age. Originating from times when documentation of each patient was not performed until major teaching hospitals in America developed the clinical medical record in the 19th century, the current transition of medical records from paper to electronic is equally as revolutionary.

In this new era of healthcare, the demands of top healthcare systems with providers over-burdened by electronic medical records must be met with solutions. Statistics vary between different specialties, but in 2019, an average of 44% of physicians reported feeling burn-out (see *figure 1*)¹. The top reason for why they felt burnt out was “too many bureaucratic tasks,” which included documentation (see *figure 2*)¹. Nurses reported the same frustrations, with over 49% of nurses across the country expressing dissatisfaction with their job¹. Reasons such as “inadequate patient quality of care” and “staff shortages” all revolve around the fact that there is too much work for care providers².

The implications of extensive physician burnout extend far beyond the effects they have on individual healthcare providers. It is estimated that the financial burden of losing even 1 physician can cost a healthcare organization anywhere between \$500,000 to \$1 million³. These costs are based on a variety of factors such as loss of productivity, loss of patient care revenue, and resources spent to replace the physician. Looking at a typical hospital with roughly 60 physicians, losses can range from a minimum of \$15.5 million to \$55.5 million³.

The current state of documentation in America’s healthcare system is taxing on time, money, and energy, causing healthcare workers to devote large amounts of time away from patients and in front of computers. While many studies seem to be focused around coping with this workload, such as meditation, breathing workshops, and mindfulness, the fact of the matter is that targeting the cause of burnout is far more effective than targeting the effects. Healthcare providers entered the industry because of face-to-face patient interaction, not documentation. While documentation is an essential aspect of the healthcare system, because it is so time-consuming, healthcare workers have reported feeling less motivated for work and less satisfaction with their profession.



Husky Hospital System

The Husky Hospital System is one of the largest healthcare providers in Massachusetts that encompasses a variety of comprehensive care centers, each with its own area of specialty and outpatient facilities.

	Description	Percentage of MA patients enrolled	Physician burnout rate (%)
Husky Medical Center (Boston, MA)	Flagship hospital for the Husky system. Established in 1965, the hospital has a strong reputation for providing quality care. Management is resistant to sweeping changes in their system.	9%	44%
Han Children's Hospital (Boston, MA)	Opened in 1970, the Children's care center prides itself on applying revolutionary techniques that can reduce costs and improve quality of care in their facility. They have been at the forefront of adopting burgeoning medical technology for their various needs.	4%	41%
Chan Medical Group (Worcester, MA)	Husky's main outpatient clinic. Their leadership works closely with the main medical campus and is not prone to any overt changes in their system.	4%	47%
Saha Psychiatry-Outpatient Services	Main outpatient psychiatry services, their funding is limited but they are looking to onboard new physicians who have a firm knowledge of working with new technologies that will	3%	40%



	reduce the need for extra training.		
Zhang Rehabilitation Center (Waltham, MA)	As the newest addition to the system, Zhang is looking for ways to radically improve the care they provide to their patients. They are interested in applying data-driven processes that will streamline their operations and reduce costs.	2%	52%

Husky Hospital Concerns

Edward Forsyth, CEO of the Husky Health System, was impressed with the initial Theo pilot results and was excited to begin onboarding the new software at their own outpatient clinics. After the initial presentation and back-and-forth conversation between consultants and executive board members of Husky Hospital, an agreement was reached that Theo would be piloted at Husky Hospital for a month demo. It was a nonbinding agreement, where Husky Hospital could break free when posed unaddressed risks. In the month, the board would bring up concerns. The goal of this pilot would be the eventual full-time adoption of Theo into the Husky Health outpatient system.

These concerns were brought up by the board:

Chief Ethics Officer

Barbara Gordon, the Chief Ethics Officer of Husky Health, prioritizes respect and patient confidentiality. A big concern in the rapid integration of technology and healthcare is the ownership and sharing of patient data.

- Where does patient data accessibility stop?
- How can we ensure that patient data is not compromised as Theo “learns” from multiple encounters?
- Is Theo’s “learning” transferable between health systems? For example, can conversations in Husky Hospital be accessible in other hospitals?
 - If so, does Husky Hospital receive any benefits or credit?



Chief Financial Officer

Kevin Chang, the Chief Financial Officer, presented questions regarding financial costs and benefits of Theo's implementation at Husky Hospital.

- What pricing structure would benefit both Husky Hospital and Voithos?
 - Per departmental license? Lump subscription sum? Another innovative structure?
 - How much should Voithos charge Husky Hospital?
- How would Husky Hospital benefit from such a structure?
- Is there a potential for revenue or compensation for Husky Hospital in regards to the questions posed by the Ethics department?

Chief Operations Officer

Arindell Speare, the Chief Operations Officer, posed concerns about the adoption of Theo into Husky Hospital.

- What does the timeline for Theo implementation look like?
 - Does Husky Health go live immediately with Theo? Or is there an onboarding time?
- What does Voithos support for Husky Hospital look like?
 - What happens during software downtime?
- How should Husky Hospital implement Theo?
 - One doctor at a time? One floor at a time? One department? Any alternative implementation strategy?
- What is the user training strategy of Theo?

The executives wanted an answer to their questions by the end of the weekend. While these questions were expected, the team knew that they needed to work hard to come up with tangible answers. They had less than a week to come up with a presentation that would address the concerns that the team posed and convince the executives to sign the contract.

Deliverables

- PowerPoint presentation (15 minutes max)
 - Slides must be annotated and address each concern posed by the Board
 - Pose recommendations to improve Theo based on each concern
- Complete citations must be included (AMA)



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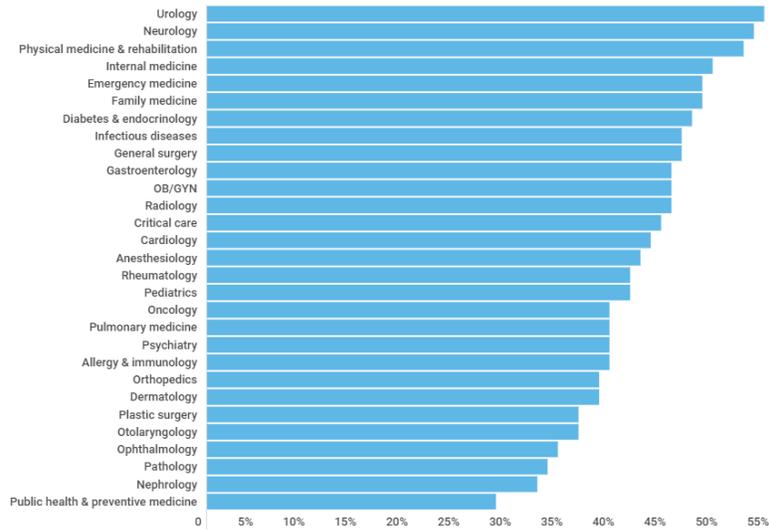
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Additional inspiration for this case came from:

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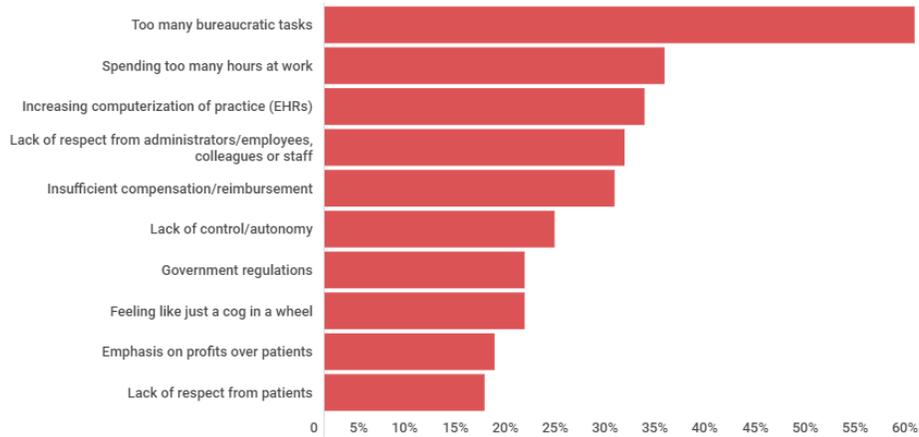
Physician burnout by specialty



Source: Medscape National Physician Burnout, Depression & Suicide Report 2019

Figure 1

Biggest contributors to burnout



Source: Medscape National Physician Burnout, Depression & Suicide Report 2019

Figure 2

