Aveanna Healthcare: Lean Teams and an Optimized DevOps Infrastructure Deliver Health IT Digital Transformation at Speed

Rapid Response to COVID-19 Crisis Keeps Essential Home Pediatric Healthcare Providers on the Job

“Working with 7Factor, we plant a seed. ‘This is what we think we need,’ and we have a conversation. They always come back with better ideas, and they’re always thinking about the user perspective. I enjoy working with the 7Factor crew.”

Monique Weeks, Associate Vice President,
Business and Clinical Solutions

BACKGROUND

Aveanna Healthcare is the nation's leading provider of pediatric home care services. With operations in 23 states, Aveanna's 30,000 nurses, therapists, home health aides, and other caregivers provide in-home pediatric skilled nursing, pediatric therapy, autism services, enteral nutrition, therapy, and adult services to families with special needs.

Aveanna serves its patients with compassion, integrity, and skill. However, managing tens of thousands of caregivers working in tens of thousands of homes is an enormous logistical undertaking. Additionally, because much of the care they provide is funded by Medicare and Medicaid, compliance and reimbursement weigh heavily on their back-office operations.

Formed through a 2017 merger of PSA Healthcare and Epic Health Services, Aveanna had struggled to bring about a digital transformation that would replace their manual, paper-based practices with automated, cloud-based systems.

The home health space is the last one jumping onto the technology train," says Karen Waller, Aveanna's Clinical IT Product Owner. "It has been the last to adopt technology such as EMRs or mobile apps. There are multi-faceted reasons for this, but even regulatory requirements have addressed the digital transformation of home health last."

Following passage by Congress of the 21st Century Cures Act, Medicaid mandated that home health workers provide electronic visit verification (EVV), capturing their GPS location, the time, patient signatures, and other information at each visit. Providers of Medicaid-reimbursed personal care services, such as Aveanna, had until January 1, 2020 to comply. (Providers of home health care services, which Aveanna also offers, have until January 1, 2023.)

"Prior to this, paperwork was being mailed or hand brought in to the office so it could be processed," says Minesh Patel, Clinical IT Product Manager at Aveanna. "The paperwork never captured GPS. The caregiver just said, 'This is the time I did my work, and I said that I was there."

The paper-based system was also slow, labor-intensive, and now would no longer be accepted for reimbursement. It was essential for Aveanna to implement EVV, and they knew that a broader digital transformation was critical for their profitability and growth. So Aveanna's internal development team brought in two large software development vendors that each threw large teams of developers at the problem.

Despite all the committed resources, the work proceeded slowly, in fits and starts. Some projects became so mired in conflicting code that they were never launched. Other solutions were released but never well adopted or integrated into the workflow. Morale was low and a spirit of defeat had set in.

The external developers, says Waller, "were not willing to learn from the field staff and the clinical documentation to understand why the requirements were the way they were."

"The vendors used junior developers to keep the costs down," says Patel, "and they suffered from some of the mistakes that junior developers make. They weren't properly supervised. They would get the work done, but their workmanship was poor and their supervisors would never review it."

"The people on the project weren't bad developers," says 7Factor founder and CEO Jeremy Duvall. "Some of the code was well written, some was terrible. All of it looked like it had been rushed. The real problem was that the whole project had been mismanaged."

Then, after a leadership shake-up that saw veteran technology leader Joseph Sharp take over as AVP of Technology, the other vendors (and some of the internal developers) were let go, and 7Factor was brought on board.

We were first hired as a stop-gap solution to maintain Aveanna's existing applications, but we soon got to work rebuilding their DevOps infrastructure from scratch and developing the tools they needed for a successful digital transformation. Then the COVID-19 pandemic hit and provided a stress test for all that we had accomplished.

PHASE ONE: BREAKING THE BOTTLENECK OF AVEANNA'S DEVOPS INFRASTRUCTURE

Problem

We immediately saw that Aveanna's development infrastructure was getting in the way of good innovation.

"Things took forever to get done," says 7Factor engineer Blake Panter "Continuous delivery didn't exist."

The company had chosen to use Azure DevOps Server as its development pipeline. This was a reasonable choice, but the internal engineer in charge of it had made some eccentric choices in how he configured the pipeline.

"He was always trying his own things that no one else was kept in the loop about," says Panter.

"It didn't work 50% of the time," says Duvall, "but he knew the levers to pull and the knobs to turn to make it work."

The internal engineer was, however, the only person who knew how to make it work. It was a classic bottleneck problem. Then, during the shake-up, he was let go. Suddenly no one could reliably convince his overengineered pipeline to work. We had to reverse engineer it to figure out how to deploy.

To innovate and improve effectively, Aveanna needed a better DevOps infrastructure, a pipeline that was efficient and reliable, and one that any authorized team engineer could run.

Solution: Optimize DevOps Infrastructure for Innovation

We scrapped Aveanna's Azure DevOps Server and rolled our own with open-source Concourse to implement continuous delivery the right way.

We have nothing against Azure DevOps and use it with our clients when it matches their needs. However, we like the discipline of Concourse's strictly containerised approach, and we knew it would help us rein in all that conflicting code from earlier efforts. With Concourse, when something goes wrong, it's much easier to figure out why, then back it out of the build.

Concourse's declarative configuration files are also easier to read, debug, and modify. Any qualified engineer on the team can examine and modify the pipeline's levers and knobs.

With the robust infrastructure we developed, any authorized engineer could deploy to production, and the pipeline could easily handle thousands of deployments per day. The bottleneck to innovation was broken wide open.

PHASE TWO: CRACK OPEN A CULTURE OF FEAR AND MISTRUST

Problem

A high-performing pipeline is only as good as the engineering teams that use it. Note that we're not saying it's only as good as the individual engineers. Aveanna and its previous vendors had plenty of excellent engineers. We even hired one of them, Katie Kang, from one of the vendors and put her on 7Factor's Aveanna team.

What they didn't have was a high-performing culture that would bring out the best from its engineering teams.

"At my previous company," says Kang, "we had to finish a ticket in one day, maybe two days at most. Any longer, and the manager would say, 'Your work takes too long.' It was always rush, rush, rush, finish it, finish it, finish it. We couldn't take the time to think things through."

"When we walked in the door," says 7Factor engineer Ahmed Ismail, "everything felt like a fire everywhere all the time. People were on edge a lot, and there was a lot of mistrust."

"In many situations, we'd be working on a certain part of code," says 7Factor engineer Crystal Panter. "If we didn't understand what was going on, we would ask the team at Aveanna, 'Why did they do that?' They'd reply, 'I'm not sure who did that or why they did it that way.'"

Talented engineers had stuck to themselves, not asking for help, not sharing what they knew, each protecting themselves from too much attention or blame.

"If you don't feel psychologically safe," says Panter, "it's a terrible place to be."

We weren't hired to fix this culture of fear for Aveanna, but we saw how it was getting in the way of innovation, so we took it on as an added challenge.

PHASE THREE: DIGITAL TRANSFORMATION DONE RIGHT

With a proper DevOps pipeline in place and the impact of our high-performing culture on Aveanna's team, innovation could finally accelerate.

With a widely distributed workforce and stringent reimbursement requirements for Medicaid and Medicare, Aveanna's manual systems created large and long-standing inefficiencies that were running up labor costs while delaying and reducing reimbursements.

The company relied heavily on paper forms and scans. For each assigned patient, the nurse or other caregiver would fill out a daily visit record (DVR): a form that included a checklist of the care required, a report by the caregiver on the patient's health, and confirmation signatures by both the caregiver and the patient or their guardian.

After completing daily visits, the caregivers would scan in the completed forms and email them to Aveanna's administrative offices, mail the paper forms, or sometimes hand-deliver them to the local office. There, back-office staff would process each form, manually entering the information into Aveanna's EMR platform and filling out forms for reimbursement.

The paper-pushing was labor-intensive and error-prone. Administrative costs were high, the revenue cycle was slow, and substantial reimbursements were lost to errors and omissions.

Earlier efforts at digital transformation had attempted to address this, but the previous external development teams had built apps that were poorly adopted, inefficient, unstable, and, in some cases, never successfully launched.

These early attempts included a web-based Aveanna Scheduler app for back-office use in filling needed shifts, and two native mobile apps: AveannaConnect, which caregivers use to sign up for shifts and access patient notes, and Aveanna EVV for electronic visit verification.

Problem: Aveanna Scheduler Slows Things Down

In the previous vendor's version of Aveanna Scheduler, several development choices made the web-app wildly inefficient, only barely an improvement over the old paper-based system.

Back-office staff frequently need to access DVR forms from completed visits to see what care was provided during each visit. They often must examine several DVR forms from a patient's previous visits, but the original Aveanna Scheduler made this very time-consuming. They would first click on an individual shift, then click another button to open the single DVR for that shift. If they wanted a record of it, they had to take a screenshot to save or print. Then they had to repeat this process for every shift's DVR they wanted to examine.

"How annoying," says Panter, "Minesh [Patel] told me that some of them were so frustrated with the manual process that they didn't want to use the app at all."

In addition to the laborious human effort, the app's architecture was also slowing the process down.

"To show the form," says Panter, "the code was calling a Lambda function in AWS. It had to go from the Aveanna Scheduler app to another part of Amazon's servers, do code there, and then send it back to the Aveanna app. Loading DVR forms took an average six to fifteen seconds, one-by-one."

Solution: Optimize Aveanna Scheduler for Back-Office Workflow

Panter disconnected the Lambda call for displaying DVR forms and handled the process entirely in the Aveanna Scheduler app. "Now, display is almost immediate," she says.

She also added the ability for back-office staff to select multiple DVR forms at once, then print or save all of them to a ZIP file. (No screenshots required.)

With the most egregious inefficiencies solved, she then worked with Aveanna to identify additional ways to assist the scheduling staff. This led to adding a template capability for the DVR forms. Patients with different care needs or living in different states require different information on their DVR forms. Previously, schedulers would have to customize each one.

"Colorado, for example," says Panter, "has different requirements than the other states, so we created a template just for them."

With the ability to save and apply templates from the Aveanna Scheduler database, schedulers now save time by assigning template DVRs to each patient as needed.

Problem: Aveanna EVV is Incompatible and Poorly Adopted

An early version of the Aveanna EVV app was incompatible with Aveanna's electronic medical records (EMR) system. As patients were discharged from one approved treatment plan and started on a newly authorized plan, Aveanna's caregivers were trained to add a hyphen followed by an incremented number to the end of their medical record number. (e.g. 987876765-1, 987876765-2) The EMR system would then create a new folder for the patient, with the incremented number in brackets.

However, the vendor hadn't set up the Aveanna EVV database or API to allow the incremented field.

"They made an assumption that we needed only one field per individual, and that was it," says Patel. "They had never looked at the database. They had never made the effort to see what was on the other side of the tent that they were integrating with. I had to argue with the developer for two hours, explaining why this was required."

More broadly, the external development team hadn't taken the time to understand their target users. Aveanna's caregivers come from across a wide spectrum of education levels and technology experience. Some were digital natives, but others struggled with the app's sign-in screen and other features. Yet the previous development team assumed and relied upon a high degree of digital sophistication. Many users couldn't figure out how to use the app and either required excessive support or quickly abandoned it.

Aveanna needed solutions designed for their workforce and with an understanding of their needs, solutions that would simplify the process for their caregivers while streamlining back-office operations.

Solution: Rethink the UX and Improve Systems Integration

Kang -- who had worked for the previous vendor but was now on the 7Factor team -- was finally able to take the time she needed to think through some important UX challenges with Aveanna EVV. She could develop a deeper understanding of the caregiver experience, then think through how the app could better serve them.

"UX is really important," says Kang. "I have more time to think about it now and come up with a better design."

She redesigned the app to make it intuitive for all of Aveanna's employees.
The 7Factor team rebuilt the Aveanna EVV app in React on the open-source Expo platform, which lets us do over-the-air updates and deploy native apps to both Google Play and the App Store. This all supports rapid innovation and continuous improvement.

We also migrated the app backend services from .NET Framework to .NET Core, all in Docker containers using ECS, and ran it all on Linux to save Aveanna thousands of dollars per month on AWS services.

We fixed the database and API incompatibility that Patel had to argue about with the previous vendor, and we properly integrated the app with Aveanna's EMR.

After Blake discovered some security vulnerabilities in the existing app, the team rebuilt the VPC with HIPAA-compliant public/private networking architecture.

Together, 7Factor and Aveanna soon launched a much improved electronic visit verification app. Adoption rates by Aveanna's caregivers began to climb.

"Adoption is going a lot smoother because we're giving them products that work," says Waller. "As the middlemen, we talk with our end users on the front lines. They tell us what they need and what's not working for them. It feels good to go back to them and say, 'This is fixed.' We're reinforcing buy-in at every interval."

The teams continue to improve and integrate the app with other solutions.

"We're in the process now of trying to harden some of the mobile apps," says Ismail. "Not just new features but also fixing some of the stuff that's already there. The whole goal of that is to not have nurses drop off the platform."

Then the COVID-19 crisis hit, and soon the optimized DevOps infrastructure, the upgraded apps, and Aveanna's newly high-performing development culture were put to the test.

PHASE FOUR: BRINGING IT ALL TOGETHER FOR A RAPID RESPONSE TO COVID-19

Problem: Certify Critical Caregivers in the COVID-19 Crisis

Then, in the midst of collaborating with Aveanna on these initiatives and other pillars of their digital transformation, the COVID-19 crisis struck, and many of the cities and states in which Aveanna operates began issuing shelter-in-place orders. Only essential workers were permitted to travel freely.

For many of Aveanna's patients, an interruption in home healthcare service could provoke a health emergency. For all of them, it would severely decrease their quality of life.

Aveanna's 30,000 caregivers and the staff and leadership who support them are the very definition of essential workers, but how would they prove this to law enforcement if they were stopped as they traveled from home to home? Aveanna needed a way to certify their critical caregivers, and they needed to deploy that certification to them fast.

"We initially created a badge that we made available on our intranet," says Monique Weeks, Aveanna's Associate Vice President for Business and Clinical Solutions. "Our employees could print it out and have it on their dashboard or carry it in their wallet. But we felt like that wasn't sufficient."

"We needed electronic badges to quickly identify our caregivers as essential workers in case they were stopped by authorities," says Waller.

"Jeremy and his team have made our jobs a whole lot easier. It has been a great experience."

Karen Waller, Clinical IT Product Owner

Solution: Rush Electronic Badges to Essential Workers

With the recent success of 7Factor's reworked Aveanna EVV app, adoption was on the rise, and Aveanna wanted to continue to encourage adoption. So they asked us to provide the electronic badges through Aveanna EVV, pushing them out to all 30,000 of their caregivers to certify that they were essential healthcare workers.

"We walked them through what we needed," says Weeks, "which included aligning with Workday, our existing ERP solution. Because our employees were already registered in Workday, they would be able to authenticate there then let Workday provide the app with their picture and date of birth to be displayed on their electronic badge."

The badges had to meet the emerging requirements of law enforcement officials. They had to be delivered securely, and they had to be delivered fast. (They also couldn't break the app in the process.)

Given sufficient time, it's not an impossible problem. Delivering it fast requires a high-performance team and an optimized DevOps infrastructure. Fortunately, Aveanna now had that.

"Ahmed [Ismail] and team were able to quickly ascertain the APIs of Workday," says Patel, "and figure out a way to successfully pull those badges up."

Relying on Workday for the app's user management wasn't ideal, but the urgency of the situation made it necessary.

"Getting the information out of Workday is a slow, slow, slow moving process," says Ismail. "In early tests of the app, it took a minute, two, even three to generate the badge. That's obviously not ideal if you're pulled over by a police officer."

Understanding the needs of Aveanna's caregivers, the 7Factor team knew they had to speed it up but didn't have the time to set-up a dedicated user management system.

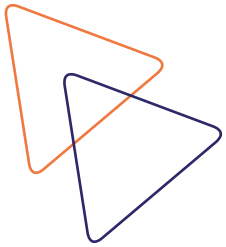
"So we created a Workday proxy," says Ismail, "a Python application that updates a cache of every user's essential information in Workday every night."

Caregivers can now pull up a badge in seconds.

Because of the work Kang had already done on the app's UX and further thought that went into the electronic badge experience, users found it very intuitive to use.

"We sent it to the Atlanta corporate office," says Weeks. "We had two people on the executive team, people who joke, 'We are not technical.' Both of them wrote me back, pleased with the results. One of them said, 'I did this while I was on a conference call, and it was so easy.' That spoke volumes to how it was set up."

Two weeks after Aveanna made the request, their caregivers had their badges and could continue providing their critical services.



Collaborating in a culture of trust with Aveanna's engineers, our team could work quickly and effectively, rolling out a well designed and intuitive solution in record time. No bottlenecks got in the way of rapid deployment and improvement.

"7Factor did a really quick turnaround," says Weeks, "and created a workflow for it that was better than I envisioned it could be. As a bonus, the EVV app is now downloaded on everyone's phone. It helped us promote the app."

As the COVID-19 crisis continues, Aveanna knows they have a DevOps team in place that can respond to any additional emergency needs that may arise. In the meantime, we continue to improve the Aveanna EVV and Aveanna Connect apps, the Aveanna Scheduler web app, and other solutions.

"It's refreshing for me," says Waller, "their willingness to listen and understand the perspectives and workflows of our end users. Understanding the whys helps you come up with the hows, and they're also interested in learning the whys so they can accurately determine the best solution."

With an optimized DevOps infrastructure and 7Factor's high-performing small teams of elite engineers, Aveanna is at last realizing the many benefits of integrated, cloud-based healthcare IT.

Our solutions are allowing them to operate more efficiently and profitably, on a scalable foundation that supports their continued growth. We're also making sure that, even in the midst of a global health crisis, Aveanna's 30,000 caregivers can continue to provide the critical and compassionate care relied upon by so many families for a better quality of life.

7Factor is a joy after what we had to deal with before.

Minesh Patel, Clinical IT Product Manager

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