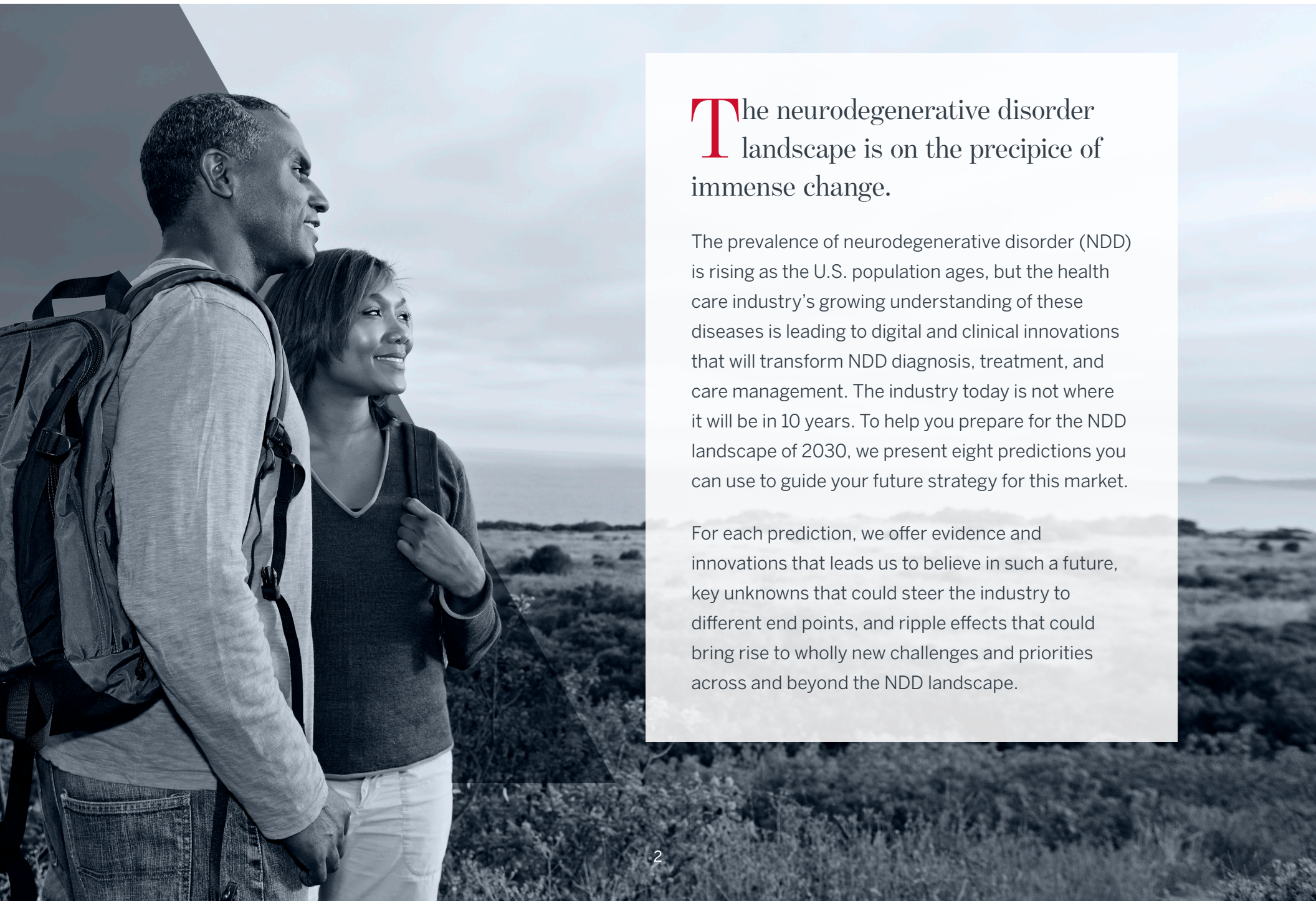


F U T U R E
OF
Neurodegenerative
Care

A black and white photograph of a man and a woman hiking together. The man is in the foreground, wearing a light-colored long-sleeved shirt and a large backpack, looking towards the right. The woman is slightly behind him, wearing a dark top and light pants, also looking towards the right. They are standing on a grassy hillside with a vast, open landscape in the background under a cloudy sky.

The neurodegenerative disorder landscape is on the precipice of immense change.

The prevalence of neurodegenerative disorder (NDD) is rising as the U.S. population ages, but the health care industry's growing understanding of these diseases is leading to digital and clinical innovations that will transform NDD diagnosis, treatment, and care management. The industry today is not where it will be in 10 years. To help you prepare for the NDD landscape of 2030, we present eight predictions you can use to guide your future strategy for this market.

For each prediction, we offer evidence and innovations that leads us to believe in such a future, key unknowns that could steer the industry to different end points, and ripple effects that could bring rise to wholly new challenges and priorities across and beyond the NDD landscape.



How to use this resource

Use these predictions, examples, unknowns, and ripple effects to initiate and inform conversations internally and with partners across the health care ecosystem about the future of NDD care.

As you explore these predictions, there are two things to keep top of mind:

- 1** Some predictions below are rosy, some less so. Consider the ripple effects that may create challenges and unintended consequences even from positive advancements.
- 2** Some predictions may seem speculative—that's by design. Consider the unknowns that will impact which trends and innovations develop or which barriers the industry is and isn't able to overcome.

Major themes

As we considered the potential ripple effects from innovations in NDD diagnosis, treatment, and care management, we identified four overarching themes. All segments of the NDD industry must keep these themes in mind as they design, plan for, and implement innovations in the coming years.

Click on each theme to see an expanded view.

The NDD patient population will become younger.



Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.



Without targeted solutions, barriers to care will exacerbate health inequities.



Payers will play a more prominent role in decision-making.



The NDD patient population will become younger.

Today, most individuals with NDDs are in their late 60s, 70s, and 80s. But improvements in diagnostics will allow providers to identify NDDs earlier, and advancements in disease-modifying therapies incentivize patients to catch NDDs early in their disease progression. As this science advances, a new and younger NDD cohort will emerge.

This new cohort will have different needs for diagnostics, treatments, and care management than populations we associate with NDDs today. They will have a greater demand for innovations that prevent disease, not just improve quality of life. They will have greater digital fluency. Many will be privately insured, changing payment dynamics and increasing the role that private plans play in granting access to NDD diagnostics and care.

Major themes

As we considered the potential ripple effects from innovations in NDD diagnosis, treatment, and care management, we identified four overarching themes. All segments of the NDD industry must keep these themes in mind as they design, plan for, and implement innovations in the coming years.

Click on each theme to see an expanded view.

The NDD patient population will become younger.



Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.



Without targeted solutions, barriers to care will exacerbate health inequities.



Payers will play a more prominent role in decision-making.



Without targeted solutions, barriers to care will exacerbate health inequities.

Digital innovations and expansive care models may improve access to care for patients who are elderly or live in rural communities. But without specifically addressing health inequity, these exciting new advancements will remain largely unavailable to already underserved populations.

For example, individuals who live in low-income areas may not be able to leverage upcoming innovations in NDD care due to lack of broadband internet, high cost of technology, low digital fluency, or inability to use technology given their cognitive or physical impairment. Additionally, many clinical trials and pilot studies primarily include white individuals, potentially causing mistrust among patients of color and hesitation from clinicians.

While barriers like these aren't new, the NDD market is yet another area where they limit access and exacerbate inequity. The health care industry must therefore address these challenges as it develops new innovations and care models to enable equitable access.

Major themes

As we considered the potential ripple effects from innovations in NDD diagnosis, treatment, and care management, we identified four overarching themes. All segments of the NDD industry must keep these themes in mind as they design, plan for, and implement innovations in the coming years.

Click on each theme to see an expanded view.

The NDD patient population will become younger.



Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.



Without targeted solutions, barriers to care will exacerbate health inequities.



Payers will play a more prominent role in decision-making.



Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.

Many individuals with NDDs are never diagnosed—or they are diagnosed late in the disease’s progression. This is particularly true for dementia, where studies show that 90% of older adults with symptoms consistent with the disorder have not received a formal, medical diagnosis.¹ This is partially due to societal factors and behaviors outside of medicine. For example, being diagnosed with a disease which the medical field doesn’t fully understand and has limited treatment options can be scary. Regularly traveling hours for treatment may not be worth slight clinical benefits. Requiring greater care for longer periods of time may strain family caregivers. These are all rational human concerns that prevent individuals from seeking care for their NDD.

To overcome these barriers and encourage patients to seek care, innovation will not only have to occur across all stages of a patient’s care journey—diagnosis, treatment, and care management—but that innovation must also be highly accessible.

Major themes

As we considered the potential ripple effects from innovations in NDD diagnosis, treatment, and care management, we identified four overarching themes. All segments of the NDD industry must keep these themes in mind as they design, plan for, and implement innovations in the coming years.

Click on each theme to see an expanded view.

The NDD patient population will become younger.



Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.



Without targeted solutions, barriers to care will exacerbate health inequities.



Payers will play a more prominent role in decision-making.



Payers will play a more prominent role in decision-making.

As digital and clinical innovations emerge, payment will almost always be a major barrier. For example, providers will not offer innovative diagnostics if payers refuse to reimburse them. In addition, many current and upcoming pharmaceutical interventions are expensive, and payers will scrutinize whether the benefits of those innovations justify the price. Finally, new virtual and home-based care models will require proof that they have outcomes on par with traditional care to receive reimbursement.

Regardless of the innovation, payers are increasingly going to be key stakeholders for innovators to win over.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Digital evaluation tools using innovations such as virtual reality and passive monitoring will become the standard of care to enable more timely, standardized, and reliable diagnoses.

Where we are now

Trends and innovations

Unknowns

The first step in the NDD diagnostic process is an in-person neurological evaluation where a clinician measures a patient's cognitive or physical capabilities. There are three primary flaws with how these evaluations occur today:

> **Timing**

Patients and their physicians often delay these tests until the patient is late in their disease progression.

> **Variation**

There is no single, gold-standard test that clinicians use to determine cognitive or physical function.

> **Context**

Many existing tests don't evaluate an individual's function in their daily environment.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION IN DIAGNOSTICS



Meet Carl

A SAMPLE DIAGNOSTIC JOURNEY

Digital evaluation tools using innovations such as virtual reality and passive monitoring will become the standard of care to enable more timely, standardized, and reliable diagnoses.

Where we are now

Trends and innovations

Unknowns

Some technologies, like virtual reality (VR) and passive monitoring, already aim to solve many of the flaws of current neurological evaluations. While clinicians and patients rarely use these tools to support their disease today, an increasingly tech-friendly provider and consumer base may expand the role these innovations play over the next 10 years.

To the right are key examples.

- 1 Researchers have used VR to give clinicians visibility into a patient's ability to complete common tasks like navigation and recall in a real-world environment. One study at the University of Cambridge showed that VR simulations can identify patients who have early stages of Alzheimer's disease more accurately and sooner than many common tests that clinicians use today.²
- 2 Passive monitoring technologies can identify changes in cognitive or physical function before they become visible to the individual, their families, or their doctor. Researchers have used Apple Watch to passively track tremors and dyskinesia development among patients with Parkinson's disease and report the results to clinicians.³
- 3 Consumers have grown more comfortable using health monitoring tools in recent years. In 2019, a Rock Health survey showed that 44% of consumers track at least one health metric digitally, up from 33% in 2017.⁴ Similarly, 22% of clinicians in 2019 said they've incorporated remote monitoring tools into their practice, up from 13% in 2016.⁵

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION IN DIAGNOSTICS



Meet Carl

A SAMPLE DIAGNOSTIC JOURNEY

Digital evaluation tools using innovations such as virtual reality and passive monitoring will become the standard of care to enable more timely, standardized, and reliable diagnoses.

Where we are now

Trends and innovations

Unknowns

- 1 Will patients and physicians overcome existing hesitations to proactively screen for NDDs?
- 2 Will cutting-edge technologies be affordable for all patients? Will they be usable regardless of a patient's level of physical/cognitive function?
- 3 To what extent will provider organizations invest in the IT infrastructure needed to measure, gather, and analyze data at scale?
- 4 How will public and private payers reimburse providers that use digital innovations in NDD diagnostics?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Neuroimaging will frequently leverage AI and ML to identify patterns in, and advance our understanding of, NDDs.

Where we are now

Trends and innovations

Unknowns

Clinicians use imaging to confirm a diagnosis, specify a condition, or rule out other causes of cognitive or physical impairment. At present, organizations may use artificial intelligence (AI) or machine learning (ML) to streamline administrative tasks, but they rarely use these tools to diagnose NDDs or advance our clinical understanding of these diseases.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION IN DIAGNOSTICS



Meet Carl

A SAMPLE DIAGNOSTIC JOURNEY

Neuroimaging will frequently leverage AI and ML to identify patterns in, and advance our understanding of, NDDs.

Where we are now

Trends and innovations

Unknowns

Over the past decade, the health care industry has increased the extent to which it leverages AI and ML—and this trend shows no sign of slowing. Some radiologists and researchers have even started to expand beyond streamlining administrative tasks and use AI and ML on MRI or PET scans to identify patterns or trends in NDD progression.

To the right are key examples.

- 1 Investing in AI is a major goal for health system leaders, not just IT leaders. In a 2020 Optum* survey, 83% of health system leaders said their organization had a dedicated AI strategy compared to just 33% in 2018.⁶ This shows a desire among health care leaders to embrace AI and ML across their organizations as a part of digital transformation.
- 2 Researchers at University of Florida are currently using AI when interpreting MRI scans of Parkinson's disease patients to identify patterns that help clinicians diagnose specific variants of the disease.⁷ The hope is that data can lead to more accurate diagnoses and allow clinical trials to focus on more precise forms of Parkinson's disease.

* Advisory Board is a subsidiary of Optum. All Advisory Board research, expert perspectives, and recommendations remain independent.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Neuroimaging will frequently leverage AI and ML to identify patterns in, and advance our understanding of, NDDs.

Where we are now

Trends and innovations

Unknowns

- 1 To what extent will provider organizations, particularly those outside of major research institutions, continue to invest in the IT infrastructure needed to leverage AI and ML?
- 2 Will public and private payers see enough value in using AI and ML to increase reimbursement for imaging?
- 3 How will regulations limit or expand data-sharing between providers and third parties?
- 4 How comfortable will patients be with third parties having access to their health data?

EXPLORE PREDICTIONS FOR...

Diagnos**t**ics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Patients and their providers will use genetic testing in many cases to understand their risk of developing neurodegenerative disorders.

Where we are now

Trends and innovations

Unknowns

Genetic testing for NDD risk does currently exist, but it is rarely done for three reasons:

> **Accuracy**

Existing tests are often not accurate.

> **Value**

There is limited benefit to knowing if a patient is high-risk since there are few preventative options.

> **Payment**

Payers don't often reimburse for genetic testing.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Patients and their providers will use genetic testing in many cases to understand their risk of developing neurodegenerative disorders.

Where we are now

Trends and innovations

Unknowns

While there are currently barriers to the use of genetic testing for NDDs, these tests are becoming more accurate, valuable, and accessible. As such, genetic testing will be a promising diagnostic tool in the coming years.

To the right are key examples.

- 1 Explorations into gene therapy as a potential treatment for NDDs is advancing the industry's understanding of biomarkers that signal NDD risk. For example, researchers found that individuals with the APOE4 genetic variant have a higher risk of developing Alzheimer's disease.⁸ Other similar studies will help genetic tests more accurately report NDD risk.
- 2 The promise of potential treatment gives a purpose to understanding patient risk, as clinicians can monitor high-risk patients early and put them on treatment plans that slow disease progression. This makes genetic testing more useful overall.
- 3 Popular direct-to-consumer products from 23andMe or Invitae test for genes associated with Parkinson's and Alzheimer's diseases, making genetic testing more widely available to consumers.

EXPLORE PREDICTIONS FOR...

Diagnos**t**ics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS



Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Patients and their providers will use genetic testing in many cases to understand their risk of developing neurodegenerative disorders.

Where we are now

Trends and innovations

Unknowns

- 1 Will understanding genetic risk for NDDs impact long-term patient outcomes and total cost of care?
- 2 Will provider and payer leaders see value in genetic testing and subsequently invest in and reimburse their use?
- 3 To what extent will advancements in treatment options overcome patients' hesitancy to know their risk of developing an NDD?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION IN DIAGNOSTICS



Meet Carl

A SAMPLE DIAGNOSTIC JOURNEY


Ripple effects

Group impacted by effect


- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators

EFFECT

IMPACT

 Digital innovations will enable clinicians to diagnose patients earlier in their disease state. This will shift the NDD cohort toward a younger population.

- **Patients** will live with diagnosed NDDs for longer periods of time.
- **Patients** will increasingly face the difficult choice of electing to know if they have a debilitating, potentially untreatable disease.
- ◆ **Providers** will change the way they grow their memory/movement programs, appealing to the preferences of consumers in their 50s and 60s, as opposed to older individuals.
- **Commercial and public payers** will play a large role in determining patient eligibility for preventative NDD screening and diagnostics.

 As diagnostic tools measure patients' physical or cognitive capabilities in their real-world environments, clinicians and researchers will have access to better data on how NDDs progress and impact patients.

- ◆ **Providers** may be able to better understand their patients' conditions, allowing them to make more timely and accurate diagnoses.
- ▲ **Industry innovators** may have the ability to leverage real-world data to improve their understanding of the NDDs and related treatment development.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION IN DIAGNOSTICS



Meet Carl

A SAMPLE DIAGNOSTIC JOURNEY


Ripple effects (cont.)

Group impacted by effect

- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators


EFFECT

IMPACT

 As AI and ML connect imaging to other biomarkers and patient data, NDD diagnoses will become more accurate and clinicians will be able to predict how a patient's disease will likely progress.

- **Patients** could receive more targeted treatment plans given that providers will have a better understanding of how diseases are likely to progress.
- ◆ **Providers** that want to be known as a top destination for NDD care will need to make costly IT investments—both in AI and ML platforms and in supporting digital infrastructure. IT leaders and teams will therefore become significant stakeholders in this clinical area.



 As more individuals receive NDD genetic screening and diagnoses, pharmaceutical manufacturers and other research organizations will have access to large registries of patients and their associated genetic risk levels.

- ◆ **Providers** will be able to risk-stratify patients based on genetic, as well as non-genetic, factors and build care management plans accordingly.
- ▲ **Industry innovators** will have larger pools of individuals who can participate in long-term clinical trials. But without dedicated attention to screening a diverse array of patients, innovations that leverage this data will only be useful for a segment of the NDD market.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 1

Prediction 2

Prediction 3



Ripple effects

OF INNOVATION
IN DIAGNOSTICS

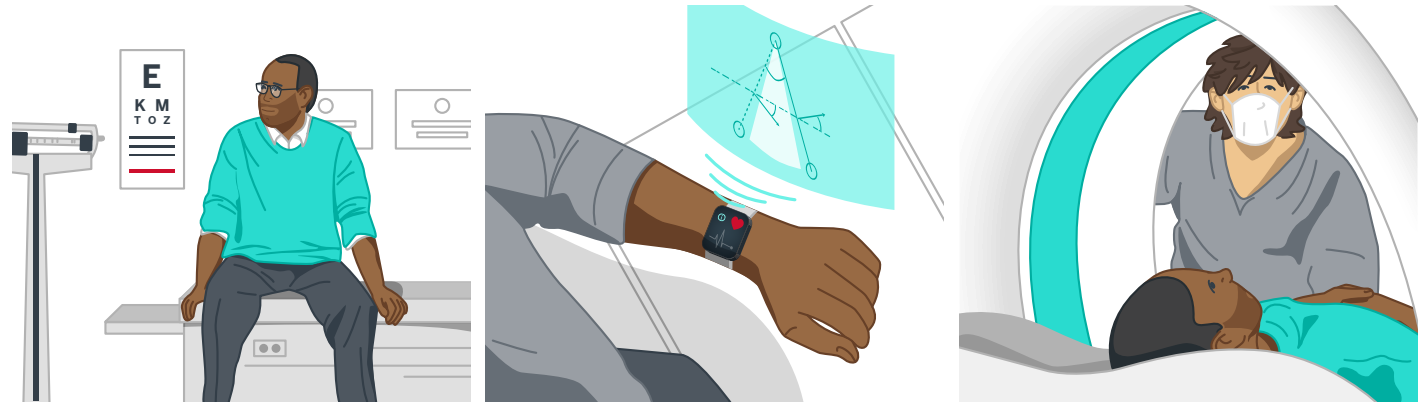


Meet Carl

A SAMPLE
DIAGNOSTIC JOURNEY

Meet Carl

Sample diagnostic journey for a patient in 2030



Carl (age 50) finds out that his mother is diagnosed with Parkinson's disease.

He talks with his primary care physician (PCP) and decides to order a genetic test. The test shows that Carl is at a high risk of developing Parkinson's disease later in life.

Carl starts using an app on his smart watch to measure and monitor changes in his movement, like degree of arm swing or tremors.

By the time Carl is 56, he isn't showing any obvious symptoms of Parkinson's. However, the smart watch shows that Carl's degree of arm swing has decreased steadily over time.

Carl's PCP refers him to a neurologist, who orders imaging exams that show signs of neurodegradation. Carl is diagnosed with Parkinson's disease at an early stage, before he shows major symptoms.

Leveraging AI, Carl's provider can predict when Carl will start seeing major symptoms and which symptoms he is likely to have, helping to inform future treatment and care management choices.

EXPLORE PREDICTIONS FOR...

Diagnosics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

While we still won't have a cure for common NDDs, there will be multiple disease-modifying therapies available to slow the progression of both Alzheimer's and Parkinson's diseases.

Where we are now

Trends and innovations

Unknowns

There are few available treatments for common NDDs such as Alzheimer's and Parkinson's. Most treatments that do exist aim to improve patients' quality of life by alleviating symptoms and do not impact the progression of the disease itself. There are some exceptions, most notably Biogen's Aduhelm, which claims to slow the progression of Alzheimer's disease, though its efficacy is under intense scrutiny.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION IN TREATMENT



Meet Sonia

A SAMPLE TREATMENT JOURNEY

While we still won't have a cure for common NDDs, there will be multiple disease-modifying therapies available to slow the progression of both Alzheimer's and Parkinson's diseases.

Where we are now

Trends and innovations

Unknowns

NDDs impact many people, are among the leading causes of death in the U.S., and have few treatment options. Therefore, there is intense interest from both the public and private sector in developing treatments. In addition, the industry's advancing understanding of the diseases and related biomarkers makes the 2020s a promising decade for NDD treatment development.

To the right are key examples.

- 1 With the FDA's approval of Biogen's Aduhelm, major pharmaceutical manufacturers like Eli Lilly, Roche, and others have shown renewed interest in their NDD assets. While it's inevitable that some drugs will fail to reach desired end points, the sheer number of promising trials and the industry's greater understanding of the diseases bode well for clinical trial successes in the 2020s.
- 2 There is significant support from the public sector in developing treatments for common NDDs as well. For example, in 2021 the Biden administration proposed \$6.5 billion in funding for a federal agency within NIH dedicated to developing therapies for diseases like Alzheimer's.⁹
- 3 There is a varied research pipeline for NDDs, including therapies that attack amyloid and tau proteins, gene therapy, anti-inflammatory drugs, and metabolic drugs. This adds flexibility in case one approach fails to produce effective treatments.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION IN TREATMENT



Meet Sonia

A SAMPLE TREATMENT JOURNEY

While we still won't have a cure for common NDDs, there will be multiple disease-modifying therapies available to slow the progression of both Alzheimer's and Parkinson's diseases.

Where we are now

Trends and innovations

Unknowns

- 1 Will current and upcoming therapies that aim to reduce biomarkers like amyloid be able to improve patients' lives in a meaningful way?
- 2 How much will NDD treatments cost? What will be private and public payers' appetite to cover these drugs with uncertain data on long-term benefit?
- 3 Will providers have the imaging and infusion capacity to provide treatment to a massive NDD population?
- 4 To what extent will health systems develop memory or movement clinics to properly diagnose, treat, and care for the NDD population?

EXPLORE PREDICTIONS FOR...

Diagnosics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Patients with NDDs will be sub-classified based on variants of their disease. These variants will be common factors in therapy choice, and will be the next frontier for R&D.

Where we are now

Trends and innovations

Unknowns

Common NDDs are treated as single diseases today. However, some like multiple sclerosis (MS), are sub-classified based on how patients exhibit symptoms. Providers often use these sub-classifications as one factor in their treatment recommendations.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION IN TREATMENT



Meet Sonia

A SAMPLE TREATMENT JOURNEY

Patients with NDDs will be sub-classified based on variants of their disease. These variants will be common factors in therapy choice, and will be the next frontier for R&D.

Where we are now

Trends and innovations

Unknowns

Advances in AI and providers' general interest in precision medicine are enabling researchers to better understand NDD pathology. As a result, the industry is starting to discover variants in NDDs like MS and Parkinson's disease that have different pathologies and may respond differently to certain therapies.

To the right are key examples.

- 1 Researchers at University College London used AI to identify three new MS subtypes in early 2021. The researchers next explored how patients with each variant respond to different treatments.¹⁰ As mentioned earlier, researchers at the University of Florida have a similar goal as they use AI on MRI scans of patient with Parkinson's disease to identify patterns that can help clinicians diagnose specific variants of the disease.
- 2 Between 20% and 30% of health systems have a precision medicine program today. The most common focus of these programs to date has been helping providers and payers improve outcomes and reduce long-term costs in oncology care. However, a 2019 Definitive Healthcare study noted that neurology was the fourth most common focus for provider precision medicine programs.¹¹ With ever increasing attention to costs and outcomes for neurology care, NDDs have the potential to be a key target for these programs should researchers continue to identify sub-classifications.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Patients with NDDs will be sub-classified based on variants of their disease. These variants will be common factors in therapy choice, and will be the next frontier for R&D.

Where we are now

Trends and innovations

Unknowns

- 1 Will providers be able to diagnose NDD variants in an efficient manner?
- 2 To what extent will pharmaceutical manufacturers develop drugs for NDD variants that have relatively small patient populations?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Advancements in digital therapeutics will put non-pharmaceutical interventions on pace with other therapies that improve quality of life or modify disease.

Where we are now

Trends and innovations

Unknowns

Digital therapeutics (DTx) as a field is still in its nascent form. However, many researchers and clinicians view neurology as a promising first target for DTx, given how sensory impulses can dictate brain activity.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Advancements in digital therapeutics will put non-pharmaceutical interventions on pace with other therapies that improve quality of life or modify disease.

Where we are now

Trends and innovations

Unknowns

Early DTx platforms have shown promising results in terms of clinical efficacy—and have the potential to improve patient access and reduce NDD treatment cost.

To the right are key examples.

- 1 Some early DTx platforms that have released trial results have effectively impacted biomarkers associated with NDDs. One notable example is Cognito Therapeutics, which released clinical trial data in March 2021 showing the tools ability to slow cognitive decline.¹²
- 2 DTx platforms can help push more care into the home setting, reducing the need for patients to travel for treatment and supporting many seniors' desires to age in place.
- 3 Payers are not guaranteed to cover the high cost of NDD drugs, especially clinic-based infusion, for millions of beneficiaries. However, they may be eager to adopt lower-cost DTx options.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT



Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Advancements in digital therapeutics will put non-pharmaceutical interventions on pace with other therapies that improve quality of life or modify disease.

Where we are now

Trends and innovations

Unknowns

- 1 To what extent will physicians be comfortable embracing the emerging field of DTx?
- 2 Who will pay for innovative tools that aim to improve quality of life but don't modify the disease?

- 3 How will the industry address common digital barriers like limited internet access and patient usability?
- 4 To what extent will major pharmaceutical and device manufacturers invest in DTx development to support their own therapies?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION IN TREATMENT



Meet Sonia

A SAMPLE TREATMENT JOURNEY

Ripple effects

Group impacted by effect

- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators

EFFECT

As NDD treatments become available, there will be intense interest from clinicians and patients alike to understand if they're eligible for treatment.

IMPACT

- ◆ **Providers** will see a spike in demand for screening and diagnostics. As a result of increased rates of diagnostics, demand for care management services will increase as well, even for patients who aren't eligible for treatment.
- **Payers** will face intense pressure from providers and patient advocacy groups to reimburse for NDD screening and diagnostics.

The high cost of NDD treatments will cause all stakeholders to reconsider their financial approach to NDD care.

- **Uninsured patients** may not have access to many treatment options. In addition, patients may have to navigate complex and strict payer formularies to be able to access drugs.
- ◆ **Providers** will have to invest in even more rigorous prior authorization processes to ensure they receive reimbursement for high-cost drugs. Providers who don't make these investments may not be able to offer patients such interventions.
- ◆ **Providers** will use these high-cost treatments as a source of revenue for memory and movement clinics that struggle to break even.
- **Payers** could seek to create and implement value-based care contracts to control high cost of care.
- ▲ **Pharmaceutical manufacturers** will have to appeal to payers in order to ensure patients have access to their drugs.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION IN TREATMENT



Meet Sonia

A SAMPLE TREATMENT JOURNEY


Ripple effects (cont.)

Group impacted by effect

- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators


EFFECT

IMPACT

 A “haves and have-nots” environment will emerge in which certain NDD variants will have targeted therapies while others will not.

■ Variants common among white **patients** will have more targeted treatments than variants common among other demographics, as many trials are primarily composed of white individuals.

◆ **Providers** whose patient panel is primarily people of color may not trust diagnostics or treatments that weren’t tested on patient populations they serve.

 A rise in digital therapeutic viability and availability will accelerate the shift of more traditional treatment options to nontraditional care sites.

■ **Patients** will have more options for home-based NDD treatment, changing their expectations for their treatment experience.

◆ **Providers** will develop home-infusion and other non-clinic-based treatment encounter capabilities.

▲ **Industry innovators** will either invest in, or partner with, digital therapeutics companies to improve outcomes or quality of life for patients who use their products.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 4

Prediction 5

Prediction 6



Ripple effects

OF INNOVATION
IN TREATMENT

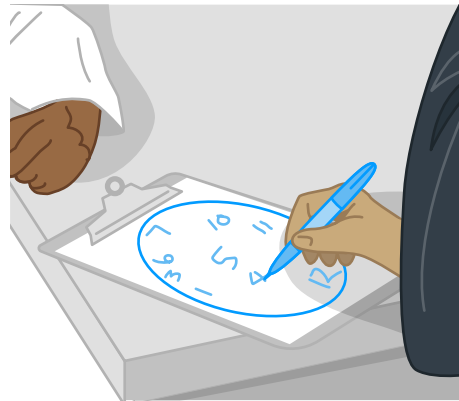


Meet Sonia

A SAMPLE
TREATMENT JOURNEY

Meet Sonia

Sample treatment journey for a patient in 2030



Sonia (age 67) is diagnosed with Alzheimer's disease. She exhibits only minor symptoms.

Sonia's doctors run a number of tests and determine that she has a particular, highly treatable variant of Alzheimer's early in its disease progression.



Sonia begins monthly infusions, at an infusion center in the nearest city, that aim to slow the progression of her disease.

While this course of action works for Sonia's friend who lives in the city, Sonia lives a 3-hour drive from the nearest infusion center. This makes receiving treatment a major disruption to Sonia's life.



Sonia chooses to stop the infusion treatment because of the long drive to the nearest infusion center.

Instead, Sonia and her neurologist opt for a visual-auditory treatment that she uses once a day for 15 minutes at home to slow her disease progression.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Aided by a proliferation of digital tools and home-based services, more patient care will occur in the home longer into a patient's disease progression.

Where we are now

Trends and innovations

Unknowns

Most people (77%) age 55 and older prefer to age in place as opposed to in a nursing home.¹³ However, diseases that impair an individual's cognitive or physical capabilities make it difficult for seniors to complete daily tasks and retain access to care as they age in place.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Aided by a proliferation of digital tools and home-based services, more patient care will occur in the home longer into a patient’s disease progression.

Where we are now

Trends and innovations

Unknowns

Seeing a massive market opportunity, many device and digital health companies are investing in assets dedicated to helping patients access NDD care at home. In addition, providers and payers are starting to recognize the financial and clinical benefits of home-based care, leading them to adopt and pay for virtual care models.

To the right are key examples.

- 1 Medical device and digital tech companies are creating new tools that help patients to receive care in the comfort of their own home, increasing access to care as they age in place. For example, Abbott’s Neurosphere Virtual Clinic allows patients with deep brain stimulators for Parkinson’s disease to receive implant adjustments remotely, as opposed to traveling to a clinic.¹⁴
- 2 Providers increasingly offer telehealth services, particularly after Covid-19. In a 2020 survey of physicians, 70% noted they expect to still be using telehealth over the next three years; 50% said the same in 2019.¹⁵
- 3 Some payers also see the benefit of covering home-based care such as virtual visits and home-based infusions where data shows improved outcomes. For example, in 2020, CMS allowed Medicare Advantage plans to expand coverage of some home-based care services.¹⁶ In addition, greater payment for virtual care under the public health emergency from Covid-19 allows these models to collect data on efficacy and cost. This data will be used to support permanent reimbursement conversations.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Aided by a proliferation of digital tools and home-based services, more patient care will occur in the home longer into a patient's disease progression.

Where we are now

Trends and innovations

Unknowns

- 1 To what extent will digital technology developers ensure that individuals with cognitive and physical impairments can use tools that facilitate aging in place?
- 2 How will the industry meet rising demand for in-person home-based care in the face of an estimated shortage of 446,000 home-health workers by 2025?¹⁷
- 3 Will virtual care programs rolled out during Covid-19 show positive impacts on quality and cost?
- 4 How will the reimbursement landscape for home health and telehealth evolve over the next decade?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Family members will continue to provide most NDD care, though they will have more tools and support to help them to manage their loved one's condition effectively.

Where we are now

Trends and innovations

Unknowns

Family members provide most daily care for many individuals with NDDs. However, few providers give patients and their family members next steps or support for managing their conditions, often resulting in unnecessary trips to the emergency department (ED) or clinician's office.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Family members will continue to provide most NDD care, though they will have more tools and support to help them to manage their loved one’s condition effectively.

Where we are now

Trends and innovations

Unknowns

As provider organizations seek sustainable models for NDD care, some are starting to see success in reducing costs and improving quality by offering greater post-diagnosis support to patients with NDDs and their families.

To the right are key examples.

- 1 Major AMCs like Ochsner and UCSF have dedicated resources to proactively educate patients and their family members on how to manage cognitive disorders at home. These programs have shown improved quality outcomes and reduced total cost of care.
- 2 The current neurologist shortage is expected to reach a 19% shortfall by 2025. As a result, time-strapped neurologists are quick to adopt tools and programs that allow them to transfer low-acuity, low-revenue care to family members and improve quality of care at the same time.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Family members will continue to provide most NDD care, though they will have more tools and support to help them to manage their loved one's condition effectively.

Where we are now

Trends and innovations

Unknowns

- 1 Will family members, especially those with children or non-flexible work arrangements, be able to continue to play a large role in caring for their loved ones as they lose their independence?
- 2 Will health system leaders recognize the value of, and invest in, dedicated programs that aim to support family members in caring for their loved ones with NDDs?

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION IN CARE MANAGEMENT



Meet Vera

A SAMPLE CARE MANAGEMENT JOURNEY


Ripple effects

Group impacted by effect


- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators

EFFECT

IMPACT

 The role of the hospital or clinic in providing NDD care will diminish significantly. Patients will go to these sites only for some diagnostics and surgical procedures.

- **Patients** may receive most of their care at home, potentially making it easier for some populations to access care.
- ◆ **Providers** will lose revenue from facility fees and replacing in-person visits with virtual interactions. To retain profits, providers must improve throughput to increase volumes or focus instead on high-revenue visits that remain in the clinic.

 Digital barriers will replace physical barriers as major access challenges. This includes if a patient has access to reliable internet access, if they can afford smart technology, or if they can use technology given their physical or cognitive capabilities.

- **Patients** and their family members who lack access to, or can't use, digital technologies will not be able to leverage cutting-edge care management models.
- ▲ **Industry innovators** will concentrate on digital usability and access as they develop therapies and technologies.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION IN CARE MANAGEMENT



Meet Vera

A SAMPLE CARE MANAGEMENT JOURNEY

Ripple effects (cont.)

Group impacted by effect

- Patients\caregivers
- ◆ Providers
- Payers
- ▲ Industry innovators

EFFECT

Family members in the “sandwich generation” (those that support both their aging parent as well as children) will have the knowledge needed to properly care for their loved ones, but they’ll still struggle to balance managing care with other responsibilities.

IMPACT

- **Caregivers** in the “sandwich generation” will increasingly be unable to support loved ones who live for a long time with the intense demands of an NDD.
- ◆ Despite **providers** investing in training patients and family members on how to manage NDDs, the high demands of care will still result in unnecessary ED visits.

EXPLORE PREDICTIONS FOR...

Diagnostics

Treatment

Care management

Prediction 7

Prediction 8



Ripple effects

OF INNOVATION
IN CARE MANAGEMENT



Meet Vera

A SAMPLE
CARE MANAGEMENT JOURNEY

Meet Vera

Sample treatment journey for a patient in 2030



Vera (age 79) is diagnosed with Alzheimer's disease, having moderate cognitive impairment.

Vera's provider connects her with a case manager who educates her and her son, Brian (age 50) on how to manage the condition.

Despite her cognitive impairment, Vera is able to remain at home because Brian can manage most issues that arise himself.

Vera continues to check in every few months with her PCP via virtual visits.

As Vera's cognitive function declines, Brian must play a more hands-on role in his mother's care. However, he finds this difficult as he also has a teenage son and must take time off work to care for both.



Parting thoughts

It's clear that the 2020s will be a decade of immense change for the NDD market. But while digital and clinical innovations hold the potential to transform millions of lives for the better, the industry can't lose sight of the potential ripple effects—both positive and negative. On the following pages are the overarching themes we identified in the beginning of this report. With the statements and predictions in mind, consider how each theme impacts your strategy and the role you play in supporting patients with NDDs.

Questions

////////////////////////////////////
For **supplier/service** innovators

1 The NDD patient population will become younger.

- How are we planning to appeal to the new demands of a younger NDD cohort?
- How will the idea of patients living with their NDD for longer periods of time impact how they interact with our innovations?

2 Without targeted solutions, barriers to care will exacerbate health inequities.

- How can we ensure individuals in traditionally underserved populations will be able to benefit from our innovations?
- How can we ensure individuals with cognitive or physical impairments will be able to leverage our innovations independently?

3 Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.

- How can we encourage consumers to interact with their disease despite their potential fears and hesitancies?
- How can we ensure that patients can and want to use or access our innovations?

4 Payers will play a more prominent role in decision-making.

- How are we planning to prove the value of our innovations to both public and private payers?
- How will an increase in the amount of care that private payers must cover impact who has access to our innovations?

Questions

////////////////////////////////////
For provider innovators

1 The NDD patient population will become younger.

- How are we planning to appeal to the new demands of a younger NDD cohort?
- How may a potential change in payer mix impact the financial viability of our memory or movement center?

2 Without targeted solutions, barriers to care will exacerbate health inequities.

- How can we improve our outreach and extend care to traditionally underserved individuals in our community?
- Are our innovative care models and processes accessible to patients across different racial, cultural, and income segments?

3 Accessible innovation in diagnostics, treatment, and care management are necessary to overcome patient hesitancy to seek care.

- How can we encourage our patient population to interact with their diseases despite their potential fears and hesitations?
- How can we make our primary care physicians more comfortable with proactively talking to patients about their neurological health?

4 Payers will play a more prominent role in decision-making.

- Do we have the IT capabilities to gather, analyze, and report data on the cost and quality benefits of our program to payers?

ENDNOTES

1. "Self-Reported Dementia-Related Diagnosis Underestimates the Prevalence of Older Americans Living with Possible Dementia," *Journal of Alzheimer's Disease*, June 29, 2021.
2. "Virtual reality can spot navigation problems in early Alzheimer's disease," University of Cambridge, May 24, 2019.
3. Gavidia M, "Apple Watch Effective in Monitoring Symptoms of Parkinson Disease," *The American Journal of Managed Care*, February 8, 2021.
4. "Digital Health Consumer Adoption Report 2019," Rock Health, 2019.
5. "AMA digital health care 2016 & 2019 study findings," American Medical Association, 2019.
6. "3rd Annual Optum Survey on AI in Health Care," Optum, 2020.
7. Jaffee M, "New AI tool to be tested in NIH-funded study to improve diagnosis of Parkinson's and related disorders," UF Health, March 18, 2021.
8. "APOE4 disrupts intracellular lipid homeostasis in human iPSC-derived glia," *Science Translational Medicine*, March 3, 2021.
9. "Budget of the U.S. Government Fiscal Year 2022," Office of Management and Budget, 2021.
10. Eshaghi A, et al., "Identifying multiple sclerosis subtypes using unsupervised machine learning and MRI data," *Nature Communications*, April 6, 2021.
11. "The Future of the Precision Medicine Market: 2019 Study Results," Definitive Healthcare, 2020.
12. "Cognito Therapeutics Announces Positive Phase 2 Results as First Digital Therapeutic to Improve Memory, Cognition, Functional Abilities and Reduce Brain Atrophy in Alzheimer's Disease," Business Wire, March 9, 2021.
13. "Most Retirees Prefer to Stay Put," AARP, October 10, 2018.
14. "Abbott introduces Neurosphere virtual clinic, first-of-its-kind remote neuromodulation patient-care technology in the U.S.," Abbott, March 8, 2021.
15. "From Virtual Care to Hybrid Care: COVID-19 and the Future of Telehealth," Amwell, 2020.
16. "We've entered an unprecedented market for aging in place," Rock Health, September 8, 2020.
17. Kavalanz P, "The US can't keep up with demand for health aides, nurses and doctors," CNN, May 4, 2018.

LEGAL CAVEAT

Advisory Board has made efforts to verify the accuracy of the information it provides to members. This report relies on data obtained from many sources, however, and Advisory Board cannot guarantee the accuracy of the information provided or any analysis based thereon. In addition, Advisory Board is not in the business of giving legal, medical, accounting, or other professional advice, and its reports should not be construed as professional advice. In particular, members should not rely on any legal commentary in this report as a basis for action, or assume that any tactics described herein would be permitted by applicable law or appropriate for a given member's situation. Members are advised to consult with appropriate professionals concerning legal, medical, tax, or accounting issues, before implementing any of these tactics. Neither Advisory Board nor its officers, directors, trustees, employees, and agents shall be liable for any claims, liabilities, or expenses relating to (a) any errors or omissions in this report, whether caused by Advisory Board or any of its employees or agents, or sources or other third parties, (b) any recommendation or graded ranking by Advisory Board, or (c) failure of member and its employees and agents to abide by the terms set forth herein.

Advisory Board and the "A" logo are registered trademarks of The Advisory Board Company in the United States and other countries. Members are not permitted to use these trademarks, or any other trademark, product name, service name, trade name, and logo of Advisory Board without prior written consent of Advisory Board. All other trademarks, product names, service names, trade names, and logos used within these pages are the property of their respective holders. Use of other company trademarks, product names, service names, trade names, and logos or images of the same does not necessarily constitute (a) an endorsement by such company of Advisory Board and its products and services, or (b) an endorsement of the company or its products or services by Advisory Board. Advisory Board is not affiliated with any such company.

IMPORTANT: Please read the following.

Advisory Board has prepared this report for the exclusive use of its members. Each member acknowledges and agrees that this report and the information contained herein (collectively, the "Report") are confidential and proprietary to Advisory Board. By accepting delivery of this Report, each member agrees to abide by the terms as stated herein, including the following:

1. Advisory Board owns all right, title, and interest in and to this Report. Except as stated herein, no right, license, permission, or interest of any kind in this Report is intended to be given, transferred to, or acquired by a member. Each member is authorized to use this Report only to the extent expressly authorized herein.
2. Each member shall not sell, license, republish, or post online or otherwise this Report, in part or in whole. Each member shall not disseminate or permit the use of, and shall take reasonable precautions to prevent such dissemination or use of, this Report by (a) any of its employees and agents (except as stated below), or (b) any third party.
3. Each member may make this Report available solely to those of its employees and agents who (a) are registered for the workshop or membership program of which this Report is a part, (b) require access to this Report in order to learn from the information described herein, and (c) agree not to disclose this Report to other employees or agents or any third party. Each member shall use, and shall ensure that its employees and agents use, this Report for its internal use only. Each member may make a limited number of copies, solely as adequate for use by its employees and agents in accordance with the terms herein.
4. Each member shall not remove from this Report any confidential markings, copyright notices, and/or other similar indicia herein.
5. Each member is responsible for any breach of its obligations as stated herein by any of its employees or agents.
6. If a member is unwilling to abide by any of the foregoing obligations, then such member shall promptly return this Report and all copies thereof to Advisory Board.

CREDITS

PROJECT DIRECTOR

Nicholas Hula

CONTRIBUTING CONSULTANTS

Erin Lane, Manasi Kapoor

PROGRAM LEADERSHIP

Solomon Banjo

DESIGNER

Kevin Matovich



655 New York Avenue NW, Washington DC 20001
202-266-5600 | [advisory.com](https://www.advisory.com)