Norfolk County Council
Adult Social Services

Artificial Intelligence

The Future of Prevention?

Thursday
30 November
9:30-10:30

Norfolk County Council
Adult Social Services

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Agenda

1. Welcome
2. Artificial Intelligence 101
3. Glimpsing the future - Preventing a fall before it happens
4. Are we making a difference? - Measuring Prevention
5. What next?
6. Q&A

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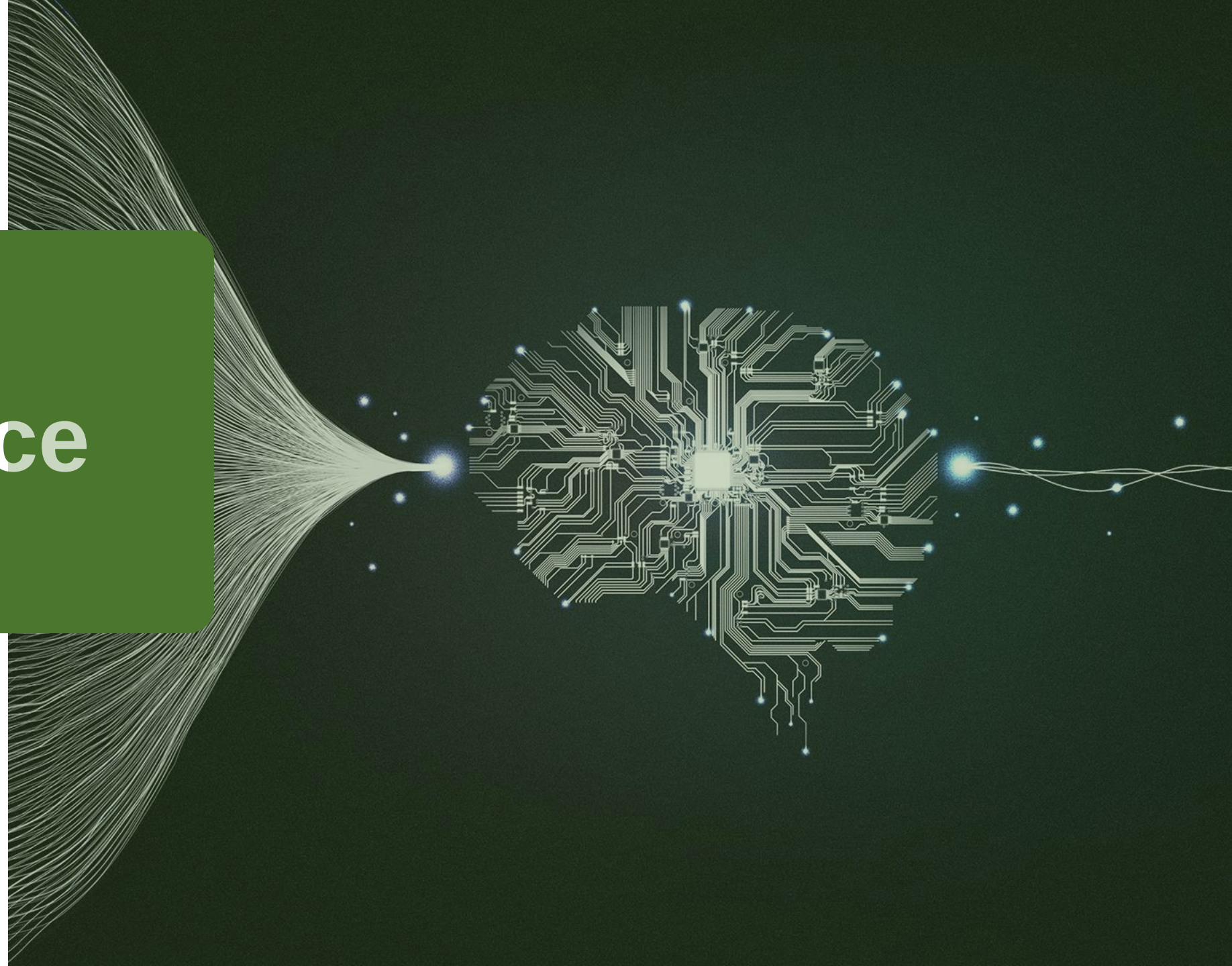
Artificial Intelligence 101



What is AI?

01

ARTIFICIAL INTELLIGENCE

Artificial Intelligence is the mechanism to incorporate human intelligence into machines through a set of rules(algorithms).

02

MACHINE LEARNING

Machine Learning is an application of AI that provides systems the ability to automatically learn, predict, and improve from experience without being explicitly programmed.

03

DEEP LEARNING

Deep Learning is a subset of ML that uses Neural Networks(similar to the neurons working in our brain) to mimic human brain-like behavior.

04

GENERATIVE AI

Generative AI, also known as generative modeling or generative deep learning, refers to the branch of deep learning that focuses on creating new content or data that resembles a given training dataset.

CHAIR OR NOT?

Imagine you are teaching a small child to recognise pictures of chairs…

Think of some rules you might teach the child to help them distinguish chairs from not-chairs (e.g. if it is made of wood then it is a chair).

CHAIR OR NOT?

All the pictures on the right are of chairs.

Would your rules correctly identify **all** of them?

Solid Back

Four legs

Horizontal seat

Rules-based systems are not very robust

CHAIR OR NOT?

In real life, how might a child actually learn to recognise chairs?

You might show them lots of examples of chairs and say “That’s a chair” each time.

They would eventually **learn their own set of rules** for identifying chairs.

When they see a new style of chair they had **never seen before**, they would use these **learned rules** to correctly identify it.

All you need to do is give them lots of examples to learn from!

This is essentially how the predictive model works – picking out those who have had falls using case notes, and then looking at other case notes to identify risk factors and build rules

Three common types of machine learning:

Method 1:
Give them labelled pictures of chairs.

After studying those pictures, they should be able to look at new pictures and predict if it's a chair or not.

Supervised Learning

Method 2:
Give them unlabelled pictures of chairs and other items.

They should be able to sort the pictures into groups of chairs or not-chairs based on similar characteristics.

Unsupervised Learning

Method 3:
Reward them.

Have them guess which images are chairs. Reward them when they get it right, and correct them when they get it wrong as they continue guessing.

Reinforcement Learning

The Guardian
Newspaper of the year

Art and design

'Design me a chair made from petals!': The artists pushing the boundaries of AI

Oliver Wainwright
@ollywainwright
Mon 15 May 2023 07.00 BST

A vision of blossomy luxury ... Andrés Reisinger's Hortensia chair. Photograph: © Andrés Reisinger

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Glimpsing the future

Preventing a fall before it happens

Vision

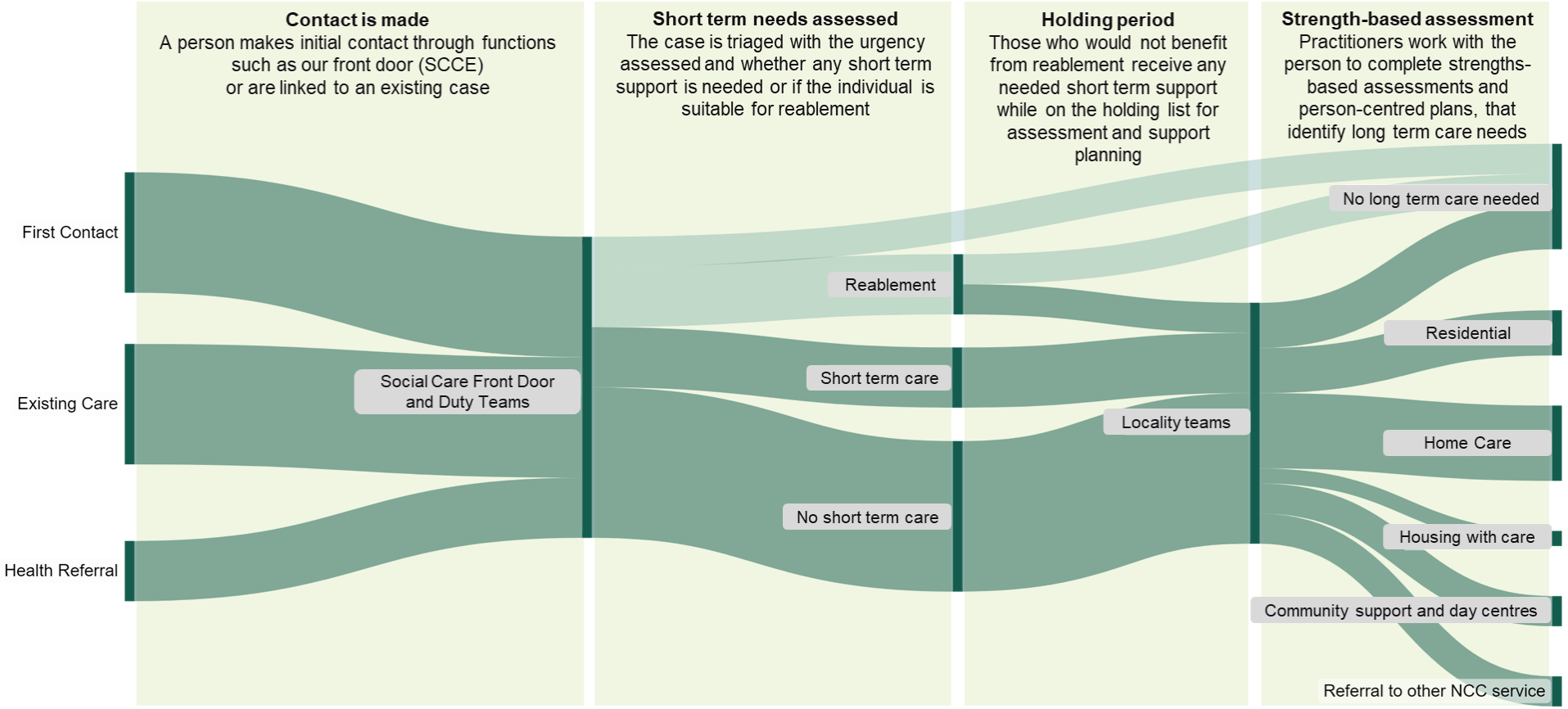
Vision Statement
"Supporting people to be independent, resilient and well"

Prevention and Early Help

Staying Independent for Longer

Living with Complex Needs

Shifting from reactive to proactive



In the last 4 weeks, we resolved 1500 contacts from people to our front door (SCCE)

Our community-based teams have 5200 open cases

We support c.4000 unpaid and family carers per year to sustain their caring role.

320 referrals each month for Deprivation of Liberty Safeguards (DoLS) from care homes and hospitals

3500 people per year with home care.

Much of our work is reactive, formal support – how do we shift towards proactive, preventative support?

Proactive Interventions

'**Proactive Intervention**': Transform the way in which Norfolk offers support to its residents. Move from reactive, formal support towards more proactive, targeted, and preventative support.

1

Identifying at risk individuals

Using sophisticated data analysis, understanding our residents more holistically

2

Intervening to mitigate the risk

Setting up a design group running a falls pilot to test the capability

3

Exploring the future of prevention in Norfolk

Setting up long term capability for prevention

We're starting by **testing our new capability with people at risk of a fall**.

Our pilot has two phases: **phase 1** identifying people on Adult Social Care records **(initial contacts now complete**); and **phase 2**, identifying people on South Norfolk District records in addition to Adult Social Care records **(starting November).**
In both phases, partners from across our ICS are involved in different elements of pilot delivery.

Why try and prevent falls using AI?

1/3
Adults over 65 experience at least one fall per year

4150
Falls related hospital admissions in Norfolk per year

40%
of care home admissions relate to a fall

- On average, a hospitalised fall causes a **£3358** increase in care costs per annum
- Falls prevention interventions can **prevent 30-35% of serious falls**
- A common issue, with a high associated cost and a low cost of preventing leaves a **great scope for benefit**!

Reactive Approach: Many current falls services involve responding as quickly and efficiently as possible to falls

Preventative Approach: What if we could use a predictive approach to identify those at risk of falling, and then address the root cause of the fall and prevent the fall from occurring in the first place?

Goal of Proactive Intervention

Early, proactive support to people before they reach crisis point to increase their ability to stay independent at home for longer

Digital Platform

Form a deeper understanding of residents and the capability to identify people at risk of escalation using advanced analytics (***Xantura***)

Partner Collaboration

Data sharing and a better way of working with partners to proactively support people early on their journey

Falls Prevention Pilot

Testing the new capability with a falls prevention pilot, starting in 2023

Setting Up For The Future

Building a strategy that enables this capability to grow, with additional partners and additional cohorts of people receiving proactive support

Identifying the most vulnerable people at the highest risk of life changing falls

Extract

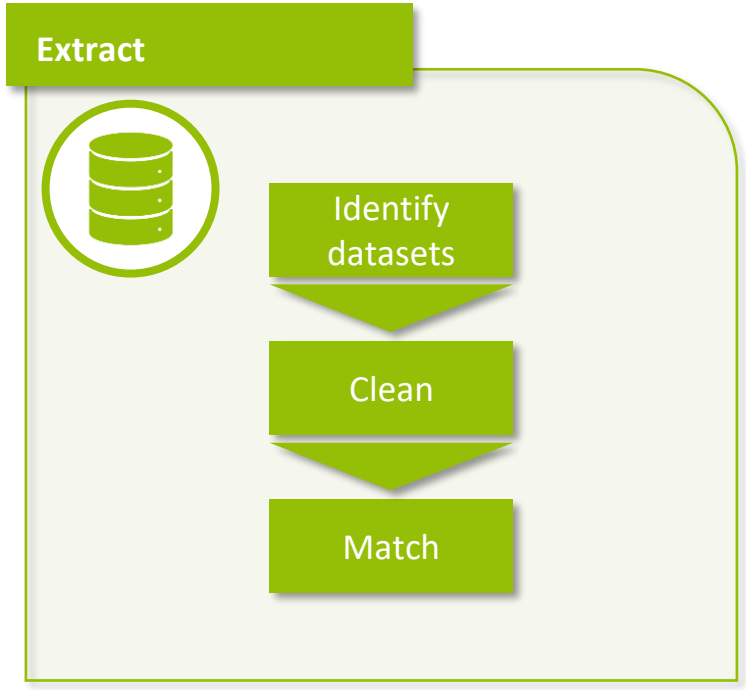
Extract information from case notes. Match customers across systems to generate a holistic understanding of each individual's experience to date

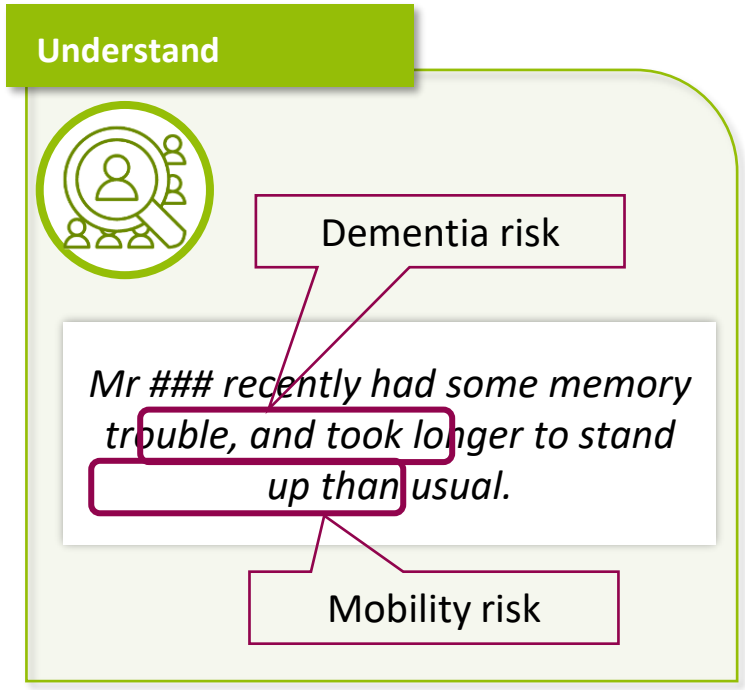
Understand

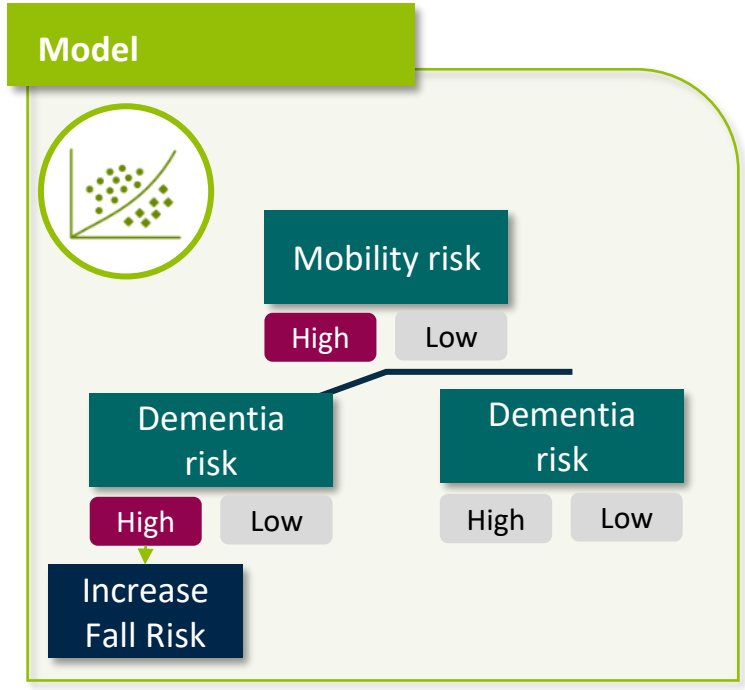
Use natural language processing to automatically extract key health, care and lifestyle risks from case notes. There are hundreds of risks in our framework

Model

Machine learning automatically assesses thousands of relationships between risks and the likelihood of falling to identify which combinations of risks are the best predictors of a fall. It then makes a prediction for every individual. Tests show the model is correct up to 70% of the time. We also dip sample to make sure the it is performing as expected

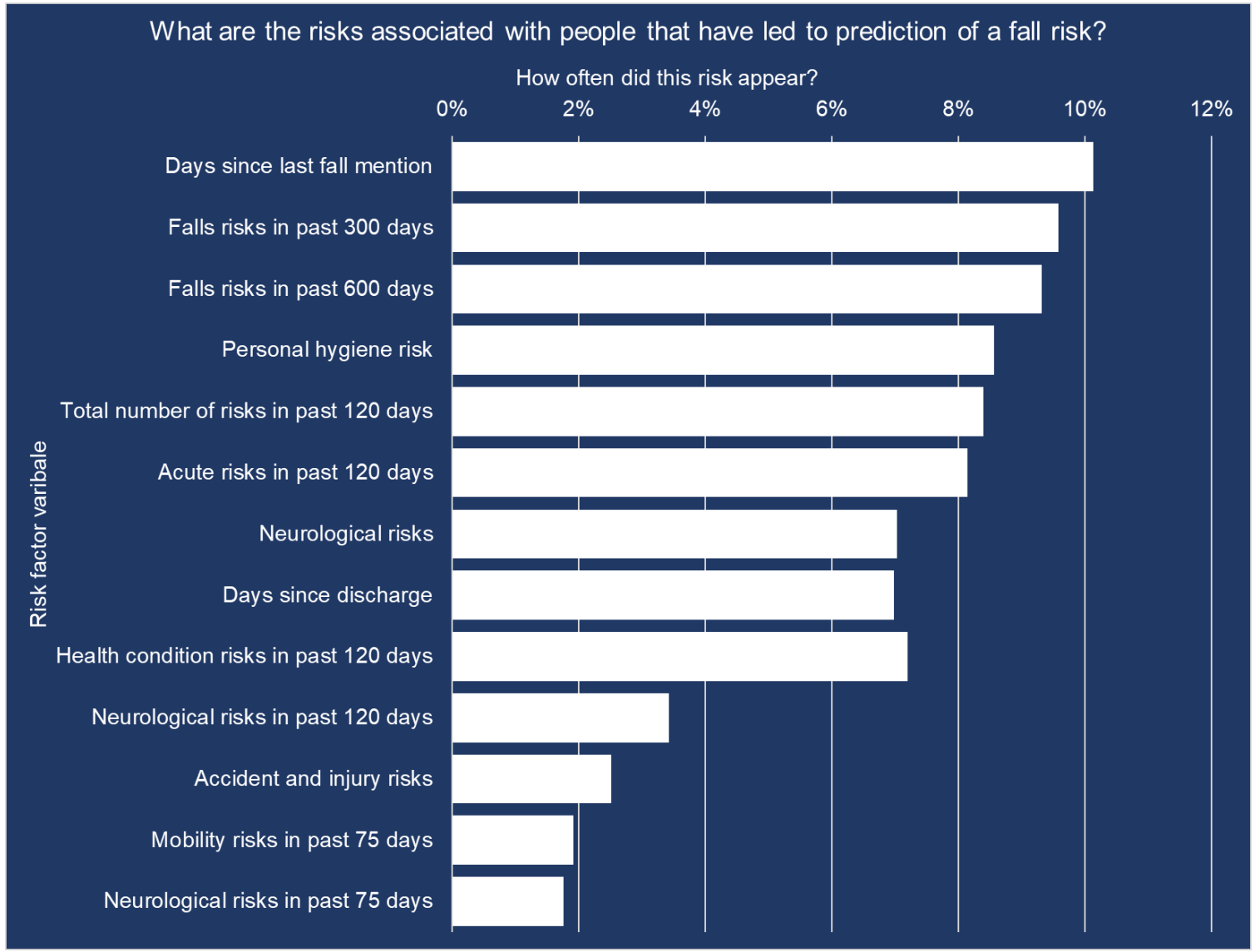






The model identifies those most at risk of a fall from identifying the most common factors associated those who have a fall

There are over 100 features identified through the model that are linked to risk of a fall



Proactive Interventions

We start by better understanding people through data

- Adults
- Place
- Districts
- Health
- Childrens
- Tech Enabled Care

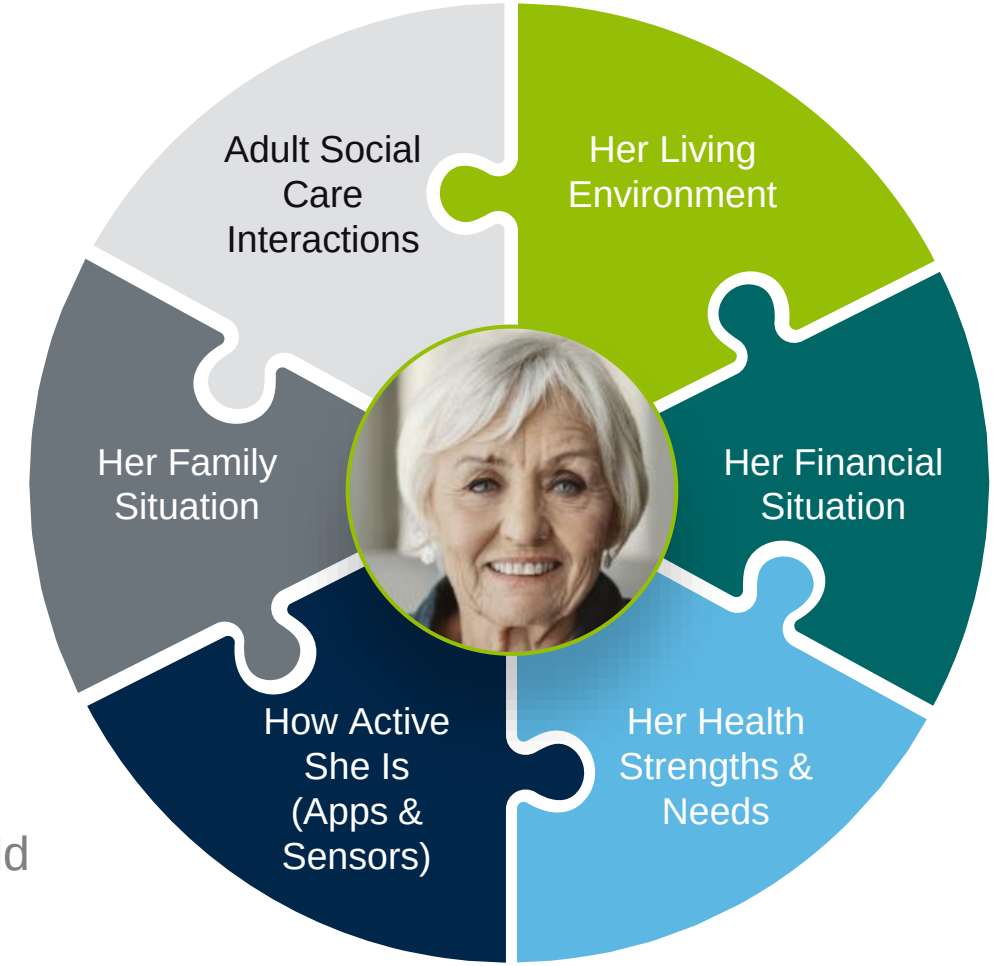
Single Customer View

Meet Sarah, a 74 year old from Diss…

We could try and understand her through the lens of social care…

… But we're also about to learn about her housing and financial situation from our partnership with South Norfolk & Broadland

… And imagine how much more timely, personalised and impactful our support could be if we knew even more about her



Proactive Interventions

We then use the latest technology to automatically extract meaningful insight about our people

Risk & Resilience

Sarah's Case Note
(13/02/2022)

What has prompted your call today?
Sarah says they used to have a carer but they have died. Sarah says that the carer did all cooking, cleaning, washing, ironing etc. **They died quite recently - 27th of last month.**
- Struggles to keep the house clean - Sarah has not made enquiries about getting a cleaner.
- **Sarah finds day to day tasks effortful - cannot change bed linen as it involves standing and lifting the mattress.**
- Sarah wants to stay in the house
- **Sarah says their legs let them down and if they fall they cannot get back up**
- Son has ordered a care alarm for Sarah
- Sarah says they try to go to Morrisons once a week. Family have rallied round and sent over food parcels etc.
- Sarah is able to make herself a microwave meal.
- **Sarah can do washing but cannot hang it up - they feel they are too likely to fall.**
- **Sarah is able to have a wash as they have a wet room.**
- Sarah is able to get into and out of a chair - they have an electric chair
- Sarah is able to get into and out of bed

What help can you / the person you are calling about get whilst you / they wait for a Social Care practitioner to respond? (Friends/family/neighbours)
- Sarah would prefer to be self-sufficient.
- Sarah says family have rallied around but feels this is not sustainable

Will you / the person you are calling about be safe for the next three days? If not, why?
- Yes

Financial assessment info:
· Client's capital has now reached: **£0 in bank - is in debt.** Pension is £197.10 weekly (pays about £40 per month for rent to district possibly - Sarah confused by a long document from district which they received recently)
.

Bereavement

Mobility

Falls

Debt

Sarah has **49** case note entries.

We have entries for **106k** residents.

It would be impossible for a human to extract this insight for Norfolk's residents in their lifetime.

We've used **machine learning to process MILLIONS of data points and words from peoples records and automatically extract meaningful insight on their strengths, needs and interests from case notes**.

Our model is correct in predicting falls for up to 7/10 people

Our Pilot

Identify our cohort using the model

Contact our cohort to understand how to support them

Intervention tailored to the person

Follow-up to understand what worked well

Environmental adjustments

- **Fire Service** Home Safety Visit
- **Assistive Technology** — Norfolk County Council
- **Housing & Handyman services** — South Norfolk Council

Mobility and keeping active:

- **Reablement** Chair Based Exercises — Norfolk First Response
- **Active Now** Exercise Classes — active norfolk

Social isolation & Local Groups

- **Voluntary Norfolk** Befriending — VOLUNTARY NORFOLK
- **Community assets** — Help Hub

Financial Services

- **Money and Debt Advice** — Help Hub

Health services

- **NHS** Multifactorial Falls Assessment — east coast community healthcare; NHS Norfolk Community Health and Care NHS Trust

Sarah has been identified as being at risk of a fall by our model

She will receive a letter, letting her know we'll be in touch

The ProtectNow NHS team (phase 1) / South Norfolk Help Hub (phase 2) talk to her and offer her relevant, preventative support

NHS Norfolk and Waveney Integrated Care Board — South Norfolk Council

Given we know she has mobility issues, Sarah is likely to be offered chair-based exercises

The same ProtectNow/Help Hub person will follow up twice with Sarah to support her in connecting to the support offered, and to get feedback on the impact it has had

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Are we making a difference?

Measuring Prevention

How do we measure this?

One **goal** of the pilot was to **reduce falls** in the community by **preventing them**

If someone had a fall, **we could probably measure that by asking them** and they could tell us

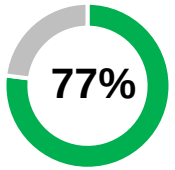
But **how would they tell us** if they had a fall **prevented**?

And how would we do this at scale?

Measuring prevention is tough because:

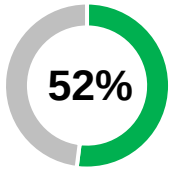
- It is a long-term benefit
- Prevention of something is harder to measure than reduction
- There isn’t much data – we only record something that happens

Outputs so far



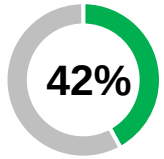
538 of 700 people **answered** the calls

Of these



278 people agreed to have a **holistic conversation**

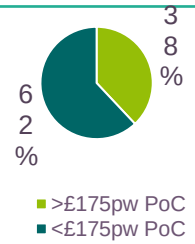
Of these



156 people agreed to take up **239 referrals** between them

We have seen strong uptake from residents, and positive feedback from partners working together. If we sustained this model in the future, ensuring sufficient prevention capacity for it will be important.

Of the people that did not engage in a call, 62% had packages of care that cost less than £175 per week.

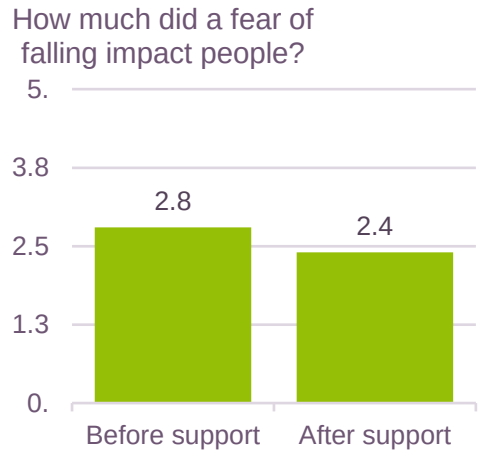


This could tell us that people who had less support already were less likely to engage in an initial conversation.

259 of **278** people (**93%**) were **eligible** for at least one service, a potential indicator of model effectvienss

Outcomes (reduced falls and impact on long term care) will be available in to 2024. However, we are starting to see user feedback from follow-up calls:

We asked people how much a fear of falling impacted on their well-being:



There was a **15% reduction** following intervention support

100% quoted no recent falls since their intervention

71% of people thought the **support was beneficial**

53% of people **said they continued with their changes**

User Voice - What We Did

Through September and October, we did a series of engagement activities with service users and staff, to understand how people felt about falling, how the pilot was being delivered, and what the challenges were.

Our methods were:

Shadowing

We shadowed **5 practitioners** delivering different interventions, so we could understand how, what and to whom the interventions were delivered.

Phone Calls

We made follow up calls to approximately **10 people** who agreed to interventions asking them what the experience had been like and how they were coping with falls.

Case Studies

We produced **3 in-depth case studies** or 'life stories' of Norfolk residents who have been struggling with falls.

Staff Focus Group

We had a **one hour discussion session** with the staff making the calls and offering interventions to residents, to find out what delivery and tracking was like.

User Voice - What We Heard

While we were out in the community, people told us their stories about falling, how it made them feel, and what helps…

"I was sitting in the chair shivering… I went off to bed and went to sleep and I had an extra blanket on me. The next thing I know was I woke up and I was on the floor. I don't know how I got there… I ended up in the hospital for 2 days. There was nothing wrong with me as such."

"I'm reasonably strong, but if he falls, I haven't got the strength. I can't get him up… I have to look for help to get him up"

"Oh yeah I'm very afraid of falling now… Out and about in the community, I have to take my walking stick. I don't think it would do much to stop me from falling, but it might help me to get back up again."

"[after the exercises] she said the strength is well and truly coming back in your legs."

"That was her birthday, and I took her some flowers up [to her grave]. And I knelt on both legs. And I just tipped over"

User Voice - What We Learned

About falling….

- Fear of falling impacts other wellbeing aspects. E.g. Making them less active, more isolated, more worried about their partners care
- Where falls can't be prevented, learning how to fall safely and get back up again and feeling reassured that they won't be left were important

About the interventions…

- People found assistive equipment and home adaptations extremely helpful and they had really improved quality of life
- Interventions were sometimes offered to people whose needs were too high for prevention

About our process…

- Some people were more worried about other things than falling. E.g. their partners care, their comfort and nutrition, feeling lonely
- It is not always clear if an intervention was actually delivered. We were reliant on the user to confirm this, and they often were not sure.

In phase 2 of the pilot, we've adjusted our processes to reflect our learning:

- Introduced a more fluid conversation style, rather than scripted questions. This means residents can talk about what's important to them, and we can make referrals that will really make a difference.
- Opened out the number of interventions to include other concerns

Some examples of our approach to measuring the pilot

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What next?

The ethical debate:

Is it right to use technology in this way?

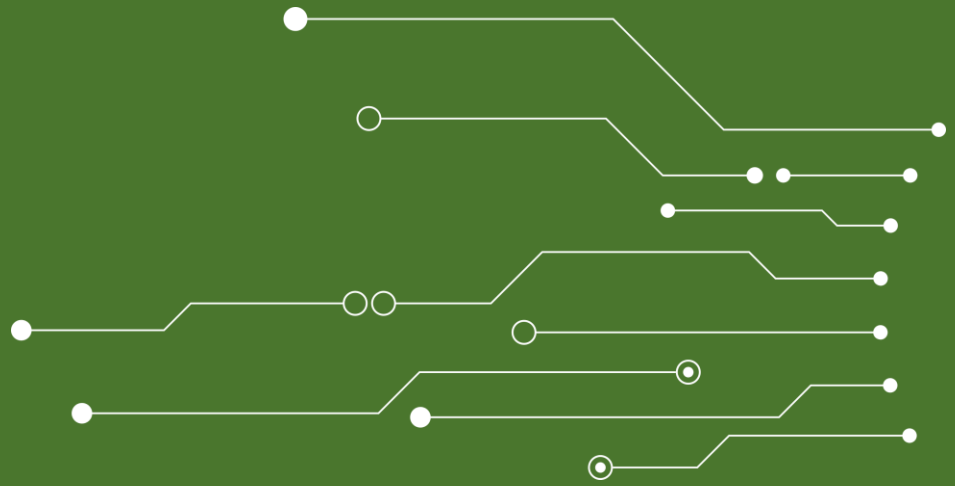
If the technology exists, and it can help, do we have a moral imperative to use it?

What about the impact on our workforce? Will we need fewer staff?

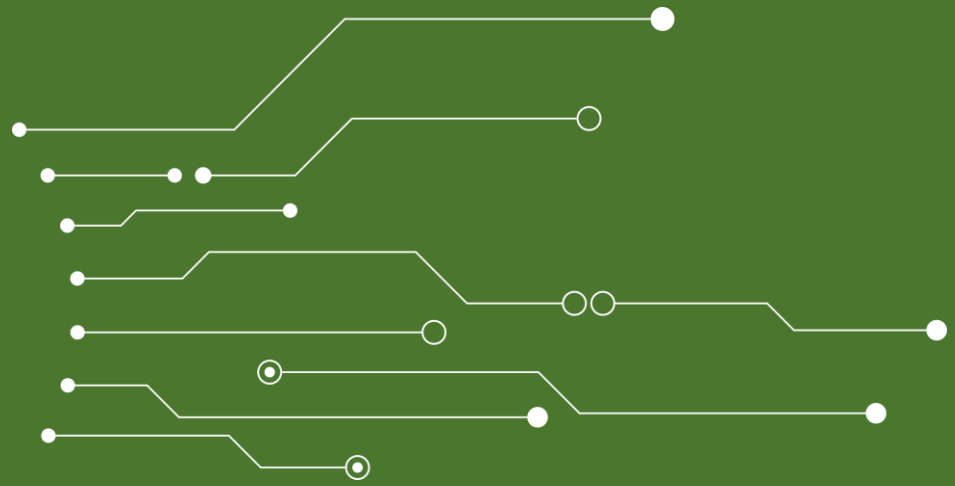
Are the outputs we get impacted by biases in the data or algorithm? Is there a risk we miss people?

Where is the balance between care and control – how much should we be proactively intervening, if people aren't asking for help?

How transparent should we be about how we are using data and technology?



Q&A



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