ALTERNATIVE POWER CHAIR CONTROLS: A FRAMEWORK FOR MAINTAINING INDEPENDENCE

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THIS PRESENTATION

1. A framework/roadmap by which clinicians can assess a client's functional ability in order to identify an appropriate access methodology so that clients can maintain as much independent mobility, self-determinacy, and dignity as possible.

2. A case study, of Bernie, a 67 Y.O woman living with Motor Neuron Disease, with whom we went through this process as their condition progressed. Eventually using the Ability Drive System in order to operate her chair using a eye tracking system (Eyegaze/Tobii Dynavox).

THE PROJECT

What?

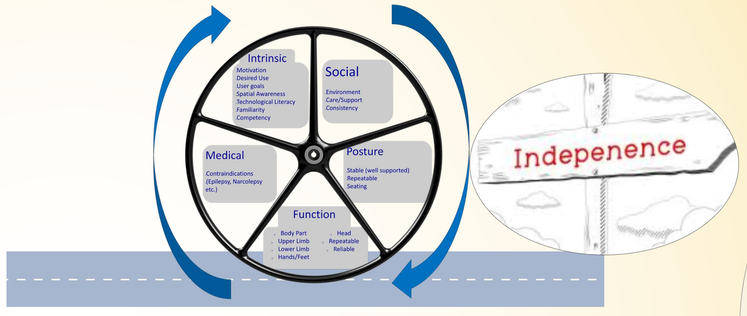
- A **Structured Framework** to help guide clinicians in assessing for and implementing alternative access methods for independent wheelchair based mobility.
- A **Roadmap** to progress along in partnership with clients
- **Upskilling** of staff within our service

Why?

- In order to facilitate **equitable** access to mobility across our service
- To **demystify** the technology involved with "alternative controls"
- Maintain the greatest degree of **independence and self determinacy** amongst our clients that we can

How?

- Providing a structured approach, including the **"Cycle of assessment"** and a **"Roadmap to Independence".**
- **Grouping** and classifying access methods
- Learning from **doing**.



Providers of public services should make reasonable adjustments so that an individual's particular disability is not the reason that they cannot access a service, cost should not be a barrier to accommodating someone's disability - (DDA section 20.1.a, 2010).

"Where a provider of services has a practice, policy or procedure which makes it impossible or unreasonably difficult for disabled persons to make use of a service which he provides, or is prepared to provide, to other members of the public, it is his duty to take such steps as it is reasonable, in all the circumstances of the case, for him to have to take in order to change that practice, policy or procedure so that it no longer has that effect."
(DDA Section 21(1), 2010)

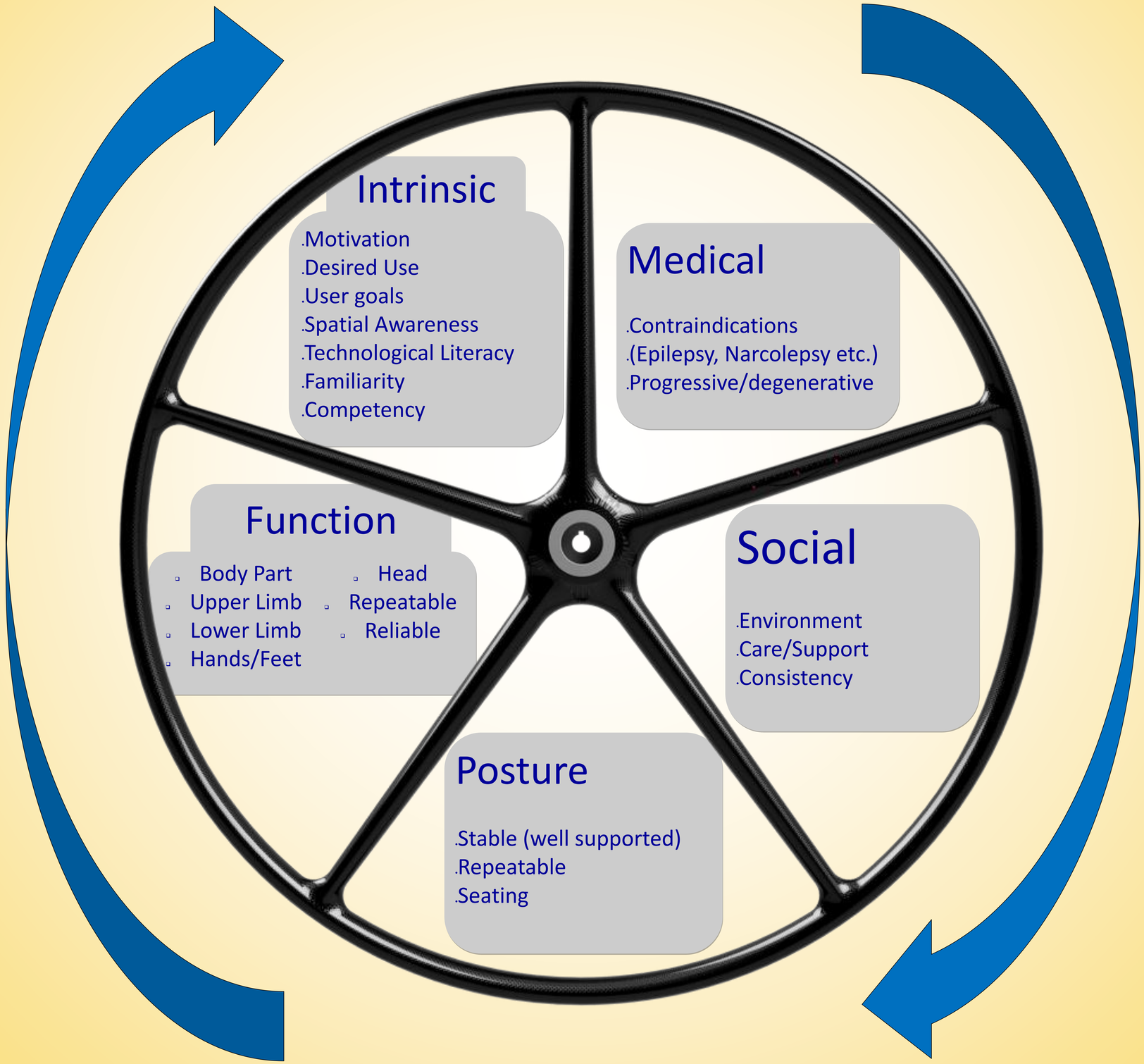
"…users have a wheelchair which allows them to be as independently mobile as their condition allows…".

"…The wheelchair allows users to interact with their able-bodied peers, engage in recreation and maintain a healthy lifestyle and prevent secondary health problems"

"Commissioning should focus on quality and whole life costs."

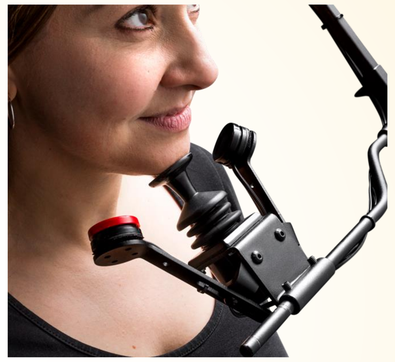
NHS England Model Service Specification for Wheelchair Services (2017)

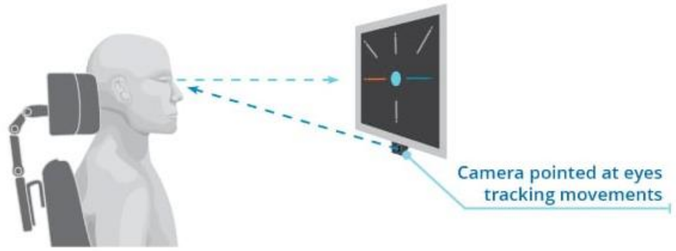
CYCLE OF ASSESSMENT

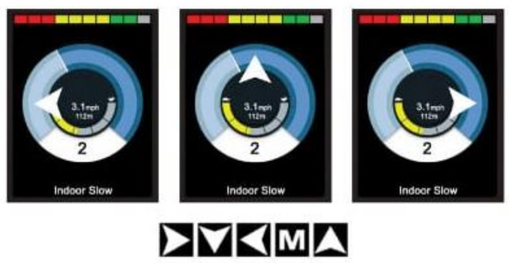


CLASSIFYING ACCESS METHODS

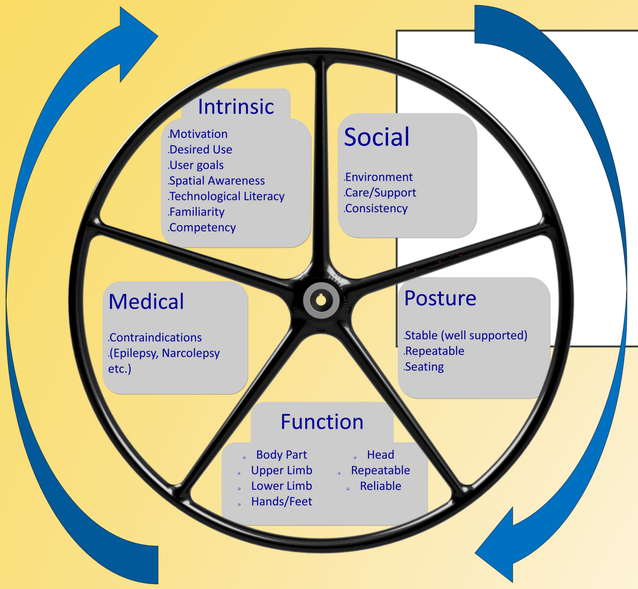
Proportional Controls	• Proportionality (speed control) • Directionality • Dynamic feedback between user and chair • Transferable skill • Very intuitive	• Joysticks (hands/feet/elbows/chin etc.) • Tilt sensing devices (gyroscope/ accelerometer based)
Discrete Controls	• Multiple inputs with various independent functions • Versatile in both location and complexity • Can still be directional	• Gated joysticks • Button arrays (head/pad/moozi) • Fibre optics • Sip and Puff • Eye tracking
Single Input Controls	• Only a single movement/input is required • Varying complexity of interface • Input can be versatile – anything that has a binary state	• Single switch scanning • Track tracing







ROADMAP



More Intuitive
Greater physical function required

Control Methods

Less Intuitive
Less physical function required

Proportional Controls

Intuitive and directional, transferable skill, inherent subconscious feedback/correction loop.

.Joystick (hands, feet, elbows, chin etc.)

.Tilt sensing devices (gyro/accelerometer)

Discrete Controls

Each input has a unique/set of functions. Versatile in location/complexity. Can be relatively intuitive/directional.

.Gated Joysticks (Moozi)
.Head Arrays
.Fibre Optic Arrays
-Sip and Puff
-Button Arrays
-Eye Tracking

Single Input Control

Only a single movement/input required. Varying complexity of interface. Input can be versatile.

.Single Switch Scanning (multiple input types)

.Track Tracing

LESSONS LEARNED

<u>Implementation</u>

Repeated Visits: Likely to need frequent reprograming as user becomes more familiar with the system

Positioning: adjustable for the user and carers, repeatable and accessible

Carer Education and support: Documentation, labelling, education, and motivation.

<u>Risk Mitigation</u>

Attendant Control: Client fatigues throughout day/Lack of finesse in tight environments

Emergency stop: user does not spot hazard/control is not operating as expected

Risk Assessment: Compatibility of medical devices, as with any other combined system

<u>Equipment</u>

Wheelchair Control system: Forward planning of potential access methods (e.g. scanning)

Gyroscope/Accelerometer: for discrete control methods, improved tracking, provides feedback loop.

Wheelbase: Mid/rear wheel chair, space/other accessories

Collaboration: Other services/trusts. Joint funding

RISK MANAGEMENT

Clinical

- Initial assessment to establish eligibility
  - Medical contraindications (epilepsy/narcolepsy as per DVLA)
  - Clinical case discussion with wider team
- Medical clearance from GP
- Visit to establish accessible home (step free access to all required areas)
- Driving assessment (performed by Technical Instructor)
- Safety features (emergency stop button, attendant control, drive settings programming)

Technical

- Medical Device Regulations
  - Combined systems – ensure compatibility statements by manufacturers, custom system otherwise
  - ISO 13485 Medical Device QM system (risk assessment, reduction, risk benefit analysis). ISO 14971 Risk Management system
  - Programming (reduced power and torque settings
  - Consider footprint of chair when attaching accessories (vent trays, communication aid mounts)
  - Location of accessories (ventilator tube routing)

CASE STUDY: BERNIE

- 67 YO Woman, MND, Diagnosed 2019
- Background:
  - Client moved to London upon retirement with her husband
  - Interested in culture, theatre, museums and art galleries
  - Keen artist (see behind!)
  - Driver, operated boats previously, very driven determined and independent person.
  - Diagnosed with MND
  - Initial power chair prescription in 2019 (Invacare Pronto M41-in stock)
  - Home was accessible, but "microenvironment." Narrow based mid-wheel drive EPIOC

Many thanks to Bernadette O'leary, whose artwork makes up the slide backgrounds from this point onwards

CASE STUDY: ASSESSMENT

Intrinsic

- Highly Motivated
- Wanted to be able to explore public spaces (museums, galleries,church) independently
- Very familiar and competent with Eyeaze as communication aid
- Previous driver (cars/boats)

Medical

No contraindications

Function

- Reduced upper limb function (high tone and weakness) which deteriorated. Started with good coordination, but eventually access moved more midline
- No active use of lower limbs (high adductor, calf, hamstring tone)
- Restricted range in neck
- Eventually all of her movements became inconsistent

Social

- Small but accessible home
- Consistent care team, very dedicated and supportive husband (both also motivated)

Posture

- Well managed – stable and consistent
- Ability to maintain midline became more difficult (chest harness, lateral supports, contoured backrest)
- Repeatable and reliable – high fixed tone

ROADMAP

Initial provision Invacare Pronto (recon stock) January 2020

- G90a, right hand swing away mounting – indoor only.

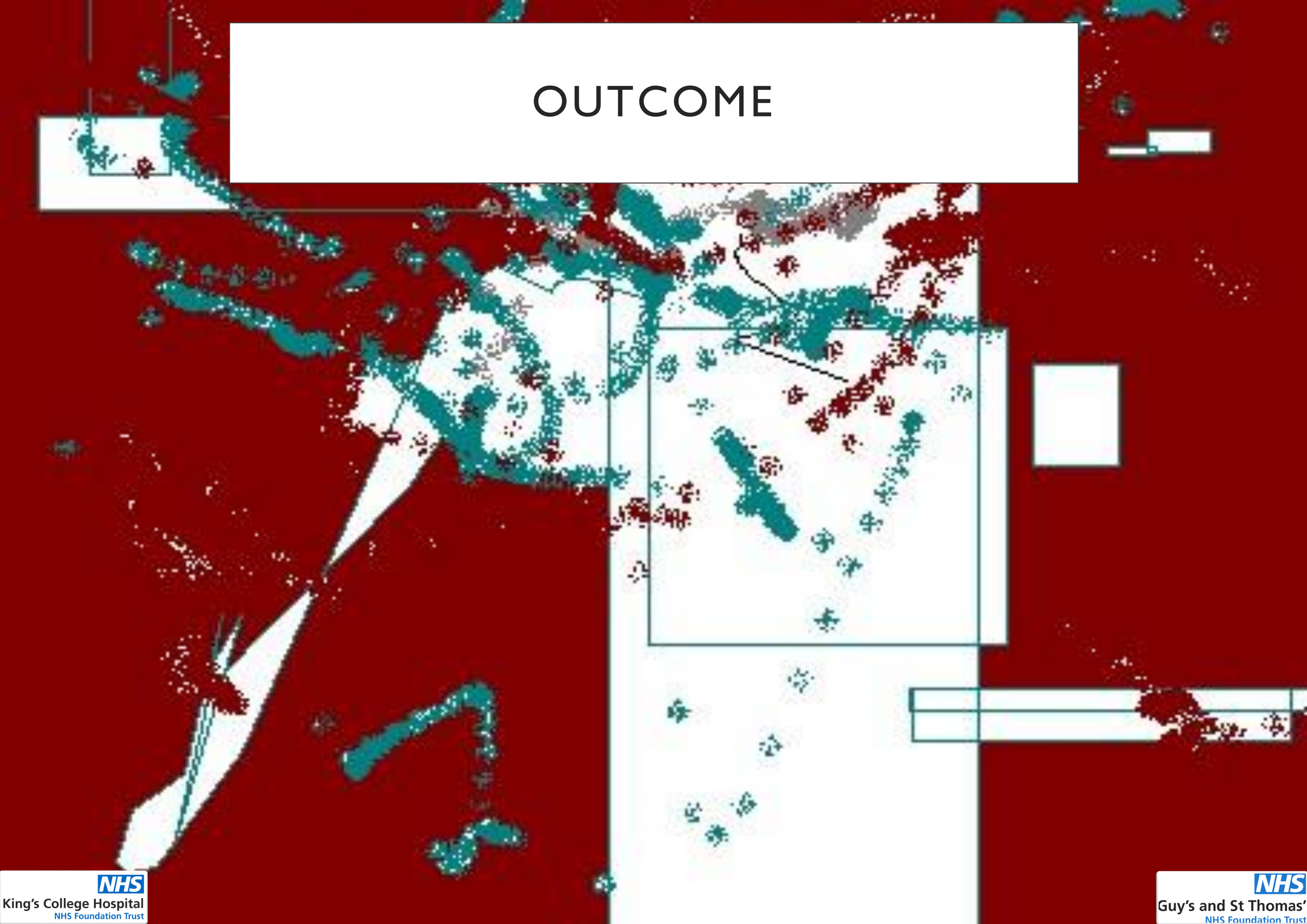
Second provision– Quantum Edge 3 Stretto January 2021

- Rnet LED, mounted on right armrest with swing away controller. Indoor-outdoor use

Control iterations

- Joystick mounted as standard (RHS)
- Inrigged Joystick mount
- Button mounted on armrest, then sideguard, for single switch scanning (May ‘22)
- Hand held single switch scanning (September ‘22)
- Ability Drive – using Communication device (Tobii Dynavox tablet) (February ‘23)
- Gyroscope fitted (March ‘23)

OUTCOME



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OUTCOME

The System gave Bernie the opportunity to independently communicate with us as well as independently manoeuvre herself within her environment, in public spaces, and even outdoors. However, the real outcome was the impact it had on both Bernie and her husband, Sean, which is better captured with their own words.

"Bernie drove the wheelchair the full length of St George's Cathedral which really surprised people once they cottoned onto her using the eye gaze and this included a tough corner " **Shaun O'Leary**

"When you get MND you might not even have the courage and confidence to make the changes you want {…}? So the request for theatre and reading of information will definitely be the lucky option. Our luxury? Me making a decision about my life, when we have MND, totally ruined. So {the} dream is the driving. Did I want to be left alone outside this loo? {...} Did I want to go out? No decision about what happens next and when. My experience with fully working eyes drive is you've been a better option for taking pictures and talking about the galleries in London you are in. I have never felt so relieved and empowered…" **- Bernadette O'Leary**

THANK YOU

In memory of Bernadette O’Leary (1956-2024) who has shown us all how to live life to the fullest, and never let an opportunity pass us by.

ANY QUESTIONS?

References

Health and Social Care Act 1995, c.50, revised 01/10/2010, Available at https://www.legislation.gov.uk/ukpga/1995/50/contents/2010-10-01 (accessed 20.11.23)

- "It is unlawful for a provider of services to discriminate against a disabled person—" "in the standard of service which he provides to the disabled person or the manner in which he provides it to him" "in the terms on which he provides a service to the disabled person" Subsections 19.1, 19.1.c, and 19.1.d
- "for a reason which relates to the disabled person's disability, he treats him less favourably than he treats or would treat others to whom that reason does not or would not apply" – Subsection 20.1.a
- "Any increase in the cost of providing a service to a disabled person which results from compliance a provider of services with a section 21 duty shall be disregarded for the purposes of subsection (4)(e)." – subsection 20.5
- "Where a provider of services has a practice, policy or procedure which makes it impossible or unreasonably difficult for disabled persons to make use of a service which he provides, or is prepared to provide, to other members of the public, it is his duty to take such steps as it is reasonable, in all the circumstances of the case, for him to have to take in order to change that practice, policy or procedure so that it no longer has that effect." - Subsection 20.1
- "Where a physical feature (for example, one arising from the design or construction of a building or the approach or access to premises) makes it impossible or unreasonably difficult for disabled persons to make use of such a service, it is the duty of the provider of that service to take such steps as it is reasonable, in all the circumstances of the case, for him to have to take in order to—
  (a)remove the feature;
  (b)alter it so that it no longer has that effect
  (c)provide a reasonable means of avoiding the feature; or
  (d)provide a reasonable alternative method of making the service in question available to disabled persons." – Subsection 21.2

(Disability Discrimination Act 1995)

NHS England, Version 1.0, July 2017, "Model service specification for wheelchair and posture services", available at https://www.england.nhs.uk/wp-content/uploads/2017/07/wheelchairs-model-service-specification.pdf (accessed 20.11.23)

- "Service users have a wheelchair which allows them to be as independently mobile as their condition allows and take account of social, educational and employment needs."
- "The wheelchair allows users to interact with their able-bodied peers, engage in recreation and maintain a healthy lifestyle and prevent secondary health problems
- "Service Users feel they have an equal chance to contribute to society and enjoy the physical and mental stimulation that this can provide."
- "Commissioning should focus on quality and whole life costs."

- **World Health Organisation, 2022. 'International Classification of Functioning, Disability and Health (ICF)' Available at: https://cdn.who.int/media/docs/default-source/classification/icf/drafticfpracticalmanual2.pdf?sfvrsn=8a214b01_4&download=true (Accessed on 20.11.23)**