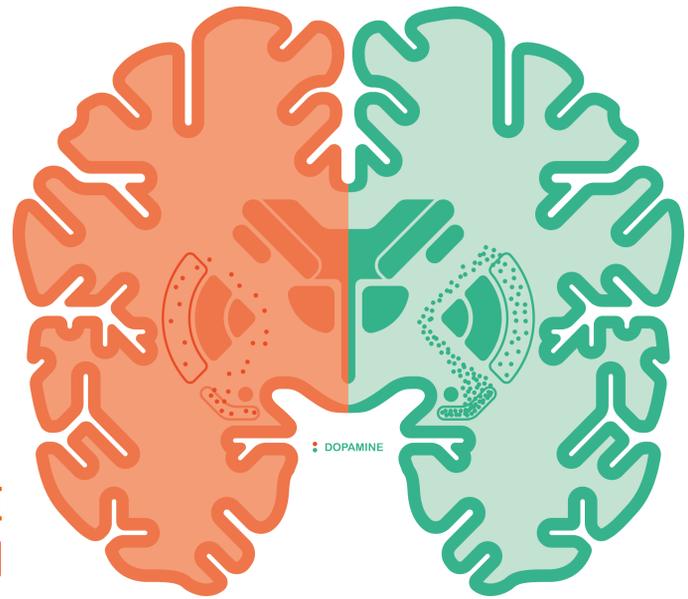


PARKINSON'S

FACTS & FIGURES

RIGIDITY
POSTURAL DISTURBANCE
REST TREMOR
SLEEPING DISORDERS
SLOW MOVEMENT
ANOSMIA AS EARLY SYMPTOM

COVID-19



2ND MOST COMMON NEURO-DEGENERATIVE DISEASE IN THE WORLD

MEN 1.5 x MORE LIKELY TO HAVE PARKINSON'S THAN WOMEN

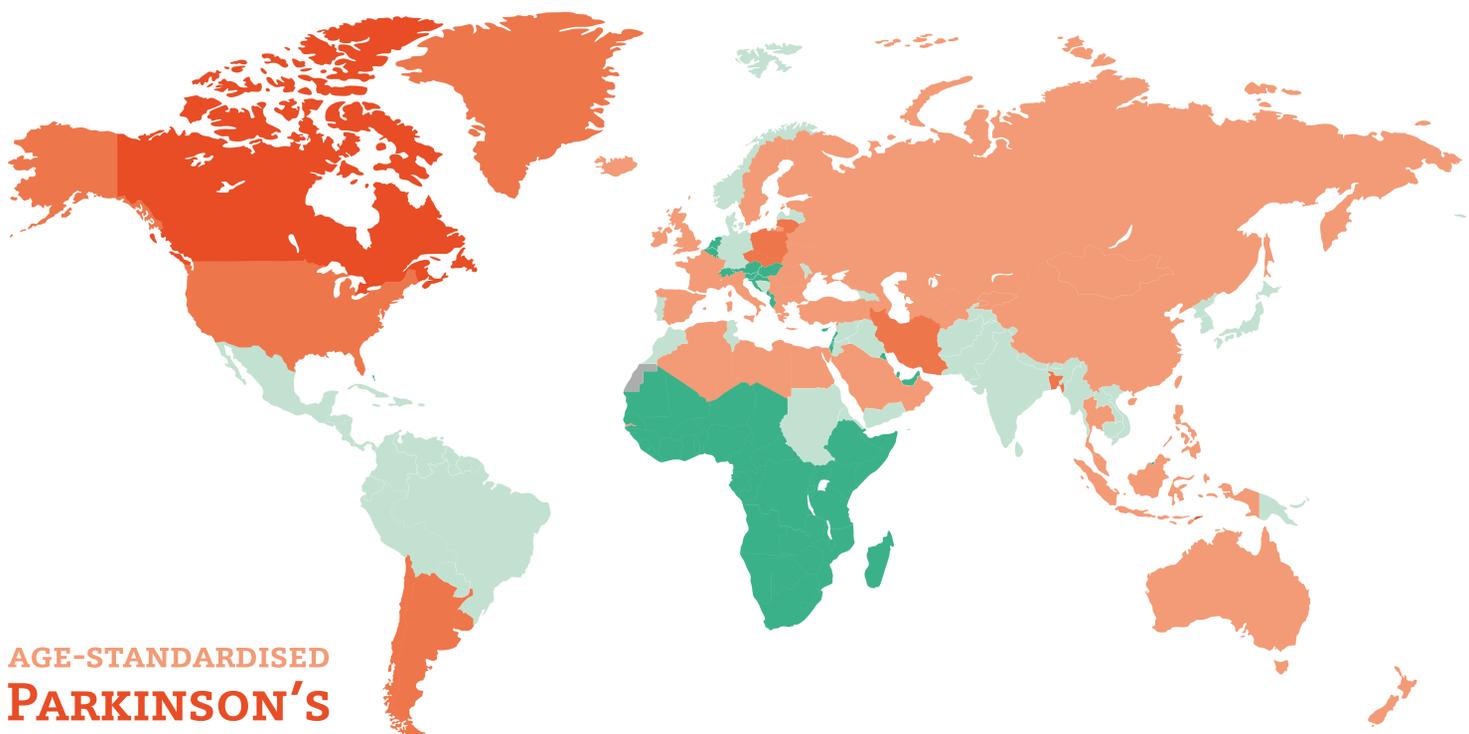
\$ 2500 COSTS FOR MEDICATION PER PATIENT AND YEAR AND \$100000 FOR SURGERY PER PATIENT IN THE UNITED STATES

10 MILLION PATIENTS AFFECTED GLOBALLY

AGGREGATION OF PD RELATED PERSONALITY CHANGES

COVID-19

211296 HAVE DIED



AGE-STANDARDISED
PARKINSON'S PREVALENCE RATES PER 100 000
2016

■ 30 - 59 ■ 90 - 119 ■ 150 +
■ 60 - 89 ■ 120 - 149 ■ NOT APPLICABLE

1. 10 Interesting Facts About Parkinson's. (2019, January 14). Retrieved June 3, 2019, from <https://parkinson.org/blog/raise-awareness/10-Interesting-Facts-About-Parkinsons>
 2. Behjati, S., & Tarpey, P. S. (2013, December). What is next generation sequencing? Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3841808/>
 3. Mhyre, T. R., Boyd, J. T., Hamill, R. W., & Maguire-Zeiss, K. A. (2012). Parkinson's disease. Retrieved June 3, 2019, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372387/>
 5. Neurological Disorders: Public Health Challenges. (2012, May 11). Retrieved from https://www.who.int/mental_health/neurology/neurodis/en/
 6. Parkinson's Disease Statistics. (n.d.). Retrieved June 3, 2019, from <https://parkinsonsnewstoday.com/parkinsons-disease-statistics/>
 7. Statistics. (2019, March 28). Retrieved from <https://parkinson.org/Understanding-Parkinsons/Statistics>

Multifaceted Approach for Management of Parkinson's Symptoms

An extensive research-based analysis from 40+ scientific articles and journals in combination with hospital workflow experience allowed the identification of painpoints and solutions

These solutions were proposed based on AI, IoT, AR/VR, Biosensors, nanorobotics and smart wearable technologies

THROUGH THIS CAREPLAN WE HIGHLIGHT DATA FROM A COLLECTION OF

53 painpoints

76 respective solutions

18 are connected to different stakeholders

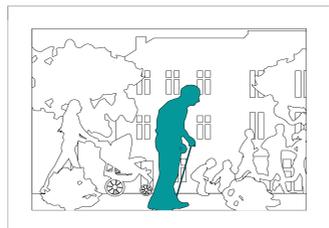
We thank our numerous ITT team members, alumni and collaboration partners worldwide for their contribution to the pathways.

1 SYMPTOMS

HOME

STAKEHOLDERS

- The patient**
The patient develops symptoms and must seek medical advice
- The family**
Patient's family is worried and must take care of encourage patient to seek help
- Tech startups**
Start ups are actively working on new products to help subside symptoms



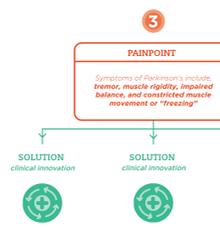
The patient is showing first symptoms of the disease: Tremor or shaking, slow movement, balance problems, frequent falls, usually start on one side of body and progress...



SOLUTION

digitalization
AI Screening

Early AI screening to detect those at risk (living ranging from age 50 to 70 in home UHF)



- Balanceaware**
Cultery with sensors are able to detect shaking and correct the tremor of the patient while eating
- Gyro Glove**
A wearable glove for patients that utilizes a gyroscope to stabilize tremor and track progress of the disease
- Smartcane**
A cane with a GPS tracker as well as a sensor that can alert for help if patient falls



IMPLEMENTED SOLUTION
clinical innovation

Wearable
Accelerometers wearable to alert when tremors are heightening

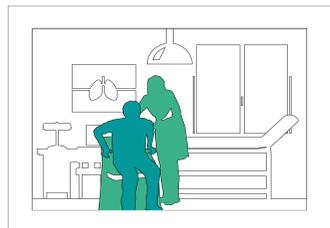
2 DIAGNOSIS

HOSPITAL

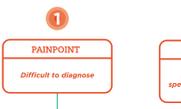
Consulting room

STAKEHOLDERS

- The patient**
Patient must make appointment to see neurologist
- The family**
Family member may need to assist with making and going to the appointment
- Neurologist**
Must be able to correctly diagnose symptoms and disease
- Hospital**
If neurologist is based out of hospital, hospital must be able to direct patient and service



The patient visits a neurologist to check muscle movement, may be asked to get out of a chair without arms, shrinkage of handwriting, problems with buttons, feet feel stuck to the floor when walking / turning, speaking softer or have slurred speech



SOLUTION

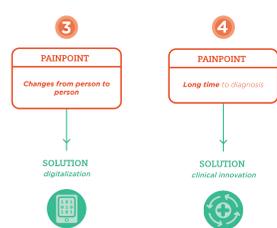
clinical innovation
Sensor Array

AI integrated sensor array (Gyroscope, Accelerometer)

SOLUTION

digitalization
Machine Learning

Machine Learning algorithms get more accurate over time



- Database**
Database of compiled symptoms and diagnosis (Touch neural devices). Typically the first attempt to tubulate a patient's symptoms is to administer levodopa. Levodopa, an amino acid medication that is able to cross the blood-brain barrier. This in turn leads to an increase in the levels of dopamine in the Basal Ganglia
- IMU**
More rapid provisional diagnosis based on motor symptoms (MLU)



IMPLEMENTED SOLUTION
clinical innovation

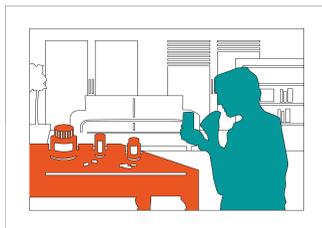
UPDRS
Digitalized UPDRS test (Digital Measurement Unit)

3 TREATMENT

HOME

STAKEHOLDERS

- The patient**
The patient must commit to routine therapy and regular intake of medication
- Family members**
The family members may need to encourage patient in therapy and be responsible for medication reminder and physical therapy transportation
- Neurologist**
Ensure correct dosage of L-dopa regularly
- Physical Therapist**
Neurologist may recommend a separate physical therapist to help patients live a normal life
- Pharmacist**
Pharmacist must fill Levodopa prescription



Aim to replace dopamine by administering L-dopa, MAO inhibitor, or Anticholinergics. Early stage can be ingested 3 times a day, however as the disease can become as frequent as every two hours



SOLUTION

digitalization
Database

Database of treatments and correlating L-dopa prescriptions

SOLUTION

clinical innovation
Exablate Neuro

Exablate Neuro is the first focused ultrasound device approved by the FDA to treat patients with non-invasive MR-guided focused ultrasound thalamotomy.

SOLUTION

clinical innovation
Opicapone

Opicapone is taken once daily to prolong the 'on' time by preventing the breakdown of L-dopa in plasma. It thereby reduces the 'off' time of symptoms by reducing dyskinesia.



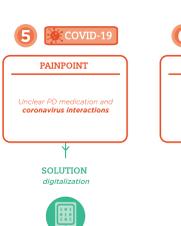
IMPLEMENTED SOLUTION
clinical innovation

Symptom Tracker
Motor symptoms and speech patterns tracked (Accelerometer, gyroscope, speech recognition)

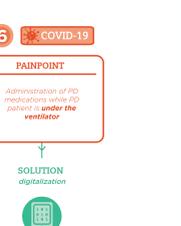


IMPLEMENTED SOLUTION
clinical innovation

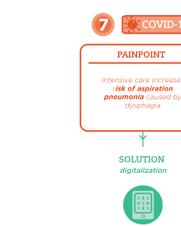
Deep Brain Stimulation
DBS is an implantable device which delivers electrical currents to target abnormal brain activity. The electrical stimulation propagates blood flow and a series of chemical reactions are generated, leading to a release of neurotransmitters. The device has a lead that is inserted into the brain, with wires running down the neck into the chest which holds a battery charged pulse generator to inhibit electrical impulses.



SOLUTION digitalization
Database
Wearable technology to track patient's condition in the real time and send information to doctors



SOLUTION digitalization
Database
Nanobots injected in the patient that releases the medications dose



SOLUTION digitalization
Database
Sensor placed on patient's throat to assess the respiration rate and swallowing

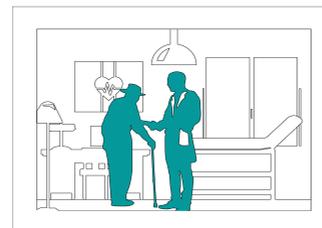
4 FOLLOW-UP

HOSPITAL

Neurologist Office

STAKEHOLDERS

- The patient**
Continue taking prescribed medication and committing to therapy and DSS
- Family members**
The family members may need to encourage patient in therapy and be responsible for medication reminder and physical therapy transportation
- Neurologist**
Ensure correct dosage of L-dopa regularly as well as DSS is working properly
- Physical Therapist**
Neurologist may recommend a separate physical therapist to help patients live a normal life
- Pharmacist**
Pharmacist must fill Levodopa prescription



Patient returns to neurologist several weeks after DBS surgery if applicable. The doctor will install the chest implant in which controls the pulsation intensity and frequency for the electrodes



SOLUTION

digitalization
App

Online follow up so elderly patients do not need to leave their home. Video calling available as well

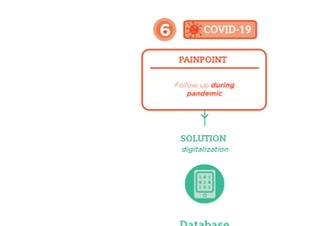


- AR / VR UPDRS**
Utilize AR / VR to give doctors more precise analytical results
- UPDRS Machine**
Utilize quantifiable metrics from sensors to give doctors more precise analytical results



IMPLEMENTED SOLUTION
clinical innovation

WAND
As the development of WAND progresses, this could eliminate the need for chest implantation all together



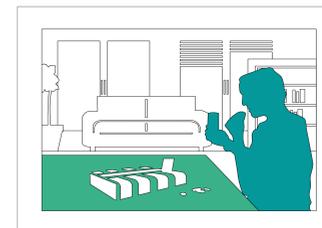
SOLUTION digitalization
Database
Telemedicine to follow up with the doctor, who receives all the current status information about the patient from the wearables and mobile apps

5 Out-Patient

HOME

STAKEHOLDERS

- The patient**
Try to maintain and control symptoms
- Family members**
Help encourage patient
- Neurologist**
Ensure patient is taking correct L-dopa dosage and symptoms are managed
- Physical Therapist**
Neurologist may recommend a separate physical therapist to help patients live a normal life
- Pharmacist**
Must fill Levodopa prescription



Patient is at home taking pills from automated pill dispenser



SOLUTION

digitalization
Pill Dispenser

Automated pill dispenser

SOLUTION

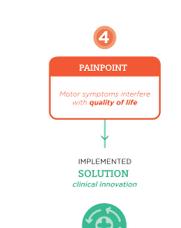
digitalization
Smartcane

Smartcane with a call for help button

SOLUTION

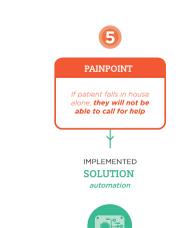
digitalization
Alexa

At home voice recognition device utilizing a microphone is able to track symptoms verbally, as well as call for help on command, alert automatic pill dispenser, notify increase symptoms display to doctors, and track progression of the disease



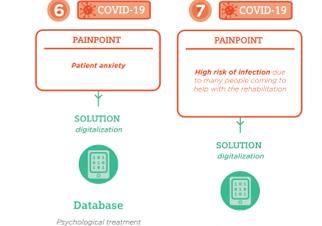
IMPLEMENTED SOLUTION
clinical innovation

Glove
Weighted therapy glove (accelerometer, gyroscope)

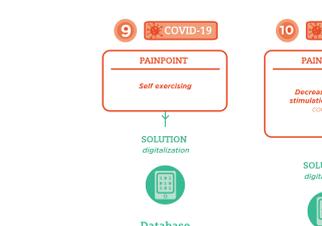


IMPLEMENTED SOLUTION
automation

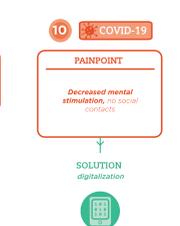
Automated Fall Protection
Air bags equipped with accelerometers and gyroscopes can detect falls and deploy in critical areas such as the beds in order to protect the patient from further harm



- Database**
Psychological treatment through telemedicine
- Database**
Robot assistance
- Database**
Video calls with family/friends



SOLUTION digitalization
Database
Wearable technology and mobile app with AI to remind the patient when to exercise, show the simple exercises where the patient does not need any additional assistance and saves the progress and makes predictions based on patient's condition



SOLUTION digitalization
Database
Mobile apps with AI, games, AR/VR to help stimulate the brain