New and emerging technologies for Parkinson’s disease

Parkinson’s disease (PD) is a neurological disorder of the central nervous system, where a loss of dopaminergic cells leads to complications with movement and progressively non-motor symptoms. Most people who get PD are aged 50 or over but younger people can be affected too. Although there is currently no cure for PD, there has been significant technological innovation to help diagnose and manage the symptoms of PD.

We looked for new and emerging technologies for the diagnosis, monitoring, treatment and rehabilitation of people with PD, by consulting clinical experts and searching specialised online and databases. For each technology we identified, experts gave us their opinion on the degree of innovation and potential for future impact on patient outcomes and the NHS.

We found forty-six new and emerging technologies; 19 for diagnosis, 2 for monitoring, 13 for treatment, 10 for rehabilitation and 2 cell replacement therapies. A number of these were of particular clinical interest and are discussed here. The full report can be found on our website.

**Diagnosis - biomarkers**

Making an accurate diagnosis of PD can be very difficult because there are other conditions which share similar symptoms and there are, as yet, no sensitive and specific validated biomarkers that can differentiate PD from other parkinsonian disorders.

Alpha-synuclein has been researched intensively as a potential biomarker for PD, but there are still outstanding questions relating to the biomarker’s specificity and sensitivity. Experts highlighted the importance of developing non-invasive tests; however even if an accurate biomarker was discovered there is still a question regarding its usefulness in the absence of an effective disease modifying treatment for PD.

**Diagnosis - Neuroimaging**

There are some well established neuroimaging methods such as positron emission tomography (PET) and transcranial sonography (TCS) that can be used to diagnose PD. PET scans can help differentiate between parkinsonian disorders but the limited availability of PET scanners in the NHS hinders their use as a diagnostic tool. TCS holds promise for the prodromal and early diagnosis of PD because it is inexpensive, non-invasive and widely available within the NHS. However because of its low specificity it cannot be used as a stand-alone diagnostic test.
**Diagnosis – clinical and genetic markers**

Non-motor symptoms of PD such as olfactory and speech dysfunction can appear decades before motor symptoms and are targets for screening and early diagnostic test development. WR Medical Electronics Co. is developing a sniff magnitude test which can detect changes in the size and intensity of a sniff, and MIT is developing voice analysis software to detect changes in speech patterns and volume. However, experts anticipate that these tests may not be sensitive and specific enough to screen or diagnose PD by themselves.

The variable expression of currently known genetic mutations reduces the clinical relevance of gene-based diagnostic testing for PD. We identified however, a gene-based diagnostic test (PDtect) in development by Diagenic which could have implications on future disease management. The test is in clinical trials and its effectiveness needs confirmation.

**Treatment - surgical**

Deep brain stimulation (DBS) is the main type of surgery used in some patients with PD and hard to control motor symptoms. DBS systems that target new brain sites such as the pedunculopontine nucleus to help treat gait and postural instability are in development. A tandem DBS system to target other types of symptoms such as cognitive function and dementia, an area of major unmet need, is also in clinical trials.

DBS is invasive and is not suitable for all patients with PD. A non-invasive, innovative treatment that uses magnetic resonance ultrasound to treat essential tremor was CE marked in 2012 but is not yet available for use in the UK. Experts indicated that based on current data its main use could be to treat tremor secondary to PD.

**Rehabilitation programmes and devices**

Exercise is an important part of the rehabilitation management of PD, and tailored exercise programmes such as Tai Chi and Wii-style video games are in clinical trials and may help to reduce balance impairments and gait function. Relatively simple rehabilitation devices that can be used easily by a person with PD are of particular importance. One such device in clinical trials is the mobilaser (Mobilaser) which uses a laser device mounted to a walking roller or cane, to serve as a visual cue. Experts commented that the simple device could help reduce the number of falls in people with PD.

**Cell replacement therapies**

There is currently no cure for PD but it is thought that cell replacement therapy may be able to slow down or stop the progression of PD. Foetal cell transplantation is being trialled in patients but it is unlikely to become part of future clinical practice due to ethical issues. Adult stem cell therapy may provide an alternative option, but there is, as yet, no evidence of benefit in early trials.

For further details of these new technologies, along with others, please read the full NIHR Horizon Scanning report which is free to download.