Assessment of the Business Case for a Deep Brain Stimulation Neurosurgical Programme for Movement Disorders

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About NSTR

The National Service & Technology Review Advisory Committee (NSTR) is part of the Service Planning and New Health Intervention Assessment (SPNIA) Framework process. NSTR is responsible for horizon scanning, co-ordinating business case development, and analysing and evaluating proposals for change and business cases that are developed through the SPNIA Framework. NSTR currently makes recommendations to all the District Health Board (DHB) Chief Executive Officers (CEOs) and to the Ministry of Health’s Executive Leadership Team (ELT) on national service matters and new health interventions that have a national impact.

NSTR’s role is to:

- provide technical and strategic policy advice to the DHB CEOs and the Ministry’s ELT on health service configuration and health interventions that have a national impact
- horizon scan for new health interventions that could be considered for formal assessment because of their potential value
- horizon scan for services and health interventions that are obsolete, ineffective or inadequate, and therefore exit or cessation is likely to be appropriate
- maintain a register of health interventions and potential disinvestments that have been recommended for assessment, and their status
- develop, over time, a precedent-based threshold against which health interventions can be ranked on their appropriateness for introduction to the New Zealand public health system, or for their provision to cease
- provide timely recommendations to the National Capital Committee on the service aspects of capital projects that require National Capital Committee approval
- co-ordinate the development of business cases, including the evidence component
- analyse and evaluate proposals for change and business cases and recommend their adoption or rejection to the DDG-CEO Group.

Printed copies of the report can be obtained from:

NSTR Convener
Ministry of Health
PO Box 5013
Wellington
New Zealand.

Enquiries about the content of the report should be directed to the above address.
NSTR Recommendations

Context

The National Service and Technology Review Advisory Committee (NSTR) considered the proposal for change for a national stereotactic Deep Brain Stimulation neurosurgical programme for movement disorders in the context of:

- Deep Brain Stimulation (DBS) is a proven intervention for movement disorders, particularly for Parkinson’s disease, and has become an important main-stream treatment.
- Since 1999, the Ministry of Health has provided some limited funding via the High Cost Treatment Programme for New Zealand patients to receive DBS surgery in Australia.
- Current selection of patients for this programme is made through a small national committee comprised of neurologists and neurosurgeons from the main centres. The programme is supported by the Auckland City Hospital Movement Disorders Clinic.
- DBS may well have additional applications in future in other areas including the treatment of refractory epilepsy, mood disorders, obsessive-compulsive disorders and other psychiatric complaints. The utility of DBS in these disorders is being investigated.

Recommendations

NSTR recommends that the DHB CEOs and the Ministry of Health’s Executive Leadership Team note that:

1. DBS is a proven intervention already publicly funded for New Zealanders via the Ministry of Health’s High Cost Treatment Pool.
2. At present up to six DBS cases per year are referred to Australia.
3. All six members of the national DBS Committee agree that a DBS service should be provided in Auckland.
4. The clinical capability and physical infrastructure to provide a national service are already in place at Auckland DHB.
5. The direct surgical costs from the Australian provider are currently AUS$86,253 (equivalent to NZ$109,955 on 18 July 2008) per patient. The estimated Auckland City Hospital costs per patient are NZ$73,689 – a difference of NZ$36,266 per patient.
6. Based on six patients per annum, savings for the New Zealand health system would be NZ$217,596¹ (for direct surgical costs). These savings do not include the costs for travel, accommodation etc for which even greater savings may be expected to be realised.

¹ These costs/savings differ from the business case due to fluctuations in the exchange rate.
7. Given the extension of indications for DBS in movement disorders and the trend to operate on patients with Parkinson's disease at an earlier stage, it is anticipated that the numbers referred for surgery will modestly increase over time.

8. NSTR has not considered the matter of additional funding beyond the current level of funding.

9. DBS is currently funded from the High Cost Treatment Pool and the Ministry’s view is that, subject to agreement by Auckland DHB to provide the service, DBS should be funded from the National Services Top Slice.

NSTR recommends that the DHB CEOs and the Ministry’s Executive Leadership Team agree that:

10. Auckland DHB establishes a national DBS service.

11. Funding for the national DBS service should be negotiated between the Ministry of Health and Auckland DHB.
# NSTR Considered Judgement Guide

This form outlines the issues considered by the National Service and Technology Review Advisory Committee (NSTR) when reviewing and making recommendations on proposals for change and business cases. This form will be used by NSTR members to record their comments when reviewing proposals for change and business cases, and to record the meeting discussion and NSTR recommendations.

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<tr>
<th>Meeting date:</th>
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<td><strong>Proposal topic:</strong></td>
<td>Deep Brain Stimulation Neurosurgical Programme</td>
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| **Background and purpose:** (description of the proposed service change or new health intervention) | The Business Case is presented to NSTR to:  
- Approve a proposal for change for Auckland District Health Board (ADHB) to provide a nationally-funded Stereotactic Deep Brain Stimulation Neurosurgical Programme for movement disorders such as Parkinson’s disease  
  
Since 1999, the Ministry of Health has provided some limited funding via the High Cost Treatment Programme for New Zealand patients to receive Deep Brain Stimulation (DBS) surgery in Australia.  
  
ADHB’s proposal for change for DBS states that the same procedures could be performed at Auckland City Hospital at a lower cost with less dislocation to the patient and relatives, while benefiting more patients nationally than is currently the case. Auckland City Hospital already has the necessary infrastructure in place to provide the proposed national service, with minimal changes required. The staff have the necessary experience in assessing patients as well as managing the post-operative care, programming and maintenance of stimulators. |
Considered Judgement Guide - Business Case

Rating definitions

1. Very poor - little detailed information and analysis for decision making
2. Poor - some detailed information and analysis for decision making
3. Good - sufficient detailed information and analysis for decision making
4. Very good - exceeds detailed information and analysis required for decision making
5. Excellent - exceeds and provides additional information and analysis for decision making

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<td>Is the information comprehensive? Does the evidence support the proposed change? Good information presented and evidence provided supports the proposal for change.</td>
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<td>Does the evidence support the proposed change?</td>
<td>Are there other likely future users/applications for the technology? DBS may well have future additional applications in other areas including the treatment of refractory epilepsy, mood disorders, obsessive-compulsive disorders and other psychiatric complaints. The utility of DBS in these disorders is still undergoing investigation and development.</td>
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<td>What is the evidence for the effectiveness and clinical safety of the proposal, the effectiveness of the counterfactual and the relative effectiveness? There is comprehensive evidence provided as part of literature review of the efficacy and safety of DBS treatment for Parkinson’s disease and other movement disorders. Modern neurosurgical techniques for movement disorders have become important main-stream treatments. Offered to appropriately selected patients, they are effective and worthwhile.</td>
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<td>Are the units in which effectiveness has been measured appropriate? Can the effectiveness and safety of the proposal and the counterfactual be compared? Has the evidence been challenged and other views discussed?</td>
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Rating

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Population health gain

Has the population group affected by the proposal been clearly identified?
- The population group affected by the proposal has been identified within the information and evidence available. The proposal indicates that the bulk of patients would be those suffering from Idiopathic Parkinson’s disease with very small numbers from the other disorders. At present up to six cases per annum are referred to Australia. If the service is provided in New Zealand the number of patients treated each year is unlikely to be more than 14.

What is the impact the proposal will have on the relevant population group?
- Given the extension of indications for DBS in movement disorders and the trend to operate on patients with Parkinson’s disease at an earlier stage, the proposal anticipates the numbers referred for surgery will modestly increase over time.

What is the expected health gain for the affected population?
- The health of selected patients with Parkinson’s disease and other movement disorders will be improved, with studies showing a significant gain in quality of life to be expected. The proposal would mean less dislocation for patients and their relatives. It would mean that appropriate surgical treatment will be timelier and at less overall cost to the New Zealand health system.

What is the timeframe?
- The programme could be fully functional within six months as all the infrastructure required is already in existence and functioning at Auckland City Hospital with the exception of the Medtronic Stimpilot system.

What is the alternative, either currently provided or as an alternative new intervention?
- The alternative is to continue with the current system with patients continuing to be operated on in Australia at a higher cost and with dislocation of patients and their relatives together with uneven follow-up care.

How does the proposal contribute to the delivery of modern models of care (see Appendix 1)?
- The delivery of DBS treatment for patients with certain movement disorders, in particular Parkinson’s disease, will be carried out by a multidisciplinary team with a focus of continuity of care and informed patient/family participation. Apart from the inpatient component of care at the time of the surgical procedure, the focus will be on ambulatory care. The service configuration is designed to provide a national care plan for this group of patients with a clear decision-making structure.

Rating (out of 5 where 1 = low, 5 = high)

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| Cost effectiveness    | Are there any estimated savings that will accrue from the proposal, and when?  
Are there any potential efficiency gains?  
What is the relative value for money of the proposal when compared with the counterfactual?  
Have the costs and the benefits (effectiveness) been adjusted for differential timing?  
Do all the costs all come at once and do the benefits come a long time into the future?  
Has an incremental analysis (e.g. has the number or severity of people treated been varied to see what difference this makes to effectiveness and cost) been done?  
Has a sensitivity analysis (e.g. how far costs would have to fall/rise to make the proposal cost effective/not cost effective) been done? | The proposal for change would see the overall cost to the New Zealand Health system reducing for treating those patients needing DBS. The calculated total immediate savings is, assuming operating on six patients per annum, at least NZ$153,065 (for direct surgical costs). Using data from the 2006 Australian MSAC report marginal cost savings of at least NZ$178,758 over five years (taking into account pharmacotherapy cost reduction only) could be expected.  
With regard to the cost effectiveness of the surgery itself, a recent study showed there was likely to be a return on investment of the costs associated with DBS surgery for Parkinson’s disease after 2.2 years. Since the documented benefit of surgery can be expected to continue for five years (and presumably more) further financial gain might be expected.  
While published data on cost effectiveness is not comprehensive, the most recent and very detailed Australian MSAC report concluded that the total cost is acceptable for patients in whom other therapies are insufficient and recommended public funding be provided. (The Australian MSA has issued two earlier reports in 2001 and 2004, both recommending continuation of the then current funding.) The Australian Ministry of Health and Aging has accepted the MSAC’s 2006 recommendation. | 4    |

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<td>What consideration has been given to the opportunity costs of funding this over other potential proposals?</td>
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<td>What could be done instead? Who would benefit then?</td>
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<td>What is the impact on equity, both between DHBs and between different groups in the community, in particular those with low health status?</td>
<td>Will the proposal help to reduce current disparities in health and wellbeing compared with the alternative (i.e. the counterfactual)? Is this quantified?</td>
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<td>Whanau ora</td>
<td>How will the proposal contribute to whanau ora compared to the alternative?</td>
<td>The proposal would look to provide timelier surgical treatment for patients and at less cost to the New Zealand health system. With the current pathway there is also uneven follow up care. At present, complications, should they arise, are usually dealt with by local New Zealand neurosurgeons. This is regarded as less than ideal as the neurosurgeon will not previously have been involved in the patient’s care. The Australian units do not provide full comprehensive follow up care.</td>
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<td>Is there evidence that the proposal will address a problem that is significant to Maori or affects Maori disproportionately?</td>
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<td>Is the proposal (in particular its delivery) likely to be effective for Maori and thus help to reduce disparities in health and wellbeing for Maori compared to the alternative? What is the evidence on this?</td>
<td>The proposed programme would ensure equity of access across all DHBs. A patient pathway is proposed as part of proposal for change.</td>
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<td>Will this proposal reduce costs and other barriers to access for Maori, or could it impose costs? Are those costs identified?</td>
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Rating: 1 2 3 4 5 (out of 5 where 1 = low, 5 = high)  **3**
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| Funding stream and affordability        | Funding stream  
What funding streams are planned or potentially available for fund the proposal?  
What consultation has taken place with funders?  
How will the capital costs be funded?  
How will the annual operating costs be funded?  
Does the proposal rely on any new funding?  
If so is it approved or likely to be?  
What impacts on inter-district flows would result?  
What are the implications/consequential impacts of a decision to fund?  
Would a decision to fund contribute to a break-even DHB environment?  
If not, what would need to take place to ensure that the proposal would contribute to a break-even DHB environment? | What funding streams are planned or potentially available for fund the proposal?  
How will the annual operating costs be funded?  
Does the proposal rely on any new funding?  
If so is it approved or likely to be?  
The current funding for the DBS programme is provided via the high cost treatment programme.  
The level of funding is not precisely set, with funding occurring on a case by case basis after recommendations made by the National DBS committee.  
There is currently provision to fund up to six cases per annum.  
Yes the proposal for change will rely on new central funding via a dedicated funding stream supporting a national DBS surgical service.  
What consultation has taken place with funders?  
Discussions would need to take place between the Ministry of Health and ADHB about negotiating funding for the proposed national DBS programme.  
How will the capital costs be funded?  
There is no capital costs required as Auckland City hospital has the required facilities in place.  
What impacts on inter-district flows would result?  
There is unlikely to be any as far as the initial assessment and surgery is concerned as the proposed system will mean only a change of the hospital in which the surgery is performed from other DHB’s viewpoint.  
Follow up and maintenance would be provided by the ADHB national unit with costs being a charge to the patient’s DHB, or by the patient’s own DHB neurologist. |       |
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| Funding stream and affordability (continued) | **Cost**  
Would a decision to fund contribute to a break-even DHB environment? If not, what would need to take place to ensure that the proposal would contribute to a break-even DHB environment?  
There is unlikely to be any effects for DHBs.  
Have all the relevant costs for each alternative been identified?  
Has the proposal and the counterfactual been compared under the same boundaries?  
Are the physical units in which the costs have been counted comparable?  
Are all the consequential or downstream costs accounted for?  
Will the proposal free up resources that can be used for other services?  
Have any potential efficiency gains and savings been identified and is there a sound plan to realise the gains?  
Have the proposal and the counterfactual been compared under the same boundaries?  
Good cost information provided within the proposal for change, with relevant comparison made with Australian providers. Annual cost of proposed pathway are very favourable in comparison to the current pathway.  
**Will the proposal free up resources that can be used for other services?**  
Yes based on six patients per annum, savings will be made for the New Zealand health system to the tune of at least NZ$153,065 (for direct surgical costs). This does not including the costs for travel, accommodation etc for which even greater savings may be expected to be realised. | Would a decision to fund contribute to a break-even DHB environment? If not, what would need to take place to ensure that the proposal would contribute to a break-even DHB environment?  
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Has the proposal and the counterfactual been compared under the same boundaries?  
Good cost information provided within the proposal for change, with relevant comparison made with Australian providers. Annual cost of proposed pathway are very favourable in comparison to the current pathway.  
**Will the proposal free up resources that can be used for other services?**  
Yes based on six patients per annum, savings will be made for the New Zealand health system to the tune of at least NZ$153,065 (for direct surgical costs). This does not including the costs for travel, accommodation etc for which even greater savings may be expected to be realised. | 4 |

| Community acceptability and ethical issues | **Is the proposal consistent with community values?**  
Yes. There is a high level of interest in DBS treatment within the community of Parkinson’s disease patients in particular, with patients generally being very informed.  
Repeated enquiry has been made by the NZ Parkinson’s Society on the behalf of members, families and carers seeking assurance that the surgery will be performed in New Zealand.  
Patients needing DBS in other DHBs would receive an upgraded national service entirely integrated within New Zealand leading to less travel and dislocation of their health needs.  
**Are there significant ethical, social, political or legal issues, or other patient concerns surrounding the use of the technology?**  
None that are known. | **Is the proposal consistent with community values?**  
Yes. There is a high level of interest in DBS treatment within the community of Parkinson’s disease patients in particular, with patients generally being very informed.  
Repeated enquiry has been made by the NZ Parkinson’s Society on the behalf of members, families and carers seeking assurance that the surgery will be performed in New Zealand.  
Patients needing DBS in other DHBs would receive an upgraded national service entirely integrated within New Zealand leading to less travel and dislocation of their health needs.  
**Are there significant ethical, social, political or legal issues, or other patient concerns surrounding the use of the technology?**  
None that are known. | 5 |

Rating  
(out of 5 where 1 = low, 5 = high)
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<td>Service configuration and implementation planning</td>
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<td>A current patient database system is in place in ADHB and this would be maintained for the proposed national programme.</td>
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<td>Yes, Movement Disorders Clinic is already in place at Auckland City Hospital, with appropriately trained personnel, infrastructure and equipment.</td>
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<td>The proposed programme would expect to be involved in education concerning DBS of New Zealand neurologists and other interested physicians as well as patient interest groups.</td>
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<td></td>
<td>The proposed programme could be fully functional in six months.</td>
<td>The proposed programme could be fully functional in six months.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Are there capital requirements or impacts? If so, how will these be addressed?</td>
<td>Are there capital requirements or impacts? If so, how will these be addressed?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None.</td>
<td>None.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What service configuration changes are required?</td>
<td>What service configuration changes are required?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimal service changes required as Movement Disorders Clinic in Auckland City hospital is well established.</td>
<td>Minimal service changes required as Movement Disorders Clinic in Auckland City hospital is well established.</td>
<td></td>
</tr>
<tr>
<td>Criteria</td>
<td>Questions</td>
<td>Comments (value judgement of evidence) and Rating (quality of evidence)</td>
<td>Total</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Service configuration and implementation planning (continued)</td>
<td>How will the outcomes and benefits of the proposal be reviewed and how will the risks be managed?</td>
<td>As part of the proposed patient pathway, an L-Dopa challenge test, baseline UPDRS assessment and the Modified Parkinson’s Disease Quality of Life questionnaire (MPDQL) would also be performed in the case of patients with Idiopathic PD. Relevant accepted baseline Disability Scale scores would be established for other disorders. These measures would be assessed and reviewed at regular intervals as part of the patient pathway. Maintenance of a high quality service will require ongoing quality assurance and constant “upskilling” as the area of DBS is still undergoing development. Well established links and relationships in place with units in Australia and exchange information as well as advice.</td>
<td>5</td>
</tr>
<tr>
<td>Priority in relation to other proposals in the annual decision making round, and against past precedents</td>
<td>How does this proposal relate to previously considered proposals?</td>
<td>NSTR felt that this proposal related well in relation to previously considered proposals as it looked to provide a service within New Zealand that was currently provided outwith the country.</td>
<td>5</td>
</tr>
<tr>
<td>Recommendations</td>
<td>Record your recommendations and any conditions.</td>
<td>The proposal for change has been well done and highlights that Deep Brain Stimulation is a proven intervention for movement disorders, particularly for Parkinson’s disease. Deep Brain Stimulation is already publicly funded for New Zealanders and the clinical capability and physical infrastructure to provide the proposed national service already exists at Auckland DHB. The estimated cost of providing the service at Auckland DHB is considerably less than continuing to purchase the current from Australian providers. <strong>Therefore:</strong> NSTR should support this proposal for change and recommend that Auckland DHB establish a national Deep Brain Stimulation Service. This would be subject to discussions with the clinicians on the current DBS Committee. The proposed DBS service should not be considered beyond the existing level of funding available for the service. The funding to support the establishment of the national Deep Brain Stimulation DBS service should be negotiated between the Ministry of Health and the Auckland DHB within existing funding streams or using existing DHBNZ IDF agreement processes if required.</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 1 - Modern Models of Care

<table>
<thead>
<tr>
<th>Previous</th>
<th>Best practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culture of independence</strong></td>
<td>Collaborative</td>
</tr>
<tr>
<td><strong>Little sector leadership</strong></td>
<td>Confident, strong sector leadership</td>
</tr>
<tr>
<td><strong>Traditional models of care</strong></td>
<td><strong>Modern models of care</strong></td>
</tr>
<tr>
<td>• ‘silo-focused’ care</td>
<td>• collaborative care</td>
</tr>
<tr>
<td>• hospital focused care</td>
<td>• ambulatory</td>
</tr>
<tr>
<td>• reactive</td>
<td>• integrated with primary care</td>
</tr>
<tr>
<td>• emergent</td>
<td>• futures, long-term</td>
</tr>
<tr>
<td>• ‘clinical services firm’</td>
<td>• Inter-disciplinary</td>
</tr>
<tr>
<td>• focus on the individual</td>
<td>• inclusive of public health</td>
</tr>
<tr>
<td>• episodic care</td>
<td>• anticipatory</td>
</tr>
<tr>
<td>• uni-causality approach to care</td>
<td>• focus on population patterns</td>
</tr>
<tr>
<td>• doctor oriented</td>
<td>• continuity of care</td>
</tr>
<tr>
<td>• passive recipients</td>
<td>• chronic/complex condition capability</td>
</tr>
<tr>
<td><strong>Multiple ad hoc decision-making structures</strong></td>
<td><strong>Clear decision-making structures that allow difficult decisions to be made</strong></td>
</tr>
<tr>
<td><strong>Unsustainably fragmented services</strong></td>
<td><strong>Service critical mass</strong></td>
</tr>
<tr>
<td><strong>Intractable recruitment issues</strong></td>
<td><strong>Recruitment critical mass</strong></td>
</tr>
<tr>
<td><strong>Fixed provider mix</strong></td>
<td><strong>Flexible provider mix</strong></td>
</tr>
</tbody>
</table>
Proposal for Change/Business Case

Contents (based on MoH ‘Considered Judgement Guide’ as well as CPC requirements).

1 Submission question (what is being requested?)
Should ADHB be providing a nationally-funded Stereotactic Deep Brain Stimulation Neurosurgical Programme for movement disorders such as Parkinson’s disease?

2 Personal details of applicants
Applicant 1:

<table>
<thead>
<tr>
<th>First name:</th>
<th>David</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surname:</td>
<td>McAuley</td>
</tr>
<tr>
<td>Title:</td>
<td>Dr</td>
</tr>
<tr>
<td>Position:</td>
<td>Neurologist</td>
</tr>
<tr>
<td>Department:</td>
<td>Neurology</td>
</tr>
<tr>
<td>Length of time with ADHB:</td>
<td>28 years</td>
</tr>
<tr>
<td>Number of previous CPC submissions:</td>
<td>Nil</td>
</tr>
<tr>
<td>Personal experience of this innovative practice:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Applicant 2 (if applicable):

<table>
<thead>
<tr>
<th>First name:</th>
<th>Barry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surname:</td>
<td>Snow</td>
</tr>
<tr>
<td>Title:</td>
<td>Dr</td>
</tr>
<tr>
<td>Position:</td>
<td>Neurologist</td>
</tr>
<tr>
<td>Department:</td>
<td>Neurology</td>
</tr>
<tr>
<td>Length of time with ADHB:</td>
<td>12 years</td>
</tr>
<tr>
<td>Number of previous CPC submissions:</td>
<td>Nil</td>
</tr>
<tr>
<td>Personal experience of this innovative practice:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Applicant 3 (if applicable):

<table>
<thead>
<tr>
<th>First name:</th>
<th>Arnold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surname:</td>
<td>Bok</td>
</tr>
<tr>
<td>Title:</td>
<td>Mr</td>
</tr>
<tr>
<td>Position:</td>
<td>Neurosurgeon</td>
</tr>
<tr>
<td>Department:</td>
<td>Neurosurgery</td>
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<tr>
<td>Length of time with ADHB:</td>
<td>14 years</td>
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<td>Number of previous CPC submissions:</td>
<td>Nil</td>
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<tr>
<td>Personal experience of this innovative practice:</td>
<td>Yes</td>
</tr>
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</table>
3 Confirmation of clinical director and Level 3 manager support

<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Have they been asked to confirm their support with CPC Manager?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Director</td>
<td>Dr Barry Snow</td>
<td>Yes (Note: previous submission made to Surgical Services and MOH)</td>
</tr>
<tr>
<td>Level 3 Manager</td>
<td>Brenda Clune</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4 Ethical approval

If applicable, please state if the Northern Region Ethics Committee has granted approval for this innovative practice/new technology yet? Yes or no.
Not applicable.

5 Background and purpose (of technology)

Since 1999, the Ministry of Health has provided some limited funding for New Zealand patients to receive Deep Brain Stimulation treatment in overseas centres via the High cost treatment programme. An arrangement was made for patients to receive the treatment at St Vincent’s Hospital in Sydney. The centre at which the surgery is now performed has changed since January 2007 to St Andrews Hospital in Brisbane.

Selection of patients for this programme has been made by a small committee comprised of neurologists and neurosurgeons in the main centres. The Chairman of this committee has been an Auckland neurologist with the programme being run from the Auckland City Hospital Movement Disorders Clinic. The current Chairman is Dr David McAuley. The experience gained from selecting patients has been invaluable and puts the Auckland City Hospital Movements Disorders Group in a unique position to proceed to the next stage of offering a full surgical programme.

While the original funding was for patients with Parkinson’s disease alone, the indications for funding have now been extended to include patients suffering from Essential tremor, Cerebellar outflow tremors and other movement disorders such as Dystonia and Hemiballism.

The following is a summary of patients considered and treated through the programme so far:

- Referrals for idiopathic Parkinson’s disease 28
- Benign essential tremor 9
- Cerebellar outflow tract disorders 5
- Hemiballism 0

- Operations performed 11
- Patients awaiting surgery 1
- Patients currently undergoing evaluation 6
Deep brain stimulation has important advantages over older ablative (lesional) procedures. In particular, deep brain stimulation does not involve a large irreversible lesion in the brain. The location and intensity of stimulation can be adjusted to fine tune the response to the individual patient’s needs. Deep brain stimulation is performed in the thalamus, in the globus pallidus and in the sub-thalamic nuclei.

While the selected target for stimulation varies according to the clinical problem (the technology remaining the same), the majority of procedures are likely to be bilateral sub-thalamic nuclear deep brain stimulation for Parkinson’s disease. Experience has shown that sub-thalamic nucleus stimulation gives the best result in Idiopathic Parkinson’s disease.

The prototypic candidate for deep brain stimulation in Parkinson’s disease is someone who experiences symptomatic relief with anti-Parkinsonian drugs but who develops significant dyskinesias and who has marked motor fluctuations, such that a significant proportion of the day is spent in a functionally impaired state. The same person may have unpredictable symptomatic relief. There may be significant complications such as nausea or drug-induced psychosis (but not present when the medication is reduced or stopped) that is refractory to treatment designed to stop these side effects.

Deep brain stimulation may well have future additional applications in other areas including the treatment of refractory epilepsy, mood disorders, obsessive-compulsive disorders and other psychiatric complaints. The utility of deep brain stimulation in these disorders is still undergoing investigation and development.

Modern neurosurgical techniques for movement disorders, particularly for Parkinson’s disease have now become important main-stream treatments. Offered to appropriately selected patients, they are effective and worthwhile. It is our belief that ready access should be available to the population of this country for such procedures when indicated. In the past, these have included ablative procedures such as thalamotomy and pallidotomy but now principally comprise Deep Brain Stimulation procedures.

At present, some funding, via the High Cost Treatment Programme, is available enabling patients to have Deep Brain Stimulation surgery performed in Australia. The cost of procedures is inevitably greater than it need be, including as it does a profit component and those associated with international currency exchange costs, travel and accommodation, for example. Taking into consideration further price rises occurring overseas, we submit that the same procedures could be performed at Auckland City Hospital at a lower cost with less dislocation to the patient and relatives, while benefiting more patients nationally.
The performance of such surgical procedures requires a team approach including:

a) experienced neurologists to make appropriate pre-operative patient selection and provide intra-operative monitoring as well as post-operative care;

b) experienced neurosurgeons skilled in stereotactic procedures with particular extra expertise in the treatment of movement disorders;

c) high-class neuro-radiology;

d) skilled nursing care;

e) liaison psychiatry;

f) neuropsychology.

This is best carried out in the context of a Movement Disorders Clinic or department.

In order to concentrate the necessary expertise and taking into account the relatively small number of cases involved, it is seen to be of national advantage that such surgery should be performed in only one centre.

Auckland City Hospital, arguably the premier teaching hospital in the country, already has the infrastructure for such a programme.

- A Movement Disorders Clinic has been established since 1996, staffed by two neurologists and a movement disorders nurse as well as an attached neuropsychiatrist and neuropsychologist.
- The clinic has accumulated considerable experience in the assessment and care of patients requiring ablative procedures.
- A national programme for pallidotomy has been co-ordinated through the clinic with all of the procedures being performed at Auckland City Hospital by the same neurosurgeon.
- Experience in organisation and co-ordination of the NZ National DBS Committee.
- Experience with DBS programming.
- Published clinical research and drug trials have also been conducted via the clinic.
- In the future, the possibility of research exists with collaboration between the neurosciences group in the Auckland Medical School and the movement disorders group.
The current v proposed patient pathway

Please describe these or provide two flowcharts and state the inclusion and exclusion criteria in patient selection, if applicable.

One of the major advantages of this proposal is that the necessary infrastructure already exists and will require little modification while the staff have the necessary experience in assessing patients as well as managing the postoperative care, programming and maintenance of stimulators.

Stimulators in general have 4–5 years of battery life depending upon such factors as required stimulus intensity, electrical impedance and stimulus frequency. The battery cannot be replaced; rather, a new IPG unit must be inserted in exchange for the old unit. Included in the maintenance costs therefore is replacement of the units every 4-5 years (two units, if the patient has had bilateral stimulators). This is a simple surgical procedure and does not require further cranial surgery or surgical adjustment of the leads from the head to the upper chest where the stimulators are placed (see illustration in Appendix 2).

a) Indications for Deep Brain Stimulation

Indications for DBS in Parkinson’s disease: Surgery would almost entirely comprise bilateral STN stimulation; in rare instances, unilateral STN stimulation might be preferred (e.g. after previous contralateral pallidotomy) or bilateral Thalamic stimulation might be preferred (e.g. in severe tremor predominant Parkinson’s disease):

1. Unequivocal clinical criteria for Idiopathic Parkinson’s disease.
2. Severe motor fluctuations that have not responded to intensive manipulations of anti-Parkinson’s medication.
3. An ongoing response to L-Dopa with a best “on” state that represents a clear functional improvement over the patient’s usual condition.
4. No cognitive impairment.
5. No psychiatric disorder that in the opinion of the neuropsychiatrist would potentially impair participation in the procedure or might result in post-operative psychiatric disorder.
6. No intercurrent illness expected to cause disability or death within four years.
Indications for DBS in benign essential tremor: This would entirely comprise thalamic stimulation.

1. Unequivocal clinical criteria for benign essential tremor.
2. Failure to respond to intensive drug treatment or
3. Limitation of treatment imposed by unacceptable side effects from appropriate medication.
4. No cognitive impairment.
5. No psychiatric disorder that in the opinion of the neuropsychiatrist would potentially impair participation in the procedure or might result in postoperative psychiatric disorder.
6. No intercurrent illness expected to cause death or disability within four years.

Indications for DBS in dystonic disorders: The indications and most appropriate DBS targets in this group of disorders are still undergoing investigation and development. Nevertheless, there are certain types of Dystonia which respond extremely well to bilateral Globus Pallidus stimulation. This should be able to be offered to New Zealand patients.

1. Unequivocal clinical criteria for Dystonia.
2. Failure to respond to other treatment including intensive appropriate drug treatment.
3. No significant cognitive impairment.
4. No psychiatric disorder that in the opinion of the neuropsychiatrist would potentially impair participation in the procedure or might result in postoperative psychiatric disorder.
5. No intercurrent illness expected to cause death or disability within four years.

Indications for DBS in cerebellar outflow disorders (generally tremor): The indications and most appropriate targets in this group of disorders are still undergoing investigation and development. Nevertheless, there are patients who have tremor following head injury, as part of symptoms caused by multiple sclerosis and other rare neurological disease which have been shown to respond to bilateral thalamic DBS. This should be able to be offered to New Zealand patients.

1. Unequivocal clinical diagnostic criteria for cerebellar outflow tract disorders.
2. Failure to respond to other treatments including intensive appropriate drug therapy.
3. No significant cognitive impairment.
4. No psychiatric disorder that in the opinion of the neuropsychiatrist would potentially impair participation in the procedure or might result in postoperative psychiatric disorder.

5. No intercurrent illness expected to cause death or disability within four years.

**Indications for DBS in Hemiballism:**

1. Unequivocal clinical diagnostic criteria for Hemiballism.

2. Failure to respond to intensive drug treatment.

3. No significant cognitive impairment.

4. No psychiatric disorder that in the opinion of the neuropsychiatrist would potentially impair participation in the procedure or might result in postoperative psychiatric disorder.

5. No intercurrent illness expected to cause death or disability within four years.

b) **Patient management pathway**

Patients would be referred by their treating New Zealand neurologist or paediatric neurologist. The referral would include detailed information derived from the patient’s records establishing the diagnosis, recounting the patient’s progress with treatment, the complications the patient is experiencing and the indications for possible surgery. A video of the patient illustrating their clinical state would be required.

After initial appraisal of the information, the patient, if thought potentially suitable, would then be assessed in the Auckland City Hospital Movement Disorders Clinic. This would include interview by the Movement Disorders Nurse, Movement Disorders Neurologists, the Neuro-Psychiatrist, Neuropsychologist and Neurosurgeon. A preoperative MRI scan of the brain would be performed. An L-Dopa challenge test, baseline UPDRS assessment and The Modified Parkinson’s Disease Quality of Life questionnaire (MPDQL) would also be performed in the case of patients with Idiopathic PD. Relevant accepted baseline Disability Scale scores would be established for other disorders. It should be possible for this to be accomplished as an out patient in the majority of instances.

The initial surgical procedure in which the intracerebral electrodes are inserted and the subsequent second surgical procedure to insert the IPGs and connect up the wiring are described in Appendix 2.
Programming of the IPGs begins immediately postoperatively and may need to continue up to two weeks afterwards. The majority of this can be done as an outpatient with the patient accommodated in a “step-down” non-hospital environment if they do not live in the region. During this time the patient would learn how to control the IPGs using the patient “Therapy Access Review Unit” with further input from the movement disorders nurse. Post-operative UPDRS and MPDQLs or other relevant disability scales would be repeated.

It is envisaged that each patient will require review in the Auckland City Hospital Movement Disorders Clinic at six-monthly intervals at which time the IPGs programming parameters and battery state will be checked and adjusted if necessary. In addition, UPDRS, MPDQLs or other disability scales would be repeated. The cost of follow up visits and travel to Auckland would be met by the patient’s local DHB for those patients domiciled in other DHB areas.

At the four-year postoperative point the battery state would be checked in more detail and the surveillance intensified with planning instituted to replace the batteries when they fail.

A full database of patients and in particular the timing of follow-up visits as well as the projected timing of IPG/battery replacement would be maintained.

We estimate that to keep a neurosurgeon proficient and the systems well practiced that a minimum of six patients need to be operated on per year. This is well within the operating theatre capability and availability at Auckland City Hospital.
7 Population health gain

The reviewers are likely to be looking for answers to some (or all) of the following:

a) Has the population group affected by the proposal been clearly identified?

It is difficult to estimate the likely true demand for deep brain stimulation treatment. The uncertainty arises because of the possible influence that knowledge the procedure is to be done in New Zealand (eliminating the need for the patient to travel abroad) might have. It is likely the threshold for referral from New Zealand neurologists would change. There is also a trend overseas to operate on patients, particularly with Parkinson’s disease, at a somewhat earlier stage (rather than waiting until complications are advanced) as experience with DBS has grown. The selection criteria employed by the current national DBS committee can be viewed as being conservative.
The prevalence of Parkinson’s disease in New Zealand has not been studied recently but worldwide is known to be of the order of 150-200/100,000 of which only an estimated 0.2–0.4% might be suitable for consideration of DBS. The prevalence of Benign Essential Tremor is approximately 400/100,000 of which less than 0.1% might require such surgery. The true prevalence of Dystonia is not known but is very small and the likely numbers suitable for DBS surgery is expected to be very tiny. We would estimate 1-2 patients every two years in a population of New Zealand’s size. The use of DBS for treatment of Cerebellar outflow tract disorders is also equally likely to be extremely small as is the case in Hemiballism.

We have no doubt that the bulk of patients would be those suffering from Idiopathic Parkinson’s disease with a very small contribution from the other disorders as indicated.

Given the extension of indications for deep brain stimulation in movement disorders and the trend to operate on patients with Parkinson’s disease at an earlier stage, we anticipate the numbers referred for surgery will modestly increase over time.

b) What is the impact the proposal will have on the relevant population group?
We believe that an adequately funded national programme for Deep Brain Stimulation surgery as outlined is the most equitable way of delivering such services to the relatively small number of New Zealand patients who are likely to require it. Establishment of such surgical programmes is well beyond the scope of other DHBs in the country; we have presented cogent reasons why Auckland City hospital is uniquely situated to conduct such a programme. The programme would allow equitable access for all people throughout New Zealand independent of their particular DHB. Funding would need to be set at a level which covers the true cost of the work-up, surgery and after-care and to allow for possible increase in case load with increasing use of the technique.

c) What is the expected health gain for the affected population?
The health of selected patients with Parkinson’s Disease, Benign Essential Tremor, Dystonia, Cerebellar Outflow disorders and Hemiballismus will be improved. Studies show a significant gain in quality of life is to be expected. Appropriate surgical treatment will be timelier at less cost to the New Zealand health system.

d) What is the timeframe?
The programme could be fully functional within six months as all the infrastructure required is already in existence and functioning at Auckland City Hospital with the exception of the Medtronic Stimpilot system.
e) What is the alternative, either currently provided or as an alternative new intervention?

Continue with the current system with patients continuing to be operated on in Australia at an unnecessarily larger cost to the New Zealand health system and with dislocation of patients and their relatives together with uneven follow up care. At present, complications, should they arise, are usually dealt with by local New Zealand neurosurgeons. This is regarded as less than ideal as the neurosurgeon will not previously have been involved in the patient’s care. The Australian units do not provide full comprehensive follow-up care.

f) How does the proposal contribute to the delivery of modern models of care (see Appendix 1 of Considered Judgement Guide)?

The delivery of Deep Brain Stimulation treatment for patients with certain movement disorders, in particular Parkinson’s disease, will be carried out by a multidisciplinary team as indicated with a focus of continuity of care and informed patient/family participation. Apart from the inpatient component of care at the time of the surgical procedure, the focus will be on ambulatory care. The service configuration is designed to provide a national care plan for this group of patients with a clear decision-making structure.

8 Cost benefit analysis

The reviewers are likely to be looking for some (or all) of the following:

- capital costs
- annual operating costs
- downstream costs
- marginal cost savings
- point of cost neutrality
- how the costs compare with the current pathway (versus proposed pathway).

Capital costs

There are no capital costs (see section 13) since the required facilities are already in existence. The Medtronic ‘Stimpilot’ hireage system eliminates the need to purchase additional equipment required for the operative procedure.

Annual operating costs

There are no fixed costs. Costs are per procedure.
Please see attached Appendix 1, showing the costing for bilateral IPG implants for a typical patient receiving deep brain stimulation to both STN for Parkinson’s disease. The costings for other bilateral procedures in the thalamus or globus pallidus would be essentially the same.

These compare very favourably with those from the Sydney, St Vincent’s Hospital unit and St Andrews Hospital in Brisbane, Australia.

On an annualised basis (assuming six patients operated upon), this would represent a saving for the New Zealand health system of at least NZ$153,065 (for direct surgical costs), not including the costs for travel, accommodation etc for which even greater savings may be expected to be realised.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Surgical cost*</th>
<th>Travel and accommodation</th>
<th>Total cost</th>
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</thead>
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<td>ACH</td>
<td>NZ$73,689</td>
<td>NZ$ variable</td>
<td>NZ$ ?</td>
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<tr>
<td>Sydney</td>
<td>AUS$85,087</td>
<td>AUS$ variable</td>
<td>AUS$ ?</td>
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<tr>
<td>Brisbane</td>
<td>AUS$86,253</td>
<td>AUS$ variable</td>
<td>AUS$ ?</td>
</tr>
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</table>

* Surgical cost includes all hospital, radiological costs and medical fees.

**Downstream costs**

Downstream costs involve those related to patient follow up, management of complications and anticipated IPG replacement after 4–5 years. Currently, follow-up care is predominantly undertaken in the patient’s DHB by the patient’s neurologist so that no increase in costs would be expected.

Where this is impracticable in the current patient care pathway, patients may return to the Australian unit. The costs are paid by the patient’s DHB.

The Auckland City Hospital Movement Disorders Clinic would be able to provide similar follow up care for patients from other DHBs with costs likely to be significantly less than the Australian counterpart.

ADHB patients will already be under the care of the Movement Disorders Clinic so that increase in costs is unlikely; indeed successful DBS may result in less frequent visits and reduced costs.

**Marginal cost savings**

The principal savings relate to the need for less medication and reduced frequency of follow-up visits. Using data taken from the Australian MSAC report of 2006, marginal cost savings of at least NZ$178,758 for six patients over five years could be expected.
Point of cost neutrality

While there would be an additional immediate cost savings for the New Zealand health system with the proposed patient care pathway, the results from limited studies\(^5\) show cost neutrality in a European setting after 2.2 years as a result of Deep Brain Stimulation treatment for Parkinson’s disease. As the benefits of Deep Brain Stimulation have been documented thus far to continue for at least five years in published literature, greater gains are to be expected.

How the costs compare with the current pathway (versus proposed pathway)

Annual operating costs of the proposed pathway compare very favourably with the current pathway (see annual operating costs above).

9 Cost effectiveness

The reviewers are likely to be looking for answers to some (or all) of the following:

a) What is the likely cost per life year saved (if any)?

Deep Brain Stimulation is concerned with relief of morbidity and improvement in health-related quality of life. This treatment, given to relatively young patients not expected to die and with a high level of disability, can be expected to result in a reduction of the high costs to the health system in caring for such patients.

b) Are there any estimated savings that will accrue from the proposal?

In the two most recent HTA publications\(^{30, 31}\) on Deep Brain Stimulation treatment and the 2003 NICE guidelines\(^{32}\) it was concluded that Deep Brain Stimulation was effective.

The overall cost to the New Zealand health system will be reduced in treating those patients needing Deep Brain Stimulation. The computed total immediate savings is at least NZ$153,065 per annum with additional marginal cost savings of at least NZ$178,758 over five years (taking into account pharmacotherapy cost reduction only - see Australian MSAC report\(^{31}\) as discussed below).

While published data on cost effectiveness is not comprehensive, the most recent and very detailed Australian MSAC report\(^{31}\) concluded that the total cost is acceptable for patients in whom other therapies are insufficient and recommended public funding be provided. (The Australian MSA has issued two earlier reports in 2001 and 2004, both recommending continuation of the then current funding.) The Australian Ministry of Health and Aging has accepted the MSAC’s 2006 recommendation.

The Australian findings are arguably the most relevant to the New Zealand situation.
Some costs calculations which were taken into account by the Australian MSAC were:

<table>
<thead>
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<th>Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of procedure</td>
<td>AUS$67,475–$73,204</td>
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<tr>
<td>Additional costs over five years</td>
<td>AUS$9,956</td>
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<tr>
<td>Pharmacotherapy cost reduction over five years</td>
<td>AUS$57,200</td>
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<tr>
<td>Reduction of patient fall costs</td>
<td>AUS$ unknown</td>
</tr>
<tr>
<td>Other indirect cost reductions</td>
<td>(eg, return to employment)</td>
</tr>
</tbody>
</table>

Quality of Life (QOL) as an economic variable could not be quantified.

It was calculated that the extra costs to improve the UPDRS score by 23.7 (a clinically significant improvement) over five years was AUS$20,232–25,961 per patient.

A similar calculation of costs and cost effectiveness in the Ontario study\(^{30}\) showed costs, including predicted offsets, per patient in the first year after surgery would be less than C$25,620, a figure which was thought to be an overestimate. When a 10-point improvement in motor score was accepted as a clinically significant change (with which we agree), a calculation of cost-effectiveness of Deep Brain Stimulation was estimated to be less than C$11,650 per 10-point improvement in motor function score.

A frequently quoted study of Tomaszewski and Holloway published in 2001\(^{23}\) describes a cost-effective analysis model of Deep Brain Stimulation treatment (which we feel is limited by available literature at the time, nature of the assumptions made and the absence of QOL data). With this model, however, an improvement of QOL of 18% or more was likely to be cost effective compared with best medical treatment. The range of QOL in studies of Parkinson’s disease treated with Deep Brain Stimulation reported so far is 16–62%.\(^{1}\)

c) When will these occur?

Because of the cost differential of the surgery between Australian units and Auckland City estimated costs, some savings would be immediate.

With regard to the cost effectiveness of the surgery itself, the recent study of Fraix et al\(^{5}\) showed there was likely to be a return on investment of the costs associated with Deep Brain Stimulation surgery for Parkinson’s disease after 2.2 years. Since the documented benefit of surgery can be expected to continue for five years (and presumably more) further financial gain might be expected.

d) Are there any potential efficiency gains?

Those related to centralising care and avoidance of the need for more costly overseas treatment.
10 Equity and opportunity cost

The reviewers are likely to be looking for answers to some (or all) of the following:

a) What are the alternatives to compare this proposal to?
There are no alternative proposals to compare this proposal to.

b) What could be done instead? Who would benefit then?
Continue the status quo with patients continuing to travel to Australia.

With regard to equity, please see our comments in section 7 b) and c).

11 Community acceptability and ethical issues

The reviewers are likely to be looking for answers to some (or all) of the following:

a) Is the proposal consistent with community values?
Yes. There is an intense interest in Deep Brain stimulation treatment within the community of Parkinson’s disease patients in particular. Patients tend to be well informed because of information obtained via the internet.

Repeated enquiry has been made by the NZ Parkinson’s Society on the behalf of members, families and caregivers seeking assurance that the surgery will be performed in New Zealand.

The community at large expects that “high cost/ high-tech” treatments will be available to those who could benefit.

Patients needing DBS in other DHBs would receive an upgraded national service entirely integrated within New Zealand leading to less travel and dislocation of their health needs.

b) Are there significant ethical, social, political or legal issues, or other patient concerns surrounding the use of the technology?
None that are known.
12 Funding stream and affordability

The reviewers are likely to be looking for answers to some (or all) of the following:

(a) How will the capital costs be funded?

There are no new capital costs. Purchase of some equipment required for monitoring during surgery is to be avoided by the hireage scheme (Stimpilot).

(b) How will the annual operating costs be funded?

There are two scenarios:

(i) Central funding - via a dedicated funding stream supporting a national service which we prefer and are advocating.

(ii) DHB - we do not regard this as an effective approach.

Central funding

There is a rational argument for provision of “high cost, high tech” services to be funded in this manner with, development of expertise, economies of scale, rationalisation and equity of access for patients within New Zealand independent of DHB funding constraints being the main supporting features.

The current funding model for Deep Brain Stimulation surgery, via the high cost treatment programme, is an indication that Deep Brain Stimulation has been accepted as an appropriate treatment by the Ministry of Health. The level of funding has not been precisely set. Funding has occurred on a case by case basis after recommendation of the National DBS committee. We understand that there is provision to fund a number of cases per year, possibly up to six.

A detailed submission similar in its content to the present application was sent to the Ministry of Health in 2006 by the Auckland City Hospital Surgical services Administration after formal presentation by ourselves with acceptance and enthusiastic support of the Auckland City Hospital Administration at senior level.

After deliberation, the Ministry referred the submission back, requesting it should be considered through the new decision making structure beginning with the local DHB CPC.

As an interim funding measure, it was suggested by ourselves that the monies from the high cost treatment programme used to fund Deep Brain Stimulation overseas be made contestable, however, this suggestion has been rejected.
c) Does the proposal rely on any new funding? If so is it approved or likely to be?
Yes (see above).
Central funding via a dedicated funding stream supporting a national Deep Brain Stimulation surgical service is required.

d) Are there inter-district flow implications, if so, how would they be managed?
There is unlikely to be any as far as the initial assessment and surgery is concerned as the proposed system will mean only a change of the hospital in which the surgery is performed from other DHBs viewpoint.

Follow-up and maintenance would be provided by the ADHB national unit with costs being a charge to the patient’s DHB, or by the patient’s own DHB neurologist.

e) What is the likely effect on other DHBs of the proposal?
There is unlikely to be any effects.

f) Are there likely to be flow-on effects in other hospitals/DHBs?
See d) above.

13 Service configuration and implementation planning
The reviewers are likely to be looking for answers to some (or all) of the following:

a) Have the flow on effects been identified?

b) Have any service configuration or implementation issues been raised?
The proposed National Stereotatic Deep Brain Stimulation Neurosurgical Programme for Movement Disorders in conjunction with the Movement Disorders Clinic, Auckland City Hospital configuration is as follows:

A. Existing resources - personnel

a) Neurosurgeon
There is a history of functional Neurosurgery for movement disorders at Auckland City Hospital. Mr Graeme Macdonald, now retired, had the largest experience of Thalamotomy in New Zealand with excellent results. These were presented to the Neurosurgical Society of Australasia in 2002.
Mr Arnold Bok has performed over 40 pallidotomies and four thalmotomies as part of the National Pallidotomy Programme. Forty-two percent of patients treated under this programme came from outside the Auckland region with 58% being referred from the Auckland neurosurgical service area.

Mr Bok has a strong interest in developing deep brain stimulation and has attended workshops on functional neurosurgery. The results of a study of 34 cases of Pallidotomy in Parkinson’s disease in Auckland performed by Mr Bok were presented to the Neurosurgical Society of Australasia in 2002 and to the Neurological association of New Zealand in 2003.

Mr Bok has also visited the neurosurgical units involved in DBS surgery in Brisbane and Sydney.

The experience Mr Bok has derived from the performance of Stereotactic Pallidotomies and Thalamotomies and the frequent performance of stereotatic biopsies of lesions in most regions in the brain, using the same technology, makes him the most experienced and pre-eminent neurosurgeon in the country in this area, uniquely placed to perform DBS surgery.

b) Neurologists

Dr Barry Snow has an extensive research and practical experience in the management of movement disorders. He has over 100 publications in the area. He has published on pallidotomy. He has led the development of the pallidotomy procedure at Auckland City Hospital.

Dr David McAuley is the senior neurologist in the Auckland City Hospital, Neurology Department, and has extensive clinical experience in the management of Parkinson’s disease and other movement disorders. He has also participated in the care of patients for pallidotomy and in the selection process as well as pallidotomy surgery. He has attended international workshops and teaching programmes on functional surgery for movement disorders. He has also attended and assisted at deep brain stimulation procedures in both Sydney and Brisbane. He is currently the Chairman of the NZ Deep Brain Stimulation Selection Committee and has headed the maintenance programme for patients following surgery in the northern region. He is proficient in stimulator programming.

c) Movement Disorders Nurse

Lorraine Macdonald is a specialised movement disorders nurse. She has helped select patients for pallidotomy, supervising them throughout the procedure. She is an integral member of the team. She has participated in research projects and has the academic skills to assist in audit of any ongoing programme.
d) **Liaison Psychiatrist**

Dr Gregory Finucane has developed an expertise in the management of psychiatric disorders in Parkinson’s disease. He is closely involved in the programme and has helped select patients for the surgical procedure.

e) **Neuropsychologist**

Hugh Kent is a neuropsychologist who works closely with Dr Finucane.

### B. Existing resources – infrastructure and equipment

a) **The Movement Disorders Clinic**

This clinic was established in 1996. It was devised to process the management of patients with movement disorders for the northern region and also for patients from throughout New Zealand. This clinic has also acted as focus for research for papers from the clinic itself and from other groups wishing to recruit patients. The Movements Disorders Clinic participates intensively in educational programmes for doctors and other professional groups who care for patients with movement disorders and also patient education. The clinic has produced literature in this area which has been disseminated throughout New Zealand. The clinic also keeps an extensive database on patients under its care. There is also an indexed videotape library.

b) **Available equipment**

High quality neuroradiology with full MRI and CT scanning equipment is available. A CRW MRI compatible stereotactic frame is also available. A Stealth Frameless Navigational Guidance system and an image fusing system are available for accurate targeting. The CT and MRI images can be fused and a stereotatic atlas can also be employed for further ease of identification and target accuracy.

The equipment required for stimulator (IPG) programming is already available and is shared with the Auckland City Hospital Pain Service.

The Medtronic Company can now provide a “stim-pilot” package which can be hired on an ad hoc basis. This provides all the additional equipment necessary to perform Deep Brain Stimulation surgery; it gets around the need for capital outlay for additional expensive equipment which may require updating from time to time. The stim-pilot system includes a micro driver for holding the fine electrodes in place and advancing them in fractions of a millimetre into the brain when near the target. Included in the stim-pilot system is the electronic system necessary for intra-operative stimulation and micro-electrode recordings to physiologically check the final position of the inserted stimulation electrodes. The Medtronic Company provides a staff member skilled in assisting with the electronic recording.
Maintenance of a high quality service will require on-going quality assurance and constant “upskilling” as the area of DBS is still undergoing development. The staff will meet this need by attendance at international conferences and workshops. Costs would be met by existing CME programmes. We already have established relationships with units in Australia and exchange information as well as advice.

The clinic would expect to be involved in education concerning DBS of New Zealand neurologists and other interested physicians as well as patient interest groups (such as the NZ Parkinsonism Society). Presentations of results will be made at the Neurological Association of New Zealand annual scientific meeting.

14 Expert clinical evidence and health technology assessment (including challenges to the evidence)

The reviewers are likely to be looking for answers to some (or all) of the following:

a) Is the information comprehensive?

b) Does the evidence support the proposed change?

c) Are there other likely future users/applications for the technology?

Literature review

Parkinson’s disease

There is now convincing and comprehensive evidence of the efficacy and safety of deep brain stimulation treatment for Parkinson’s disease. The increasing number of published studies is evidence the procedure has gained widespread acceptance and is recognised as an acceptable option when medically intractable symptoms have occurred. Most agree that the risk to benefit ratio of DBS is favourable.

There is level 1b evidence that bilateral Deep Brain Stimulation of the Subthalamic Nuclei is effective in the short term and at least level 3a evidence that the effect continues for up to five years.

The most common target is STN but some studies have targeted GPi. The weight of opinion is in favour of STN stimulation. However, there are potential reasons for targeting one in favour of the other which requires further study.

Treatment results up to 2002 were summarised by Pollak et al. The main evidence of the efficacy of DBS for PD currently comprises uncontrolled case series, the larger and most notable of which includes that of the Deep brain stimulation for Parkinson’s disease study group in 2001, P Krack et al in 2004, W Schapbach et al in 2005; Rodriguez-Oroz in 2005; Fraix et al and R Goodman et al in 2006. Follow up in these series now extends out to five years.
Two meta-analyses including these and other studies have been published in the last two years by Weaver et al.\textsuperscript{7} and Kleiner-Fisman et al.\textsuperscript{11} respectively with a detailed systematic review of the literature published by Hamani et al.\textsuperscript{8} The weakness of these data is the lack of randomised controlled studies (with one recent exception).\textsuperscript{2}

The main endpoints used in the majority of these studies have been the motor effects usually measured by the UPDRS III with stimulator on and no drugs given post-operatively and the L-dopa equivalent reduction in drug dosage. Secondary endpoints have included the reduction in “off” time and other parameters such as the reduction in dyskinesia. In some, changes in ADL’s, as measured by the UPDRS II score, have been studied while lesser attention has been given to health-related QOL changes.

The recent systematic review of the literature by Hamani et al.\textsuperscript{8} described the outcomes of 471 patients with Parkinson’s disease treated with bilateral subthalamic nuclear stimulation. With stimulation on, UPDRS III motor scores in the off-medication condition improved by 50% after six months, 56% after 12 months, 51% after two years and 49% after five years compared with the pre-operative off-medication scores. At 12 months of STN stimulation, the mean improvement in tremor was 81%, in rigidity 63%, in bradykinesia 52%, in gait 64% and in postural instability 69%, when compared with pre-operative off-medication scores. On-medication dyskinesias were reduced by 94% as assessed 12 months after stimulation using the UPDRS for complications of therapy score. There was an overall 52% reduction in the levodopa-equivalent dose intake after 12 months of stimulation. Most adverse effects were mild to moderate. There was a 1–2% incidence of severe adverse effects (death or permanent neurological deficit related to intracerebral haemorrhages). Nineteen percent of patients had adverse effects related to stimulation that could be reversed by changing stimulation parameters. There was a 9% incidence of adverse effects related to the hardware (infections, lead and pulse generator problems).

Similar results were obtained in the most recent meta-analysis published by Kleiner-Fishman G et al.\textsuperscript{11}

A large short-term study published in September 2006\textsuperscript{2} is the first randomised trial of DBS for PD. This study used randomised pairs methods with the primary endpoint being changes from baseline to six months of the QOL as assessed by the PDQ-39 and the severity of motor symptoms without medication as measured by the UPDRS III. Various secondary outcome measures included changes in dyskinesia scale and in the ADL as measured by the UPDRS II and the Schwab and England scale. This trial also confirmed the superior efficacy of neuro-stimulation over best medical management in patients with advanced Parkinson’s disease and levodopa-related motor complications. A significant and clinically meaningful improvement in QOL for the patients studied was obtained. The patients had longer periods and better quality of mobility with less dyskinesia.
Other studies\textsuperscript{1, 14, 25, 26, 27, 28} have also addressed improvement in Health-related QOL measures, showing positive results.

A useful and authoritative summary of the management of late stage Parkinson’s disease\textsuperscript{29} was published in 2006 by the European Federation of Neurological Societies (EFNS) and the Movement Disorders Society-European Section (MDS-ES) which incorporates the indications for DBS.

The economic impact of Parkinson’s disease itself and of Deep Brain Stimulation as a treatment has been addressed by some studies.\textsuperscript{5, 23, 24} The European SPARK study group published a study last year\textsuperscript{5} showing STN Deep Brain Stimulation has good outcomes and little cost burden in Parkinson’s disease with L-Dopa induced motor complications. The costs became neutral after 2.2 years.

**Essential tremor**

DBS of the thalamus for treatment of medically intractable Essential Tremor has repeatedly been shown to be highly effective in published case-series studies.

Lee et al in 2005,\textsuperscript{13} for example, showed a statistically significant improvement in FTM action tremor scores and writing scores over a median follow-up period of 27 months. The incidence of complications was similar to that experienced in treating patients with Parkinson’s disease.

The results have been shown to be maintained for at least six years by Sydow and others.\textsuperscript{17}

In addition to suppression of the primary symptom of tremor, DBS has been shown to improve quality of life as measured by standardised scales.\textsuperscript{13, 14, 15, 1}

The recent report of the Quality Standards Subcommittee of the American Academy of Neurology: Practice parameters, therapies for essential tremor,\textsuperscript{16} came to the conclusion that DBS of the VIM thalamic nucleus may be used to effectively suppress medically refractory limb tremor in essential tremor and has fewer adverse side effects than thalamotomy.

**Dystonia**

Treatment of Dystonia in its various forms by DBS is still currently undergoing development. The technique has predominantly comprised stimulation of the Globus Pallidus interna while in some instances; stimulation of the Thalamus has been used. Case reports or small case series are the principal evidence that it is effective.\textsuperscript{18} The best results so far have been obtained with primary generalised Dystonia\textsuperscript{19} particularly those patients who are positive for the DYT1 gene mutation. There are reports of good responses of some patients with secondary Dystonia and some patients with Heredodegenerative Dystonia.\textsuperscript{18} Hemidystonia seems to respond less well because of
the presence of associated focal brain lesions. Severe focal Dystonia (which has been unresponsive to other treatments such as botulinum toxin injections), for example Spasmodic torticollis and Meig’s syndrome have responded well. Results have usually been expressed in terms of improvement of scores using one of three abnormal movement scales with the Burke-Fahn-Marsden movement scale scores being most commonly employed. There is some data which shows decrease of loss of disability and improvement of quality of life in patients with Dystonia.¹

Cerebellar outflow tremor

In the review of Wishart et al²⁰ 75 cases were collected from the literature up to 2002 of Thalamic DBS treatment for tremor caused by Multiple Sclerosis with follow up to 12 months. Tremor reduction and improvement in daily functioning was achieved in most patients with 88% experiencing sustained improvement in tremor. Some data concerning improvement in quality of life in such patients exists.¹ The procedure did not seem to increase the MS relapse rate. More reprogramming was necessary to maintain the effects over time than in other disorders such as Parkinson’s disease.

Other types of Rubral (Holmes) tremor following trauma or after hemiplegia have been treated with Thalamic DBS.²¹ The numbers of cases are too small to draw any definite conclusions. Improvement in tremor has been reported.

Hemiballism

A very small literature exists on the use of DBS in Hemiballism. The case report of Nakano et al²² for example demonstrated the successful long-term treatment of this disabling disorder.

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### 16 Appendix: Scoring tool

<table>
<thead>
<tr>
<th>(A) Quality of evidence (for costs v outcomes)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will be reduced with either an improvement or no change in outcomes (cost neutrality point expected within first 12 months)</td>
<td>100</td>
<td>90</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will be reduced with either an improvement or no change in outcomes (cost neutrality point expected within first two years)</td>
<td>90</td>
<td>80</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will be reduced with either an improvement or no change in outcomes (cost neutrality point expected within first three years)</td>
<td>60</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will remain neutral but outcomes will improve</td>
<td>60</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will be increased but patients will likely experience significantly improved overall survival rates</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Submission indicates that, for the diagnostic group in question, procedure costs will be increased but patients will likely experience significantly reduced morbidity rates</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

The grades of evidence used are those by Eccles et al (BMJ 316:1369, 1998):
• Grade A: Directly based on category I evidence.
• Grade B: Directly based on category II evidence, or extrapolated recommendation from category I evidence.
• Grade C: Directly based on category III evidence, or extrapolated recommendation from category I or II evidence.
• Grade D: Directly based on category IV evidence, or extrapolated recommendation from category I, II, or III evidence.

The US Agency for Health Care Policy and Research defined the categories or levels of evidence as:
• Level Ia: Evidence from meta-analysis of randomised controlled trials.
• Level Ib: Evidence from at least one randomised controlled trial.
• Level IIa: Evidence from at least one controlled study without randomisation.
• Level IIb: Evidence from at least one other type of quasi-experimental study.
• Level III: Evidence from non-experimental descriptive studies such as comparative studies, correlation studies and case-control studies.
• Level IV: Evidence from expert committee reports or opinions and/or clinical experience of respected authorities.

(B) Cost effectiveness

New technologies that:
• cost $5,000 or less per life year saved would earn an extra 15 bonus points
• cost $5,001-$10,000 per life year saved would earn an extra 10 bonus points
• cost $10,001-$20,000 per life year saved would earn an extra 5 bonus points.

(C) Additional qualifiers for MOH and ADHB priority areas

Each priority area that is included in the submission regarding a particular diagnostic group is given an additional 2 points. The 13 objectives included by the MOH as having priority are as follows (highlight those qualifiers that you believe apply):
1. Reduce smoking.
2. Improve nutrition.
3. Reduce obesity.
4. Increase the level of physical activity.
5. Reduce the rate of suicide and suicide attempts.
6. Minimise harm caused by alcohol and other drug use.
7. Reduce the incidence and impact of cancer.
8. Reduce the incidence and impact of cardiovascular disease.
9. Reduce the incidence and impact of diabetes.
10. Improve oral health.
11. Reduce violence in interpersonal relationships, families, schools and communities.
12. Improve the health status of people with severe mental illness.
13. Ensure access to appropriate child health services.

In addition, if a diagnostic group that is the focus of the submission falls within the following MOH priority service delivery parameters it will be given a further 2 points:

A. Public health.
B. Primary health care.
C. Reducing the waiting time for elective services.
D. Increasing the responsiveness of mental health services.
E. Improving the accessibility and appropriateness of services for people living in rural areas.

Furthermore, ADHB has, in its strategic plan, outlined initiatives of value to the organisation. Any submission which impacts on, or addresses, one or more of the following will be given an additional 2 points per valued initiative:

(CPC ‘measures’ of such priority areas are currently being established.)

I. Increase the predictability of resource utilisation for a given diagnostic group (For CPC purposes: The technology must be one that directly facilitates an increase in prediction of x percentage more than current).

II. Increase standardisation, consolidation and integration (for CPC purposes: the technology must be one that directly facilitates an increase in standardisation, consolidation and integration of approximately x percent).

III. Improve the ability of ADHB to measure improvements (for CPC purposes: the technology must be one that directly allows other improvements to be measured).

IV. Improve workforce development (for CPC purposes: ...).

V. Provide specified management plans for high cost patients (for CPC purposes: need to specify $ amount).

VI. The impact of the new initiative on the diagnostic group in question would be to meet or supersede national benchmarks for managing such patients (for CPC purposes: ...).

VII. Improve cross-sector relationships (university, neighbouring DHBs etc) (for CPC purposes: the technology must be one that directly facilitates improvement of a cross-sector relationship if implemented).

VIII. Measure costs accurately (for CPC purposes: the technology must be one that directly allows costs of other technologies to be measured).
IX. Prioritise Maori, Pacific Island, migrant and poor patients (for CPC purposes: these groups must be shown to have a higher incidence of the condition that the technology addresses).

X. Improve responsiveness to acute demand (for CPC purposes: the new technology must be estimated to be able to address x percentage of current demand, not currently being addressed).
Information on Deep Brain Stimulation: Treatment for Parkinson’s Disease and Certain Other Movement Disorders

Dr D McAuley, Neurologist, Movement Disorders Clinic, Auckland Hospital

A Background to surgery

Parkinson’s disease

Parkinson’s disease results from the loss of certain dopaminergic neurones (nerve cells which release the chemical neurotransmitter dopamine) in the brain. As a result of the loss of these neurones, patients develop the symptoms of Parkinson’s disease, namely tremor, stiffness of the muscles, slowness of movements and impaired balance. The disease is slowly progressive over many years. The most effective treatment remains medication, particularly the drug L-Dopa. This treatment enables the lacking Dopamine to be replaced within the brain, thereby improving the symptoms and signs of Parkinson’s disease. After a period of time, however, often up to ten years, fluctuations develop in the response to L-Dopa therapy. The fluctuations take various forms. They can become very unpredictable. In addition, involuntary movements called dyskinesia also develop. The combination of fluctuations and dyskinesia can be very troublesome.

Because of these problems in the long term management of Parkinson’s disease, surgical procedures have been developed to try to control both the fluctuations and the dyskinesia. One of these surgical procedures is Deep Brain Stimulation. At present this procedure is only used for patients whose symptoms cannot be adequately controlled with optimum medication.

Surgery

Deep Brain Stimulation (DBS) is an extension of surgical procedures performed successfully for many years around the world, including in New Zealand. The older surgery involved destruction of tiny areas in the brain that are not functioning properly. The targets in the brain have included the Thalamus (Thalamotomy) and Globus Pallidus (Pallidotomy). There were specific reasons for performing one or other of these operations. The older type of surgery is now performed very infrequently because DBS is considered superior.
Pioneers of DBS in France found that it was possible to obtain similar, if not better results, by continuously electrically stimulating the same targets in the brain. This technique is thought to probably work by ‘stunning’ the target area without permanently damaging the nerve cells in the region and blocking abnormal nerve signals.

A newer and seemingly better target is the Subthalamic Nucleus. Most centres worldwide now place the stimulating electrodes in the Subthalamic Nucleus for Parkinson’s disease and in the Thalamus for Benign Essential Tremor.

The technique has the advantage that stimulation can be turned off whenever required. The procedure can be done on both sides of the brain if necessary. The technology used in placing the stimulating wire electrodes into the precise target in the brain is essentially the same as that used in the older surgery. Because the Subthalamic nucleus is a smaller target than the others, even more precision is required. This means an impeccable operative technique is needed to confirm the location of the target.

The implanted electronic stimulator is very similar to a cardiac pacemaker and will continue to function for up to about four to five years before the battery needs to be changed. The stimulator is controlled by an electronic programmer placed on the chest over the unit when required.

Like the earlier types of surgery, Deep Brain Stimulation has specific indications and is only suitable for a minority of patients with Parkinson’s Disease and certain other Movement Disorders such as Benign Essential Tremor.
B Description of surgery

All anti-Parkinson’s medication is withheld from the evening prior to the surgery but other essential medication is continued.

The entire operation of electrode (electrical wire) implantation is done under local anaesthetic with the patient awake. Local anaesthetic is used to numb the areas where the head frame equipment will be placed. Mild sedation may also be used intermittently if necessary. A special (Stereotatic) frame is attached to the head which enables calculations to be made so that the exact site for the stimulation electrode can be measured. An MRI scan of the brain is also done with the frame attached to the head. The MRI is an extremely accurate way of mapping the part of the brain which is to be the target.

Local anaesthetic is also used to numb the area of the skin over the skull before a small hole is made. As the patient is still awake it may be possible to hear what is being done and to talk to the surgeon and other members of the team at this stage. A fine temporary electrode is passed into the brain to the target cells. The neurologist and neurosurgeon use the temporary electrode to ensure the target cells have been located. The electrode is stimulated while the patient is examined to check that the abnormal movement pattern improves with the stimulation. Electrical recordings may also be taken from the electrode to further check that the electrode is correctly placed in the desired target. Characteristic patterns of electrical activity arising from the target cells are looked for. Once the correct position of the electrode is confirmed, final calculations on the computer are made for the exact location. The temporary electrode is then removed and the permanent stimulation electrode is inserted along the same pathway. The permanent electrode is a thin insulated wire.

With accurate positioning of the electrodes on both sides of the brain achieved, the permanent stimulator electrodes are fixed in position so that they cannot move from the correct part of the brain. The operation in total usually lasts approximately four to six hours.

During the next five to seven days, with the patient back in the ward, testing of the electrodes is carried out by the neurologist and the likely settings for the stimulators are determined. After this time, the patient is taken back to the operating theatre where the electrode is connected to the Implantable Pulse Generator (stimulator) on both sides under general anaesthesia. As the patient is asleep there is no pain or discomfort. A connection cable is passed under the skin from the chest to the head to connect the permanent stimulator electrode to the stimulator itself. The stimulator is implanted in the upper chest just below the collar bone, at the end of the cable. All parts are now implanted.
The Implantable Pulse Generator (Stimulator) is a small metal box about the size of a stop watch which contains the battery and electronic circuitry that produces the stimulation pulses. It is very similar to a cardiac pacemaker.

Prior to discharge from the hospital, the stimulators are programmed to give continuous stimulation of the target nerve cells. The doses of the anti-Parkinsonian medication the patient was previously taking are also modified.

During subsequent follow up the stimulators are adjusted if necessary while the drug dosages are further modified. It is usually possible to reduce the doses of medication substantially although there is generally a continuing need to take some. The effects of the electrical stimulation allow the dose to be reduced with the same overall benefit in symptom control. It is the reduction in dose of the medication which leads to a significant improvement in side effects such as dyskinesias and motor fluctuations.

C Complications and risks of the procedure

Short-lived discomfort at the operative sites may occur. Some discomfort may also be apparent at the site of the stimulator but this is usually minor.

As with all surgical procedures on the brain, there is always a risk of major neurological or neurosurgical complications. The neurosurgeon who performs the procedure will explain in detail all possible complications that could occur as a result of the surgery. These can include:

(a) the risk of the stimulator or the connecting wires moving or eroding through the skin - less than 1%
(b) movement or breakage of the electrode leads - less than 1%
(c) the risk of infection
(d) haemorrhage within the brain - extremely rare; in those cases in which this has been reported the haemorrhage has been very small and not usually associated with any significant neurological deficit
(e) leakage of the cerebrospinal fluid (CSF) through the wound is uncommon
(f) mood changes can occur rarely; patients with significant previous psychiatric disorders are not thought to be good surgical candidates for this reason
(g) difficulty speaking may occur rarely.

The overall risks for this surgical procedure of any complication is small and less than 5%.
D  Expectations and results of DBS for Parkinson’s disease

(a) Patients who are likely to benefit from this surgery and judged least likely to experience significant side effects, of necessity have to be very carefully assessed; this takes time.

(b) The surgical procedure itself is very lengthy and demanding of the patient; it requires lying on an operating table, awake, with the head frame attached for some hours.

(c) The best effects one can hope for from DBS surgery is the same as that obtained from optimum drug treatment (L-Dopa) without the side effects (dyskinesia and fluctuations). Dyskinesia will be reduced/minimised as will fluctuations while at the same time an increase in “on” time is to be expected. It may be possible to reduce the doses of or even stop some of the anti-Parkinson’s medication.

(d) Not all symptoms will be controlled.

(e) The stimulators can be adjusted as necessary to meet the patient’s needs.

(f) The stimulators can be turned off altogether at any time.

(g) The procedure is non-destructive and reversible.

E  Funding in New Zealand for the procedure

Restricted funding is available from the NZ Health Department High Cost Treatment Programme for patients who fulfil the criteria to allow them to have the procedure. A NZ National Committee comprised of neurologists and neurosurgeons determines which patients are likely to benefit and therefore should be funded. Applications to the committee are usually made via the patient’s own neurologist.

F  Further information

- The Parkinsonism Society of New Zealand www.parkinsons.org.nz/
- Neurological Foundation of New Zealand www.neurological.org.nz/
- British Parkinson’s Disease Society http://www.parkinsons.org.uk/
- American Parkinson’s Association http://www.apdaparkinson.org/user/index.asp
- Cleveland Clinic-Web MD
  http://www.webmd.com/content/article/46/1833_50743.htm

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