

# Appendix L: Economic modelling for Parkinson's disease nurse specialist care

The appendix from CG35 detailing the methods and results of this analysis is reproduced verbatim in this section. No revision or updating of the analysis has been performed as part of the 2017 update.

## 1.1 Background

The Parkinson's Disease Society is encouraging the development of Parkinson's disease nurse specialists (PDNS) across the UK. There are in the region of 180 nurses already in post with plans to increase this to 240 over the next few years (GDG).

A literature search was performed to identify economic evaluations of PDNS care. One study met quality criteria<sup>362</sup> and is presented along with the clinical evidence of Parkinson's disease nurse specialist intervention.

In practice there may be interactions between PDNS care and standard care, which makes it difficult to separate the costs and benefits discretely between the interventions. The GDG considered monitoring medications, as opposed to diagnosing, which is an appropriate example of where PDNS care may substitute standard care with equivalent outcomes. Therefore, the GDG felt it was of value to investigate in this guideline the cost implications of PDNS care based on equivalent effectiveness of completely substituted activities.

## 1.2 Aim

The aim was to estimate the costs and costs saved with equivalently effective and completely substituted PDNS care in comparison to standard care over a 1-year period from the NHS perspective. The additional costs of PDNS care and the cost savings per home visit, per clinic consultation and per hospital-based visit were calculated.

## 1.3 Methods

The annual cost per PDNS was estimated using the sum of the annual salary and training costs discounted at 3.5%. Additional costs of PDNS care were estimated using the unit costs of other professionals' time used in discussing patient care.

Cost savings were estimated from the perspective of the NHS. Estimates were derived from unit costs and discounted at 3.5% (Table G1). Savings were calculated for PDNS care by (a) home visit (b) clinic consultation and (c) hospital-based visit. To calculate savings per intervention, the unit costs of standard care were used to estimate the resources saved by PDNS care.

The net cost of PDNS care over 1 year was calculated as the sum of the annual salary, training costs and additional costs of PDNS care minus the cost savings.

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## 1.4 Data sources

**Table G1 Unit costs derived from *Unit costs of health and social care 2004*<sup>418</sup>**

GP home visit lasting 13.2 minutes (plus 12 minutes travel time)	65
District nurse home visit (A–F)	20
GP clinic consultation lasting 12.6 minutes	28
Nurse practitioner in primary care surgery consultation	14
Hospital-based consultant: per patient-related hour (A–F)	114
Hospital-based staff nurse, 24-hour ward per hour of patient contact	41
Expected annual cost of training at 3.5% discount rate (district nurse)	5,149
Salary per year of district nurse	25,362
Additional cost per visit to GP by PDNS to discuss patient care	28
Additional cost per visit to carer to discuss patient care	0
Additional cost per visit to consultant to discuss patient care	38

**Table G2 Nurse activity – assessing patients<sup>362</sup>**

	Average number or per cent of patients assessed
Per week	13.7
At home	75%
At GP	14%
At hospital consultant clinics	11%

**Table G3 Nurse activity – discussing patients<sup>362</sup>**

	Number of visits per week
To GPs	5
To carers	2
To consultants	1

## 1.5 Assumptions

The main assumptions to this costing approach are as follows:

- PDNS care substitutes for standard care for ongoing monitoring of treatment at equivalent effectiveness.
- Nurse activity reflects substituted activities.
- PDNS care is provided at the unit costs and includes the costs for consultant time spent discussing patient care.
- Consultant time is costed per 20-minute visit.
- Healthcare resources for patients by PDNS, such as medication, are similar to standard care.<sup>362</sup>
- Administration activities are included in salary.
- Cost of visit to GP to discuss patient care = cost of nurse time included in salary + cost of GP time = £28.
- Cost of visit to carer to discuss patient care = cost of nurse time included in salary = £0.  
Cost of 20-minute visit to consultant to discuss patient care = cost of nurse time included salary + cost of consultant time = £38.

The results from a randomised control trial suggest PDNS care maintains clinical effectiveness and improves patients' sense of well-being.<sup>362</sup> This supports the assumption that PDNS care has at least equivalent effectiveness to consultant care.

It is not always clear whether PDNS care is substituting some or all of the consultant care or is serving as additional care.<sup>364</sup> In this analysis, consultant care is face-to-face contact with a consultant for PD care needs by a patient. Therefore, the cost-saving estimates pertain only to situations where care is a substitution, such as monitoring medications, and not where the care may be additional to standard care or duplicating standard care.

### Results

**Table G4 Net cost of PDNS over 1-year period with 3.5% discount rate**

Cost of training per year	+5,149
Cost of salary per year	+24,504
Additional costs of other health professionals' time discussing patients in one year	+8,974
Cost savings of other health professionals' costs from assessing patients in one year	-39,264
Net cost of PDNS care over one year	-637

**Table G5 Additional costs of nurse activity – discussing patient care**

	Number of visits per year to discuss patient care <sup>+</sup>	Costs per year (£ 2004)
To GPs	261	7,305
To carers	104	0
To consultants	52	1,983
Total costs		9,288
Total costs at 3.5% discount rate		8,974

<sup>+</sup>Estimated from Table G3 with 1 year = 52.2 weeks.

**Table G6 Cost savings of PDNS care when substituting standard care**

	Average number of patients assessed <sup>+</sup>	Costs per year (£ 2004)
Per year	714	
At home	536	34,848
At GP	100	2,802
At hospital consultant clinics	79	2,988
Total		40,638
Total costs at 3.5% discount rate		39,264

<sup>+</sup>Estimated from Table G2.

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## 1.6 Sensitivity analysis

The estimates used in the model are subject to uncertainty. Therefore, a one-way sensitivity analysis was carried out to assess the impact of key variables used by the model. A one-way sensitivity analysis varies one parameter while maintaining the other parameters at baseline values. The variables included are: (a) cost of training per year, (b) cost of salary per year, (c) additional costs of other health professionals' time discussing patients in one year, and (d) cost savings of other health professionals' costs from assessing patients in one year. Plus or minus 10% was used as an estimate of the variability of the parameters.

**Table G7 One-way sensitivity analysis**

ICER lower      ICER higher

Cost of training per year	5,149	4,634–5,664	–1,152	–123
Cost of salary per year	24,504	22,054–26,955	–3,087	+1,813
Additional costs of other health professionals' time discussing patients in one year	8,974	8,076–9,871	–1,535	+260
Cost savings of other health professionals' costs from assessing patients in one year	39,264	35,338–43,190	+3,289	–4,564

– = cost savings  
+ = additional cost.

The cost savings of other health professionals' costs had the most impact on the ICER, ranging from an additional cost of £3,289 to cost savings of £4,564. Increasing and decreasing the cost of PDNS training by 10% resulted in cost savings of PDNS. However, by altering the other three parameters, costs range from cost savings to additional costs implying the model is not robust to changes in the assumptions.

## 1.7 Discussion

Based on the average nurse activity in the randomised controlled trial in the UK (Tables G2 and G3),<sup>362</sup> for one year of one PDNS, approximately £640 is saved. Cost savings appear when PDNS care is substituting for standard care. However, in practice there may be variability in the interactions between types of care. There may be substituted care, additional care, duplication of care or a combination of these.<sup>364</sup> Nevertheless, the more PDNS care substitutes for standard care in a practice, the greater the potential for the outcomes to approach these average cost savings. How much PDNS care substitutes, duplicates or increases benefit for the same cost in comparison to standard care is not known. As the sensitivity analysis indicates, the cost savings from other health professionals' costs had the most impact on the ICER ranging from cost savings of £4,564 to an additional cost of £3,289. The costing of other health professionals reflects the average activity of PDNS. Therefore, how much PDNS care is substituting standard care at equivalent effectiveness needs to be assessed in further studies to improve cost estimates.

Only unit costs were used to assess the benefit of PDNS care versus standard care in terms of cost savings. However, unit costs may not fully represent all costs and benefits. This may have under-estimated the benefit of PDNS care. There may be increased patient benefits gained from a greater responsiveness of PDNS care to emerging scientific evidence, such as the earlier reduction in selegiline use found in nurses versus doctors<sup>362</sup> or improved access to care. There may be an improved sense of patient well-being while maintaining clinical effectiveness.<sup>417</sup> There also may be interactions of care as an additional benefit to PDNS care working in standard care that has not been measured. Currently, however, there is insufficient evidence available to measure such benefits.

On the other hand, the unit costs may underestimate the costs of PDNS care. The resources used in PDNS care are assumed to be equivalent to those used in standard care. However, PDNS care may use more or less or higher or lower cost resources resulting in higher or lower costs that are not reflected in the estimate. The RCT is the only study that gives an indication of the cost components in PDNS care versus standard care<sup>362</sup> and suggests that these are similar between the groups. However, apomorphine was excluded from the total cost of healthcare. Therefore, further evidence on the costs of resources used is needed to inform cost-effectiveness analyses.

The initial cost of establishing PDNS care will be incurred by the NHS. Therefore it would be helpful to evaluate whether initial costs can be recovered over time to warrant the initial investment. However, this is also contingent on the resource implications of the care. This cost-savings estimate is based on one PDNS with average nurse activity. While activity with less substitution of standard care or higher resources used would reasonably decrease the cost savings and potentially result in a net cost, it has not been determined how having more than one PDNS would affect costs and cost savings. The net estimate should not be interpreted as the complete indication of the benefit of PDNS care, nor do the estimates provide an indication of the appropriate amount of PDNS care that should be available. Instead, the net estimates suggest on average the cost savings of one PDNS based on average nurse activity.

A sensitivity analysis was performed to investigate changes to the cost inputs used in this analysis on the net cost. Increasing and decreasing the cost of PDNS training by 10% was the only parameter that maintained cost savings of PDNS. Increasing the cost of salary per year and the additional costs of other health professionals' time discussing patients and reducing the cost savings of other health professionals' costs from assessing patients by 10% resulted in additional costs. This suggests that further data are needed to assess the cost effectiveness of PDNS. The baseline analysis pertains to average PDNS care across the UK; however, this does not limit the applicability of the methods to individual centres to assess differences in both costs and cost-savings estimates.

The incremental costs compared with the incremental benefits was not estimated due to the difficulty in separating PDNS care from standard care and the limited evidence on measurable benefits. One study estimated PDNS care costs of £200 per patient per year.<sup>362</sup> However, it is likely this value depends on the total number of patients, PDNSs and nurse activity. Furthermore, PDNS care versus standard care and nurse activity may not be consistent between services. Therefore, cost-effectiveness results may not be generalisable. Due to the difficulty in disentangling PDNS care and consultant care in different practices and the limited measurable benefits, a more general net cost approach, based on completely substituted care with equivalent effectiveness and average nurse activity, was performed.

## 1.8 Conclusion

Increasing the cost of salary per year and the additional costs of other health professionals' time discussing patients and reducing the cost savings of other health professionals' costs from assessing patients by 10% resulted in additional costs. Therefore, the cost effectiveness of PDNS care requires further evidence. This highlights the need for further studies to measure the benefits of PDNS care to adequately assess the cost effectiveness. Due to the interactions of care and data limitations, benefits have been simplified in the form of cost

savings from standard unit costs. The cost-saving estimates are subject to the assumptions and therefore the results should be interpreted correspondingly.