KiTEC

Update of the PleurX peritoneal catheter drainage system for vacuum-assisted drainage of treatment-resistant, recurrent malignant ascites (MTG9)

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Project Details

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Glossary of Terms

LVP	Large-volume paracentesis
EAC	External Assessment Centre
HCHS	Health Service Cost Index
NICE	National Institute for Health and Care Excellence
PSSRU	Personal Social Services Research Unit

1. Background

The PleurX is an indwelling catheter (manufactured by CareFusion) for vacuum drainage of malignant ascites (MA) in the community setting. The technology was evaluated by NICE, with assessments completed by one of the external assessment centre (EAC), Cedar in 2011. The assessment result is published as a NICE medical technology guidance (MTG9). An update of this assessment is planned and as part of the assessment review process NICE has requested an update to the cost analysis for the base-case scenario.

Malignant ascites is a sign of peritoneal carcinomatosis, the presence of malignant cells in the peritoneal cavity. While survival in this patient population is poor, averaging about 20 weeks from time of diagnosis, quality of life can be improved through palliative procedures [1]. The conventional management of treatment-resistant, recurrent malignant ascites involves repeated large-volume paracentesis (LVP) procedures that are carried out in hospital. Most commonly this is done as an inpatient procedure, although some centres are able to offer paracentesis as a day-case procedure. Inpatient paracentesis is carried out when patients have developed troublesome symptoms from recurrent ascites. This can entail someresult in delay while waiting for admission, during which the patient continues to experience symptoms. The PleurX peritoneal catheter drainage system (UK Medical Ltd) is designed to remain in place indefinitely and patients and carers are trained to perform fluid drainage when needed by attaching the vacuum bottle to the catheter. The use of the PleurX peritoneal catheter drainage system may allow greater patient independence, and lead to resource savings through a reduced need for repeated LVP procedures and hospital bed days.

The cost model was submitted as a part of the assessment. This model evaluated the costs per patient and system impact of the PleurX peritoneal catheter drainage system for the drainage of treatment-resistant, recurrent malignant ascites in the community setting when compared with inpatient and outpatient large-volume paracentesis (LVP). The base-case analysis showed that PleurX peritoneal catheter drainage system may result in cost saving of £679 per patient when compared with inpatient large-volume paracentesis LVP. The cost-savings were heavily dependent on a reduction in inpatient stay in the PleurX arm. When the PleurX peritoneal catheter drainage system was compared with outpatient large-volume paracentesis, an additional cost of £1,010 per patient was incurred. This is because the use of PleurX peritoneal catheter drainage system requires an increased number of home nurse visits, with only a small saving in hospital bed days. The original model & parameters submitted by the manufacturer was accepted by Cedar and subsequently by NICE. The results of the cost model informed recommendation development by NICE.

2. Analysis

KiTEC reviewed the cost model and updated all cost parameters. Where updated unit costs were not readily available, the original cost was inflated to 2016 prices using the HCHS index. The major changes in the update relate to the cost of a hospital bed day, and the revision of unit staff costs. The original unit costs were taken from the 2009 NHS reference costs; while the updated costs were taken from the 2015-16 NHS reference costs, and the unit Costs published by the Personal Social Services Research Unit (PSSRU) 2016.

The updated unit costs and source of the costs for LVP and PleurX catheter are presented in Table 1 and 2, respectively.

Table 1. Updated unit costs for LVP

Cost Parameter	Cost parameters		Source for updated cost parameters
	Value used in the original model	Updated value	
Intervention cost of LVP			
Catheter and pack	£ 32.00	£33.64	Uplifted from Mullan et al [2]
Connector	£ 6.87	£7.22	Uplifted from Mullan et al [2]
Drain	£ 4.94	£5.19	Uplifted from Mullan et al [2]
2L Drainage Bag	£ 0.64	£0.67	Uplifted from Mullan et al [2]
Procedure cost/sundries	£ 121.00	£127.21	Uplifted from Mullan et al [2]
Inpatient stay for LVP			
Cost per hospital bed day	£ 312.00	£ 355.00	NHS reference cost 2015-16 HRG code used: FZ12Q (Major General Abdominal Procedures, 19 years and over, with CC Score 0)
Cost of complications of LVP			
Infection	£ 194.06	£198.97	Includes: • A medical oncology consultant led first attendance visit: £197 (Source: NHS reference cost 2015-16, HRG code: WF01B, non-Admitted Face to Face Attendance, First appointment) • 7 day course of antibiotics (Ciprofloxacin) £1.97 (Source: British National Formulary)
Catheter failure	£ 395.91	£405.73	Includes: • A medical oncology consultant led first attendance visit: £197 (Source: NHS reference cost 2015-16, HRG code: WF01B, non-Admitted Face to Face Attendance, First appointment)

			- 250,000 unit vial of Streptokinase: £16.73 (Source: uplifted from previous model) - Ultrasound lasting less than 20 minutes: £51.00 (NHS reference cost 2015-16, HRG code RD40Z, Ultrasound Scan with duration of less than 20 minutes, without contrast) - A contrast fluoroscopy lasting less than 20 minutes: £141.00 (NHS reference cost 2015-16, HRG code: RD30Z, Contrast Fluoroscopy Procedures with duration of less than 20 minutes)

Table 2. Updated unit costs for PleurX catheter

Cost Parameter	**Cost parameters**		**Source for updated cost parameters**
	Value used in the original model	**Updated value**	
Intervention cost of PleurX catheter			
PleurX catheter kit (50-9050)	£245.00	£245.00	Provided by manufacturer
PleurX drainage kit (50-7510)	£63.75	£63.75	Provided by manufacturer
Procedure cost/sundries	£121.00	£127.21	Uplifted from Mullan et al [2]
Inpatient stay for PleurX catheter			
Cost per hospital bed day	£ 312.00	£ 355.00	NHS reference cost 2015-16, HRG code used: FZ12Q (Major General Abdominal Procedures, 19 years and over, with CC Score 0)
Follow-on costs of ascites management			
PleurX drainage kit box (10 units)	£637.50	£637.50	Provided by manufacturer
Cost per home visit per hour	£78.00	£67.89	Uplifted from PSSRU 2015
Cost of travel per nurse visit	£1.50	£1.58	Uplifted from the original model
Cost per typical nurse visit (20 minutes)	£27.00	£14.33	PSSRU 2016
Cost of complications of PleurX catheter			
Infection	£ 194.06	£198.97	Assumed to be the same as the cost of treating infection caused by LVP
Catheter failure	£ 395.91	£405.73	Assumed to be the same as the cost of treating catheter failure caused by LVP
Cost of re-intervention	£741.75	£790.96	Assumed to be the cost of the first PleurX peritoneal catheter

			placement procedure including one hospital bed day

The results of the updated base case scenario are reported in Table 3. The updated base-case analysis showed that managing treatment-resistant, recurrent malignant ascites with the PleurX peritoneal catheter drainage system may result in cost saving of £1,051 per patient when compared with inpatient LVP. In this scenario, 7.4 hospital bed days were saved per patient, but 23.5 more community nurse visits to the patient's home were needed. When the PleurX peritoneal catheter drainage system was compared with outpatient LVP, an additional cost of £871 per patient was incurred, including 23.5 extra nurse visits but 1.9 fewer hospital bed days used per patient.

Table 3. Base case result per patient

	PleurX	LVP inpatient	LVP outpatient
Total cost per patient	£2,483	£3,534	£1,612

LVP is currently offered as an inpatient, outpatient or day-case procedure and that practice varies across the UK. However, there is a lack of evidence about the proportion of patients treated using LVP in an inpatient versus outpatient setting. The original assessment team sent a key opinion leader (KOL) questionnaire to eight clinicians with experience of using PleurX; however only two clinicians replied. Based on their pooled proportion (57.1%) of patients treated using LVP as inpatients as reported by the two clinicians, the weighted cost of a LVP is calculated as £2,709, which is slightly more expensive than PleurX peritoneal catheter drainage system. However due to a poor response rate that the data from the KOL questionnaire had limited reliability. Uncertainty surrounding the proportion of outpatient and inpatient LVPs means that potential cost savings across the NHS are difficult to estimate.

3. Conclusions

The new base-case analysis with updated unit costs shows PleurX peritoneal catheter drainage system is cost saving when compared with inpatient LVP, but incurs a cost when compared to outpatient LVP. The results of the updated model are consistent with the findings of the original model.

1. Garrison, R.N., et al., *Malignant ascites. Clinical and experimental observations.* Annals of Surgery, 1986. **203**(6): p. 644-651.
2. Mullan, D., et al., *Draining malignant ascites at home with tunnelled catheters: complications and costs.* EUROPEAN JOURNAL OF PALLIATIVE CARE, 2015. **22**(6).