Addendum to the Diagnostic Assessment Report on Depth of Anaesthesia Monitoring (E-Entropy, Bispectral Index and Narcotrend)

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Introduction

SHTAC were requested to recalculate the base case and sensitivity analyses for the BIS module with a revised cost for the sensors of £14.08. All other assumptions and model inputs were to remain the same as for the analyses presented in the DAR.

Results

BIS compared with Standard clinical monitoring

Base case

Total intravenous anaesthesia (TIVA)

The costs, QALYs and incremental cost effectiveness ratio (ICER) modelled for patients considered at high risk patients of intraoperative awareness undergoing general anaesthesia with TIVA, comparing standard clinical monitoring with BIS (using the revised sensor cost are presented in Table 1. The same analysis for a general surgical population, undergoing general anaesthesia with TIVA, is presented in Table 2.

Table 1 - Cost effectiveness of BIS compared with standard clinical monitoring in a population at high risk of awareness, undergoing TIVA. Revised BIS sensor cost of £14.08 per patient

	Cost (£)	Incremental Cost (£)	QALYs	Incremental QALYs	ICER (£/QALY gained)
Standard clinical monitoring	24.19		-0.0011		
BIS monitoring	39.09	14.90	-0.0005	0.0007	21,940

Table 2 - Cost effectiveness of BIS compared with standard clinical monitoring in a general surgical population, undergoing TIVA. Revised BIS sensor cost of £14.08 per patient

	Cost (£)	Incremental Cost (£)	QALYs	Incremental QALYs	ICER (£/QALY gained)
Standard clinical monitoring	23.13		-0.0007		
BIS monitoring	33.76	10.63	-0.0004	0.0003	33,478

Mixed anaesthesia (induction with IV anaesthetic (propofol) and maintenance with inhaled anaesthetic (sevoflurane))

The costs, QALYs and ICER modelled for patients considered at high risk of intraoperative awareness undergoing mixed general anaesthesia, comparing standard clinical monitoring with monitoring by BIS are presented in Table 3. The same analysis for a general surgical population, undergoing mixed general anaesthesia, is presented in Table 4.

Table 3 - Cost effectiveness of BIS compared with standard clinical monitoring in a population at high risk of awareness, undergoing mixed general anaesthesia. Revised BIS sensor cost of £14.08 per patient

	Cost (£)	**Incremental Cost (£)**	**QALYs**	**Incremental QALYs**	**ICER (£/QALY gained)**
Standard clinical monitoring	14.31		-0.0011		
BIS monitoring	29.56	15.25	-0.0006	0.0005	29,118

Table 4 - Cost effectiveness of BIS compared with standard clinical monitoring in a general surgical population, undergoing mixed general anaesthesia. Revised BIS sensor cost of £14.08 per patient

	Cost (£)	**Incremental Cost (£)**	**QALYs**	**Incremental QALYs**	**ICER (£/QALY gained)**
Standard clinical monitoring	13.25		-0.0007		
BIS monitoring	25.81	12.56	-0.0004	0.0003	47,882

Deterministic sensitivity analysis

Total intravenous anaesthesia (TIVA)

One way sensitivity analyses of key parameters were undertaken in both the general surgical population, and the high risk surgical population undergoing general anaesthesia with TIVA. The results are shown in Table 5 and Table 6.

Table 5 – One-way sensitivity analysis: BIS compared with standard clinical monitoring in patients at high risk of awareness undergoing TIVA. Revised BIS sensor cost £14.08 per patient

Parameter	Input value	Standard clinical monitoring		BIS		Incremental		ICER (£/ QALY gained)
		Cost (£)	QALYs	Cost (£)	QALYs	Cost	QALYs	
Probability awareness	0.0006	22.76	-0.0005	38.75	-0.0003	15.99	0.0002	82,903
	0.0119	26.92	-0.0024	39.75	-0.0008	12.84	0.0016	8,027
Odds ratio awareness with DoA monitor	0.1	24.19	-0.0011	38.86	-0.0004	14.67	0.0008	18,734
	0.6	24.19	-0.0011	39.69	-0.0007	15.50	0.0004	37,537
Duration of LPS (years)	0.25	24.19	-0.0011	39.09	-0.0005	14.90	0.0007	22,446
	1	24.19	-0.0012	39.09	-0.0005	14.90	0.0007	20,994
Probability of LPS[a]	0.195	23.53	-0.0125	38.93	-0.0121	15.40	0.0004	37,251
	0.48	24.98	-0.0302	39.28	-0.0293	14.30	0.0008	16,919
Duration of PTSD (yrs)	5.6	24.19	-0.0010	39.09	-0.0004	14.90	0.0006	26,876
	9.6	24.19	-0.0014	39.09	-0.0005	14.90	0.0008	17,649
Proportion PTSD[b]	0.345	23.59	-0.0009	38.95	-0.0004	15.36	0.0005	30,748
	0.733	24.78	-0.0014	39.23	-0.0005	14.46	0.0009	16,942
LPS QoL decrement	-0.075	24.19	-0.0011	39.09	-0.0005	14.90	0.0007	22,318
	-0.05	24.19	-0.0011	39.09	-0.0005	14.90	0.0007	22,533
PTSD QoL decrement	-0.134	24.19	-0.0012	39.09	-0.0005	14.90	0.0007	20,108
	-0.068	24.19	-0.0008	39.09	-0.0004	14.90	0.0004	33,168
Probability people with PTSD seek treatment	0	22.54	-0.0011	38.69	-0.0005	16.16	0.0007	23,793
	1	27.41	-0.0011	39.87	-0.0005	12.46	0.0007	18,344
Cost of sensors	13.3125	24.19	-0.0011	35.57	-0.0005	11.38	0.0007	16,756
	22.1875	24.19	-0.0011	42.61	-0.0005	18.42	0.0007	27,124

Notes

[a] changing the probability of LPS also changes the probability of PTSD, since PTSD is calculated as proportion of the probability of LPS (i.e. people with PTSD are a sub-group of people with LPS). Sensitivity of the results to changes in this parameter is therefore a combination of the effect of LPS (overall) and PTSD combined

[b] varying the proportion with PTSD within the population of LPS

Table 6 - One way sensitivity analysis: BIS compared with standard clinical monitoring in a general surgical population, undergoing TIVA. Revised BIS sensor cost £14.08 per patient

Parameter	Input value	Standard clinical monitoring		BIS		Incremental		ICER (£/ QALY gained)
		Cost (£)	QALYs	Cost (£)	QALYs	Cost	QALYs	
Proportional change in propofol use	-0.272	23.13	-0.0007	32.11	-0.0004	8.98	0.0003	28,275
	-0.113	23.13	-0.0007	35.43	-0.0004	12.31	0.0003	38,748
Probability awareness	0.001	22.91	-0.0006	33.71	-0.0003	10.80	0.0002	44,491
	0.0023	23.38	-0.0008	33.82	-0.0004	10.44	0.0004	25,778
Odds ratio awareness with DoA monitor	0.1	23.13	-0.0007	33.68	-0.0003	10.55	0.0004	29,767
	0.6	23.13	-0.0007	33.97	-0.0004	10.85	0.0002	48,636
Duration of LPS (years)	0.25	23.13	-0.0007	33.76	-0.0004	10.63	0.0003	34,062
	1	23.13	-0.0007	33.76	-0.0004	10.63	0.0003	32,368
Probability of LPS[a]	0.195	22.89	-0.0122	33.70	-0.0120	10.81	0.0002	48,459
	0.48	23.40	-0.0295	33.83	-0.0292	10.42	0.0004	27,657
Duration of PTSD (yrs)	5.6	23.13	-0.0006	33.76	-0.0003	10.63	0.0003	38,915
	9.6	23.13	-0.0007	33.76	-0.0004	10.63	0.0004	28,252
Proportion PTSD[b]	0.345	22.91	-0.0006	33.71	-0.0003	10.80	0.0003	42,554
	0.733	23.33	-0.0008	33.81	-0.0004	10.48	0.0004	27,597
LPS QoL decrement	-0.075	23.13	-0.0007	33.76	-0.0004	10.63	0.0003	33,915
	-0.05	23.13	-0.0007	33.76	-0.0004	10.63	0.0003	34,162
PTSD QoL decrement	-0.134	23.13	-0.0007	33.76	-0.0004	10.63	0.0003	31,308
	-0.068	23.13	-0.0006	33.76	-0.0003	10.63	0.0002	45,089
Probability people with PTSD seek treatment	0	22.54	-0.0007	33.62	-0.0004	11.08	0.0003	34,888
	1	24.27	-0.0007	34.03	-0.0004	9.76	0.0003	30,743
Cost of sensors	13.3125	23.13	-0.0007	30.24	-0.0004	7.11	0.0003	22,396
	22.1875	23.13	-0.0007	37.28	-0.0004	14.15	0.0003	44,561

Notes

[a] changing the probability of LPS also changes the probability of PTSD, since PTSD is calculated as proportion of the probability of LPS (i.e. people with PTSD are a sub-group of people with LPS). Sensitivity of the results to changes in this parameter is therefore a combination of the effect of LPS (overall) and PTSD combined

[b] varying the proportion with PTSD within the population of LPS

Mixed anaesthesia

One way sensitivity analyses of key parameters were undertaken in both the general surgical population, and the high risk surgical population undergoing mixed general anaesthesia. The results are shown in Table 7 and Table 8.

Table 7 - One way sensitivity analysis: BIS compared with standard clinical monitoring patients at high risk of awareness undergoing mixed general anaesthesia. Revised BIS sensor cost £14.08 per patient

Parameter	Input value	Standard clinical monitoring		BIS		Incremental		ICER (£/ QALY gained)
		Cost (£)	QALYs	Cost (£)	QALYs	Cost	QALYs	
Probability awareness	0.0006	12.88	-0.0005	28.91	-0.0003	16.03	0.0002	93,139
	0.0119	17.04	-0.0024	30.80	-0.0012	13.76	0.0012	11,591
Odds ratio awareness with DoA monitor	0.25	14.31	-0.0011	29.23	-0.0005	14.91	0.0007	22,207
	0.81	14.31	-0.0011	30.16	-0.0009	15.84	0.0003	61,433
Duration of LPS (years)	0.25	14.31	-0.0011	29.56	-0.0006	15.25	0.0005	29,746
	1	14.31	-0.0012	29.56	-0.0006	15.25	0.0005	27,937
Probability of LPS[a]	0.195	13.65	-0.0125	29.26	-0.0122	15.61	0.0003	47,074
	0.48	15.10	-0.0302	29.91	-0.0295	14.82	0.0006	23,010
Duration of PTSD (yrs)	5.6	14.31	-0.0010	29.56	-0.0006	15.25	0.0004	35,174
	9.6	14.31	-0.0014	29.56	-0.0007	15.25	0.0006	23,712
Proportion PTSD[b]	0.345	13.71	-0.0009	29.29	-0.0005	15.58	0.0004	39,561
	0.733	14.90	-0.0014	29.82	-0.0007	14.93	0.0006	22,980
LPS QoL decrement	-0.075	14.31	-0.0011	29.56	-0.0006	15.25	0.0005	29,587
	-0.05	14.31	-0.0011	29.56	-0.0006	15.25	0.0005	29,854
PTSD QoL decrement	-0.134	14.31	-0.0012	29.56	-0.0007	15.25	0.0006	26,825
	-0.068	14.31	-0.0008	29.56	-0.0005	15.25	0.0004	42,656
Probability people with PTSD seek treatment	0	12.66	-0.0011	28.81	-0.0006	16.16	0.0005	30,855
	1	17.53	-0.0011	31.01	-0.0006	13.48	0.0005	25,746
Cost of sensors	13.3125	14.31	-0.0011	26.04	-0.0006	11.73	0.0005	22,395
	22.1875	14.31	-0.0011	33.08	-0.0006	18.77	0.0005	35,840

Notes

[a] changing the probability of LPS also changes the probability of PTSD, since PTSD is calculated as proportion of the probability of LPS (i.e. people with PTSD are a sub-group of people with LPS). Sensitivity of the results to changes in this parameter is therefore a combination of the effect of LPS (overall) and PTSD combined

[b] varying the proportion with PTSD within the population of LPS

Table 8 - One way sensitivity analysis: BIS compared with standard clinical monitoring in a general surgical population undergoing mixed general anaesthesia. Revised BIS sensor cost £14.08 per patient

Parameter	Input value	Standard clinical care		BIS		Incremental		ICER (£/ QALY gained)
		Cost (£)	QALYs	Cost (£)	QALYs	Cost	QALYs	
Proportional change in sevoflurane use	-0.330	13.25	-0.0007	24.40	-0.0004	11.15	0.0003	42,497
	-0.074	13.25	-0.0007	27.22	-0.0004	13.98	0.0003	53,268
Probability awareness	0.001	13.03	-0.0006	25.71	-0.0004	12.69	0.0002	60,911
	0.0023	13.50	-0.0008	25.93	-0.0005	12.42	0.0003	38,163
Odds ratio awareness with DoA monitor	0.25	13.25	-0.0007	25.69	-0.0004	12.45	0.0003	39,515
	0.81	13.25	-0.0007	26.02	-0.0005	12.78	0.0002	76,121
Duration of LPS (years)	0.25	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	48,612
	1	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	46,486
Probability of LPS[a]	0.195	13.01	-0.0122	25.70	-0.0121	12.69	0.0002	65,417
	0.48	13.52	-0.0295	25.94	-0.0292	12.41	0.0003	40,661
Duration of PTSD (years)	5.6	13.25	-0.0006	25.81	-0.0004	12.56	0.0002	54,556
	9.6	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	41,208
Proportion PTSD[b]	0.345	13.03	-0.0006	25.71	-0.0004	12.68	0.0002	58,669
	0.733	13.45	-0.0008	25.90	-0.0004	12.45	0.0003	40,524
LPS QoL decrement	-0.075	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	48,428
	-0.05	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	48,736
PTSD QoL decrement	-0.134	13.25	-0.0007	25.81	-0.0004	12.56	0.0003	45,142
	-0.068	13.25	-0.0006	25.81	-0.0004	12.56	0.0002	61,822
Probability people with PTSD seek treatment	0	12.66	-0.0007	25.55	-0.0004	12.89	0.0003	49,116
	1	14.39	-0.0007	26.33	-0.0004	11.94	0.0003	45,487
Unit cost of sensors	13.3125	13.25	-0.0007	22.29	-0.0004	9.04	0.0003	34,468
	22.1875	13.25	-0.0007	29.33	-0.0004	16.08	0.0003	61,297

Notes

[a] changing the probability of LPS also changes the probability of PTSD, since PTSD is calculated as proportion of the probability of LPS (i.e. people with PTSD are a sub-group of people with LPS). Sensitivity of the results to changes in this parameter is therefore a combination of the effect of LPS (overall) and PTSD combined

[b] varying the proportion with PTSD within the population of LPS