Analysis of Methods for Incorporating Carer Quality-Of-Life in a Health Economic Model from a NICE Perspective



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Objectives

- The National Institute for Health and Care Excellence (NICE) recommends modelling carer quality-of-life (QoL) if it is relevant to the decision problem¹; however, guidance on how to do this is lacking. Technical Support Document 8 (TSD8)² provides limited guidance on carer QoL methods.
- The objective of this study was to apply methods used to quantify carer QoL in previous NICE submissions, identified via a targeted literature review, and using an existing model, test the impact of these methods on cost-effectiveness results.

Methods **Targeted Literature Overview Electronic searches of the following databases were conducted** The NICE website was also searched for NICE appraisal documents **Population: Outcomes:** in July 2023: Caregiver, carer, family, HRQoL, utilities, in August 2023. sibling. burden



The TLR identified three core methods used to apply carer QoL in economic models for NICE appraisals.

- Each method can be applied by health-state or by treatment group; however, the former appeared to be the most common.
- The three methods are expected to show no difference in carer QALYs where there is equivalent life expectancy.
- Where there is an extension to life, we expect differences in carer QALYS (we applied a 5% mortality difference to test this).



The TLR identified a number of caps to avoid implausible total estimates of carer QALYs being generated. The key ones for the utility decrement method are outlined below.

ID	Description of Cap		Assumptions Applied		
Α	Cap on total carer losses.		Limit applied to prevent negative losses.		
В	Cap based on age.		Carer QoL impact no longer captured once patient age reaches 18.		
С	General population utility.		Prevents the carer QoL being greater than age/sex matched general population norms.		
Bereavement Method		Desc	ription		
Lump sum. One bas		One-c based	off lump sum estimated as 9% of the QALY loss of a patient, d on a similar calculation by Christensen 2014. ³		
Annual decrements. Ar		Annua	ual disutility of -0.04%, based on an estimate by Song <i>et al.</i> 2010. ⁴		

Model Used to Test the Carer QoL Methods

An existing Markov-based economic model was used to test the impact of the approaches on cost-effectiveness results.

With extension to life: emental QALYs = B + C + D With extension to life: Incremental QALYs = B + D With extension to life: Incremental QALYs = B + D Treatment-based area B in the graphs. Treatment-based values were averaged across the model time horizon based on the health-state values. Health State Carer Utility per Core Method **** **** ***** ***** ****** ****** ****** ******* ******** ************************************	This approach typically links the total QALYs accrued by carers to the patient's survival status; however, it is possible to allow carer QALYs to continue to accrue after patient death.	 Inked to the patient's improvement in QoL. The limitations of this approach are that it might be difficult to differentiate between positive and negative changes. 	 Patient's worsening QoL This approach may penalise the treatment with better survival. The assumption is that carer QoL will return to baseline after patient death. 	Where there is no extension to life all methods predict the same carer QALY change,	The Markov model has eight disease states, each with an increasing burden to both patient and carer.	HS 8	HS 7 ↑ ↑ ↑	HS 5 HS 4 HS 4 HS 4	Model Overview
extension to life, we expect to see QALY gains of Method 1 > Method 2 > Method 3the model time horizon based on the health-state values.the model time horizon based on the health-state values.110.22020.900.12-0.1030.900.12-0.1040.900.12-0.1050.830.06-0.1760.830.06-0.1770.780-0.2290.22-0.1090.22-0.1090.22-0.1090.22-0.1090.23-0.1790.78090.78090.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2290.2390.2490.2490.2590.2590.2590.2290.2290.2390.2390.2490.2490.2590.2590.26	With extension to life: Incremental QALYs = B + C + D	With extension to life: Incremental QALYs = B + D	With extension to life: Incremental QALYs = B - D	represented by area B in the graphs.	Treatment-based values were averaged across	Health State	Health Stat 1 (Absolute Utility)	e Carer Utility pe 2 (Utility Increment)	r Core Metho 3 (Utility Decr
$\delta = 0.77$	ith extension to life, we expect to s However, this may not hold if assum E.g., for the absolute utility method would reduce.	see QALY gains of Method 1 > Metho nptions around carer QoL post-patier I, if we assume that carer QoL mainta	od 2 > Method 3 nt death are altered. ains at baseline post patient death, the	n the QALY gain	the model time horizon based on the health-state values.	2 3 4 5 6 7 8	0.90 0.90 0.90 0.83 0.83 0.78 0.78	0.22 0.12 0.12 0.12 0.06 0.06 0	-0.10 -0.10 -0.10 -0.17 -0.17 -0.22 -0.22

Results

Cost-Effectiveness Results

Results across core methods

- No difference was observed among core methods with no extension to life.
- Utilities applied by treatment arm produced slightly more favourable results for the intervention across core methods.
- The absolute utility method (Method 1) yielded the highest QALY gain, followed by utility increments (Method 2), then

Core method	Utility applied by	iNMB (Life extension)	iNMB (No life extension)		
1 (Absolute utility)	solute utility) £13,660		£107,872		
2 (Utility increments)	Health	-£43,947	£107,872		
3 (Utility decrements)	State	-£60,421	£107,872		
1 (Absolute utility)		£19,620	£113,839		
2 (Utility increments)	Treatment	-£37,987	£113,839		
3 (Utility decrements)	GITT	-£54,461	£113,839		

Results of various cap and bereavement scenarios based on the utility decrement core method

Cap	Bereavement	ΔiNMB	
NA	Lump sum		£27
NA	Decrements over time		£8
CAP A: Based on caregiver losses	NA		£8
CAP B: Based on age	NA	-£5,350	
CAP C: Based on general population utility	NA	-£14,283	
CAP A: Based on caregiver losses	Lump sum	-£14,283	
CAP B: Based on age	Lump sum	-£5,079	
CAP C: Based on general population utility	Lump sum	-£14,012	
CAP A: Based on caregiver losses	Decrements over time	-£14,012	
CAP B: Based on age	Decrements over time	-£5,342	
CAP C: Based on general population utility	Decrements over time	-£14,275	

- Caps can have an important impact on the results, depending on certain model inputs, such as starting age, as well as assumptions around extension to life.
- Bereavement scenarios had very little impact on

utility decrements (Method 3).

• The differences between absolute utility and utility decrements are driven by the **absolute** magnitude of the utility values for each approach following death of the patient - absolute utilities are 10 times larger than utility increments.

iNMB is based on a willingness-to-pay of £30k per quality-adjusted life-year.

results in this analysis.

Conclusion

What did this analysis show?

- Without an extension to life, using equivalent utility data, no difference was observed across the core methods.
- With an extension to life, the absolute utility method showed the largest QALY gain, the utility decrement method showed the lowest QALY gain (potentially negative).
- The importance of caps and bereavement will **depend on the** decision problem and will vary. With an extension to life, in this example, bereavement approaches had a minimal impact.

What are the areas for further research?

- This analysis did not comment on the number of caregivers, inclusion of siblings, and appropriateness of alternative data sources for carer QoL values.
- Further guidance from NICE on methods for incorporating carer QoL would be welcomed.



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References: 1) Methods guide = https://www.nice.org.uk/process/pmg36/chapter/introduction-to-health-technology-evaluating cost effectiveness of universal meningitis vaccination (Bexsero) in England: modelling study, BMJ. 4) Song et al.; 2010, Long-term Effects of Child Death on Parents' Health Related Quality of Life: A Dyadic Analysis. Abbreviations: HRQoL = health-related quality of life; HST = highly specialised technology appraisal; TA = technology appraisal; MTA = multiple technology app quality of life; SOC = standard of care; HS = health state; iNMB = incremental; net monetary benefit; NMB = net monetary benefit.