EE503

Key Features of Economic Models Used in Submissions to NICE in Dermatology Indications

Tom Clemmet, MSc[1]; Kelly Campbell, PhD[1]; Hasan Basarir, PhD[1]

[1] RTI Health Solutions, Manchester, United Kingdom

BACKGROUND

- The incident cases of skin and subcutaneous diseases worldwide is estimated to be 4.9 billion, resulting in an annual burden of 43 million disability-adjusted life-years (DALYs) in 2019. A total of 94.74% of DALYs were associated with years lived with disability rather than years of life lost.[1]
- The National Institute for Health and Care Excellence (NICE) in the United Kingdom has recommended new medicines in dermatology indications, including psoriasis (PsO), atopic dermatitis (AD), hidradenitis suppurativa (HS), prurigo nodularis (PN), and alopecia areata (AA).
- Cost-effectiveness models used in these submissions have some shared features. Understanding these features and the reasons for deviating from them may help inform future cost-effectiveness modelling in dermatology.

OBJECTIVE

To review the key features of economic models used in submissions to NICE in dermatology indications.

METHODS

- The NICE website was searched using the keyword "dermatology" on 24 April 2024, and the website categorisation provided was used to identify the relevant technology appraisals (TAs).
- For each indication identified in the initial search, a subsequent search was conducted using the indication as a keyword to ensure all relevant TAs were captured.
- TAs were excluded if they were either reporting a cost-comparison model rather than a cost-effectiveness model, were not in a dermatology indication, or were under development.

CONCLUSION

- NICE evidence assessment groups (EAGs) evaluated submissions that were informed by the York model, its derivatives, and alternative structures in a range of dermatology indications (PsO, AD, AA, and PN), and in general did not raise concerns about these model structures.
- Two notable modelling features identified were waning of the treatment-specific utilities and the use of CODA output for characterising uncertainty in probabilistic analyses.
- Model structures used were broadly accepted by NICE and therefore did not negatively influence the outcome.

RECOMMENDATIONS FOR FUTURE RESEARCH

- The York model may form an appropriate basis for cost-effectiveness models in dermatology indications.
- Different approaches to modelling multiple lines of treatment in adaptations of the York model have been accepted by NICE.
- Modellers may consider using CODA output to characterise uncertainty in response rates/transition probabilities, where possible, given its flexibility regarding distributional assumptions and preservation of intercorrelations between parameters.
- To consider treatment effect waning in response-based models, waning the treatment-specific utilities directly may be appropriate.

References

1. Yakupu A, et al. Front Public Health. 2023;11:1145513.
2. NICE. TA103. 2006.
3. NICE. TA134. 2008.
4. NICE. TA146. 2008.
5. NICE. TA180. 2009.
6. NICE. TA350. 2015.
7. NICE. TA419. 2016.
8. NICE. TA442. 2017.
9. NICE. TA455. 2017.
10. NICE. TA475. 2017.
11. NICE. TA511. 2018.
12. NICE. TA574. 2019.
13. NICE. TA575. 2019.
14. NICE. TA907. 2023.
15. NICE. TA534. 2018.
16. NICE. TA681. 2021.
17. NICE. TA814. 2022.
18. NICE. TA926. 2023.
19. NICE. TA955. 2024.
20. NICE. TA392. 2016.
21. NICE. TA935. 2023.
22. NICE. TA958. 2024.
23. NICE. TA339. 2024.
24. NICE. TA82. 2004.
25. NICE. TA177. 2009.
26. Dias S, et al. 2011. https://www.sheffield.ac.uk/media/34185/download?attachment.

Contact Information

Tom Clemmet, MSc
RTI Health Solutions

Phone: +44(0)161.447.6013
Email: tclemmet@rti.org

Scan QR code to view full version of poster

RESULTS

Searches

Figure 1 presents the identification and screening processes.

Summary of Findings

- The 24 included TAs covered interventions with a range of mechanisms of action (Figure 2) across 7 different dermatology indications (Figure 3).
- A range of model structures was used; 18 of 24 models were based on or similar to the "York model" from TA103 (Figure 4).[2]
- Parameter uncertainty was often considered using standard univariate distributions. Ten of 24 models sampled from Convergence Diagnostic and Output Analysis (CODA) output to characterise uncertainty related to the response rates and transition probabilities.
- A notable approach used in 3 AD TAs and the PN TA was the waning of utility values in the treatment arm to capture waning of treatment effect over time.

Figure 1. Review Process Diagram

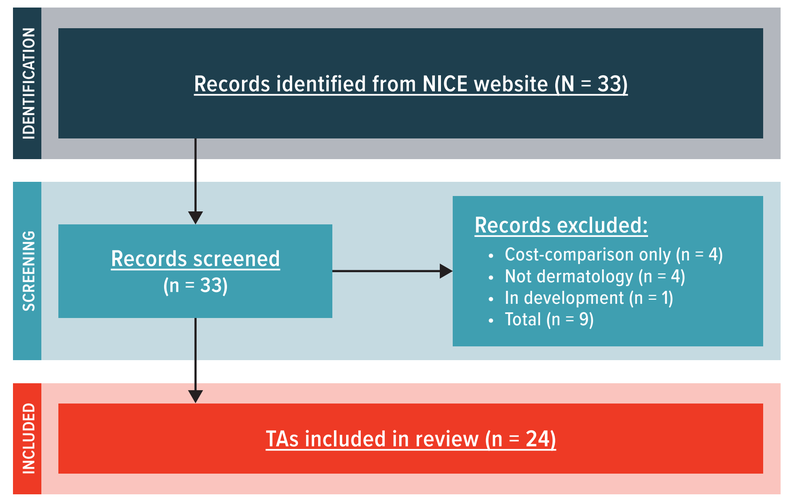
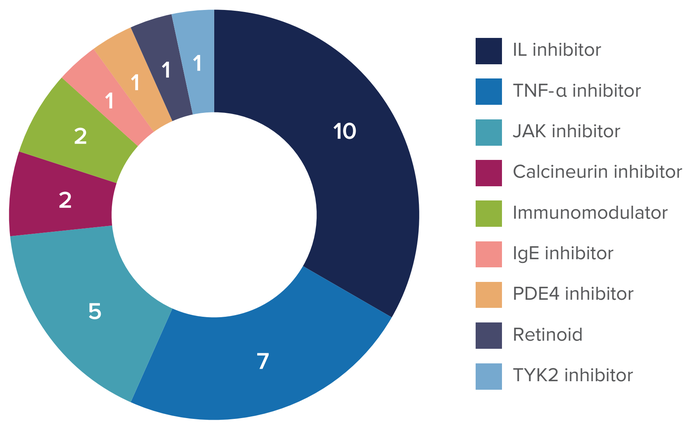


Figure 2. NICE TA Interventions by Their MOA



IgE = immunoglobulin E; IL = interleukin; JAK = Janus kinase; MOA = mechanism of action; PDE-4 = phosphodiesterase 4; TNF-α = tumour necrosis factor alpha; TYK2 = tyrosine kinase 2.

Figure 3. NICE TAs by Indication

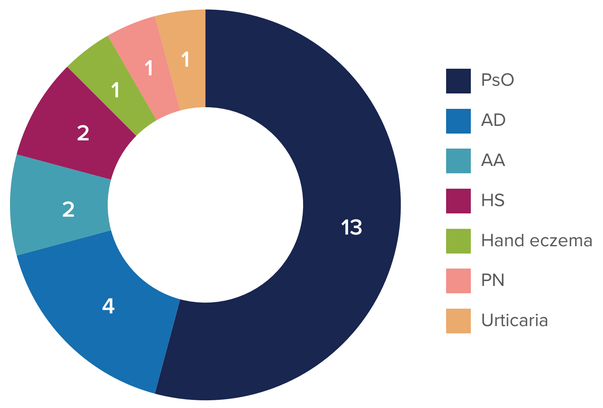
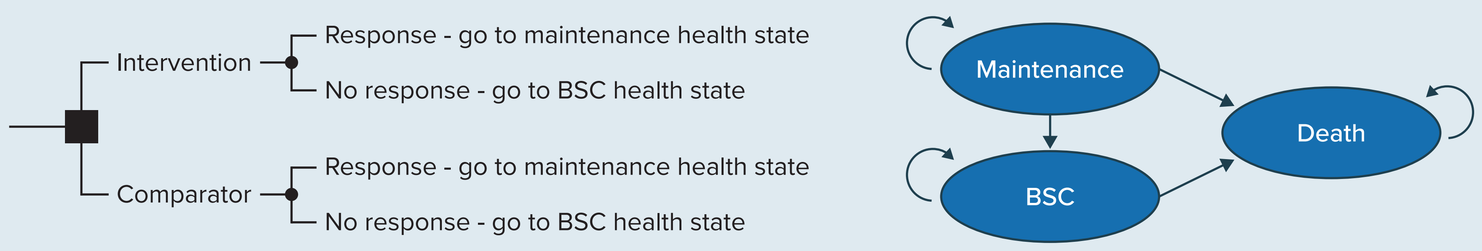


Figure 4. York Model Diagram



BSC = best supportive care.

Source: Diagram based on the model structure in TA103.[2] This diagram includes "Death" as a health state, which was not included in the TA103[2] model but was introduced in TA350[4] and featured in subsequent versions of the York model

Model Structure

Cohort Models Based On the York Model

- The response-based York model included a short-term and a long-term component (Figure 4).
- The York model (TA103[2] in PsO) was explicitly mentioned as the basis of models used in the 12 other submissions in PsO.[3-14] In addition, models used in 5 other submissions relied on a similar structure without explicit citation (TA534,[15] TA681,[16] and TA814[17] in AD; TA926[18] in AA; TA955[19] in PN).
- Differences observed in these 18 models include:
  - Alternative numbers of lines of treatment
  - Whether treatment sequences were explicitly included in the model structure or whether an optional sequence was derived by ranking interventions according to their net benefit
  - Whether the short-term component was represented by a decision tree or a Markov model (useful for modelling multiple lines of treatment)
  - Alternative (indication-specific) definitions of response and alternative (study-specific) timing of response assessment

Other Cohort Models

- Both HS models (TA392[20] and TA935[21]), 1 AA model (TA958[22]), and the urticaria model (TA339[23]) were cohort-level with induction and maintenance phases, like the York model. However, they deviated from the York model by including transitions between health states defined by disease-specific measures of response. In the York model, the only possible transition was from response (maintenance) to no response (BSC).
- TA339[23] in urticaria included additional features not included in the York model, such as disease relapses and re-treating patients with the intervention.
- In TA82[24] in AD, effective treatment led to patients moving to an "emollients only" state (not maintenance).

Individual-Level Simulation Model

- In TA177[25] in hand eczema, an individual-level simulation was used, although no clear justification was provided for this choice.

Uncertainty

- Parameter uncertainty considered in probabilistic sensitivity analysis (PSA) was often based on standard univariate distributions. However, in 10 of the TAs (8 PsO TAs[2-6,8,9,11]; TA814 in AD[17]; TA935 in HS[21]), CODA output was used to inform the uncertainty in response rates/transition probabilities instead.
- CODA output provides all values generated from the joint posterior distribution in a meta-analysis. No assumptions about the distributional form are required, and intercorrelations between the parameters are preserved during the sampling process.[26]
- In 8 TAs,[10,13,15,16,19,20,23,24] parametric distributions (Dirichlet, beta, or lognormal) were reported for the response rates and transition probabilities. In 4 cases,[7,12,14,18] the distributions used were not clear.
- A PSA was not conducted in TA177[25] in hand eczema, the argument being that a PSA would "not give an intuitive or meaningful representation of the uncertainty surrounding the input values," as the clinical efficacy parameters had been informed by expert opinion.
- There was no clear guidance or justification for using or not using CODA in probabilistic analyses in the TAs reviewed.

Waning

- In cost-effectiveness models, waning of treatment effect is often implemented via estimates provided for the clinical endpoints.
- In 3 AD TAs (TA534[15], TA681[16], and TA814[17]) and the PN TA (TA955[19]), all of which followed a York model structure, utility values were waned directly as an alternative approach. The rationale for utility waning was not given, but waning the treatment effect would have been difficult as no treatment effect was explicitly applied.
- After utility waning was first introduced in TA534,[15] the EAG recommended its inclusion in TA681,[16] and it was used in the EAG's model in TA814.[17]

TA Recommendation

- Only 1 TA (TA926[18] for baricitinib in AA) did not receive a positive recommendation due to treatment not resulting in a meaningful improvement in quality of life and cost-effectiveness estimates being subject to considerable uncertainty. The model structure used was suggested to be "appropriate."
- EAGs did not object to adaptations of the York model in indications where there were limited prior appropriate cost-effectiveness analyses (TA534[15] in AD, TA926[18] in AA, and TA955[19] in PN).
- Criticism of model structures by EAGs was limited, especially in indications with multiple previous submissions.
- Issues raised by EAGs included the definition of response, the quality of data, and assumptions regarding the cost and efficacy of BSC.

Presented at: ISPOR Europe 2024; 17-20 November 2024; Barcelona, Spain