Demonstrating the value of Precise Thick~N INSTANT for the treatment of dysphagia in the UK

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INTRODUCTION

- Dysphagia is a disease characterised by difficulty swallowing and is typically caused by other conditions such as neurological disorders, stroke, and cancer.[1]
- Treatment for dysphagia involves thickening of beverages, foods, and medications with powdered thickeners.[2]
- Precise Thick~N INSTANT (PTI) is a first-in-class xanthan gum-based liquid thickener, which works in a similar way to powdered xanthan gum thickeners to increase bolus viscosity and therefore safety of swallow.[3]
- Advantages of PTI over powdered thickeners include the hygienically sealed bottle with a pump mechanism for dispensing doses accurately, longer shelf life of 12 months compared to 4-8 weeks for powders, and increased palatability of thickened drinks.[4]
- A budget optimisation model was developed to compare the costs of using powdered thickeners with the predicted costs of introducing PTI as an alternative treatment. The main output is the annual cost difference per patient when transitioning to PTI. Additionally, the budget impact of introducing PTI was assessed where the costs of a scenario with no PTI were compared to a scenario where PTI is introduced over a period of 5 years.

OBJECTIVE

- The PTI budget optimisation model aimed to identify the current costs associated with the treatment of dysphagia using ACBS (Advisory Committee on Borderline Substances) approved powdered thickeners and estimate the financial impact of introducing PTI as a treatment alternative for NHS prescriptions.

METHODS

- The population entering the model are adults (aged 12+ years) with dysphagia. This population was calculated using the NHS spend on fluid thickeners in 2019[5] (£16,613,939) divided by the estimated acquisition costs of a single patient per year (£461.42). It was assumed that patients require eight 200ml drinks per day, based on the European Food Safety Authority (EFSA) recommending 1.6L of fluid intake for females excluding water in food.[6] This is a conservative assumption which favours powdered thickeners.
- Cost categories included in the model are preparation, wastage, clinical complications, and acquisition. A systematic literature review was conducted to identify inputs.[7] These were then confirmed by participant feedback from a prospective, controlled, multicentre, single-arm, interventional trial which compared powdered thickeners to PTI in the UK (UK study), and semi-structured interviews with key opinion leaders.[4,8-10]
- Preparation time data (time to prepare and time waited for correct consistency) were taken from the UK study (Table 1).[8-10] The average cost of NHS staff per hour (£26.34) was sourced from PSSRU Unit Costs of Health & Social Care 2023.[11]

	Powdered thickener	PTI
Time to prepare drink (minutes)	1.40	0.67
Time to wait for safe consumption (minutes)	1.38	0.59

Table 1: Preparation time for powder thickener and PTI

- Clinical complications considered in the model were dehydration, acute kidney injury (AKI) and aspiration pneumonia (AP). Clinical complication data were sourced from retrospective cohort studies (Table 2).[12-15] The percentage of patients not compliant with the recommended daily intake of fluid was sourced from the UK study (PTI: 83.33%; powder: 91.67%).[8-10] The cost of treating an AKI episode (£3,721.00) was sourced from a report into the economic impact of AKI in the UK, and the cost of treating AP (£1,909.34) was sourced from the NHS National Cost Collection.[16,17] The reduction in likelihood of AP due to more accurate dosing was based on the percentage difference between the accuracy of powder dosing and the accuracy of PTI dosing (11.46% reduction with PTI).[3,7]

Clinical variable	Input
Rate of AKI	1.47%
Increased risk of AKI due to dehydration	2.33
% patients who develop AP per year due to aspiration	11.10%
Additional days in hospital due to dehydration	2.00
Hospital admissions per patient per year	0.52

Table 2: Clinical variables used in the model

- Costs involving wastage included the cost of inaccurate measurement of thickener, cost of drinks thrown away due to poor mixing or wrong consistency, and the cost due to expiration of containers of thickener. Error due to weight variation of the powder scoop was sourced from a systematic review of xanthan gum-based thickeners.[3] The percentage of drinks thrown away due to poor mixing or wrong consistency was sourced from the UK study.[8-10] It was assumed that half of drinks made incorrectly using PTI could be corrected by adding more PTI, but all drinks made incorrectly using powder are thrown away. The average number of full containers discarded due to expiration was estimated at one for powders and zero for PTI due to the longer shelf life (12 months vs. 4-8 weeks).[4]

	Powdered thickener	PTI
Error due to weight variation in scoop	10.00%	0.00%
Drinks thrown away due to poor mixing	4.53%	1.51%

Table 3: Wastage data used in the model

- Acquisition costs were sourced from the Company's price offering to the ACBS and the BNF.[18,19] Price per serve was calculated as £0.25 for PTI and £0.16 for powder.
- Market share data were based on NHS Prescription Cost Analysis data and internal market share forecasts.[20] PTI uptake was conservatively estimated as 10%, 20%, 30%, 40% and 50% in years 1-5, respectively.

RESULTS

Base case

- Introduction of PTI as a treatment strategy is estimated to save the NHS and UK care system £1,797.86 per patient per (Table 4 and Figure 1). PTI costs an additional £274.16 per patient per year compared to powdered thickeners. However, cost savings across preparation, complications, and wastage far outweigh the additional acquisition costs.

Cost category	PTI	Powdered thickener	Difference
Preparation costs	£1,617.46	£3,554.45	-£1,937.00
Complications costs	£605.43	£671.49	-£66.06
Wastage costs	£5.56	£74.52	-£68.96
Acquisition costs	£735.58	£461.42	£274.16
		Cost saving	£1,797.86

Table 4: Per patient per year results

- The final estimated population of community dwelling patients prescribed thickened fluids for treating dysphagia was 36,006. If this population were extrapolated to include dysphagic patients in hospital, cost savings would be even greater.
- In terms of overall budget impact, over 5 years, PTI leads to a cost saving of £98,664,666 (-11.37%, Table 5), varying from £6,473,369 in Year 1 to £33,150,669 in Year 5. The average annual budget impact is a cost saving of £19,732,933 (-11.37%, Table 5).

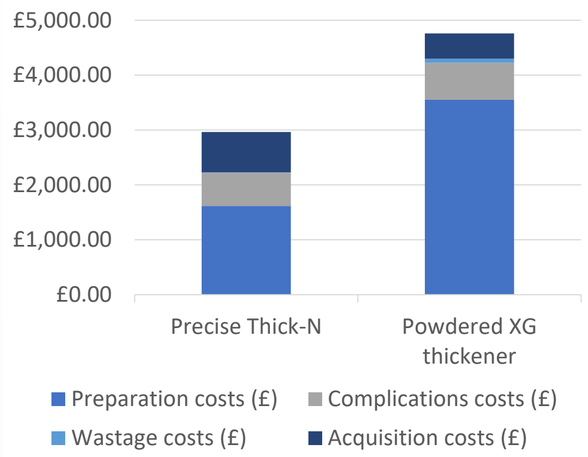

Figure 1: Per patient per year results

	Average over 5 years	Total over 5 years
Cumulative population of patients eligible for treatment with PTI (N)	36,441	182,203
Patients treated with PTI (N)	10,976	54,879
Total costs in scenario without PTI (£)	£173,526,145	£867,630,727
Total costs in scenario with PTI (£)	£153,793,212	£768,966,061
Budget impact (£)	-£19,732,933	-£98,664,666
Budget impact (%)	-11.37%	-11.37%

Table 5: Budget impact results

One-way sensitivity analysis

- A one-way sensitivity analysis (OWSA) was carried out to test model uncertainty. Parameters were varied by upper and lower confidence intervals, or ±20% in the absence of these data (Figure 2).
- OWSA results are centred on the base case average budget impact over 5 years (-£19,732,933). The model was most sensitive to number of drinks per day, cost of NHS staff per minute, and time to prepare a drink using powdered thickener. It should be noted that these parameters in the base case are backed up by robust or published data, increasing confidence in the model results.

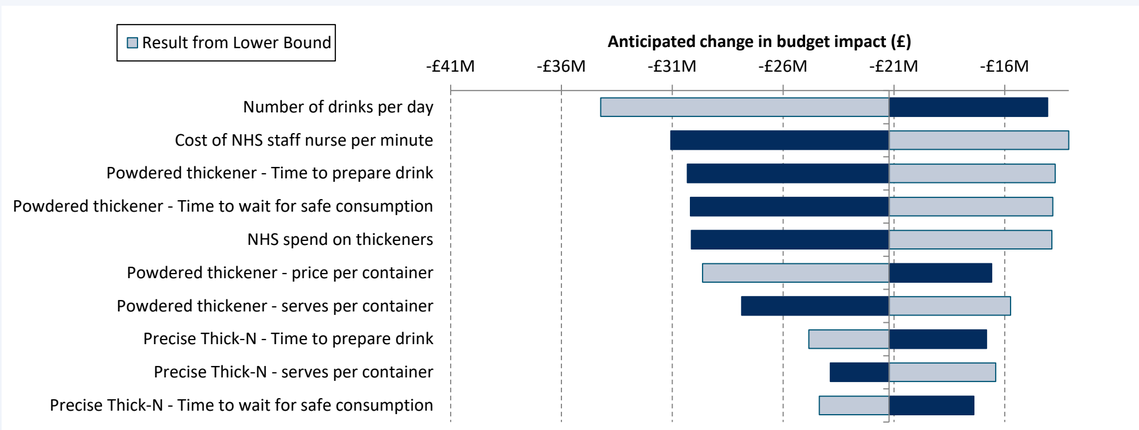

Figure 2: OWSA results

DISCUSSION

- PTI is easy to use, saves time and reduces a patient's risk of dysphagia complications compared to powdered thickeners
- This model is based on published data and a recently conducted UK controlled multicentre single arm interventional trial which compared powdered thickeners to PTI in the UK.
- Limitations in the present model include:
  - The reduction in likelihood of AP due to more accurate dosing is based on an assumption that minor improvements in accuracy of IDDSI level directly translate to a reduced risk of AP.
  - The number of containers discarded due to expiration per year is an assumption based on discussions with KOLs.
  - A larger sample size of the UK study would increase reliability of results.

CONCLUSIONS

- PTI represents an alternative format for patients with dysphagia who require thickened fluids that is accurate, simple, and saves time.
- Using PTI instead of powdered thickener is expected to lead to a saving of £1,797.86 per patient per year.
- Introducing PTI in patients with dysphagia may lead to considerable cost savings in the UK driven by a reduction in costs associated with preparation, clinical complications, and wastage.

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