

# Evaluation of a high sensitivity thyroglobulin assay for use in patients following total thyroidectomy and radioiodine ablation

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## Background

- Thyroglobulin (Tg) is used for monitoring patients who have undergone total thyroidectomy (TT) and radioiodine (RAI) ablation therapy for thyroid cancer.
- The current method is the Siemens Immulite assay with limit of quantification of 2 ng/mL following in-house evaluation.
- Recent guidelines suggest the use of high sensitivity Tg (hs-Tg) as an alternative to TSH stimulated Tg levels.<sup>1</sup>
- The aim is to evaluate the hs-Tg Beckman Access II assay with a stated functional sensitivity of 0.1 ng/mL.

## Thyroglobulin

45 patient specimens were analysed on both the Siemens Immulite assay and the Beckman Access assay (Figure 1 and 2).

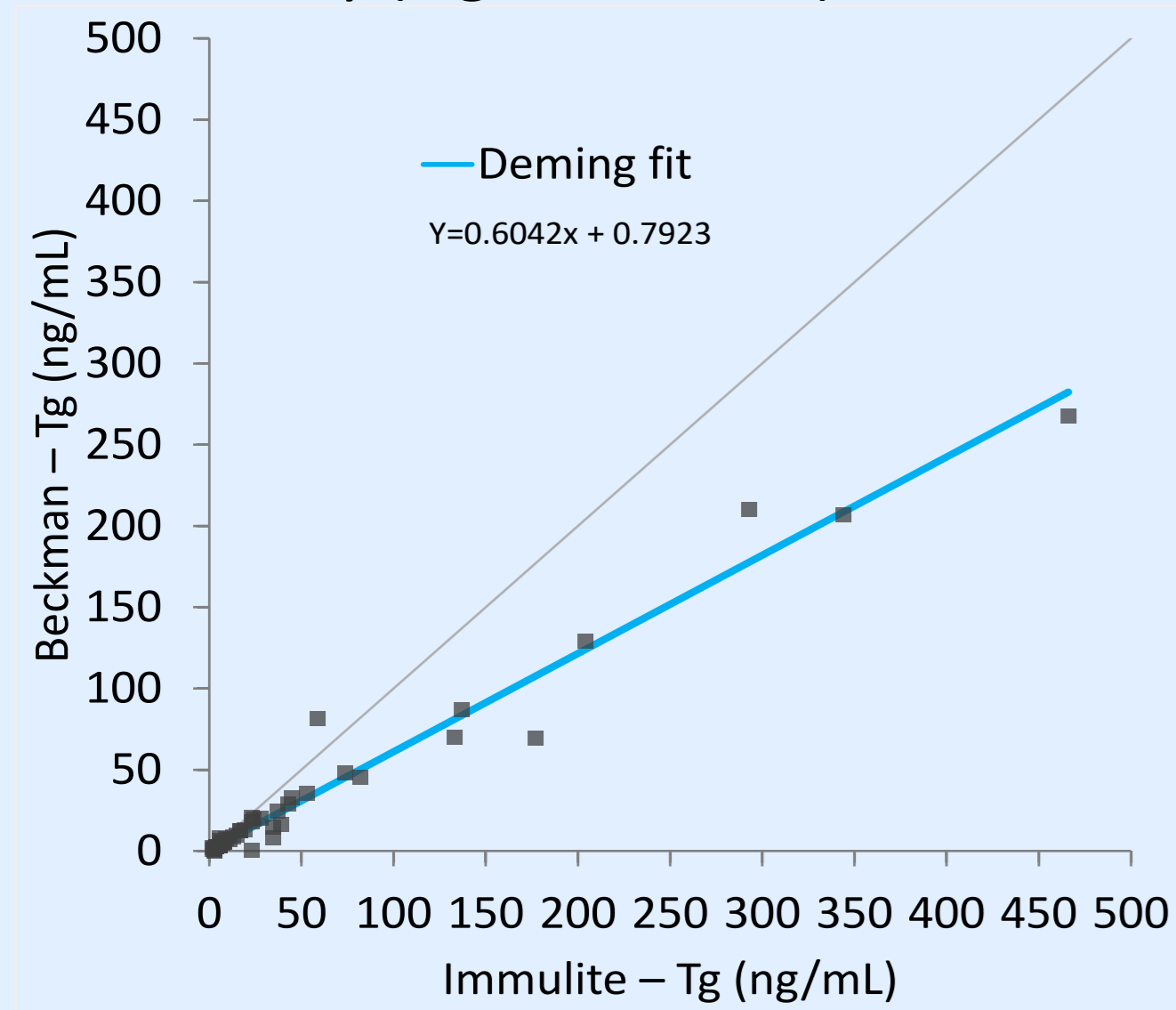


Figure 1. Deming regression of patient data

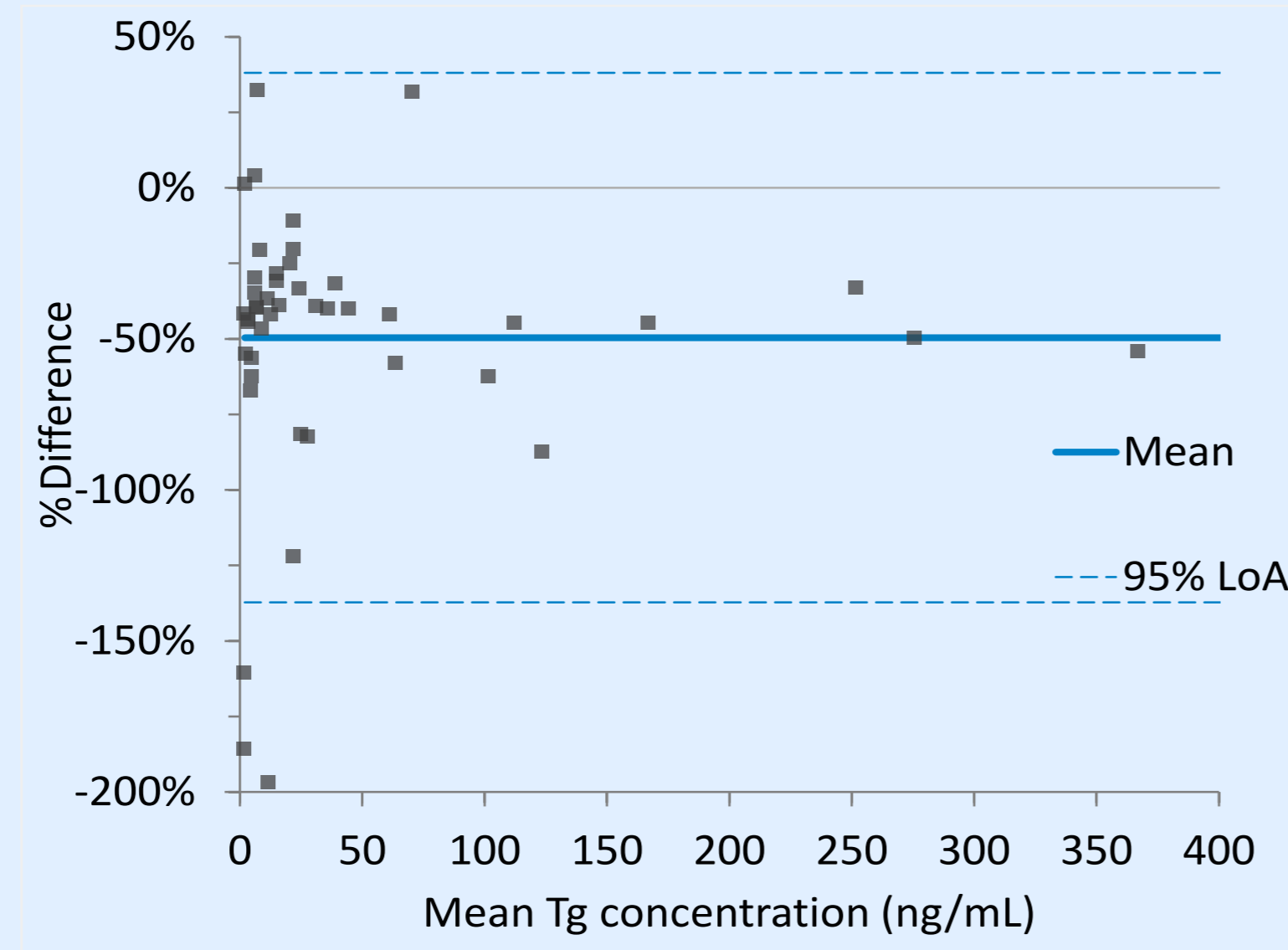


Figure 2. Bland-Altman plot of patient data

•The Beckman hs-Tg assay showed acceptable EQA performance compared to UK NEQAS method mean.

•Imprecision was acceptable for both patient samples (table 1) and IQC material.

Mean (ng/mL)	Intra-assay imprecision (%CV)	Total imprecision (%CV)
0.13	10.2	11.3
0.77*	2.0	3.6
1.13	2.4	11.3
2.62	1.7	7.3

Table 1. Imprecision data for patient samples.  
\* Analysed over 3 days

## Thyroglobulin antibodies

Guidelines recommend measurement of thyroglobulin antibodies on all thyroglobulin requests. The Beckman TgAb assay was evaluated against the Immulite assay (Figure 3).

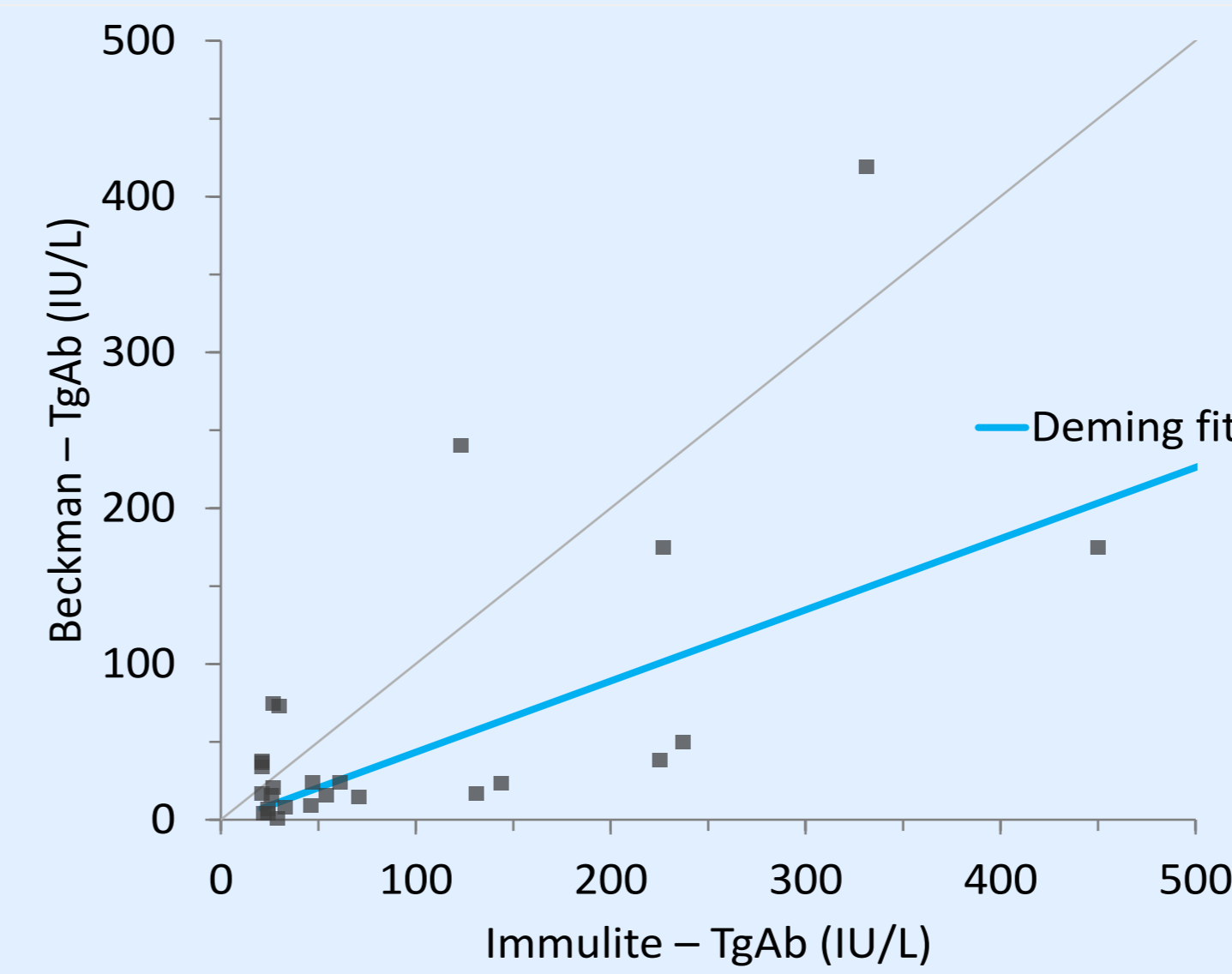


Figure 3. Deming regression of patient data

•The Beckman TgAb assay showed acceptable EQA performance compared to the method mean.

•Imprecision was within manufacturers stated performance (Tables 2 and 3).

Mean (IU/L)	Intra-assay imprecision (%CV)	Total imprecision (%CV)	Total SD
1.6	5.9	14.1	0.22
42.7	3.5	5.0	
206	4.5	5.5	

Table 2. Imprecision data for patient samples

	Level 1	Level 2	Level 3	Level 4
Target value(IU/L)	4.2	69.8	134	298
Mean (IU/L)	4.2	72.6	140	308
%CV	10.6	8.3	6.1	4.8

Table 3. Imprecision data for IQC material

## Clinical evaluation

### Method

- Samples were analysed from 140 patients with an Immulite Tg <2 ng/mL and TgAb <20 IU/L following TT and RAI.
- Clinical information obtained from electronic patient records to include time of TT and RAI

### Hs-Tg results

- Results were classified as detectable or undetectable based on the quoted functional sensitivity of 0.1 ng/mL.

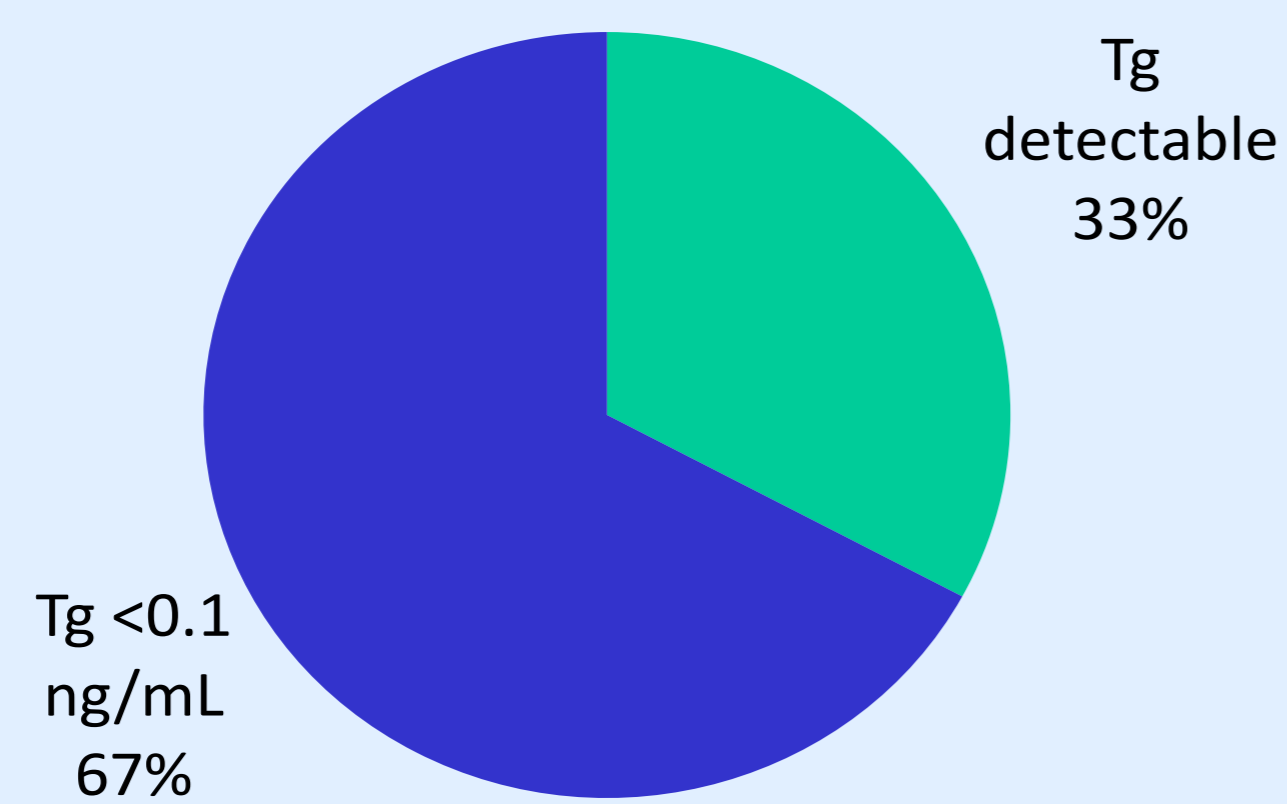


Figure 4. Frequency of thyroglobulin result by classification

### Time post RAI treatment

- Time post RAI was obtained for all patients and ranged from one month to twenty years.
- Median time post RAI was four years.

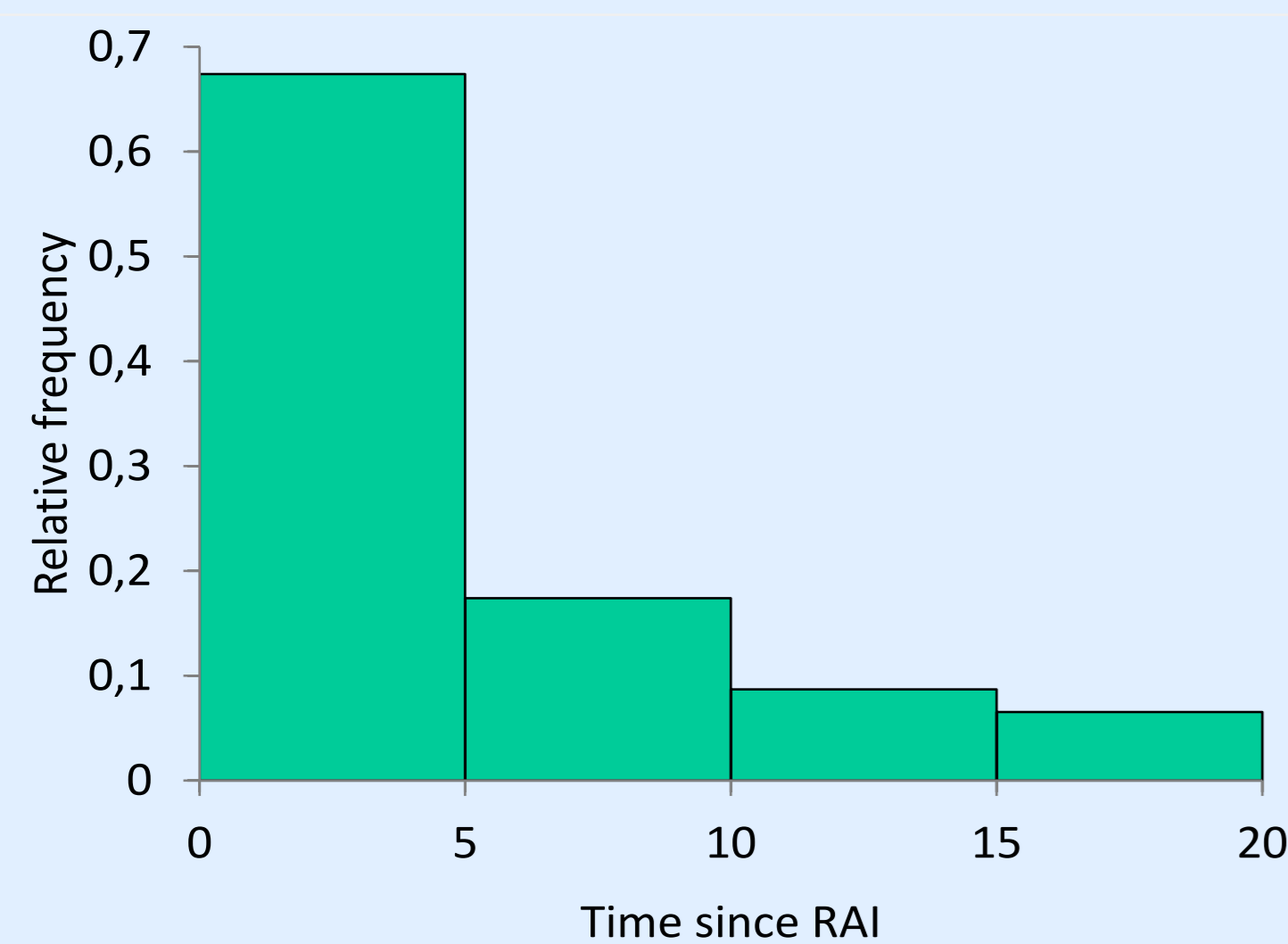


Figure 5. Time post RAI treatment in patients with a detectable hs-Tg

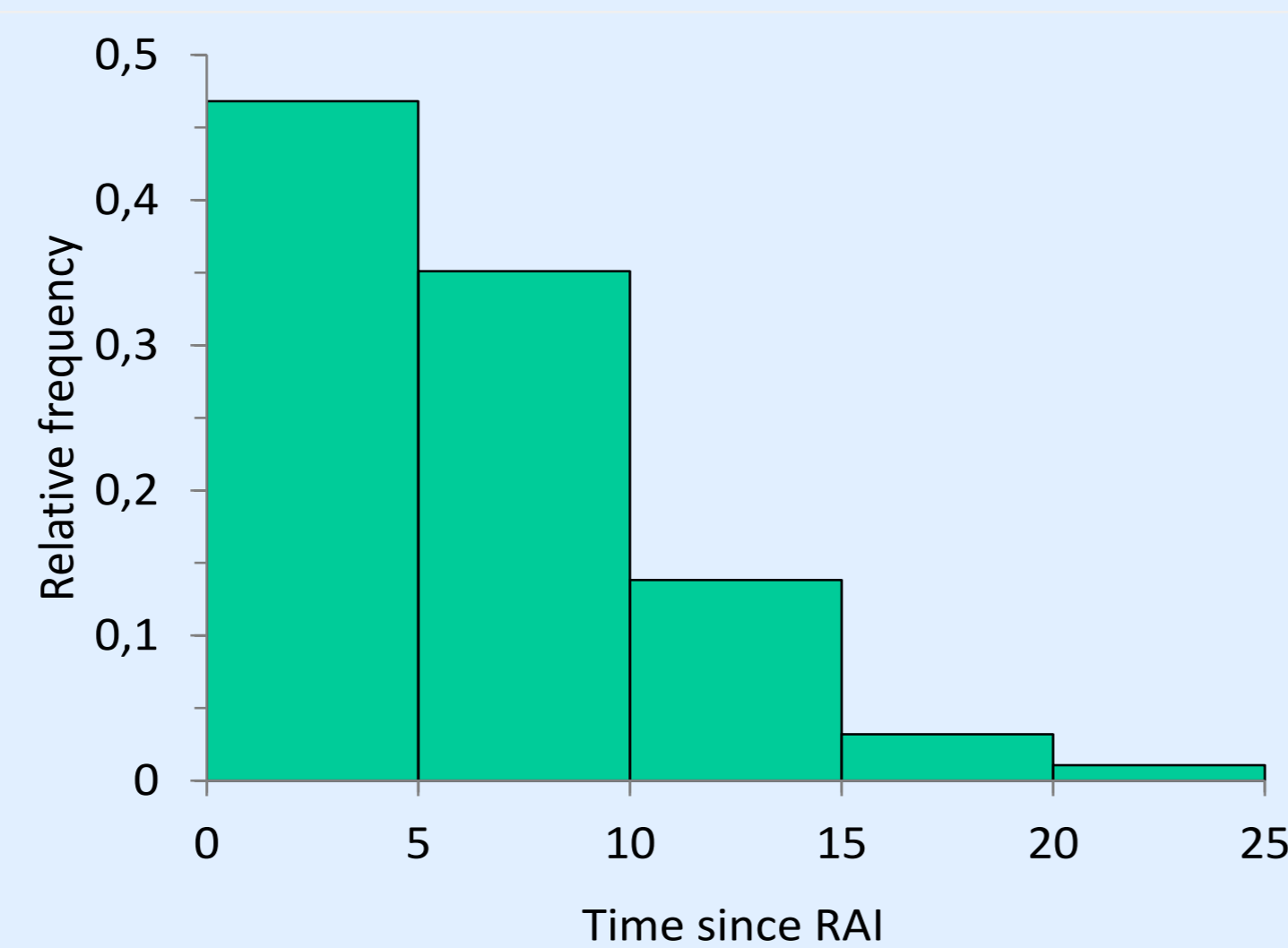


Figure 6. Time post RAI treatment in patients with an undetectable hs-Tg

## Current patient follow up

- Patients with normal neck ultrasound and stimulated Tg <2 ng/mL are classified as low risk and have annual follow up for 5 years.

## Proposed new patient follow up

- All patients to undergo dynamic risk stratification at 9-12 months post RAI.

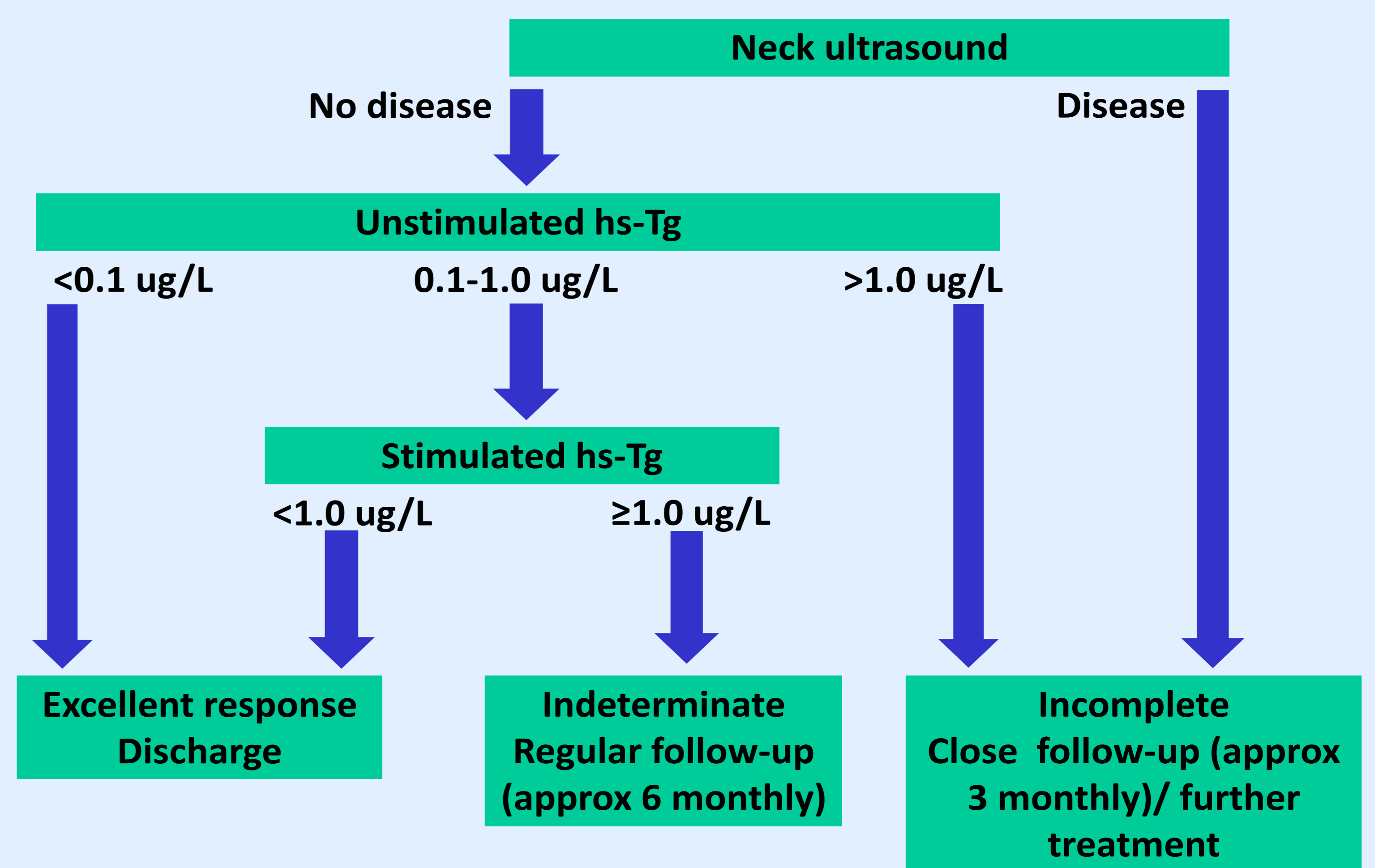


Figure 7. Proposed protocol for management of patients following RAI

### Advantages

- Improved dynamic risk stratification
- Improved allocation of resources to patients who need follow-up
- Reduced patient anxiety for those at low risk of recurrence

## Conclusion

- For patients with ongoing follow-up, a period of paired analysis would be required due to the significant negative bias observed.
- The hs-Tg assay has acceptable imprecision and EQA performance.
- A subset of patients with detectable hs-Tg were identified; further investigation is required to determine the clinical significance.
- Discussions are ongoing with clinicians as to how hs-Tg would change practice.

## References

1. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer  
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