

Supplementary analyses

A. Copy of survey questions and possible responses

Thyroid Disease Questionnaire

Thank you for taking the time to complete this short survey. At Newcastle University we are interested in the prescription of levothyroxine for subclinical hypothyroidism in older adults (>70 years). As a practicing health professional with a clinical interest in thyroid disease, your view is very important to us.

Your participation in this survey is voluntary and all responses will be grouped together so it will not be possible to identify your individual responses from the overall findings.

Patient name: Bill
Age: 80 years
Presenting complaint: Tiredness
Serum thyroid-stimulating hormone (TSH) value on two occasions: 6.5 and 6.8 mU/l (reference range: 0.4 – 4.5 mU/L)
Serum Free Thyroxine level on two occasions: 14 and 13.5 pmol/L (reference range: 10 – 22 pmol/L)

Your view on treating Bill with levothyroxine

1. Would you treat Bill/expect Bill to be treated with levothyroxine?
 - a) Yes
 - b) No
 - c) Unsure

Your view on prescribing levothyroxine for subclinical hypothyroidism

2. Are you aware of the current recommendation to generally avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults?

- a) Yes
- b) No
- c) Unsure

If No skip to question 8

3. How did you become aware of the recommendation to avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults?
- a) Professional guidelines (e.g., European Thyroid Association or American Thyroid Association)
 - b) Word of mouth
 - c) Academic article
 - d) Scientific meeting or conference
 - e) Training or CPD event
 - f) Other (please specify – free text)
4. Do you follow the recommendation to avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults?
- a) Yes, I follow the recommendation
 - b) Yes, I follow the recommendation but with certain exceptions
 - c) I sometimes follow the recommendation
 - d) No, I never follow the recommendation
 - e) Unsure

5. Do you agree that prior to the recommendation to avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults, there was excessive prescribing of levothyroxine for these patients?
- a) Yes
 - b) No
 - c) Unsure

If No skip to question 6

6. Has the recommendation to avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults addressed the problem of unnecessary levothyroxine prescribing for these patients?
- a) It has solved the problem
 - b) It has partly addressed the problem
 - c) It has made no difference
 - d) It has created other problems
 - e) Other (please specify – free text)
7. Do you feel that the recommendation to avoid levothyroxine treatment for mild subclinical hypothyroidism in older adults has improved your prescribing behaviour for these patients?
- a) Greatly improved
 - b) Slightly improved
 - c) No effect
 - d) Unsure
 - e) Other (please specify – free text)
8. Please add any other thoughts or views you have on levothyroxine treatment for subclinical hypothyroidism in older adults
- Free text

About you

9. Which of the following best describes your current job role?
- a) endocrinologist (Consultant or equivalent)
 - b) Nurse or allied health care professional
 - c) Trainee endocrinologist
 - d) Academic with no clinical commitments
 - e) Other clinician (please specify – free text)
10. Please select your gender
- a) male
 - b) female
 - c) I would prefer not to say
11. Please could you tell us your age (in years)
- a) under 30
 - b) 31-40
 - c) 41-50
 - d) 51-60
 - e) 61-70
 - f) over 70
 - g) I would prefer not to say
12. How long have you been in practice or been a practicing endocrinologist?
- a) 1- 5 years
 - b) 6 – 10 years
 - c) 11 – 15 years
 - d) 16 -20 years
 - e) >20 years

Thank you for taking the time to complete this survey.

B. Additional (supplementary) analyses

Sample

In total, 565 people gave their informed consent to participate in the survey. Twenty-five participants did not proceed with the survey after consenting. Four participants who identified as “Nurse or Allied Health Professional” were excluded. Within the remaining 536 participants, when asked about whether they were aware of the current guidelines, 492 of participants were aware, 25 were not aware, 16 were unsure, and 3 did not provide a response.

We conducted our supplementary analyses on the subset of those who reported that they were aware of the current guidelines. This was done to remove a potential bias in participants’ responses owing to uncertainty over the nature of the levothyroxine treatment guidelines. Of the 492 participants, 19 (3.9%) had missing data in the survey (with the exception of those who would by default have missing data due to the survey’s skip logic). We performed our tabulations and analyses on a complete case (listwise) basis.

Separately, the questionnaire was sent to local General Practitioners (GPs) in the Newcastle Gateshead Clinical Commissioning Group. Of the 264 GPs contacted with the survey link 28 (10.6%) responded and completed the survey. Their responses to the survey questions are described separately.

Results

Supplementary Table 1. Descriptive characteristics of participants who were aware of current guidelines

n	473
Age, n (%)	
Under 30	8 (1.7)
31-40 years	94 (19.9)
41-50 years	98 (20.6)
51-60 years	120 (25.4)
61-70 years	91 (19.3)
Over 70 years	61 (12.9)
Prefer not to say	1 (0.2)
Gender, n (%)	
Male	271 (57.4)
Female	201 (42.4)
Prefer not to say	1 (0.2)
Years of qualification, n (%)	
0-5 years	58 (12.3)
6-10 years	52 (11)
11-15 years	56 (11.9)
16-20 years	62 (13.1)
>20 years	243 (51.3)
Prefer not to say	2 (0.4)
Current role, n (%)	
Endocrinologist	403 (85.2)
Trainee	18 (3.8)

Others	52 (11)
Location of work, n (%)	
Europe	222 (47)
North America	133 (28)
Egypt and North Africa	27 (5.7)
South Africa	20 (4.2)
Latin America	41 (8.7)
Other	30 (6.4)
Source of guidance, n (%) †	
2014 European Thyroid Association guideline	175 (37.1)
2012/14 American Thyroid Association guideline	243 (51.5)
Word of mouth	33 (7)
Academic article	218 (46.2)
Meeting or conference	228 (48.3)
Training or CPD event	28 (5.9)
Other	26 (5.5)
† Multiple choice question	

Responses from GPs

Amongst GPs, 14 (50%) of the 28 were unaware of guidelines pertaining to the older symptomatic person with SCH. When compared to other health professionals and adjusted for age group and sex of the respondent, GPs were nearly 28 times more likely to be unaware of these guidelines than endocrinologists [adjusted odds ratio of 27.7 (10.8 – 71.6)]. A quarter of GPs would prescribe levothyroxine to the older person with SCH. Approximately 88.2% (n = 15/17 with available data) followed the guidelines at least some of the time. Just under a quarter (23.5%; n = 15/17) of GPs felt there was excessive prescribing prior to the guidelines. Majority of GPs (58.8%; n = 10/17) felt the guidelines had helped

improved their prescribing behaviour. Of those who felt there was excessive prescribing, a minority (45.5%; n = 5/11) felt the guidelines had at least partly addressed the problem of unnecessary prescribing.

Excessive LT4 prescribing

Of the 473 responses received, 326 (68.9%) felt that there had been excessive prescribing of LT4 in the older population with SCH previous to the guidelines being formulated whereas 57 (12.1%) and 90 (19.1%) disagreed or were unsure, respectively. Endocrinologists (72.6%) were most likely to feel that there was excessive LT4 prescribing in the past in older SCH people compared to trainees (55.6%) and other specialties (42.2%). Almost 91% (n = 37/41) of clinicians in Latin America felt that there had been excessive LT4 prescribing in older people. Respondents from other regions where 45.8 – 67.2% agreed that this was the case also shared this view. In the subset of clinicians who were aware of the guidelines, majority (91.1%) of those who felt that there was over-prescribing of LT4 prior to the guidelines always or almost always followed the guidelines (**Supplemental Table 2**).

Supplementary Table 2. Follow guidelines in relation to perception of previous over-prescribing

	Felt there was excessive prescribing prior to guidelines?		
	Yes (n = 325)	No (n = 57)	Unsure (n = 90)
Follow the current guidelines?			
Always/Always but with certain exceptions	296 (91.1)	42 (73.7)	76 (84.4)
Sometimes	29 (8.9)	11 (19.3)	14 (15.6)

Never	0	4 (7)	0
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Data presented as frequency and percentage.

Of those who follow the guidelines (both always and sometimes), how many say that it slightly or greatly improves prescribing behaviour?

Of those who followed the guidelines at least some of the time, 73.7% felt it helped improve prescribing behaviour (**Supplementary Table 3**). Of the clinicians that felt that there had been excessive prescribing previously (n= 325), most health professionals (78.1%) overall felt that guidelines had improved prescribing practice in older SCH patients although there was inter-professional variability in opinion: endocrinologists – 78.8%, trainees – 70%, and other specialists – 73.9%. Similarly, there was wide variation between the various regions with 77.8% of clinicians from Europe agreeing that prescribing in the older age group had been improved by guidelines, and 69.2% of respondents from North America agreeing.

In the group of clinicians that felt there was excessive prescribing prior to these guidelines and who always or sometimes followed these guidelines (n=330), 77.6% felt that the guidelines had completely or partly addressed the issue of LT4 over-prescribing in the older age-group (**Supplementary Table 4**).

Supplementary Table 3. Improve prescribing behaviour in relation to following guidelines.

	Do you follow the current guidelines?		
	Always/Always but with certain exceptions (n = 414)	Sometimes (n = 54)	Never (n = 4)
Improved prescribing behaviour?			
Greatly/Slightly improve	315 (76.1)	28 (51.9)	0

No effect	72 (17.4)	22 (40.7)	4 (100)
Unsure	16 (3.9)	2 (3.7)	0
Other	11 (2.7)	2 (3.7)	0

Data presented as frequency and percentage.

Of those who follow the guidelines, how many say it always/sometimes solved the problem of excessive LT4 prescribing?

We had data on 415 participants who provided a response to the question on whether the guidelines had addressed the problem of excessive prescribing. We analysed a subset of 325 participants who had also felt there was excessive prescribing prior to the guidelines (due to the survey's skip logic). Of those who followed the guidelines at least some of the time, 77.5% acknowledged that the guidelines solved or at least partially solved the problem of over-prescribing, 8% felt it made no difference, whereas a minority (2.2%) felt it had created other problems (**Supplementary Table 4**).

Supplementary Table 4. Over-prescribing in relation to following the guidelines at least some of the time.

	Do you follow the current guidelines?		
	Total (n = 325)	Always/Nearly always (n = 306)	Sometimes (n = 29)
Addressed problem of unnecessary prescribing			
Solved/Partly solved	252 (77.5)	237 (77.5)	15 (51.7)
No difference	26 (8)	21 (6.9)	5 (17.2)
Created other problems	7 (2.2)	4 (1.3)	3 (10.4)
Unsure	33 (10.2)	28 (9.2)	5 (17.2)
Other	7 (2.2)	6 (2)	1 (3.5)

Data presented as frequency and percentage.

Analysed in subset of participants who felt there was excessive prescribing prior to the guidelines.