

Insights into **MANaging** Growth for Endocrine Nurses

12-13 October 2017, Toulouse, France

An Independent Medical Education Event for Paediatric Nurses

Audit of Adrenal Function Tests

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University



Introduction

- Audit
- Overview of adrenal function tests
- Education



Audit – why?

- Explore UK Paediatric Endocrine Nurses' knowledge on Adrenal Function Tests
- Follow up
 - 'Principles of Care for the child and young person in endocrinology'
 - More detail on dynamic investigations



Audit focus

- Nurses' role in dynamic function testing
- Adrenal function tests your centre performs
- Understanding of the rationale and need
- Need for further education?



Audit process


- Email survey sent to 40 UK paediatric endocrine nurses
- 18 responses (45%)
- Audit was open online for 6 weeks, with 3 reminders




Nurses' role

- ? Part of the Endocrine Nurse Specialist role to undertake dynamic function tests
- Do you?

RCN Competences

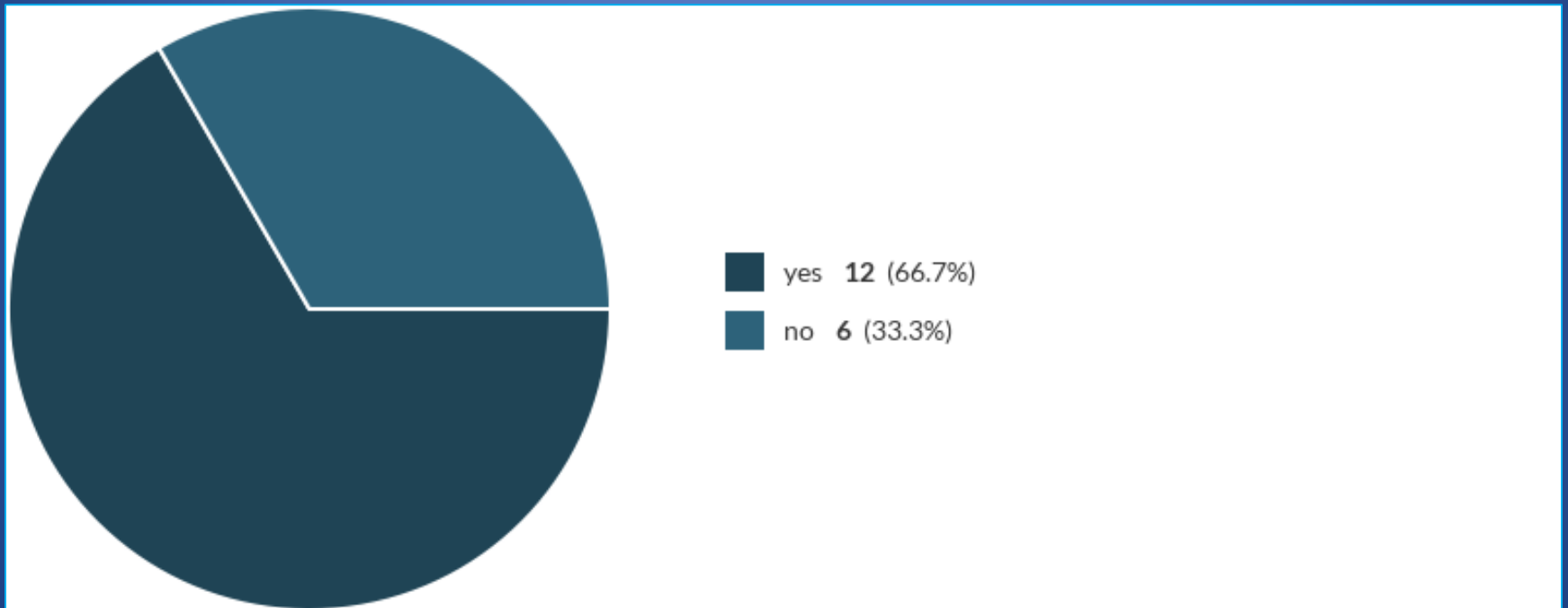


Competences:
an integrated career and
competency framework for children's
endocrine nurse specialists



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Do you undertake dynamic function testing?



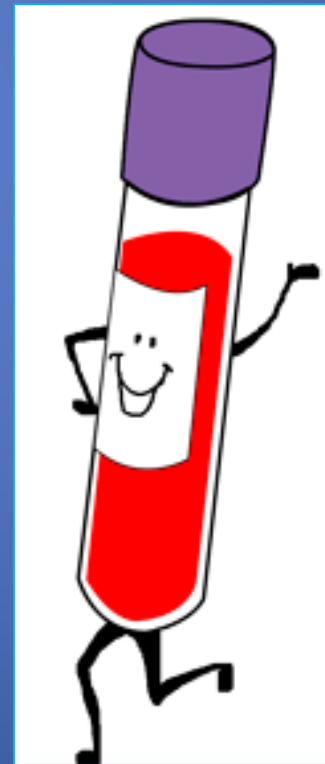
If not..

Who carries out the test?

- Ward staff
- Junior doctors
- Advanced Nurse Practitioners

Should it be part of your role?

- 50 / 50 response



Why don't you carry out tests?

- Caseload too big
- Not skilled in venepuncture / cannulation
- Cannot do specialist role and testing
- Relationship with child and family
 - Want the child / family to feel relaxed in clinic consultations

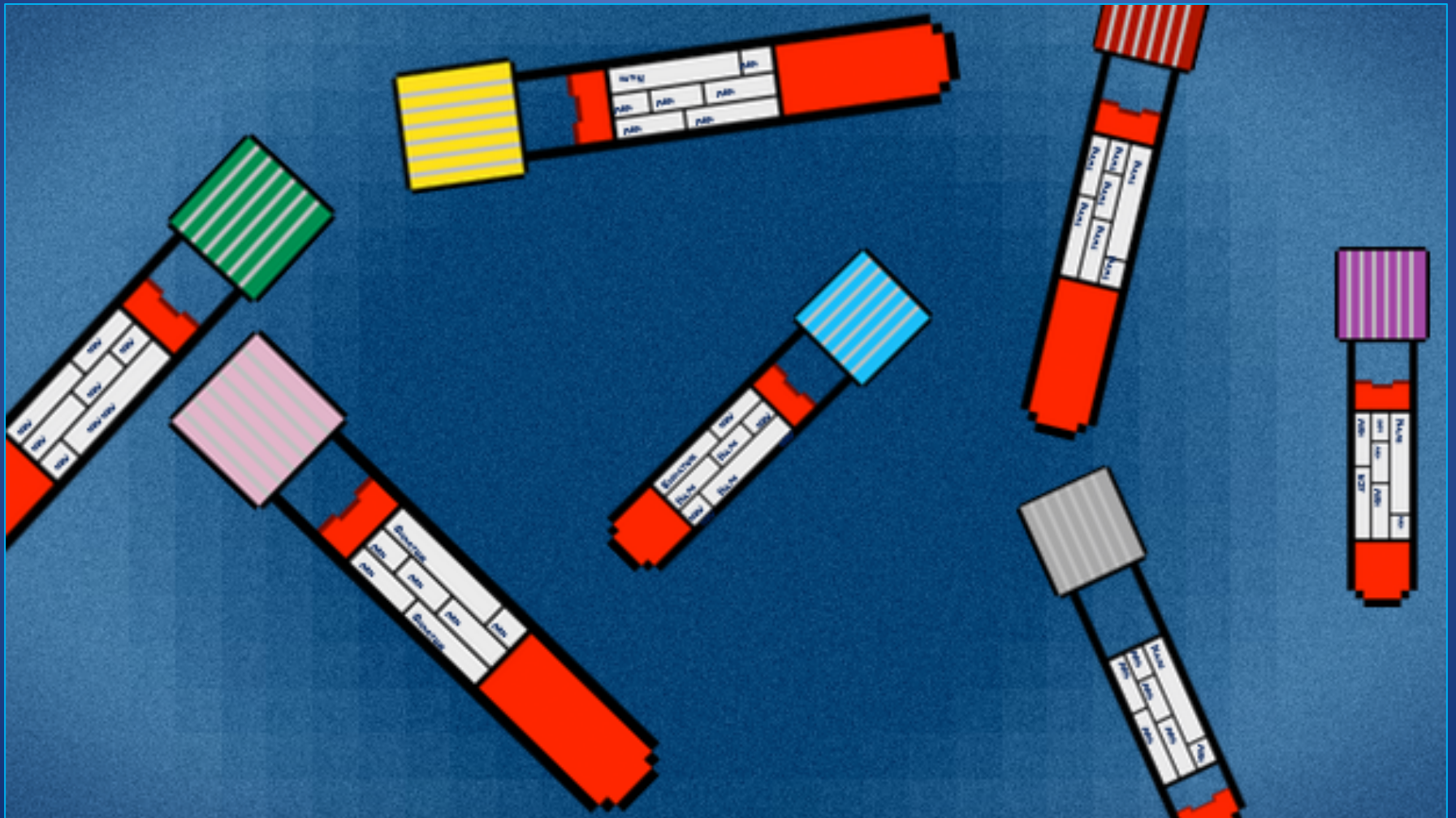
What do you think? Do you agree?

Adrenal Function tests

- Triple pituitary function tests
- Standard dose synacthen test
- Low dose short synacthen test
- Long synacthen test
- Cortisol day curve
- 24 hour profile
- Hydrocortisone day curve
- Low dose dexamethasone suppression test
- High dose dexamethasone suppression test
- Corticotrophin releasing hormone (CRH) test



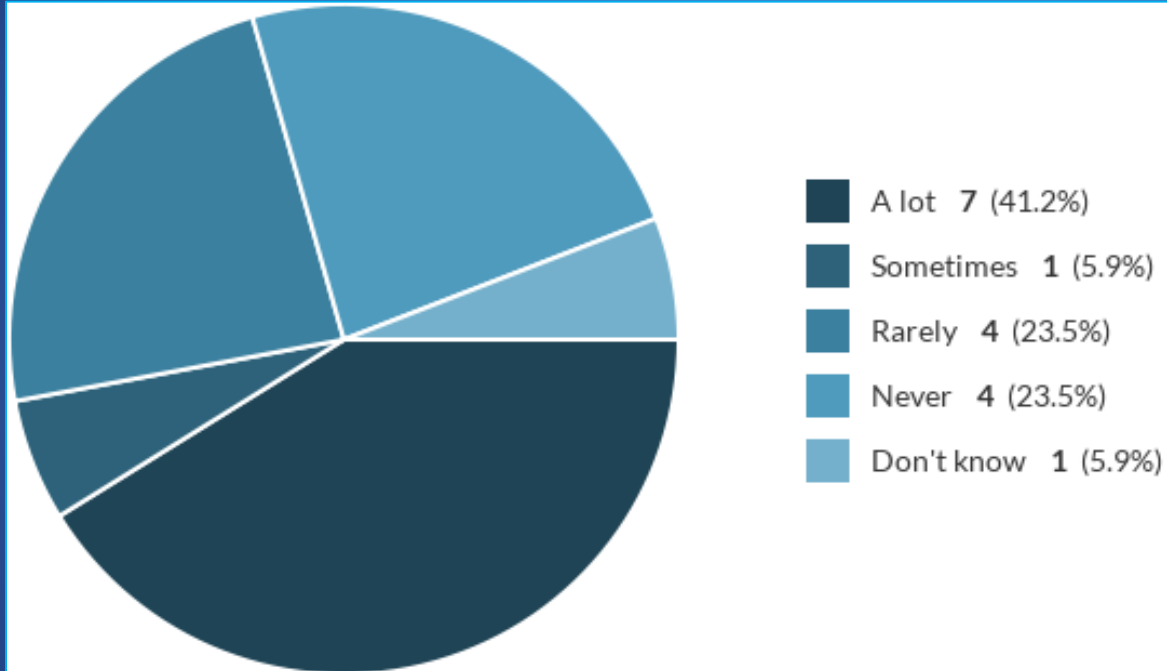
Triple pituitary function test



What is it?

- Combination of ITT / TRH / GnRH tests
- Indications
 - Assessment of GH, Cortisol, GnRH and TSH secretion in patients suspected of –
 - Panhypopituitarism
 - Those who have had
 - Surgery
 - Trauma
 - Radiotherapy
 - to the hypothalamo – pituitary region
- GnRH not needed in children under 10, unless demonstrating early puberty

How often?



Why?

- To test full pituitary function
- Test the hypothalamo-pituitary axis
- When multi pituitary deficiency is suspected

- Don't know x3

Standard dose Short Synacthen Test

- Assesses the response of the adrenal gland to exogenous adrenocorticotrophin (ACTH) (SYNtheticACTH)
- A test of adrenal, not pituitary function
- Investigations for:
 - Primary adrenal insufficiency
 - CAH
- Cannula needs to be inserted ONE HOUR before sampling commences
- Peak cortisol should be $>550\text{nmol/L}$



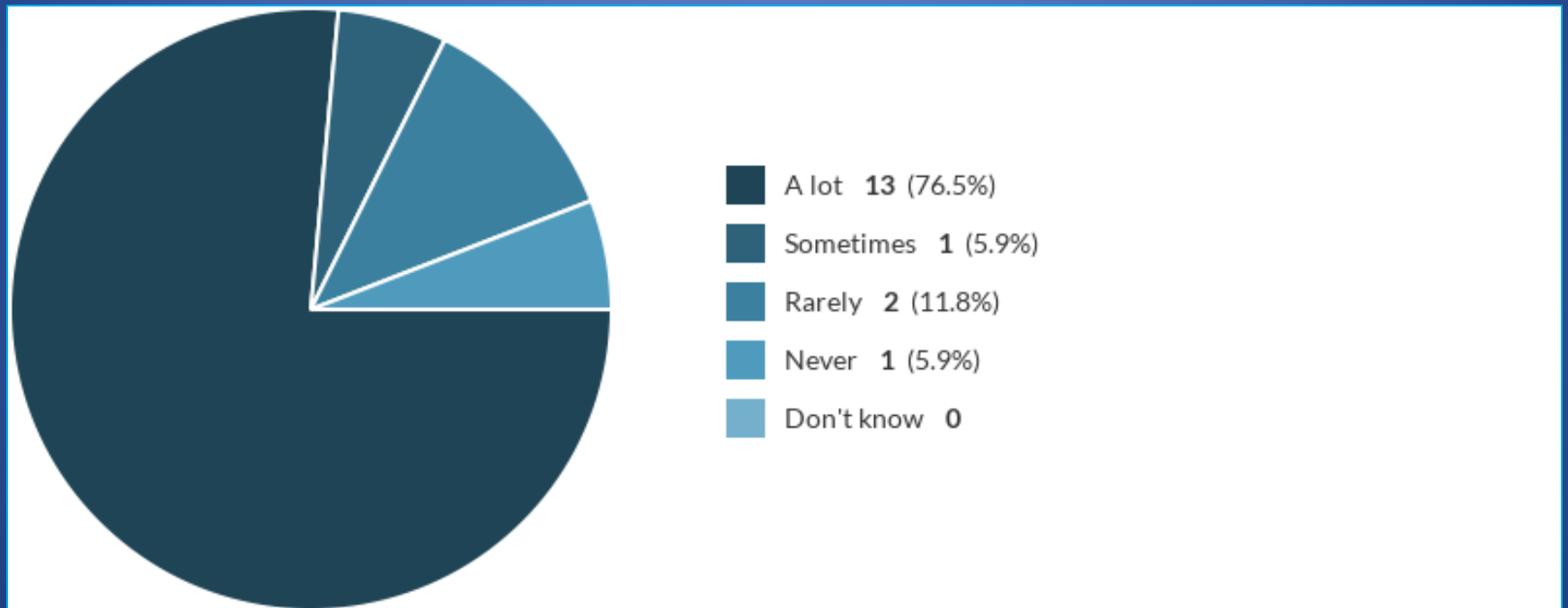
Standard dose Short Synacthen Test

Time	Cortisol	ACTH	17-OHP
0	✓	✓	✓
30	✓	✓	✓
60	✓	✓	✓

- IM injection after time 0
 - < 6/12 : 62.5mcg
 - 6/12 – 2yrs : 125mcg
 - > 2yrs: 250 mcg
- Elevated basal 17-OHP or a rise above 30nmol/L
 - Associated with CAH
 - Higher rises –
 - more classical forms
 - Lesser rises - ? Carriers

Overwhelming full understanding of need and rationale

Standard dose Short Synacthen Test



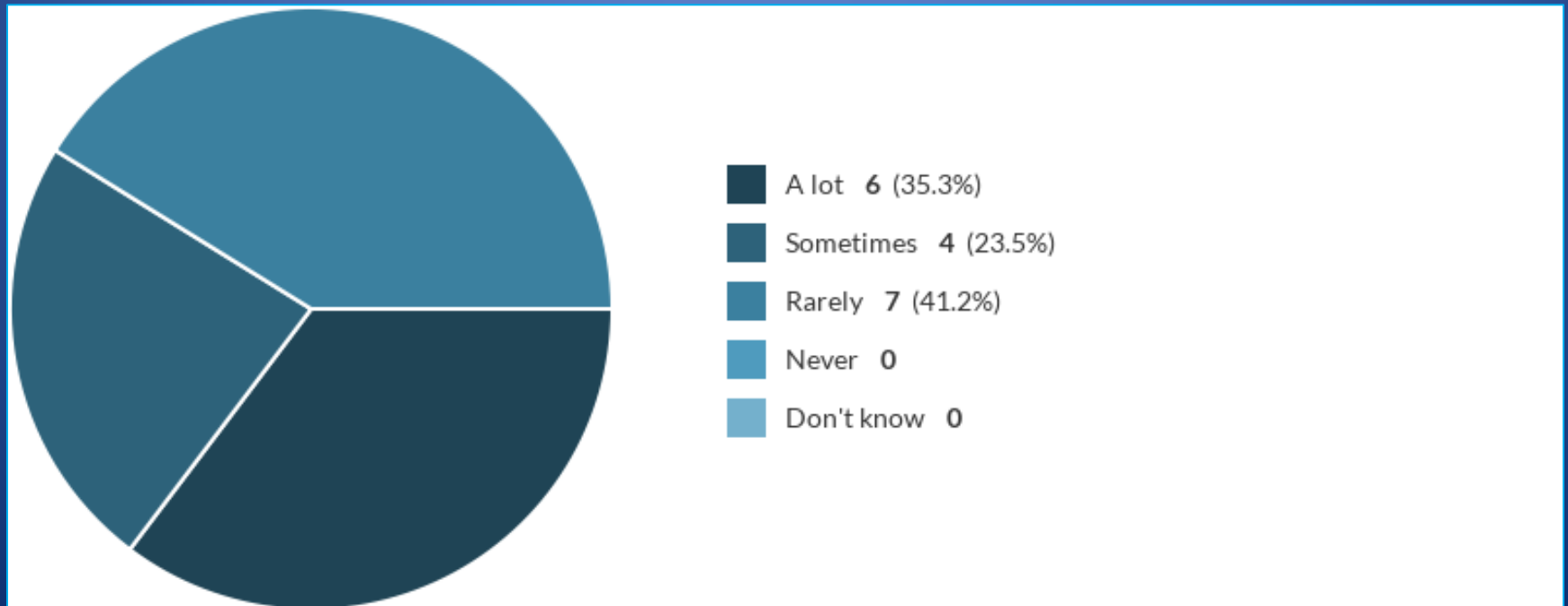
Low dose short synacthen test

- Investigations for secondary adrenal insufficiency
 - Post cranial surgery or radiotherapy
 - Document recovery of HPA axis following prolonged exogenous steroid treatment
- Interpretation
 - Morning peak cortisol >500nmol/L is normal
 - >350nmol/L can be seen in healthy people
 - Peak stimulated cortisol should rise above 550nmol/L
 - Usually combined with an increase of >200nmol/L over baseline values

Time (min)	Cortisol	ACTH
Baseline (8am)	✓	✓
Baseline 0	✓	
<i>Administer Synacthen</i>		
5	✓	
10	✓	
15	✓	
20	✓	
25	✓	
30	✓	
35	✓	
40	✓	
45	✓	

Low dose short synacthen test

- Relatively good understanding
 - Test recovering adrenal gland
 - To assess for secondary adrenal insufficiency
 - Assessment of hypothalamic pituitary adrenal axis

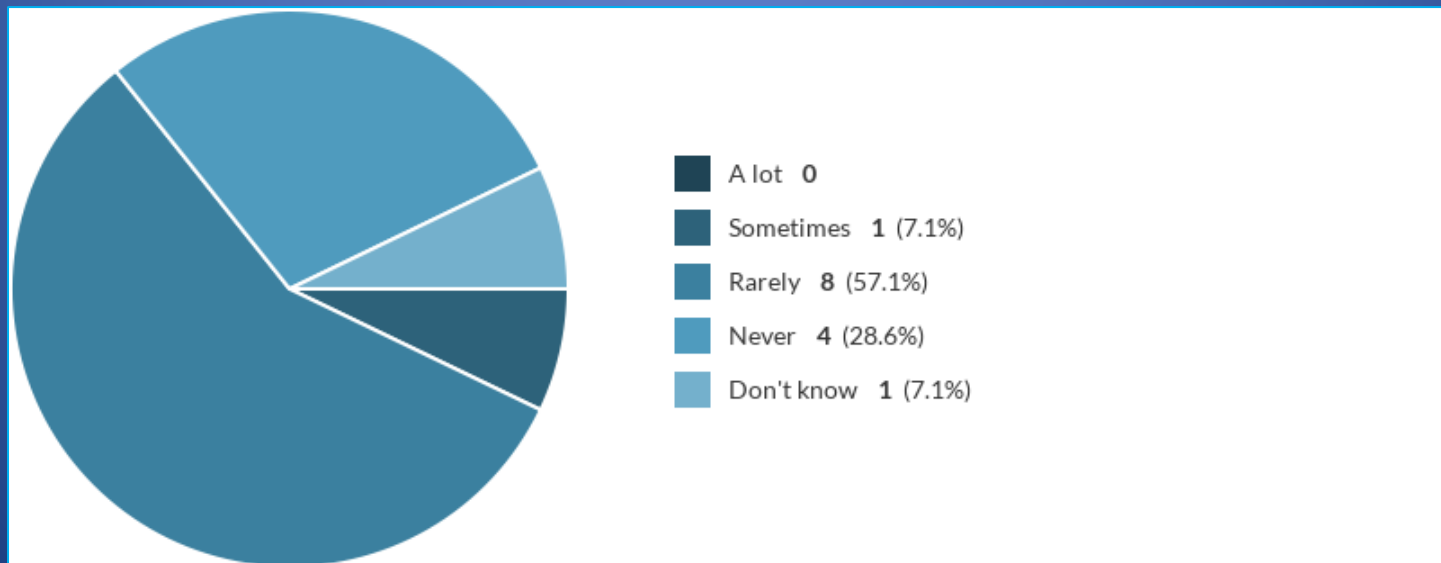


Long Synacthen Test (Prolonged ACTH test)

- Diagnostic uncertainty following short and LD synacthen tests
 - Especially when there is concern re suppressed adrenals
 - All steroid therapy (except dexamethasone and betamethasone) interfere with cortisol assays.
 - HC to be stopped for at least 12 hours before the test
 - Prednisolone etc 3 days
- Day 1
 - Bloods for Cortisol and ACTH 0900
 - Synacthen 1mg IM 0900
- Day 2
 - Synacthen 1mg I 0900
- Day 3
 - Syncathen 1mg 0900
- Day 4
 - Repeat bloods

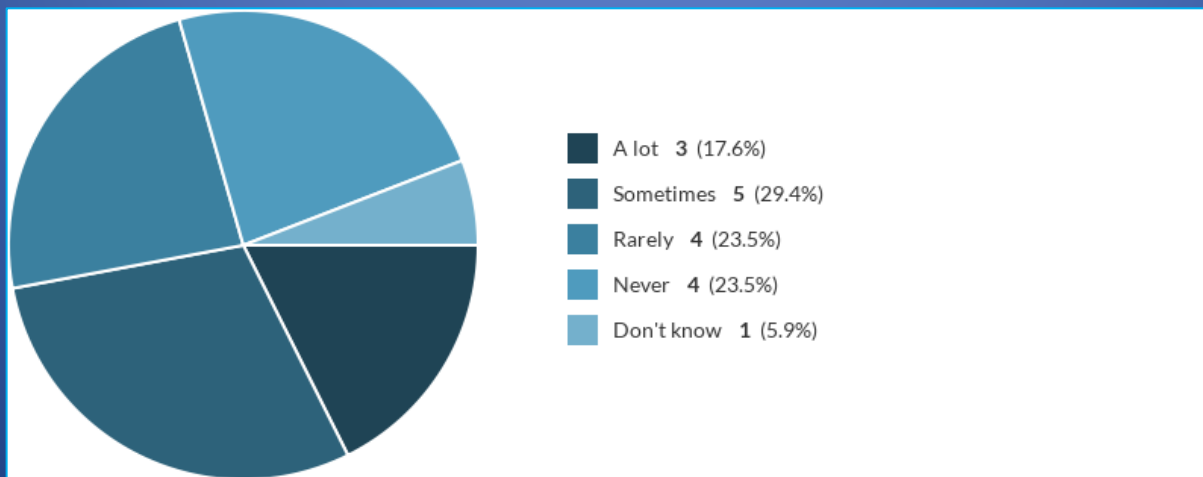
Long Synacthen Test (Prolonged ACTH test)

- Much less understanding
 - For cases of adrenal function where response is slow
 - Don't know / not heard of it
 - Cushing's investigations?



Cortisol day curve

- Accurate measures of cortisol levels throughout the day
 - Peaks between 0700 and 0800, nearly zero by midnight
- Mixed responses
 - Natural production of cortisol
 - Levels of hydrocortisone replacement
 - Don't know / not sure



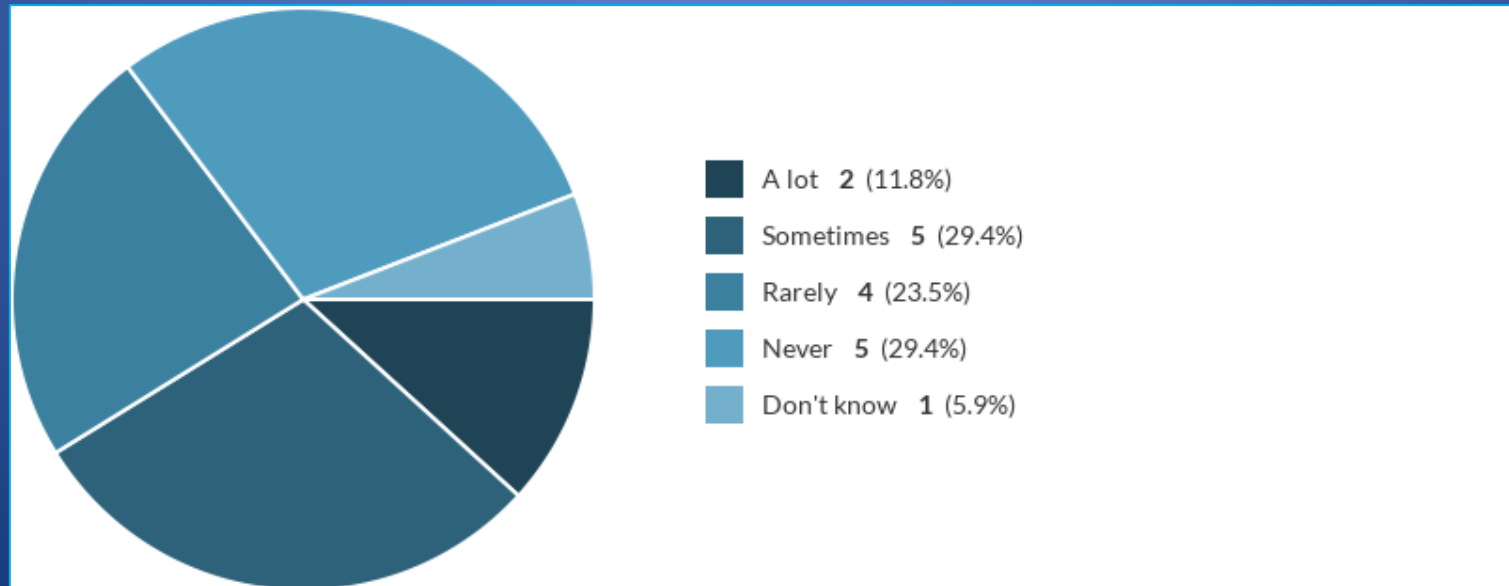
Hydrocortisone day curve

- Assessment of accuracy of Hydrocortisone dose
- Assessment of compliance with therapy
 - Rapid growth / advancing bone age
 - Androgen excess
 - Loss of testicular volume in boys
 - Recurrent hospital admissions for salt loss in CAH



Hydrocortisone day curve

- Overwhelming response
 - Assess the dose of medication throughout the day
 - Ensuring correct dose of hydrocortisone
 - Don't know x5

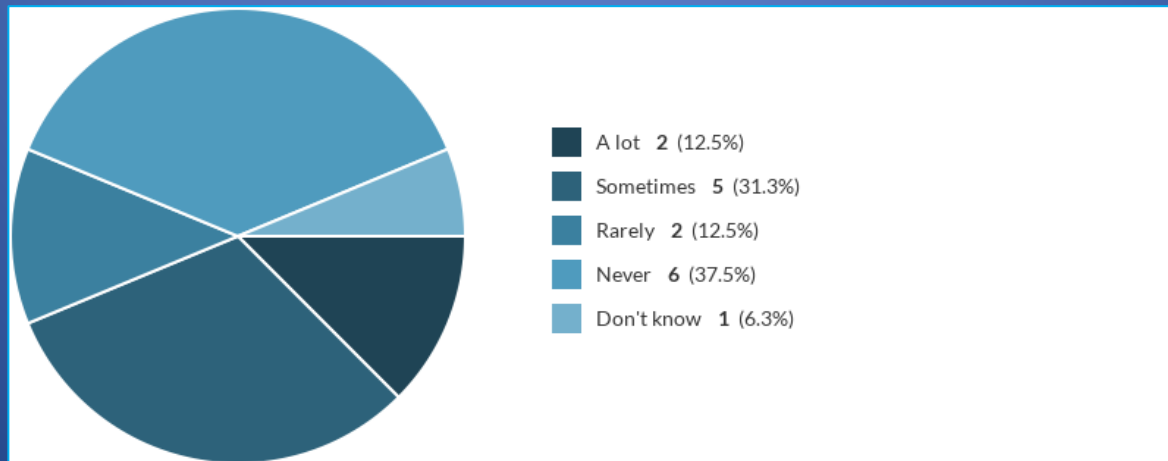


24 hour profile

- Very similar to Hydrocortisone day curve
- Also measuring 17OHP
- Useful to assess the troughs and peaks of both cortisol and 17OHP with the taking of the hydrocortisone tablets
- Shows that may be better to have smaller doses more frequently
 - Allows very fine tuning of dosing

24 hour profile

- Mixed responses
 - Cortisol levels in children on hydrocortisone replacement
 - Also check 17-OHP
 - Check if drug doses are appropriate
 - Resources
 - Day ward
 - Research purposes?
 - Don't know x 5

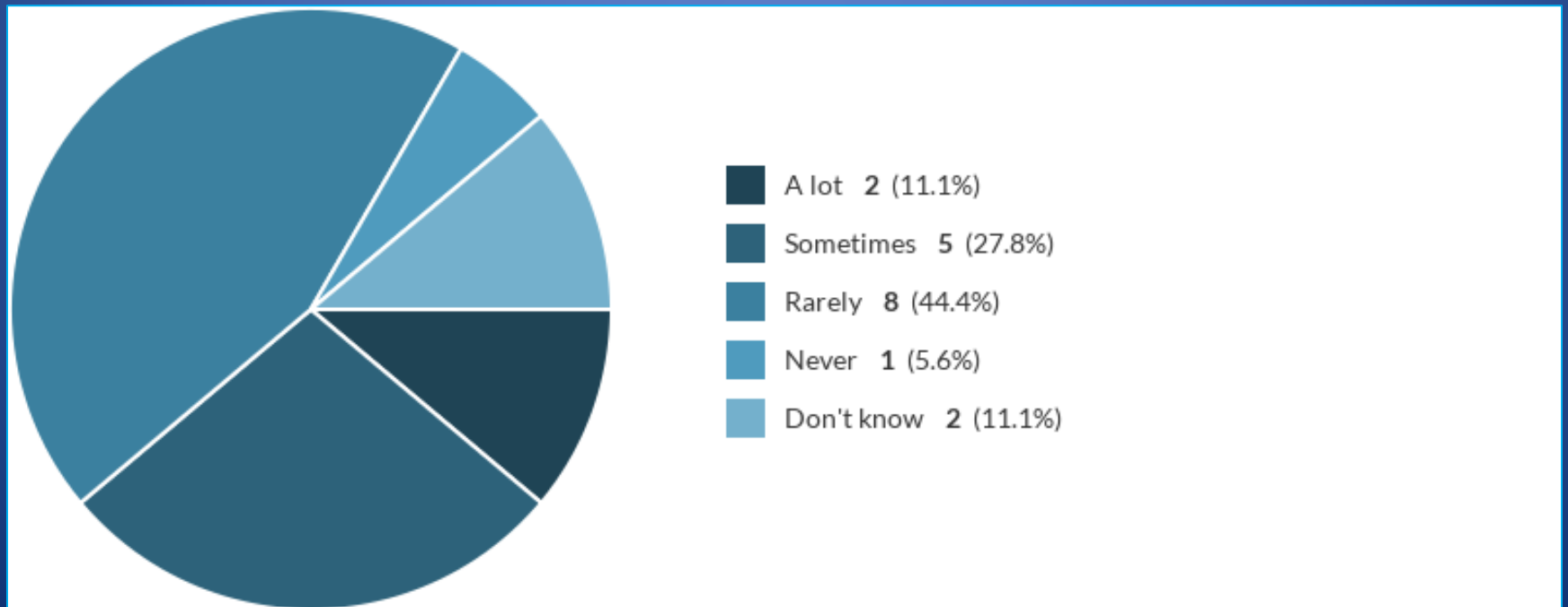


Low dose dexamethasone suppression test

- Diagnosis of Cushing syndrome
 - Cortisol levels
 - $<50\text{nmol/L}$ on day 4 excludes Cushing syndrome
 - Failure to suppress
 - Confirms hypercortisolism
 - Does not confirm cause
- Bloods for ACTH and Cortisol at 0900
 - Dexamethasone 0.5mg 6 hourly for eight doses
 - Repeat bloods at end of test (after 4 days)

Low dose dexamethasone suppression test

- Good knowledge, although performed rarely
- Some had no knowledge

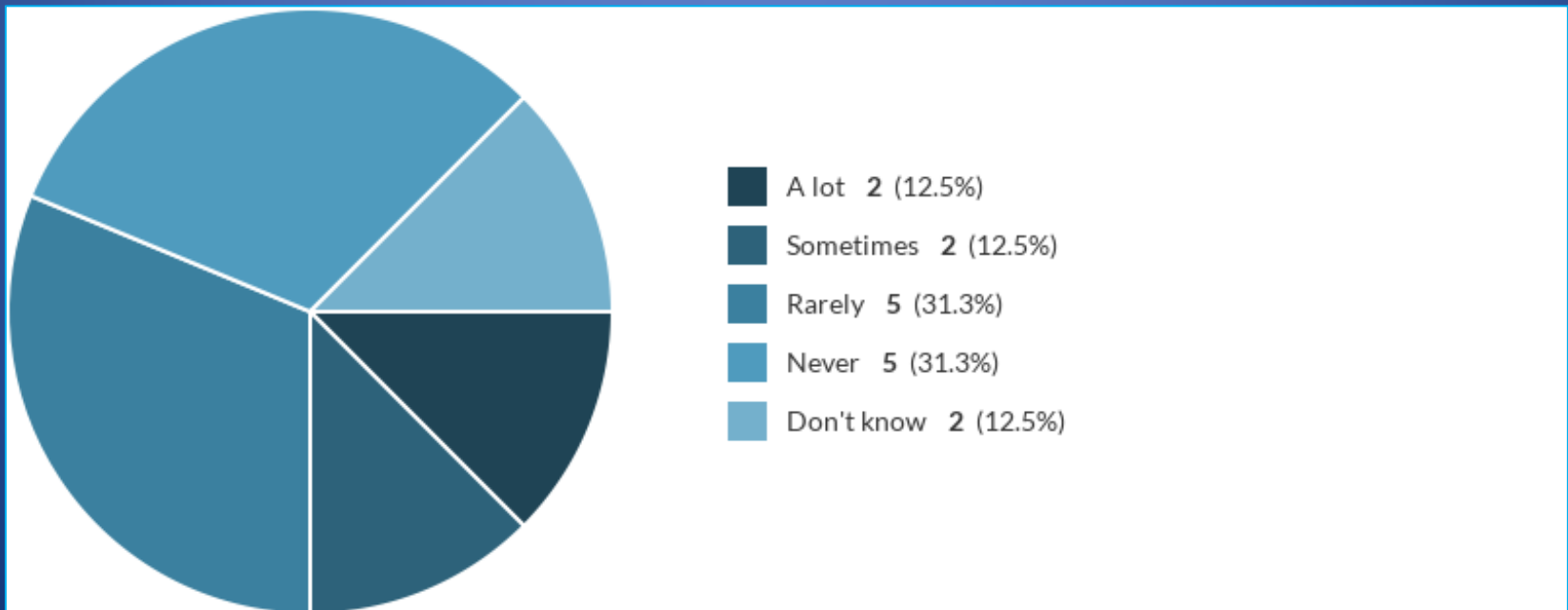


High dose dexamethasone suppression test

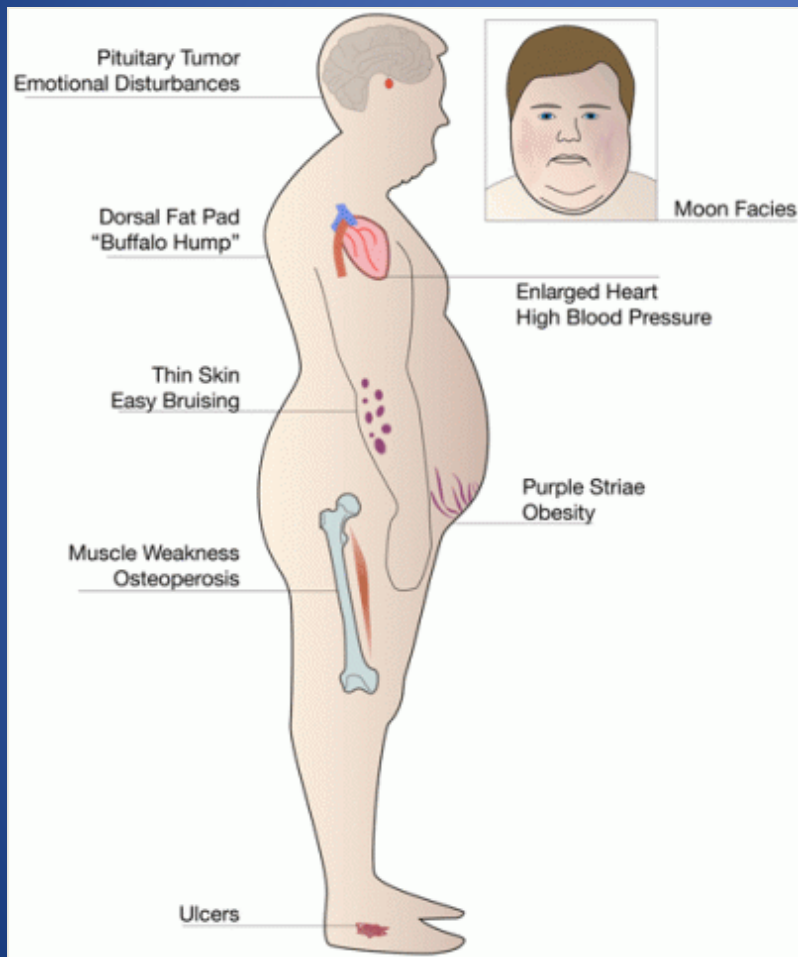
- Differential diagnosis of Cushing syndrome
- Pituitary dependant hypercortisolaemia
 - Cortisol usually suppresses to at least 50% of basal levels
- Adrenal tumours / ectopic ACTH
 - Failure to suppress
- Same protocol as LDDST except 2mg dexamethasone

High dose dexamethasone suppression test

- Less of an understanding
 - 7 did not know
- Those who did
 - Differentiate pituitary and ectopic causes of Cushing's



CRH test



- Differential diagnosis of Cushing's syndrome
 - May be useful in determining the source of ACTH dependent Cushing's

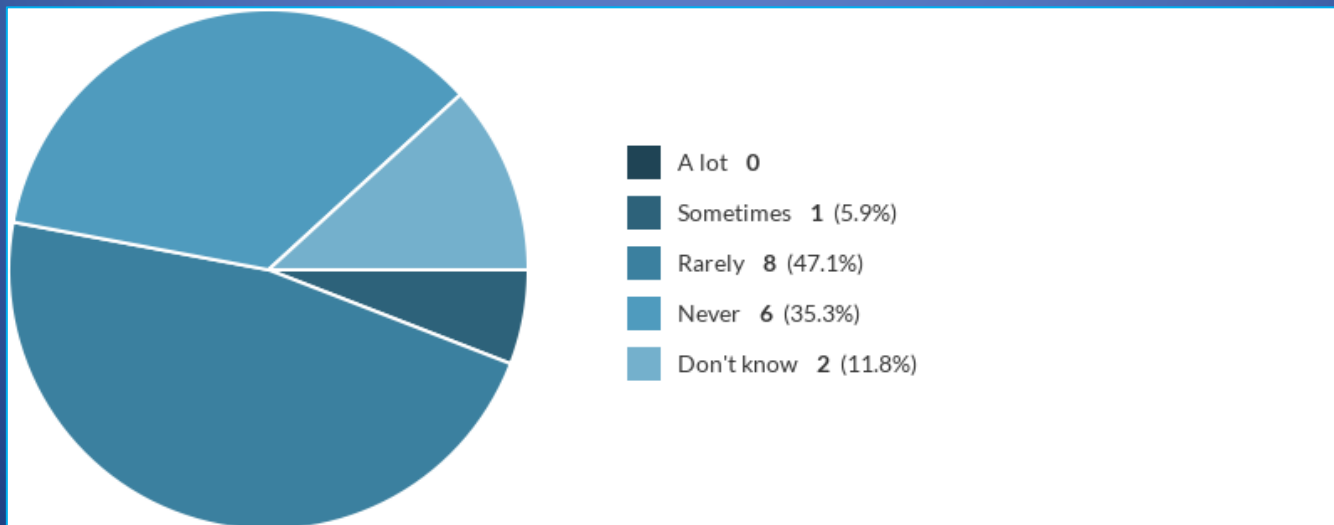
CRH test

- Interpretation
 - ACTH and Cortisol are secreted in response to CRH in 'normal' people
 - An exaggerated response is seen in Cushing's disease (pituitary ACTH over production)
 - In ectopic ACTH syndrome
 - ACTH and Cortisol fail to respond to CRH
- Facial flushing, hypotension
- Fast from midnight

Time (mins)	Cortisol	ACTH
<i>-30 Insert cannula</i>		
-15	✓	✓
0	✓	✓
<i>Administer CRH</i>		
5	✓	✓
15	✓	✓
30	✓	✓
45	✓	✓
60	✓	✓
90	✓	✓
120	✓	✓

CRH test

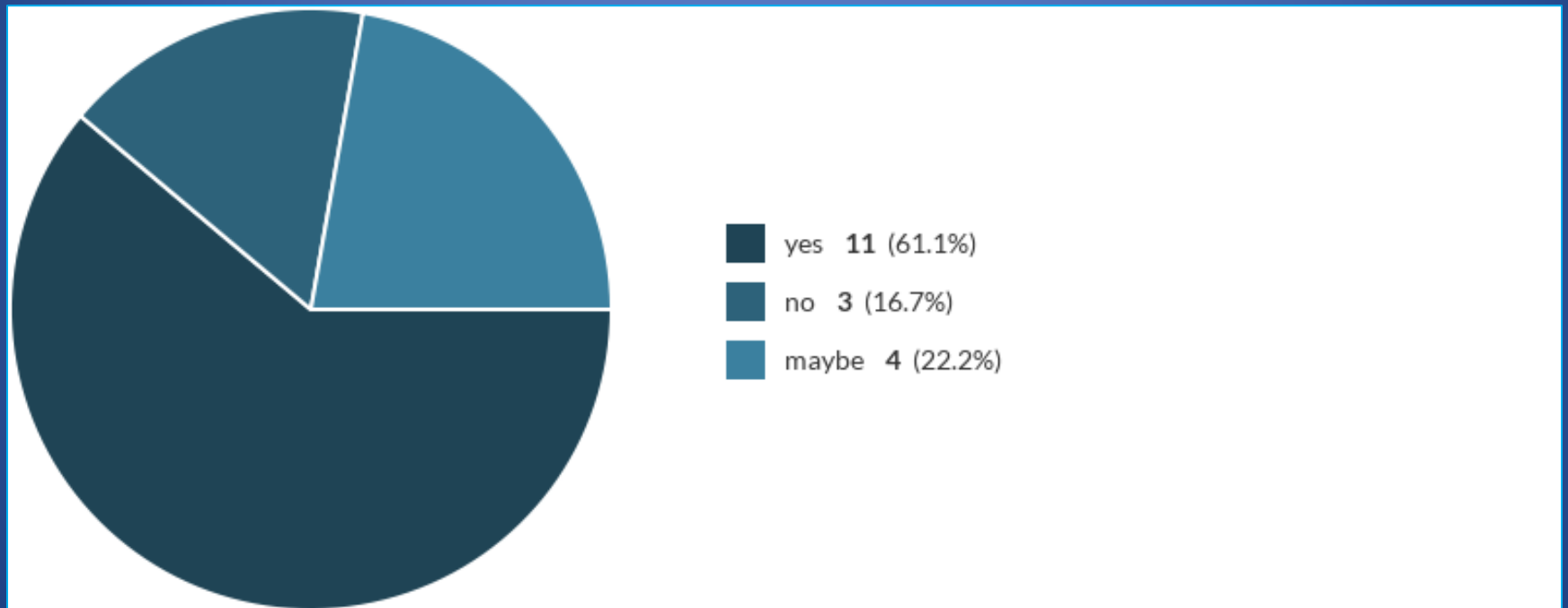
- Less of an understanding
 - Diagnosing Cushings
 - Differentiating between Cushings disease and syndrome
 - Don't know x7



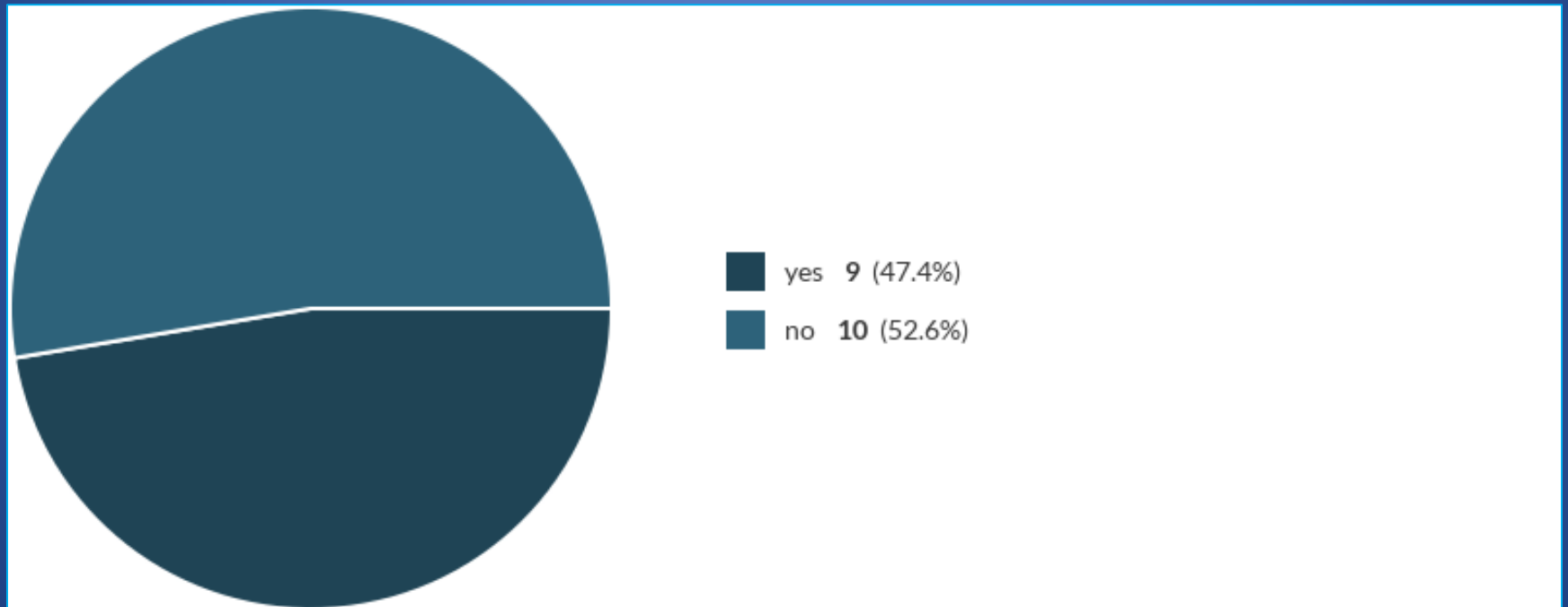
Adrenal conditions seen in your centre

	A lot	Sometimes	Rarely	Never	Don't know
CAH	13	5	0	0	0
Addisons	6	9	2	1	0
AHC	0	1	6	0	11
Cushings Syndrome	1	2	12	3	0
Cushings disease	1	2	11	3	0
Adrenal insufficiency (hypopit)	13	4	1	0	0
Adrenal suppression – steroid use	7	9	2	0	0
Adrenal tumours	1	4	9	3	1
Adrenarche	13	5	0	0	0
ALD	0	3	11	2	2
FGD	1	4	10	1	2
Triple A	0	2	6	7	3
Other	2	2	1	1	12

Education on adrenal disease and adrenal function tests



Qualification in paediatric endocrinology



Conclusion

- Larger sample
- More education needed
 - Accessible
 - Website / online portal
 - Regular meetings
 - Formal training course

How is this done in your country?



Further reading

Continuing professional development

Understanding clinical investigations in children's endocrinology

- ▶ NCYP626 **Davies K, Collin J** (2015) Understanding clinical investigations in children's endocrinology. *Nursing Children and Young People*. 27, 8, 26-36.
Date of submission: February 25 2015. *Date of acceptance:* June 5 2015.

Abstract

Children and young people referred to paediatric endocrinology services present with a wide range of illnesses and disorders varying from minor to life-threatening conditions. This article introduces the role of the children's endocrine nurse in caring for children and families undergoing investigations that are frequently undertaken to identify specific problems associated with pituitary, adrenal and thyroid glands. Although children with endocrine

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