

New asthma diagnostic guidelines

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Diagnosis – no shortage of guidelines

- BTS Asthma guidelines – updated Sept 2016
- NICE Asthma guidelines – draft form 2015, expected Oct 2017
- GINA guidelines 2017
- (ERS/ATS guidelines – severe asthma)

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To cover

- BTS 2016 – what’s changed since 2014
- NICE ?2017 – why another player on the scene/what’s their take
 - **“BTS met NICE in January 2017 for a useful exchange of views about the publication of the NICE Asthma Diagnosis and Management Guidelines due later this year. BTS and SIGN will issue a further statement when the NICE guidance has been published, setting out the way forward which we hope will be of benefit to people with asthma, their carers and healthcare professionals.”**
- Case presentations
- Discussion

BTS – from 2014 to 2016

Figure 2: Presentation with suspected asthma in adults

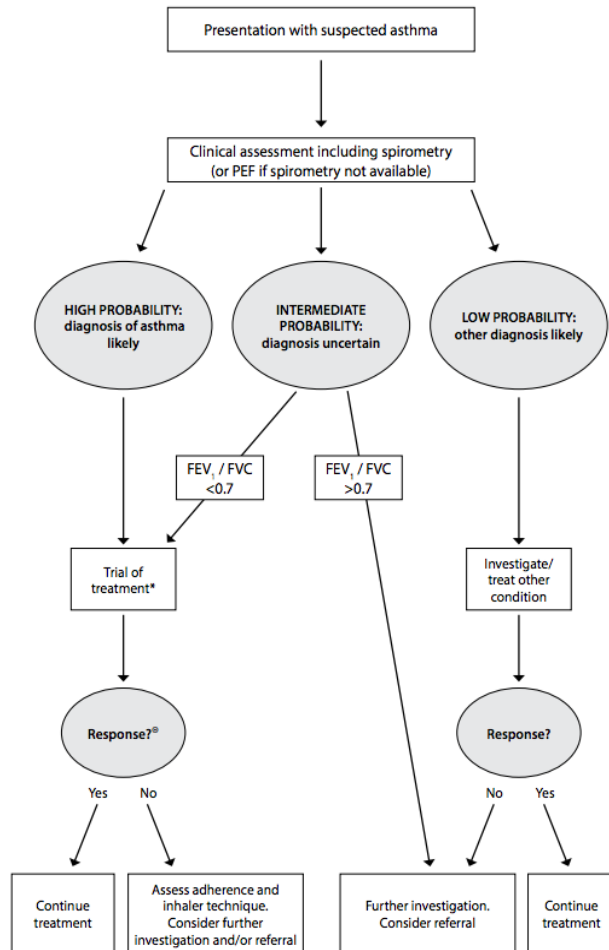
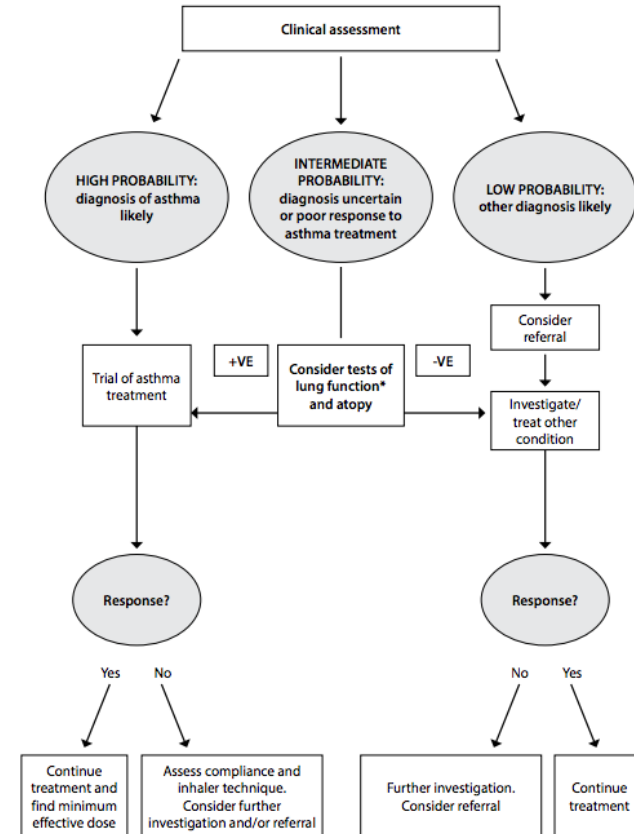


Figure 1: Presentation with suspected asthma in children



* Lung function tests include spirometry before and after bronchodilator (test of airway reversibility) and possible exercise or methacholine challenge (tests of airway responsiveness). Most children over the age of 5 years can perform lung function tests.

BTS – from 2014 to 2016

- Overarching principles
 - “Tests influence the probability (sic) of asthma but do not prove a diagnosis”
 - “Asthma status and the outcome of diagnostic tests for asthma vary over time”
 - Predictive values of individual symptoms, signs and diagnostic tests

BTS – from 2014 to 2016

- Spirometry
 - Use of lower limit of normal (LLN) encouraged rather than fixed $FEV_1:FVC < 0.7$ (as over-diagnoses in tall/elderly)
 - Use of reversibility (as appropriate)
- Use of tests for eosinophilic inflammation
 - Fractional exhaled nitric oxide (FeNO)
- Use of tests for atopic status

BTS – from 2014 to 2016

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FeNO - devices



FeNO (fractional exhaled nitric oxide)

- Rationale:
 - L-Arginine converted to L-citrulline, generating NO, via nitric oxide synthase (NOS- endothelial, inducible and neuronal forms)
 - Atopic asthmatics, iNOS upregulated in response to IL-4/IL-13, producing increased NO concentrations in exhaled air
 - Correlates with sputum eosinophilia
- Detecting T_H2 inflammation

FeNO

- Noninvasive
- Fairly easy
 - Breathe out at set flow (50ml/s for 10-12 seconds depending on device)
 - Some people still cannot do



FeNO

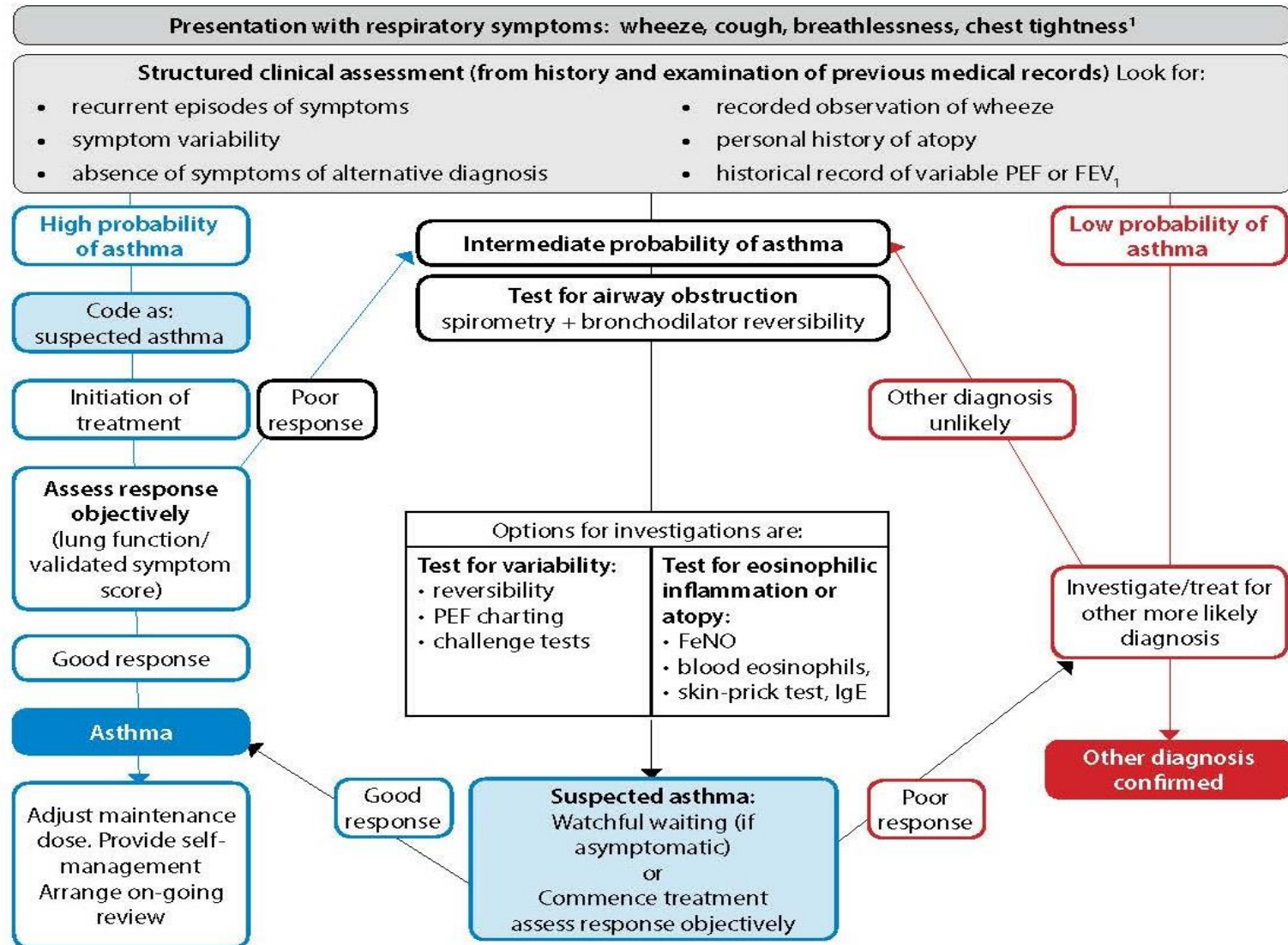
- Levels affected by
 - Age (increase with age)
 - Smoking (decrease by 30-60%)
 - Rhinovirus infections (increase by 50-150%)
 - Recent intake of nitrate-containing (green leafy) food (40-60%, peak 1-2 hrs after intake)
 - ?Atopy
 - Others possibly lesser/no effects – exercise, pollution, spirometry beforehand

FeNO

- What is normal?
 - Different devices will produce different results
 - Depends on what you're trying to do with the result ?diagnose/manage and whether emphasizing specificity/sensitivity?
 - >20-40ppb (in adults) – probably best to think of spectrum

Strategy	Description*	Parameter*	Range of predictive values* (Note that a single value indicates data from a single study)				Comments**
Strategies for detecting eosinophilic inflammation or atopy			Sens ⁱ	Spec ⁱ	PPV ⁱⁱ	NPV ^{iv}	
FeNO	Adults: Regard a FeNO level of 40 ppb or more as a positive test Children 5–16yrs: regard a FeNO level of 35 ppb or more as a positive test.	FeNO in adults FeNO in schoolchildren	43–88% 57%	60–92% 87%	54–95% 90%	65–93% 49%	These studies are all in secondary care populations. Approximately 1 in 5 adults with a positive FeNO test will not have asthma (ie false positives) and 1 in 5 adults with a negative FeNO test will have asthma (ie false negatives).

Figure 1: Diagnostic algorithm



¹ In children under 5 years and others unable to undertake spirometry in whom there is a high or intermediate probability of asthma, the options are monitored initiation of treatment or watchful waiting according to the assessed probability of asthma.

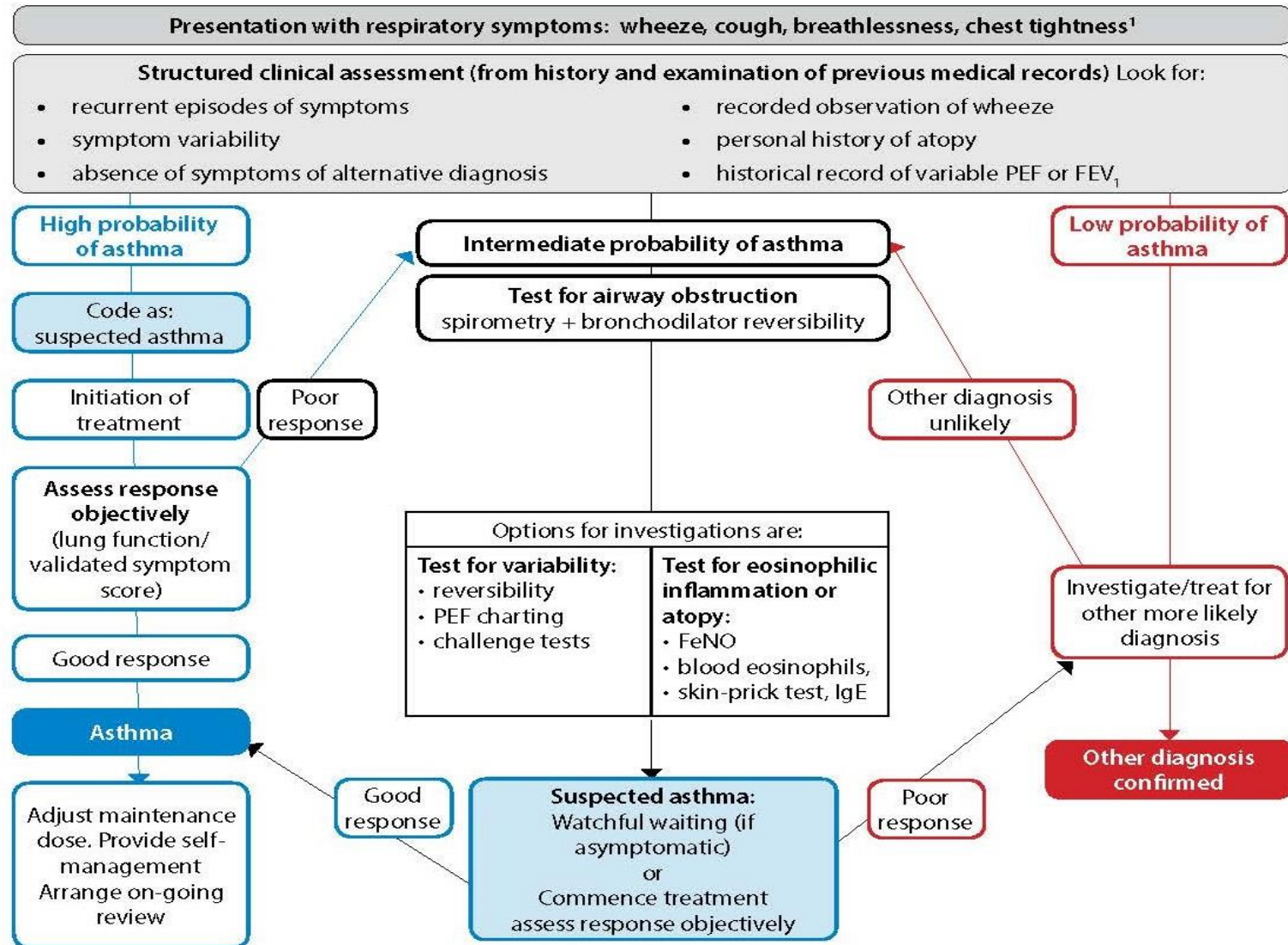
Table 2: Factors to consider in an initial structured clinical assessment

<p>Episodic symptoms (see sections 3.2.1 and 3.2.2)^{13,21-24,64,74,75}</p> <p>More than one of the symptoms of wheeze, breathlessness, chest tightness and cough occurring in episodes with periods of no (or minimal) symptoms between episodes. Note that this excludes cough as an isolated symptom in children.⁷⁶ For example:</p> <ul style="list-style-type: none"> • a documented history of acute attacks of wheeze, triggered by viral infection or allergen exposure with symptomatic and objective improvement with time and/or treatment • recurrent intermittent episodes of symptoms triggered by allergen exposure as well as viral infections and exacerbated by exercise and cold air, and emotion or laughter in children • in adults, symptoms triggered by taking non-steroidal anti-inflammatory medication or beta blockers. <p>An historical record of significantly lower FEV₁ or PEF during symptomatic episodes compared to asymptomatic periods provides objective confirmation of the obstructive nature of the episodic symptoms.</p>	<p>2⁺⁺ 2 3</p>
<p>Wheeze confirmed by a healthcare professional on auscultation (see section 3.2.1)^{23,25}</p> <p>It is important to distinguish wheezing from other respiratory noises, such as stridor or rattly breathing.</p> <p>Repeatedly normal examination of chest when symptomatic reduces the probability of asthma.</p>	<p>2⁻</p>
<p>Evidence of diurnal variability^{21-23,34,74}</p> <p>Symptoms which are worse at night or in the early morning.</p>	<p>2⁻ 4</p>
<p>Atopic history (see section 3.2.4)^{19,23,64,75,77,78}</p> <p>Personal history of an atopic disorder (ie eczema or allergic rhinitis) or a family history of asthma and/or atopic disorders, potentially corroborated by a previous record of raised allergen-specific IgE levels, positive skin prick tests to aeroallergens or blood eosinophilia.</p>	<p>2⁺⁺ 2⁺</p>
<p>Absence of symptoms, signs or clinical history to suggest alternative diagnoses (including but not limited to COPD, dysfunctional breathing, obesity) (see section 3.3.3).</p>	

BTS – diagnosis in children?

- Same flow chart

Figure 1: Diagnostic algorithm



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BTS – diagnosis in children?

- Same flow chart
- Measuring lung function difficult <5yrs old, complex relationship of spirometry to diagnosis, gas trapping may be superior to expiratory flow.
- PEF's no use.
- Feasible to measure FeNO from age 3-4

What about NICE?

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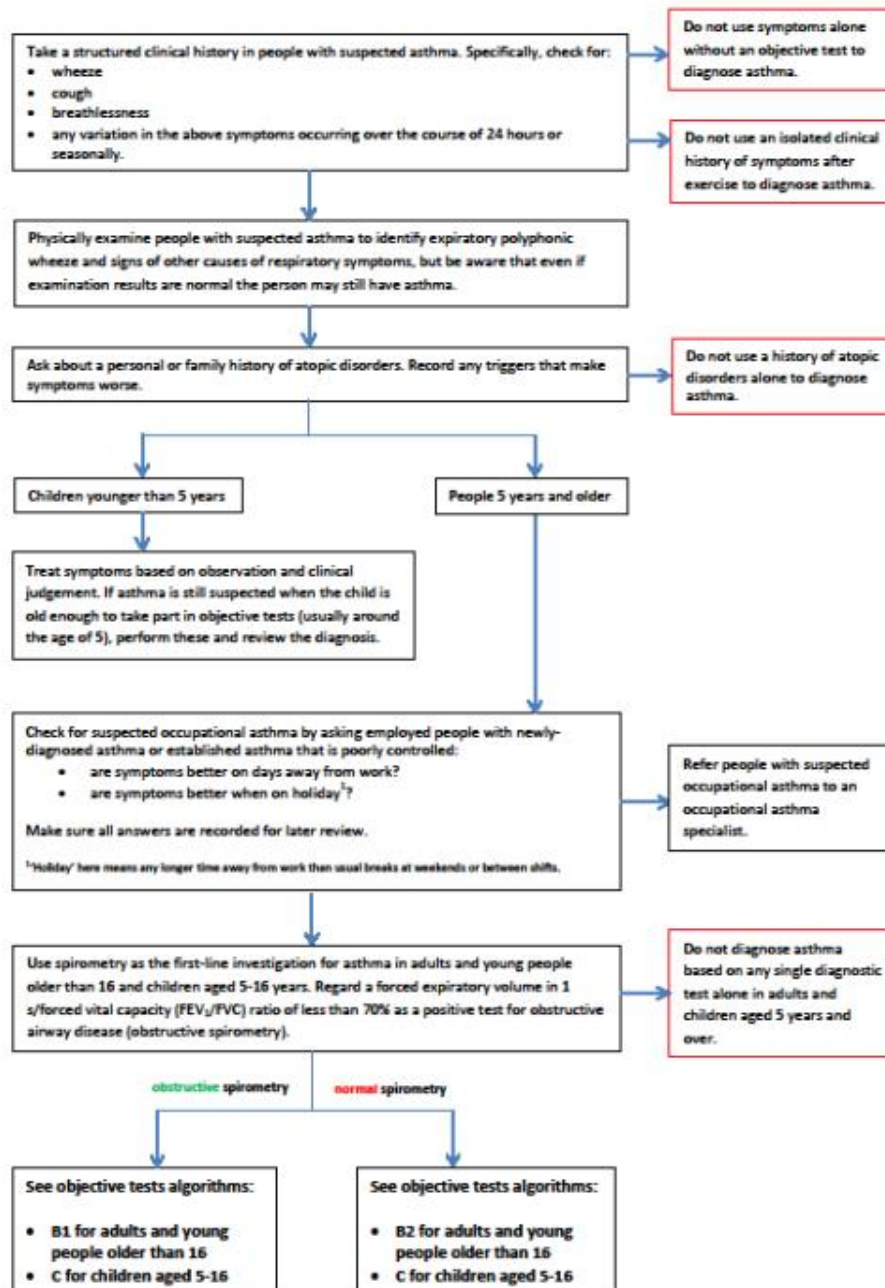
NICE: GPs should use FeNO and 'twitchiness' tests to confirm asthma diagnosis

NICE guidelines

- Less emphasis on probabilities, more emphasis on objective tests, especially FeNO
- Most pathways go through FeNO, but still requiring some evidence of variability to make the diagnosis (PEFR measuring, reversibility test, methacholine challenge)

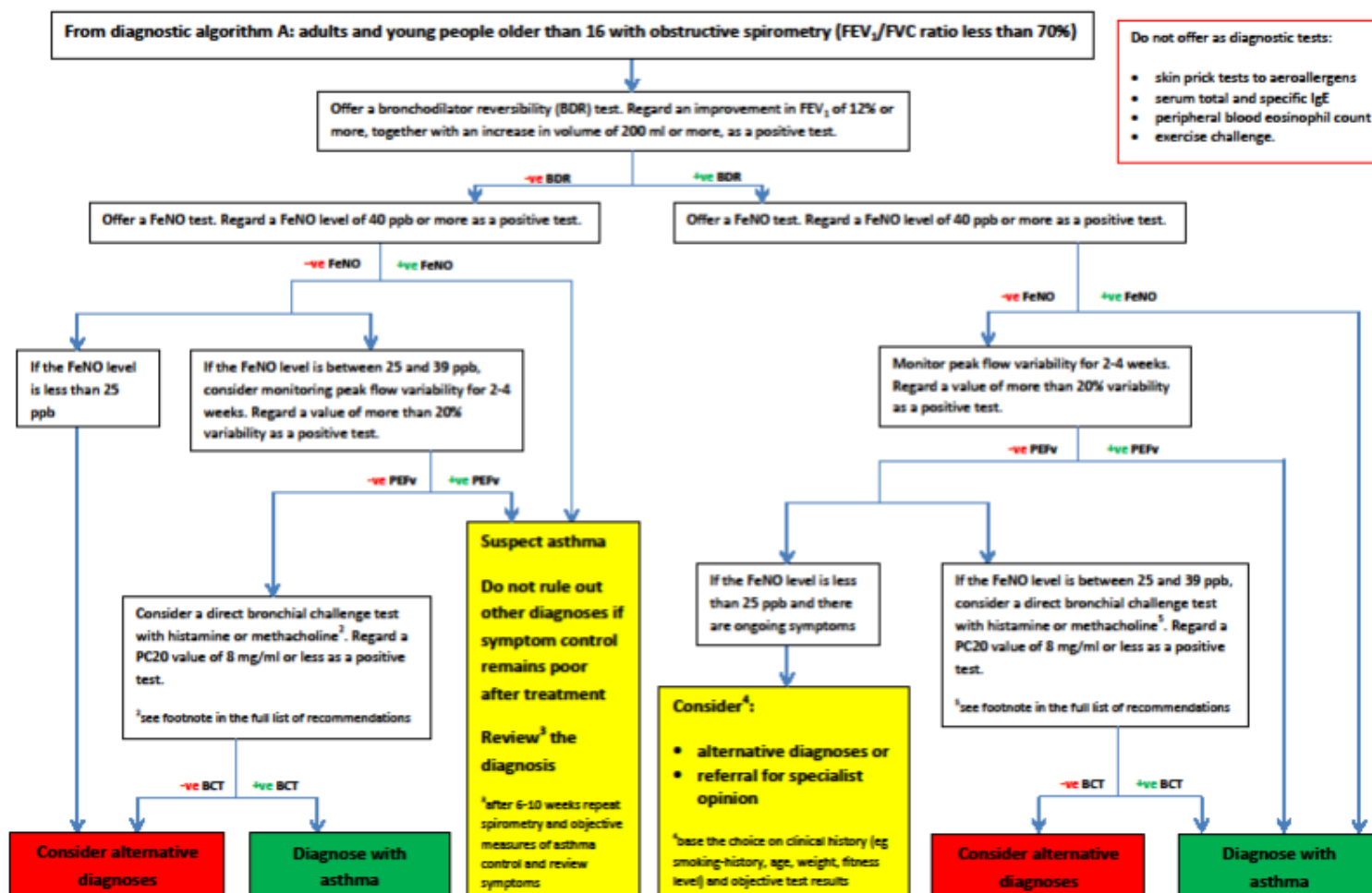
NICE guideline 2017

Diagnostic algorithm A – initial clinical assessment and first-line objective test for adults and children

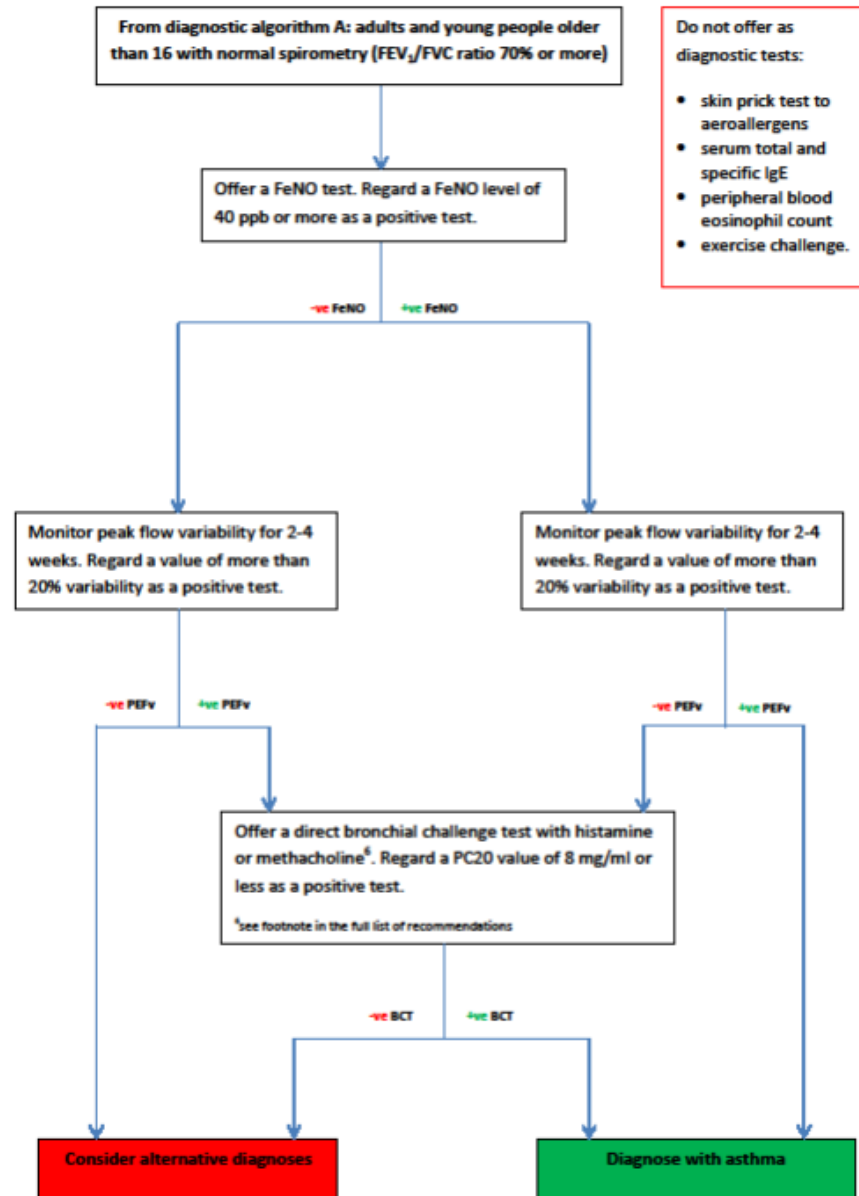


NICE guidance

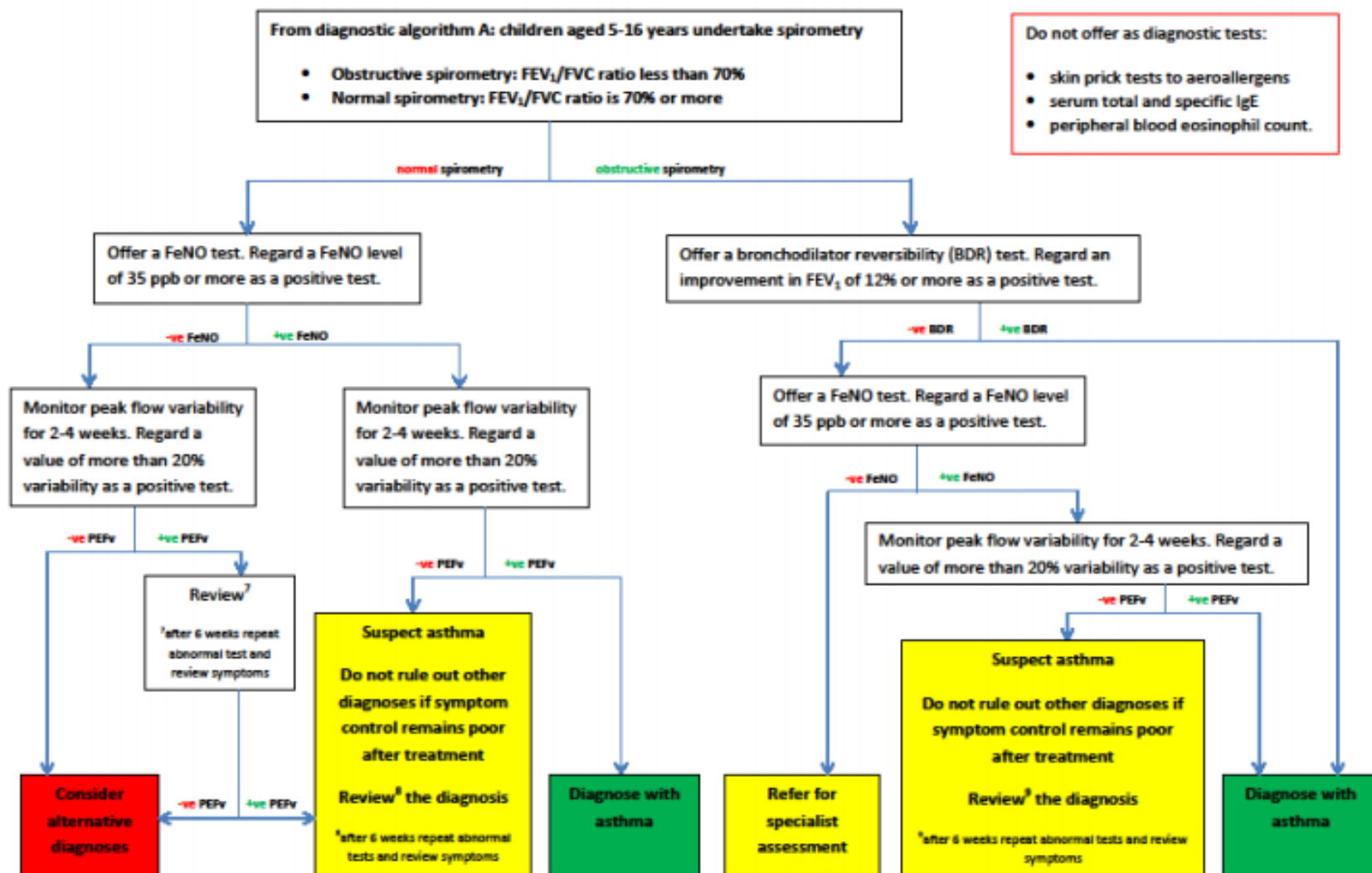
Diagnostic algorithm B1 – objective tests for adults and young people older than 16 with obstructive spirometry



Diagnostic algorithm B2 – objective tests for adults and young people older than 16 with normal spirometry



Diagnostic algorithm C – objective tests for children aged 5-16 years



Cases

CASE STUDY 1 - CHARLIE

- 18mths, attends with troublesome wheeze, cough and breathlessness.
- Mum says he developed eczema at age 2mths. From age 8mths he has suffered from intermittent but frequent chest symptoms. Mum describes a pattern of recurrent symptoms, typically a runny nose, followed by a cough and then within 12 hrs the onset of wheezing and breathlessness.
- However, she has also noticed some symptoms of a coughing at night and after running around at times when he does not have a cold. He also has persistent rhinitis even when he doesn't have a cold.

CHARLIE

- At first he wasn't distressed by these symptoms, but for the last 3 mths his activities (and particularly his sleep) have become increasingly disturbed.
- Mum has asthma and uses a bronchodilator from time to time. His father had eczema as a child. His mum has tried giving Charlie her ventolin through her spacer. She noticed it helped a little.

CHARLIE - EXAMINATION

- Weight and length on the 25th centile.
- Mild sub-costal recession, hyperinflation of chest with prominent sternum and widespread wheeze.
- Flexural eczema.

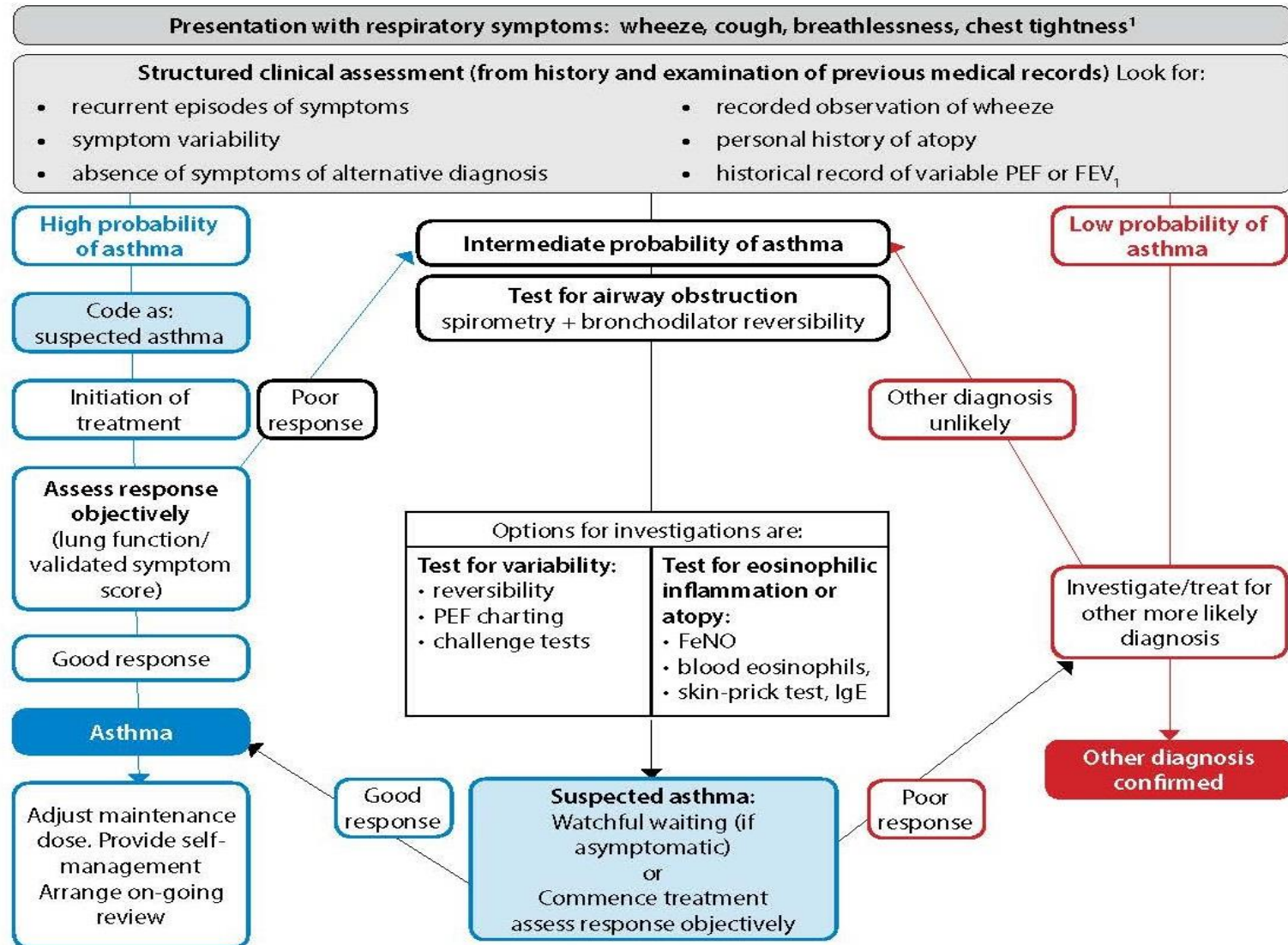
CHARLIE – DIAGNOSIS AND MANAGEMENT

- Diagnosis of asthma high probability because of typical symptoms, presence of wheeze, response to bronchodilators, personal and family history atopy.
- Doc decided to prescribe a therapeutic trial corticosteroid 200mcg bd via an MDI and a spacer with a face mask. The doc explained to mum that he was giving him preventative treatment for asthma. He arranged to see Charlie in 2m time.
- After 3-4 wks, mum noticed Charlie's symptoms settled and his sleep returned to normal.
- At 2m review he was asymptomatic so the dose of inhaled steroid was stepped down to 100mcg bd.

Any change with new guidelines?

- BTS 2016
 - No, high probability, straight to trial of treatment, no 'objective' test for response but good subjective response, dose then adjusted
- NICE 2017

Figure 1: Diagnostic algorithm



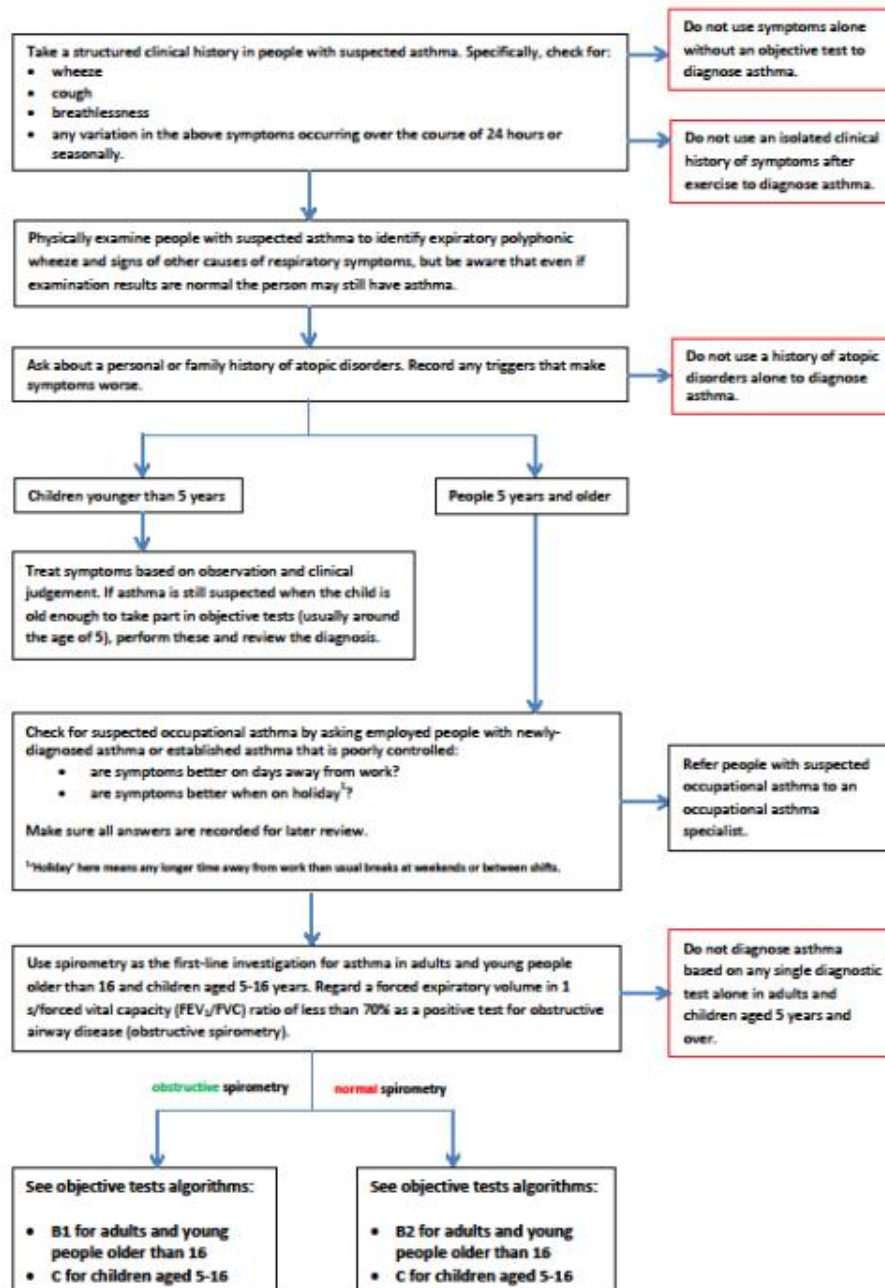
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Any change with new guidelines?

- BTS 2016
 - No, high probability, straight to trial of treatment, no 'objective' test for response but good subjective response, dose then adjusted
- NICE 2017
 - No, under 5: treat based on symptoms/clinical judgement

NICE guideline 2017

Diagnostic algorithm A – initial clinical assessment and first-line objective test for adults and children



JESSICA - PRESENTATION

- 12yr old who has been coughing for 4 days. She comes with her mother who has a letter from Jessica's school about her reluctance to join in PE lessons.
- Jessica says she coughs more than her friends and has difficulty keeping up with them.
- 5 courses antibiotics for cough and URTI in past 2 yrs and expecting same today.
- Mum reports mild wheezing and breathlessness and that Jessica is often woken from sleep with cough and wheeze.
- Cough is dry.

JESSICA - DIAGNOSIS

- Jessica has a high probability of asthma?
- Not wheezing at consultation and PEFr close to predicted level.
- Given reliever inhaler as trial and told to take if SOB or excessive coughing.
- Also given PEFr meter and diary card to complete for 2 weeks.

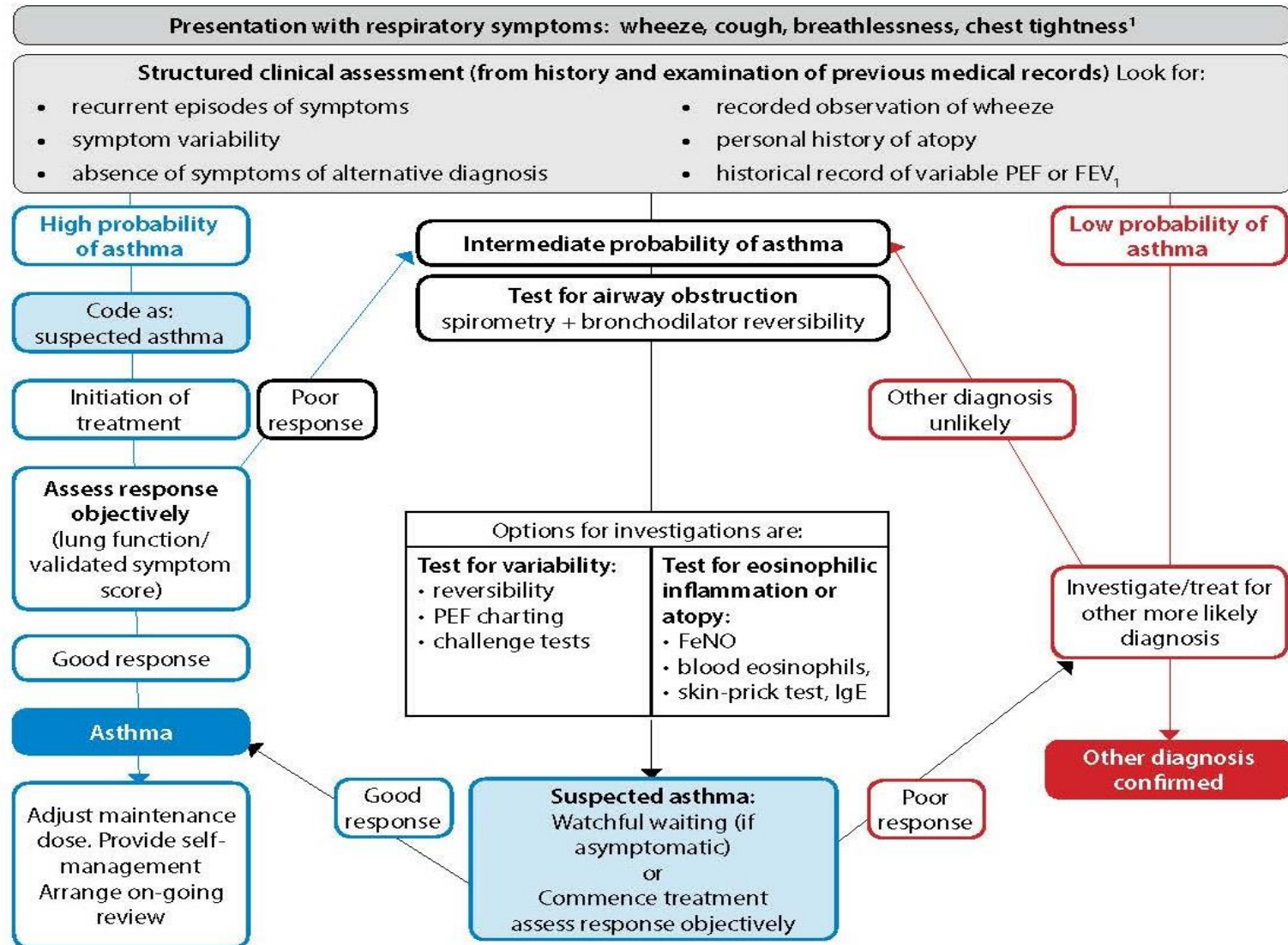
JESSICA – 1 WEEK LATER

- Jessica and mum return with incomplete diary card.
- Does show some peak flow variability with marked reduction after exercise.
- Used reliever inhaler and it definitely improved symptoms.
- Feeling better, still not keen on PE as she has been told off for using inhaler during hockey.
- Inhaled steroids mentioned. Jessica thinks they will make her fat and mum thinks they will make her muscular. Insist on alternative.
- Ask about special vacuum cleaner.

Any change with new guidelines?

- BTS 2016
 - If say intermediate risk
 - No use in PEF monitoring
 - Should have spirometry +/- reversibility, further tests of atopy/eosinophilia dependant
 - Asthma questionnaires/objective test of response to treatment

Figure 1: Diagnostic algorithm



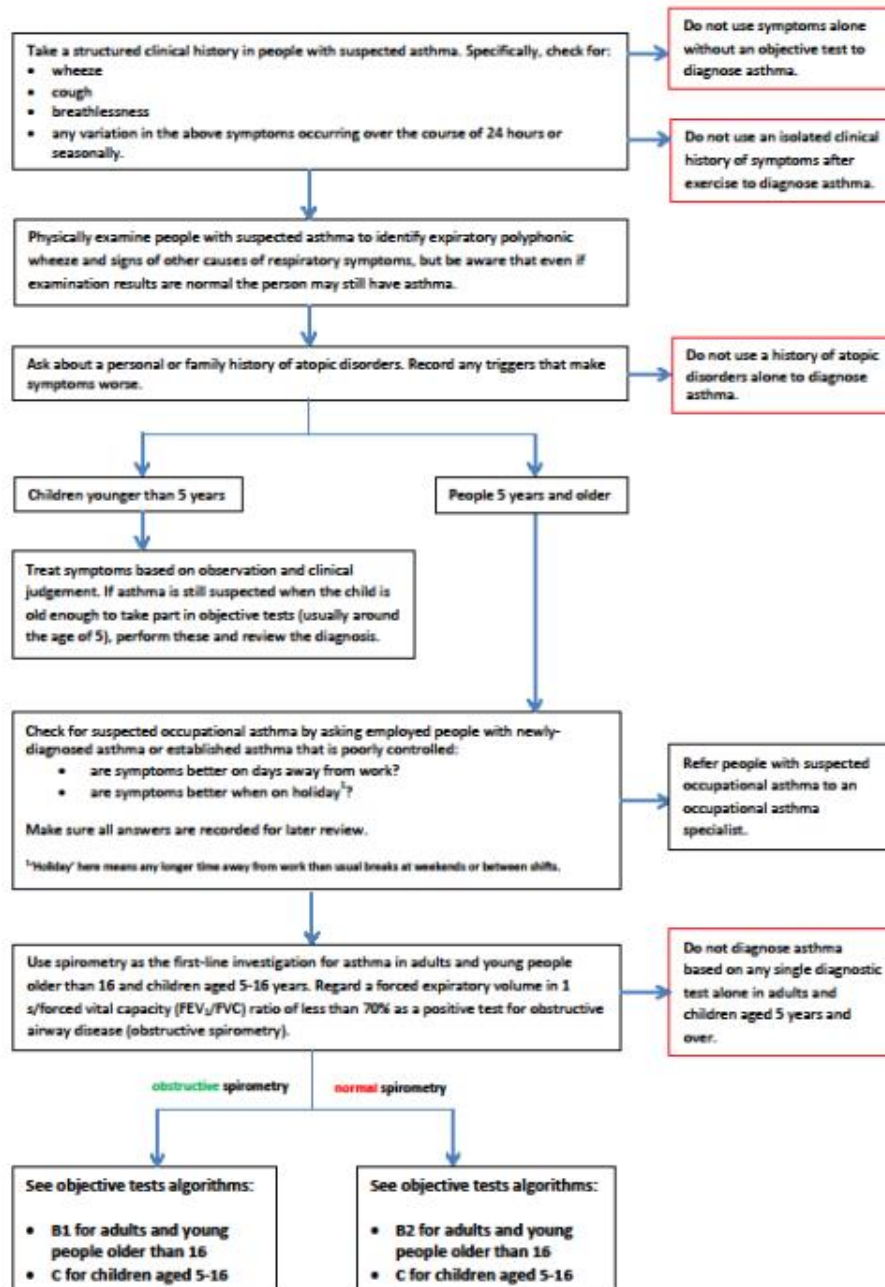
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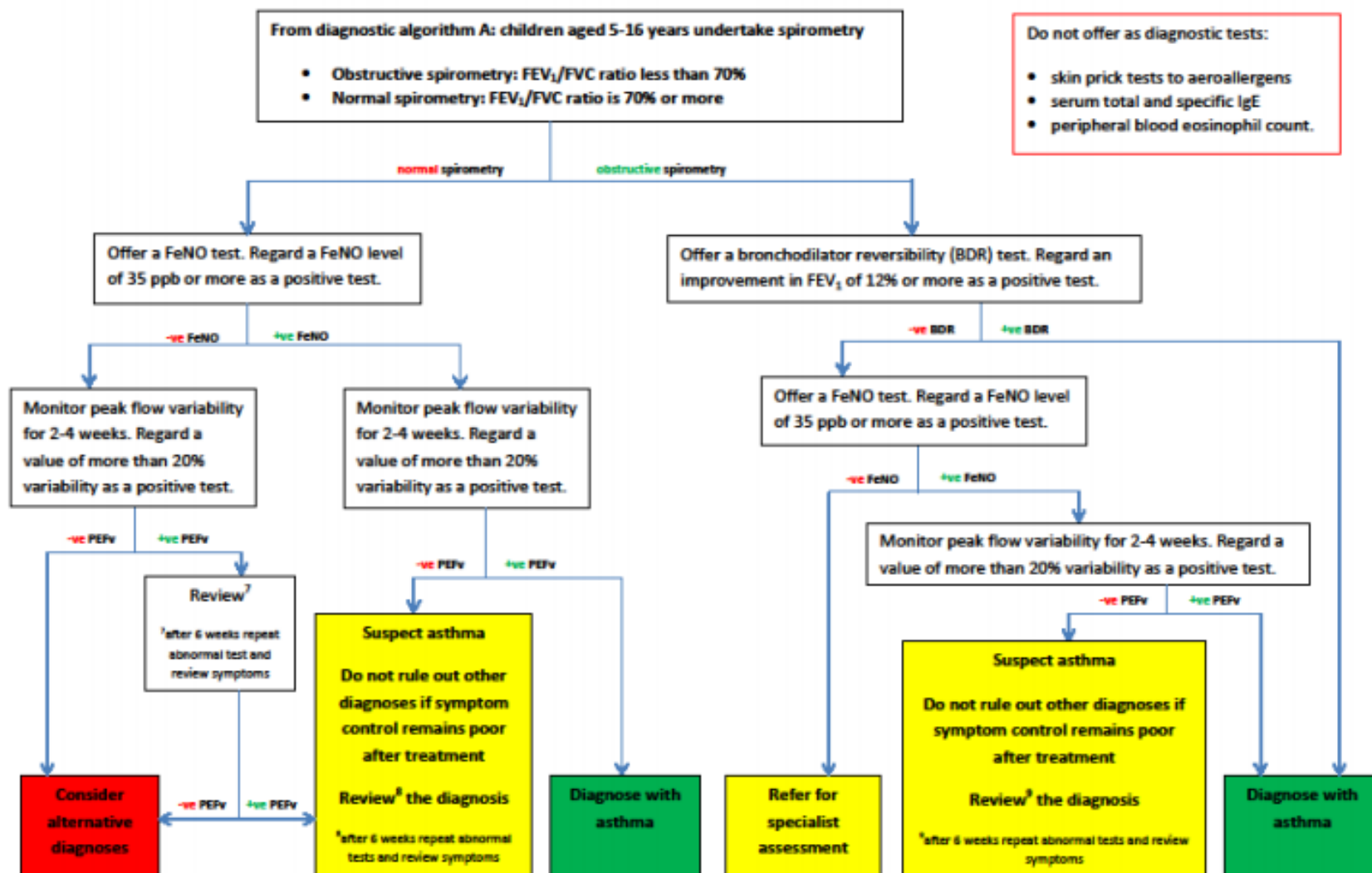
- NICE 2017
 - Doesn't matter about probability high or intermediate
 - Spirometry as first line test
 - Going to need to do a FeNO
 - May need to do PEFr variability
 - May need to repeat tests after 6 weeks

NICE guideline 2017

Diagnostic algorithm A – initial clinical assessment and first-line objective test for adults and children



Diagnostic algorithm C – objective tests for children aged 5-16 years



JESSICA – DETERIORATING CONTROL

- Over next 4 yrs, Jessica attends for immunisations, travel consults and the pill but each time apparent asthma was poorly controlled and she was poorly compliant.
- Prescription record showed average third correct use.
- After party, collapsed and admitted with severe asthma attack.
- Discharged and recommended to see practice nurse who quickly established good rapport.
- Tried different range of devices, drew up an asthma plan that Jessica was happy with.

BTS 2016 – an aside on other changes

- Entire chapter on asthma in adolescents
- Entire chapter on self-management education, incorporating written PAAP's.
 - Reduces emergency use of healthcare resources, including emergency department (ED) visits, hospital admissions and unscheduled consultations
 - Improves markers of asthma control, including reduced symptoms and days off work, and improves quality of life.
- HDM avoidance measures no longer routinely advised

Will - presentation

- 23 yr old having trouble in after work 5 a side football matches
- Chesty child and “always ill.”
- Thinks he had an inhaler for a while but didn’t use it once he got to secondary school as didn’t like carrying it around or going to school office if he needed it.
- Works as a builder’s mate

Will

- Feels sob when running especially in the spring and summer.
- Stops to rest and improves.
- Particularly bad episode when playing away and thought he should come in.
- Mat uncle has asthma and mum has hayfever

Will - examination

- Tall, slim with clear chest on auscultation
- PEFR just above predicted.

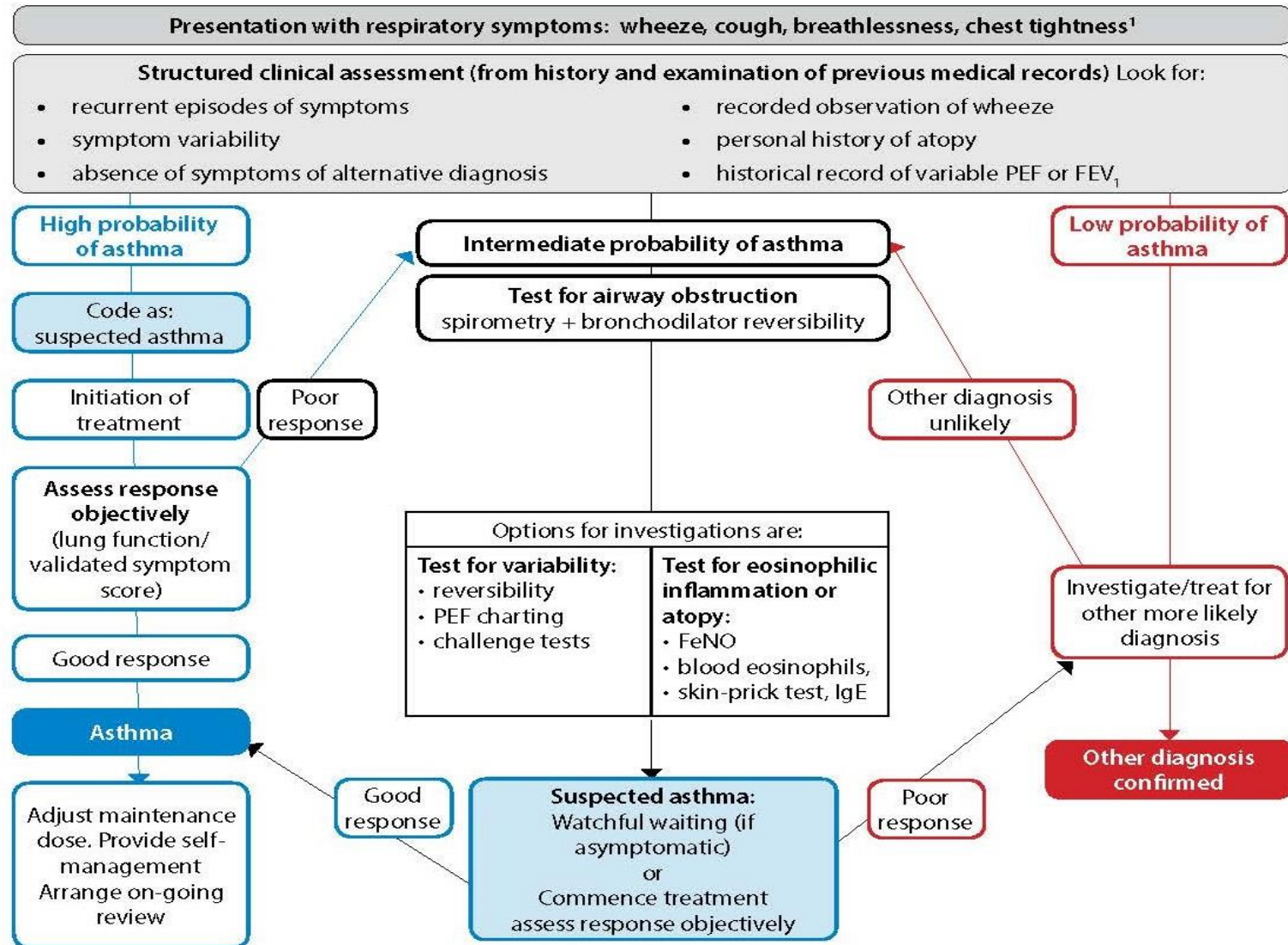
Will – treatment options

- Ventolin
- Montelukast
- FOLLOW-UP

Any change with new guidelines?

- BTS 2016
 - Intermediate probability, spirometry +/- reversibility, consider tests of atopy/eosinophilia then follow-up to assess response to treatment

Figure 1: Diagnostic algorithm



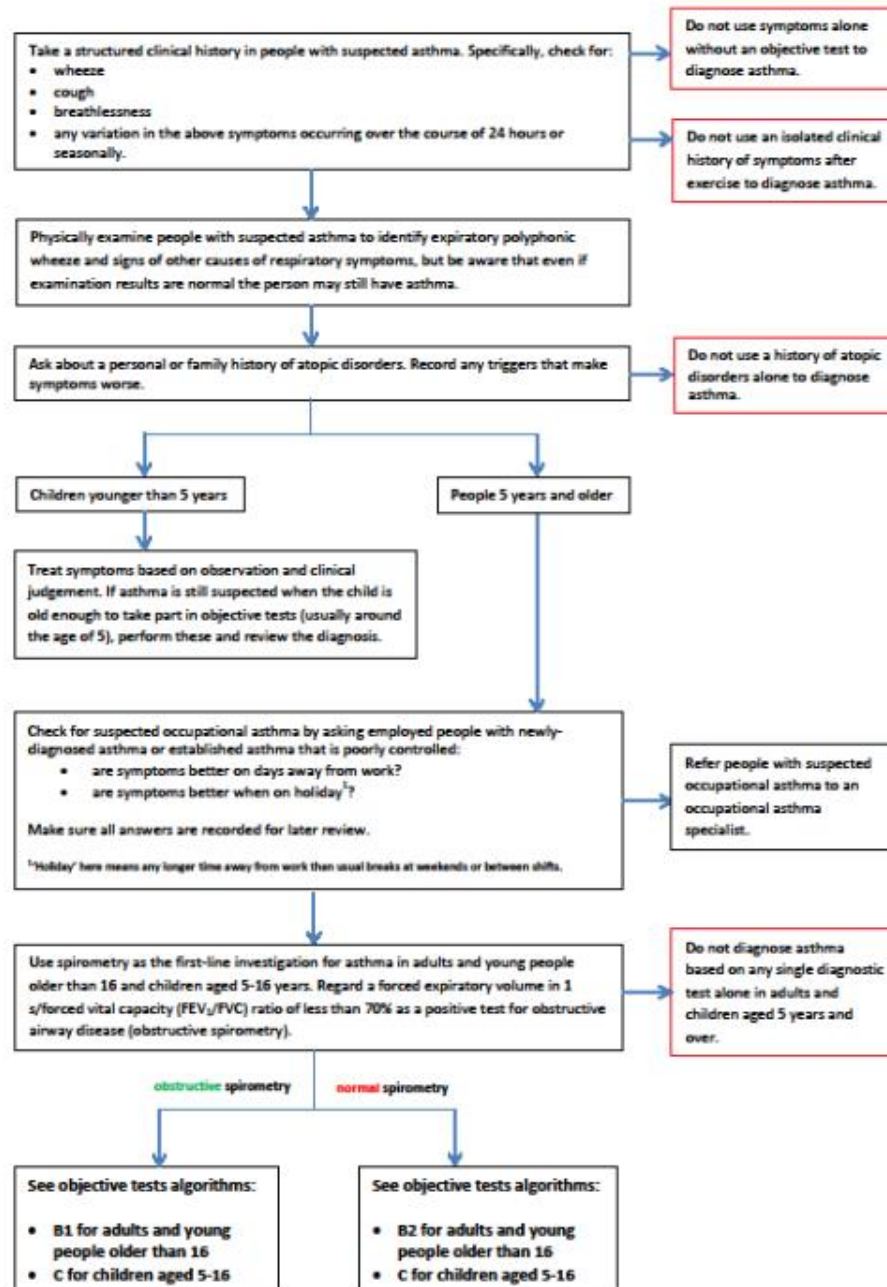
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Any change with new guidelines?

- NICE 2017
 - Spirometry
 - Regardless, everyone gets a FeNO
 - Definite diagnosis requires
 - FeNO positive AND bronchodilator reversibility
 - FeNO positive AND PEF variability
 - Positive methacholine test
 - Intermediate diagnosis possible via several routes

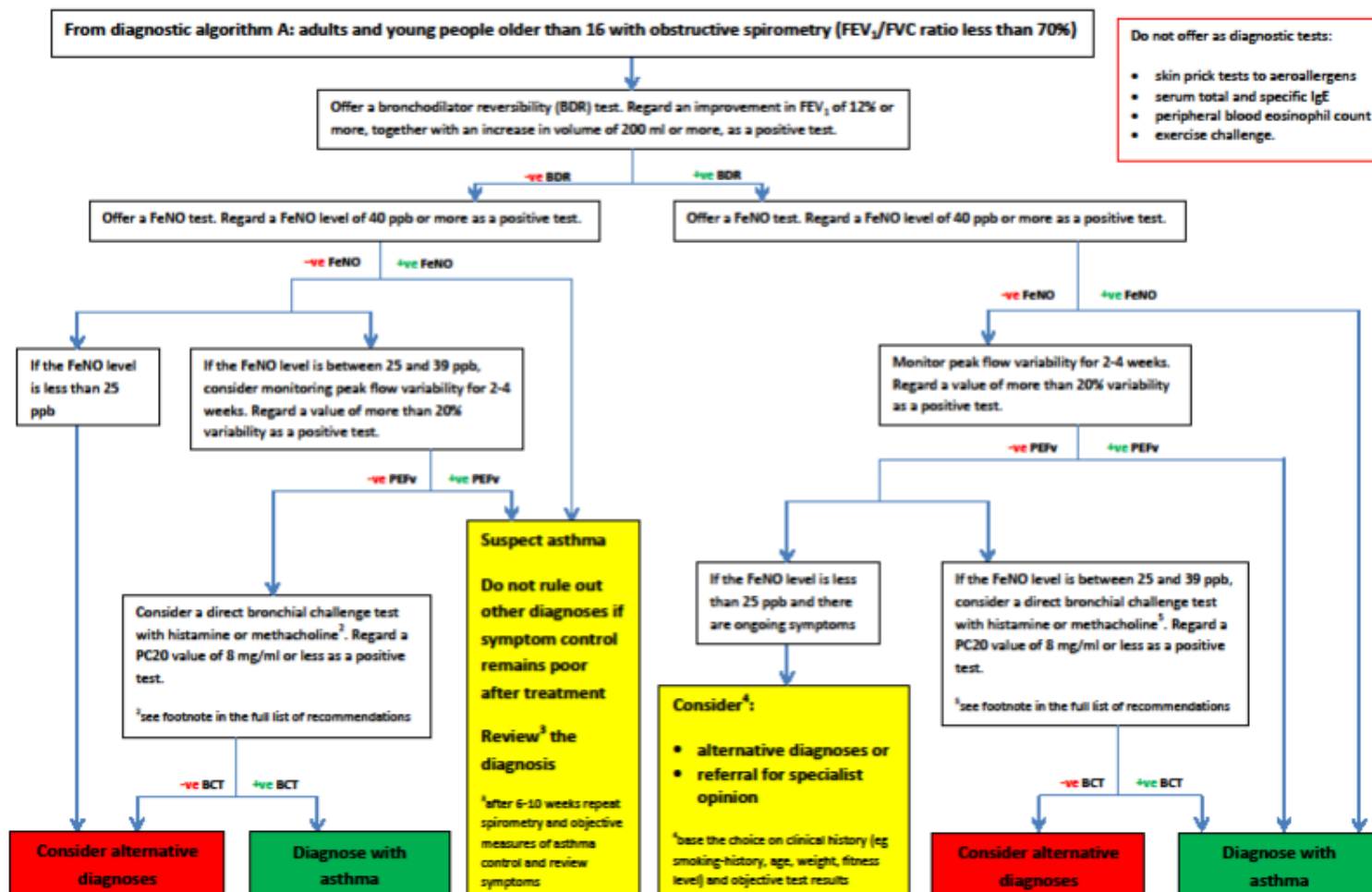
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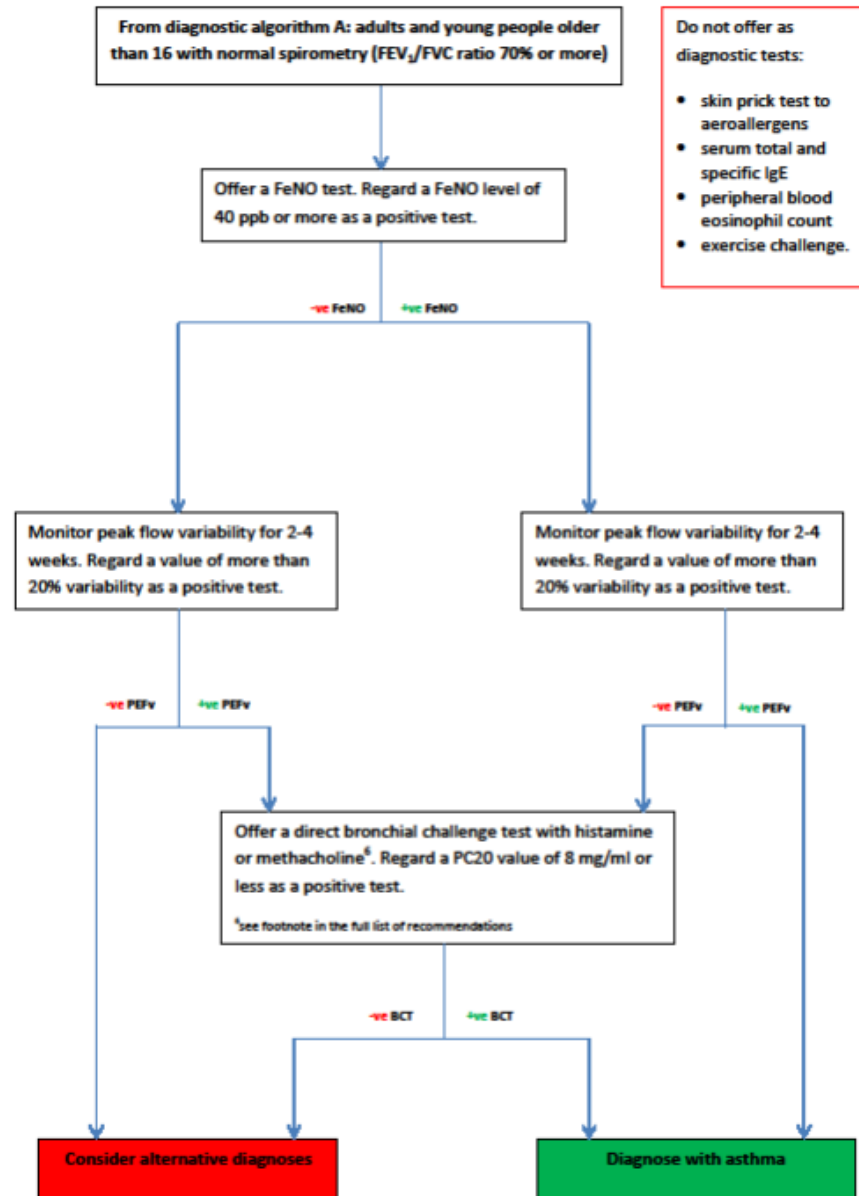


NICE guidance

Diagnostic algorithm B1 – objective tests for adults and young people older than 16 with obstructive spirometry



Diagnostic algorithm B2 – objective tests for adults and young people older than 16 with normal spirometry



Frank

- 64 yr old man
- Productive cough with colds and in winter for last 3 yrs. Treated with antibiotics each time.
- Finding he is puffing at the top of stairs and when gardening.
- Usually well and not a chesty child – played rugby for his school.
- Smoked for a while and gave up aged 40 yrs – total 20 pack years.

Frank

- Sent by his wife as she is worried.
- Cough not a prominent feature when well.
- O/E: Good AE bilat, mild bibasal exp wheeze, PEFr 80% predicted.
- Apex not displaced, JVP not raised, BP 148/85mmHg, ankles nad.

Any change with new guidelines?

- BTS 2016
 - Likely low risk, nil further needed
- NICE 2017
 - As above

In summary

- Both guidelines incorporating FeNO more (but to different extents), emphasizing objective tests/questionnaires more (but to different extents).
- Both trying to avoid overdiagnosis
- Both acknowledging difficulties in <5 yrs old
- NICE – complex and you will need to invest in a FeNO machine!