What's new in the 8th edition?

There are several changes and updates throughout this guideline, but these are the principal ones (section numbers in brackets).

New personnel & contact numbers (2, & appendix 19)

New sections

6.2a 6 X.	*Rothia mucilaginosa*
6.2 a 6 XI	*Klebsiella*, *E.coli* & other coliforms
6.2a 6 XIII	RSV
6.3c	*Exophiala dermatitidis*
6.9d	Trikafta (triple therapy)
6.13	The child in difficulty – CF Focus
6.15a	Exercise
7.8	Gastro-oesophageal reflux and aspiration (unsafe swallow)
11.2h	Anti-emetics

Policy changes / additions: (section number in brackets)

Chapter 3 - How the service runs

3.1 Clinics

- Joint CF diabetes clinic now twice a month on the 1st Monday and 3rd Friday of the month.
- For those seen regularly in network-care clinics by the whole RBH MDT, if seen 2 / year locally, they must be seen at RBH 2/year (including annual review); if seen 3-4 / year locally, they need only be seen at RBH once, for annual review. This means they will be seen by the full RBH MDT at least 4 times each year.
- MRSA/Cepacia clinic every month (2nd Friday)
- Children with multiresistant PsA should come to 2nd wave.
- Those with cepacia can come back to normal clinic after 2 years of no growth but come to 2nd wave.
- In clinic, NTM sputum cultures sent, if there is clinical concern, if the child has cultured it previously, and at annual review.

3.2 Annual review

- LCI measured at annual review only if FEV_1 >80%.
- DxA scans done at 10 & 15 yrs (no longer done from 8 years and then every 2 years).
- CGMS done at 10 & 14 years (no longer 12 & 15 years).
- Data only put onto CF Registry (no longer use our own database).
- Protocol of what to do with an abnormal ventilation scan.
- Default position for bloods to be taken at RBH.
- Initial blood results must go into clinic letter (formal report will follow).
- Blood pressure measured when old enough to do lung function.

3.3 Transition

- Pre-transition visits offered twice now, at 14 and 15 years old.
- 'Named worker' for every young person - Adult Transition Nurse.

- The original laboratory report of the genotype must be attached to the ICP.

3.4 Homecare

- Visits aim to be up to one hour whenever possible.
- Parent support groups are offered where possible.

Chapter 4 - Admission to hospital

4.1 Admitting patients

- Consent must be taken for IV aminoglycoside courses for all children, every time.
- Preadmission form to be filled in when booking an admission.
- Sputum/cough swab collected twice weekly.

4.3 Venous access

- PICC team details.
- CXR to be taken after long line insertion if not placed under ultrasound control.

4.5 Self-administration of medicines

- Amendments to policy, latest version dated Nov 2018.

4.7 Infection control

- Children with multiresistant PsA should come to 2nd wave.
- Those with cepacia can come back to normal clinic after 2 years of no growth but come to 2nd wave.

Chapter 5 - Making the diagnosis

5.1 Newborn Screening

- 1 day education visit conducted for patients transferred to our care from abroad.

5.3 Sweat testing

- Sibling of a newly diagnosed case. Even if asymptomatic, we do this routinely for under 5 year olds, and older children if there is clinical suspicion or if the parents wish due to their need for reassurance.

5.4 Genetic analysis

- Genetic analysis now carried out at RBH.
- Ensure specify ethnicity put on genetics requests as have panel for Asian children.

5.5 CFSPID

- New definitions.
- Will come in for education visit if re-categorised as CF.

Chapter 6 - Respiratory care

6.2a 5 Intravenous antibiotics – principles for unknown organism

- Reducing use of IV aminoglycosides by only using if gram negative organisms a confirmed issue. Single agent IV meropenem will be used if child has never had *P aeruginosa* or no *P aeruginosa* for 3 years (which must include the last year off nebulised

antibiotics). If chronic *P aeruginosa* infection, including those still on nebulised antibiotics, then standard IV ceftazidime and tobramycin will be used.

6.2a 6 I. *Staphylococcus aureus*

- Information on CF START study.
- Prophylactic dose of flucloxacillin same for all: both those taking part in CF START (0-4 yrs old) & those not in the study who are having prophylaxis (0-3 yrs old) – 125 mg BD.
- If an infant does not tolerate flucloxacillin prophylaxis, we no longer use co-amoxiclav as an alternative.
- Testing azithromycin sensitivity to ensure *S.aureus* not resistant in those on long term AZM.

6.2a 6 III. *Pseudomonas aeruginosa*

- Failed eradication – another 3 weeks ciprofloxacin + 3 months nebulised therapy – tobramycin/colistin/tobramycin. New flow chart.
- If 2nd attempt with 3 months nebulised therapy fails, we will use IV antibiotics.
- If the 1st growth is mucoid *P aeruginosa*, we use ciprofloxacin for 3 weeks plus 3 months nebulised therapy (tobramycin/colistin/tobramycin).
- N-acetyl cysteine (NAC) for all on IV aminoglycosides.
- Antibiotic sensitivity testing not more than every month.

6.2a 6 IV. MRSA

- Oral treatment is now 2 weeks of rifampicin + cotrimoxazole.
- Prophylactic flucloxacillin should not be used in patients with MRSA for 2 years after MRSA is cleared, but flucloxacillin can be used as treatment for subsequent MSSA growths.

6.2a 6 VII NTM

- All in one section now (no appendix).
- Cefoxitin for 2 weeks only at induction.
- Clarification of when considered eradicated and segregation rules.
- Increased dose of clofazamine. Weight <30kg get 50 mg, 30Kg and above – 100mg.
- *M abscessus* therapy - If macrolide-resistant, use clofazamine instead of azithromycin. ERM+ve are susceptible to be macrolide-resistant, but we only stop AZM if confirmed resistant, we do not switch based on ERM status alone.
- Children will have an induced sputum 3 monthly for the 1st year, and if IS not successful will have a BAL at 6 months. If still positive culture at 6 months, consider 2nd eradication course.
- ECG to measure QT interval to be carried out on those starting NTM therapy due to long term use of azithromycin & moxifloxacin, and sometimes clofazamine.

6.2b Drug allergy & desensitisation

- Mini (partial) desensitisation procedure.

6.3a Aspergillus fumigatus – infection & ABPA

- Posaconazole 1st line antifungal
    - for all children with ABPA.
    - for children 8 years and above with aspergillus infection.

    - for treatment of aspergillus infection in 7 years and below if child unwell, or it is the only organism cultured in a child with significant lung disease. If routine culture in a well child use itraconazole.
- Dual therapy (posaconazole + terbinafine) for *Scedosporium apiospermum (*as well as *Lomentospora prolificans*).

6.5 RhDNase
- Removed policy of alternative day rhDNase as no one doing this anyway.

6.6. Hypertonic saline
- We are targeting its use in young children (aged <6 years) with respiratory concerns, but at this stage this is not being routinely offered to all newly diagnosed patients. This policy will be reassessed in a year's time.

6.7 Mannitol
- Commissioned and can be prescribed for post-pubertal children.

6.8 Long term azithromycin
- ECG to measure QT interval to be carried out on those starting (or already on) long term azithromycin.

6.9 CFTR modulators
- Orkambi (2-11 yrs) & Symkevi (12 yrs +) now prescribable. Ivacaftor for post pubertal R117H; and 6 months with gating mutations.

6.11 Pneumothorax
- No spirometry for 6 weeks after pneumothorax.

6.12 Intractable wheezing / severe small airways disease
- We have removed methotrexate and subcutaneous terbutaline as no longer used.
- We would consider once daily Relvar combination inhaler (as well as seretide or Symbicort).

6.13 The child in difficulty – CF Focus
- No longer challenging protocol, but CF Focus meeting with formal adherence monitoring.

6.14 Bronchoscopy
- We now lavage all 6 lobes (6 x 1m/kg aliquots) maximum total 150 mls.
- Send BAL for galactomannan if suspect aspergillus.
- RhDNase can be instilled in saline or neat (with air in syringe).

6.15d Nebulisers
- Table of drugs and their nebulisers

6.16 Oxygen
- Home O_2 ordering process.

Chapter 7 - Gastrointestinal & nutritional care

7.1 Nutritional care & assessment

- To simplify vitamin regimens, we start all patients (PS and PI) on DEKAs and continue. Dose is adjusted depending on levels measured at annual review.

7.10 Liver disease

- We are now using Paravit-CF as the routine vitamin K supplement for those with liver disease as it contains sufficient vitamin K that we do not have to prescribe separate menadiol/phytomenadione.

Chapter 8 - Other non-pulmonary complications of CF

8.1 CF-Related Diabetes

- CGMS screening at 10 and 14 years
- Rapilose used for oral glucose tolerance test (OGTT), not Lucozade.

8.4 Bone metabolism

- DxA scans at 10 & 15 yrs (not every 2 years from 8 years old), and new rules when to repeat

8.5b Sinusitis

- Sinus rinses and rhDNase sinus nebulisation protocols.

8.5c Hearing, tinnitus and vestibular dysfunction

- We will test for mitochondrial mutation m.1555A>G, which predisposes to aminoglycoside ototoxicity in the whole clinic. If found, we will try to avoid IV aminoglycosides in that child.
- Audiology should be carried out if family history of deafness in a close relative.

Chapter 9 Transplant assessment

- *M. abscessus* - All subspecies contraindication to transplant.

Chapter 11 - Drug formulary

Additions

- Ceftazidime-Avibactam
- Fosfomycin IV
- Paravit-CF
- Relvar ellipta
- Tymbrineb
- Orkambi
- Symkevi
- Ivacaftor for 6m up

Removed

- Aquadeks
- Domperidone
- Ethinyl oestradiol

- Methotrexate
- Subcutaneous terbutaline

Dose changes
- Amphotericin nebulised
- Clofazamine
- Doxycycline
- Ethambutol
- Minocycline
- Teicoplanin IV
- Tigecycline (no loading dose)

New information
- Anti-emetic section (11.2h)
- Chloramphenicol – when to do blood levels
- Ciprofloxacin & moxifloxacin – adverse effects on joints
- Doxycycline & minocycline – when to use in 8-11 yr olds
- Mannitol – commissioned for post-pubertal children
- NAC – effervescent tablets
- Posaconazole suspension doses for <8 year olds
- Teicoplanin – levels
- Tobramycin nebulised - when a DRA is needed when switching formulations
- Vitamin – recommended daily doses

Appendices

Appendix 2. Advice on PsA acquisition
- Includes air conditioning and street play fountains.

New appendices
3. CF Preadmission plan
7. Physiotherapy device & nebuliser cleaning
8. Sputum induction protocol
10. CFTR Gene variants' nomenclature
15. NHSE Commissioning Medicines for Children in Specialised Services