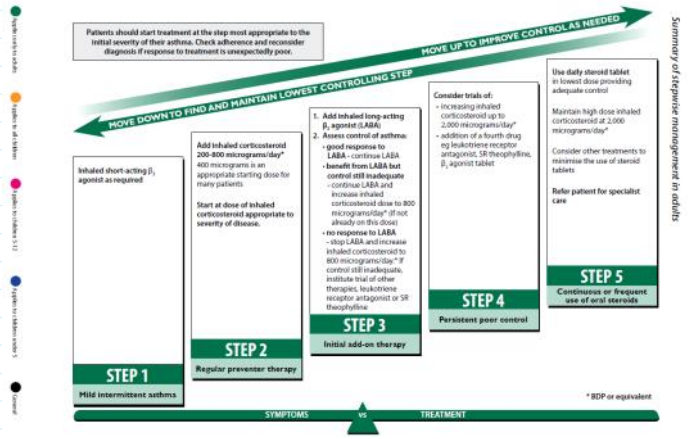
BTS Steps

14 October 2020 11:27

Based on October 2014 guidelines:



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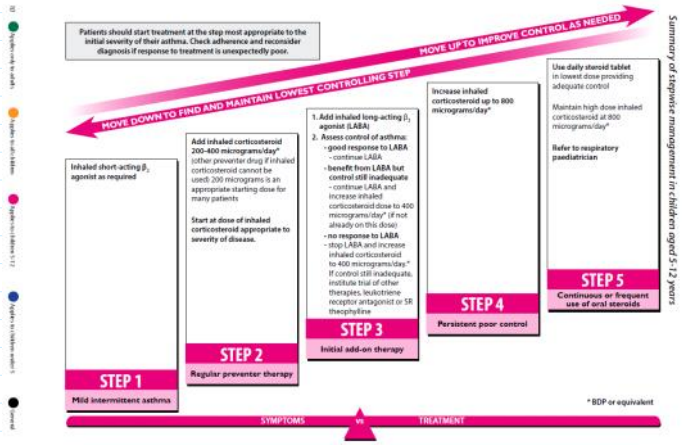
Adults



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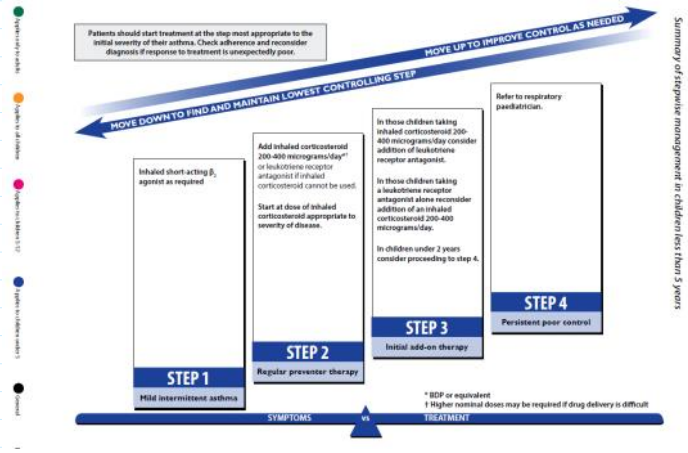

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What we had in our paper?

BTS step†	
Step 1	Inhaled SABA as needed
Step 2	ICS or LTRA
Step 3	Add LABA to ICS or use high-dose ICS (≥400 mg/day FP equivalent)
Step 4	Add LTRA/Theo to (ICS+LABA) or add LABA/LTRA/Theo to high-dose ICS
Step 5	Add OCS

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8793. Asthma control step 0
8794. Asthma control step 1
8795. Asthma control step 2
8796. Asthma control step 3
8797. Asthma control step 4
8798. Asthma control step 5

66Y9. Step up change in asthma management plan
66YA. Step down change in asthma management plan

663V0 Occasional asthma
663V1 Mild asthma
663V2 Moderate asthma
663V3 Severe asthma

Asthma Medication Coding
CodeAndData/Holly/s6_sha_prep_asthmamed.Rnw

Set up flags using the pre-defined medication codes:

f_therapy_part$preventer<-f_therapy_part$flag_ICS+
f_therapy_part$flag_ICS_LABA+
f_therapy_part$flag_LTRA>0

Get dose information and then merge (numdose, daily maximum dose), get ICS dose strength

BTS Step 0:
SABA 1, rest 0
BTS Step 1:
ICS_low:1, rest 0
BTS Step 2:
(ICS_low 1 AND LABA 1) OR (ICS_LABA)
BTS Step 3:

Holly Code Questions
1: Is strength not just the number of mg? If yes, then why some of them have different strength than what their name suggests?
2: If num_dose is NA, then you make it 4....why is that?

Code Structure for BTS Steps

1: define medcodes (SABA/LAMA etc.)
2: load dosage_id, which provide details in text_dose and dosage quantity
Processing dosage data:
Find all those which says "as needed"
3: load quantity info (which I assume is a list of all inhalers and the quantity of dosage they contain)

Process f_therapy now (which is a list of all medication encounters, one entry for every prescription)
4: Keep only the f_therapy where any asthma-related medication is prescribed (those defined in step 1)
5: Merge the dose information from dosage_info (will contain actual_usage, and asneeded flags)
6: Merge the quantity info. from the separate file (step 3)
7: if number of doses is not known, default to 4 (is that typical????? Maybe ask Holly)
8: Compute daily dose maximum (number of doses per day * strength)
9:

30th Oct 2020 adults

BTS: step 1: only SABA
step 2: ICS (upto 800mg)

Get Read Codes for LTRA

Holly code:
Step 0: SABA ✓, rest ↓
Step 1: ICS (low/unknown) ✓, rest ↓ (excluding SABA)
Step 2: ICS (low/unknown) AND LABA
OR
ICS-LABA (low/unknown)
Step 3:

loop for each patient:
start_state = unknown

input: SABA, ICS + dose, LABA, other meds (LTRA, montelukast, methylx),

3rd Nov 2020

d_dosage: actual_dosage
difficult to 4 doses if NA

number of puffs from d_dosage unlike with
f_therapy ←dose_id→ d_dosage
ics will give you number of puffs (dose)

Separately, set quantity info of each drug (in mg)
to compute very low, low, medium and high dose

Input Space for coding

- Resolve your input for every time_point → SABA, LABA, ICS, OCS, other drugs

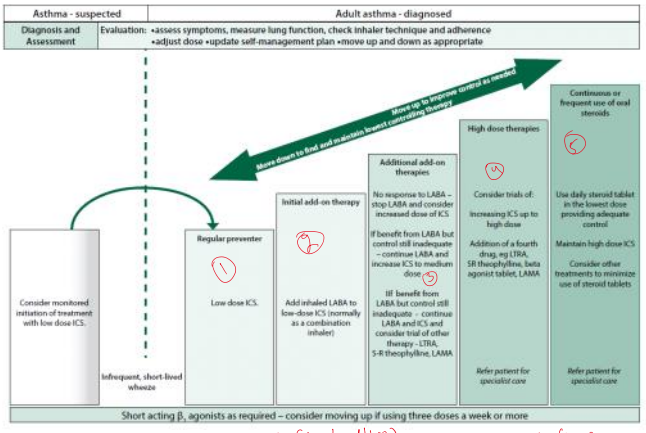
ICS_VL	ICS_L	ICS_M	ICS_H	LABA	SABA	SAMA	methylx	LTRA	montelukast	OCS

Let us use 2016 BTS guidelines

Asthma - suspected	Adult asthma - diagnosed
Diagnosis and Assessment	Evaluation: •assess symptoms, measure lung function, check inhaler technique and adherence •adjust dose •update self-management plan •move up and down as appropriate

ICS: 0, VL, L, M, H
SABA: 0/1
LABA: 0/1
SAMA: 0/1

ICS : 0, VL, L, M, H
SABA: 0/1
LABA: 0/1
SAMA: 0/1
Methylx: 0/1
LTRA: 0/1
Omalizumab: 0/1
OCS : 0/1



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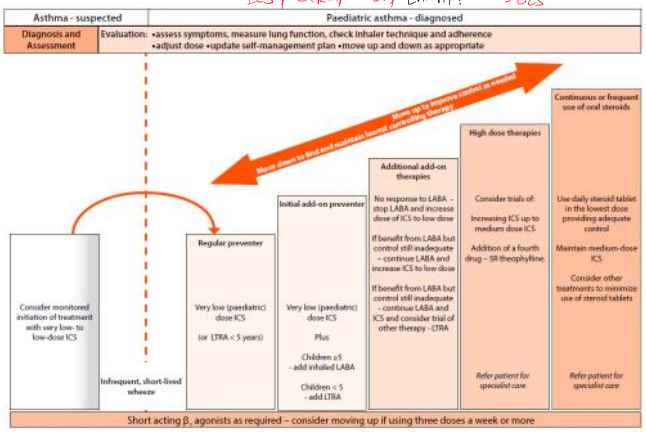
Acting: - ICS (low/med/high)
- LABA + ICS / LABA
- ICS / LTRA/methylx/ LAMA/?

- ICS (high)
- LTRA/methylx/LAMA?
- OCS



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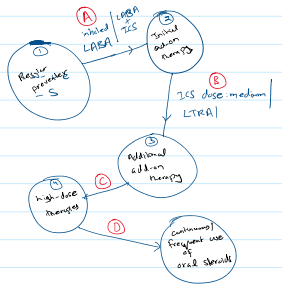
let's start with adult BTS FSM model:




```
loop:
current_state = unknown;

while (record end not reached)
{
  check inputs
  and decide new state accordingly
  store:
    time_stamp, state, input_type
}
```

f_therapy_part: 923,301
f_therapy_part_ICS: 335,703

Input
- ICS
- ICS + LABA
- SABA
- LABA
- SAMA
- methylx ← S-R theophylline
- SABA + SAMA
- LTRA
- omalizumab
- OCS

(A) (LABA
or
(LABA + low-dose ICS)

(B) (medium dose ICS)
or
- ~~short~~ (- medium dose ICS AND - LTRA or S-R or LAMA)

(C) - high dose ICS
or
- add fourth drug (LTRA, or S-R, or beta agonist tablet, LAMA)
- Refer patient

(D) - OCS AND high-dose ICS

Fully code logic

- taking only SABA : step 0
- low-dose ICS : step 1
- low-dose ICS AND LABA
OR
- LABA } step 2

- ICS low/medium/high
OR
ICS medium + LABA } step 3

ICS high
or
ICS or * LABA } Step 4

OCS + previous step logic } Step 5

PHARMACOLOGICAL MANAGEMENT

ADULT DOSES OF INHALED CORTICOSTEROIDS

ICS	Dose: Low dose	Medium dose	High dose*
Pressurised metered dose inhalers (pMDI)			
Beclometasone dipropionate — BecD / BecDQVAR			
Non-proprietary	100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800	200 micrograms four puffs twice a day 1600
Clenil Modulite	100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800 250 micrograms two puffs twice a day 1000	
Qvar (extrafine) Qvar autohaler Qvar Easi-breathe	50 micrograms two puffs twice a day 200	100 micrograms two puffs twice a day 400	100 micrograms four puffs twice a day 800
Ciclesonide — CiC			
Alvesco Aerosol inhaler	80 micrograms two puffs once a day 160	160 micrograms two puffs once a day 320	
Fluticasone propionate — FL			
Flixotide Evohaler	50 micrograms two puffs twice a day 200	125 micrograms two puffs twice a day 500	250 micrograms two puffs twice a day 1000
Dry powder inhalers			
Beclometasone			
Non-proprietary Easyhaler	200 micrograms one puff twice a day 400	200 micrograms two puffs twice a day 800	
Asmabec — BecOnly	100 micrograms one puff twice a day 200	100 micrograms two puffs twice a day 400	
Pulvinal — BecOnly	100 micrograms one puff twice a day 200	200 micrograms one puff twice a day 400	400 micrograms one puff twice a day 800
Budesonide — BuD			
Non-proprietary Easyhaler	100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800	400 micrograms two puffs twice a day 1600
Budelin Novolizer		200 micrograms two puffs twice a day 800	200 micrograms four puffs twice a day 1600
Pulmicort Turbohaler	100 micrograms two puffs twice a day 400 200 micrograms one puff twice a day 400	200 micrograms two puffs twice a day 800 400 micrograms one puff twice a day 800	400 micrograms two puffs twice a day 1600
Fluticasone propionate — FL			
Flixotide Accuhaler	100 micrograms one puff twice a day 200	250 micrograms one puff twice a day 500	500 micrograms one puff twice a day 1000
Mometasone — MomF			
Asmanex Twisthaler	200 micrograms one puff twice a day 400	400 micrograms one puff twice a day 800	

BecD
BecDQVAR **
CiC **
Fl **
BecAsma **
BecPul
BuD **
Fl **
MomF **
Bec+Form
BuD+Form **
Fl+Form
Fl+Salm **
Fl+Vilan
** Paediatric dose

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PHARMACOLOGICAL MANAGEMENT

ADULT DOSES OF INHALED CORTICOSTEROIDS (CONTINUED)

ICS	Dose: Low dose	Medium dose	High dose*
Combination inhalers — Bec+Form			
Beclometasone dipropionate (extrafine) with formoterol			
Fostair (pMDI)	100/6 one puff twice a day 200	100/6 two puffs twice a day 400	200/6 two puffs twice a day 800
Fostair (NEXThaler)	100/6 one puff twice a day 200	100/6 two puffs twice a day 400	
Budesonide with formoterol — Bud+Form			
DuoResp Spiromax	200/6 one puff twice a day 400	200/6 two puffs twice a day 800 400/12 one puff twice a day	400/12 two puffs twice a day 1600
Symbicort Turbohaler	100/6 two puffs twice a day 400 200/6 one puff twice a day	200/6 two puffs twice a day 800 400/12 one puff twice a day	400/12 two puffs twice a day 1600
Fluticasone propionate with formoterol — Fl + Form			
Flutiform	50/5 two puffs twice a day 200	125/5 two puffs twice a day 500	250/10 two puffs twice a day 1000
Fluticasone propionate with salmeterol — Fl + Salm			
Seretide Accuhaler	100/50 one puff twice a day 200	250/50 one puff twice a day 500	500/50 one puff twice a day 1000
Seretide Evohaler	50/25 two puffs twice a day 200	125/25 two puffs twice a day 500	250/25 two puffs twice a day 1000
Fluticasone furoate with vilanterol — Fl + Vilan			
Relvar		92/22 one puff once a day 92	184/22 one puff once a day 184

* High doses should only be used after referring the patient to secondary care.

PAEDIATRIC DOSES OF INHALED CORTICOSTEROIDS

ICS	Dose: Very low dose	Low dose	Medium dose#
Pressurised metered dose inhalers (pMDI) with spacer			
Beclometasone dipropionate — BecD			
Non-proprietary	50 micrograms two puffs twice a day 200	100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800
Clenil Modulite	50 micrograms two puffs twice a day 200	100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800
Qvar (extrafine)* Qvar autohaler Qvar Easi-breathe		50 micrograms two puffs twice a day 200	100 micrograms two puffs twice a day 400
Ciclesonide — CiC			
Alvesco Aerosol inhaler		80 micrograms two puffs once a day 160	160 micrograms two puffs once a day 320
Fluticasone propionate — FL			
Flixotide Evohaler	50 micrograms one puff twice a day 100	50 micrograms two puffs twice a day 200	125 micrograms two puffs twice a day 500
Dry powder inhalers			
Beclometasone			
Asmabec**		100 micrograms one puff twice a day 200	100 micrograms two puffs twice a day 400
Budesonide — BuD			
Non-proprietary Easyhaler		100 micrograms two puffs twice a day 400	200 micrograms two puffs twice a day 800
Pulmicort Turbohaler	100 micrograms one puff twice a day 200	100 micrograms two puffs twice a day 400 200 micrograms one puff twice a day 400	200 micrograms two puffs twice a day 800 400 micrograms one puff twice a day 800
Fluticasone propionate — FL			
Flixotide Accuhaler	50 micrograms one puff twice a day 100	100 micrograms one puff twice a day 200	250 micrograms one puff twice a day 500
Mometasone — MomF			
Asmanex Twisthaler		200 micrograms one puff twice a day 400	
Combination Inhalers			
Budesonide with formoterol — BuD+Form			
Symbicort turbohaler	100/6 one puff twice a day ** 200	100/6 two puffs twice a day** 400 200/6 one puff twice a day* 400	
Fluticasone propionate with salmeterol — Fl+Salm			
Seretide Accuhaler		100/50 one puff twice a day 200	
Seretide Evohaler		50/25 two puffs twice a day 200	

* Not licensed for children under 12 years ** Not licensed for children under 6 years
# Medium doses should only be used after referral of patient to secondary care

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17th Nov 2020

merge f_therapy_part_ICS & f_therapy_part

get number of patients

for kpatient {

current_state = unknown

for event_date

{

Logic in adults

if unknown state

flags

SABA
LABA
SAMA

if SABA == 1, and rest 0,

(adults)

if unknown state

flags

SABA
LABA
SAMA
methylx
SABA-SAMA
ICS
ICS-LABA
LTRA
omal-gumab
OCS

if SABA == 1, and rest 0,
state = 0.

if ICS_low_dose == 1, and rest 0
state = 1

if ICS_low_dose + LABA,
state = 2

if ICS_medium_dose and (rest)
state = 3

if ICS-high-dose and OCS == 0
state = 4

if ICS_high dose AND OCS == 1
state = 5

~~A AND B~~

$\bar{A} \cap \bar{B} \cap \bar{C}$

(AuBuC)