APRV – TRADITIONAL METARULES

Goal: Maintain a mean airway pressure that recruits and maintains end expiratory lung volume.

- All patients should have an ABG at the time of randomization and generally every 2 hours unless contraindicated
- Protocol will be run within 30 minutes of new ABG's
- Use PaO2 if available, only use SPO2 if PaO2 more than 30 minutes old.

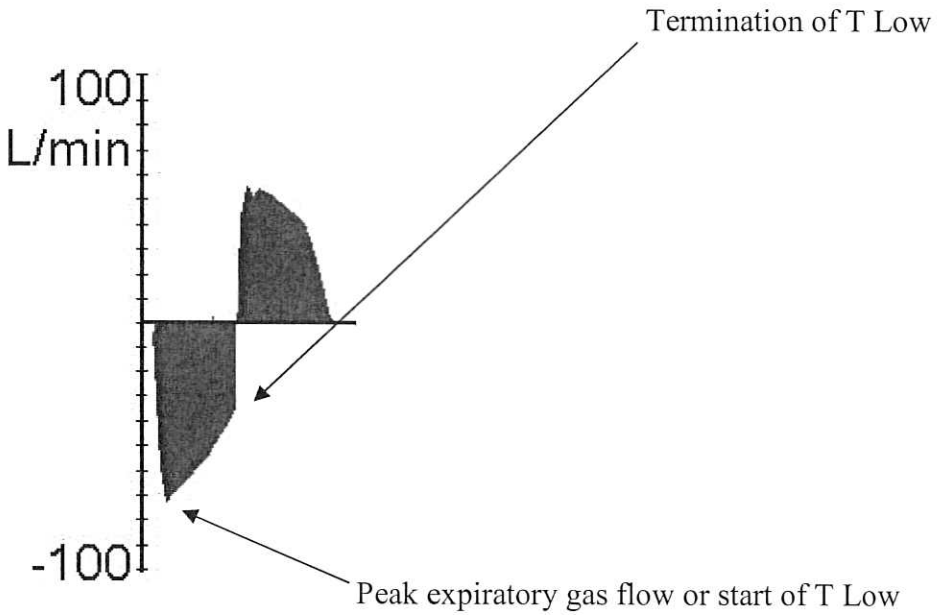
Initial settings:

- FiO2: set at current level – may have to increase initially
- Slope: always set at "0" sec. Want a square wave form.
- P High: (High level of CPAP) Set at the plateau pressure if on conventional ventilation. If on Pressure Support start at the PS level.
- T High: (amount of time at P High) Controls the number of releases (rate) from P High to P Low.
    - VR > 30 = T High of 4 sec
    - VR 21-29 = T High of 5 sec
    - VR $\leq$ 20 = T High of 6 sec
- P Low: (low level of CPAP) always set at "0"cmH2O. There will be residual or intrinsic PEEP. It will be between 1 – 5 cmH2O and can vary from breath to breath.
- T Low: (amount of time P High is released from the lung) Set at 0.4 to 1.0 sec. Adjust to have the Peak Expiratory Flow Rate percentage 50 to 75%.
- ETCO2: place the ETCO2 in line. It is a standing order for this protocol and will be for the study.
- ATC (automatic tube compensation): Enter the tube size and amount of compensation. Start with 100% compensation. When ATC is turned on, a green line will appear along the pressure wave form. If large spikes or whip are seen in the green line, decrease the amount of compensation in 20% decrements. If at 40% compensation with large spikes and whip, turn the ATC off. Some patients do not tolerate it. May help with work of breathing.
- P0.1: (occlusion pressure) Set the P0.1 to measure every 10 minutes. Set up the screen to show trend of the P0.1 as either a wave form or a short trend with either the pressure or flow wave form. P0.1 is a measure of the patient's neuro stimulus to breath. The ventilator performs a mini NIF during the first 100 milliseconds of the breath. It will only be measured on a spontaneous breath. Normal is 2-5. 1 – 2 indicate the patient is over sedated or has no neuro stimulus to breath. Over 6 indicates an increased drive to breath. Indicates impending respiratory fatigue. For more information see article on Respiratory Care Team page.
- RSBI: (Rapid Shallow Breathing Index) Frequency / Minute volume. Set up the screen to show trend either as waveform or a short trend. Calculation is done every 6 seconds. Frequency / minute. Patients with an RSBI less than 100 are able to wean from the ventilator.

- Draw an ABG 30 minutes after initiation.

Adjusting therapy:

- Measure the % peak expiratory flow. Freeze the ventilator screen with two or three releases on the screen.
- Move the cursor to the termination of T Low. Note the lpm.
- Move the cursor to the start of T low.
- Divide termination of T Low by start of T low.
- This is the % peak expiratory flow. For more information see article on Respiratory Care team space.

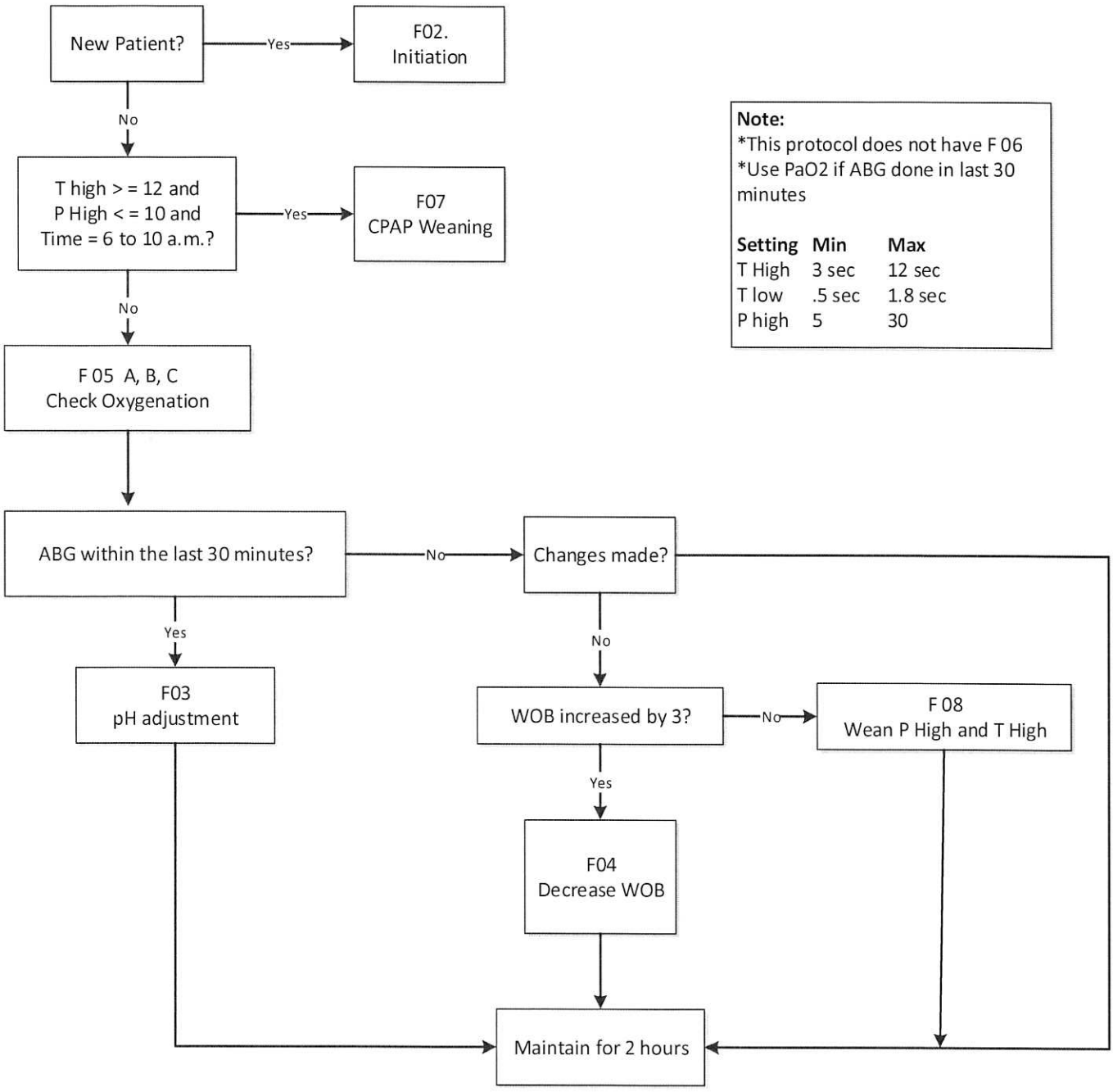


- Maintain the % peak expiratory flow between 50 to 75%.
- If the % is less than 50 – decrease T Low by 0.1 sec, wait 10 minutes and re-measure the %peak expiratory flow.
- If the % is more than 75 – increase T Low by 0.1 sec, wait 10 minutes and re-measure the % peak expiratory flow.
- The Drager Evita has an internal "High PEEP" alarm. The ventilator will alarm and release all the pressure in the circuit. This will de-recruit lung and is to be avoided. The "High Peep" alarm will be triggered when:
    - The measured PEEP is 5 cmH2O above the set PEEP for 10 breaths.
    - The measured PEEP is 8 cmH2O above the set PEEP for 2 breaths or 15 seconds.

- Lengthen T Low by 0.1 sec increments to decrease intrinsic PEEP.
- Increase T Low by 0.1 sec increments to maintain intrinsic PEEP between 1 to 5 cmH2O.

APRV Traditional

F 01. CORE



Note:
*This protocol does not have F 06
*Use PaO2 if ABG done in last 30 minutes

Setting	Min	Max
T High	3 sec	12 sec
T low	.5 sec	1.8 sec
P high	5	30

6/24/2013

Legend
CORE: Map to titration of protocol, guide to individual flows
F followed by a number: Flows
S followed by a number: States, decisions
A followed by a number: conditions
Above used to enhance communication/ prepare for computerization

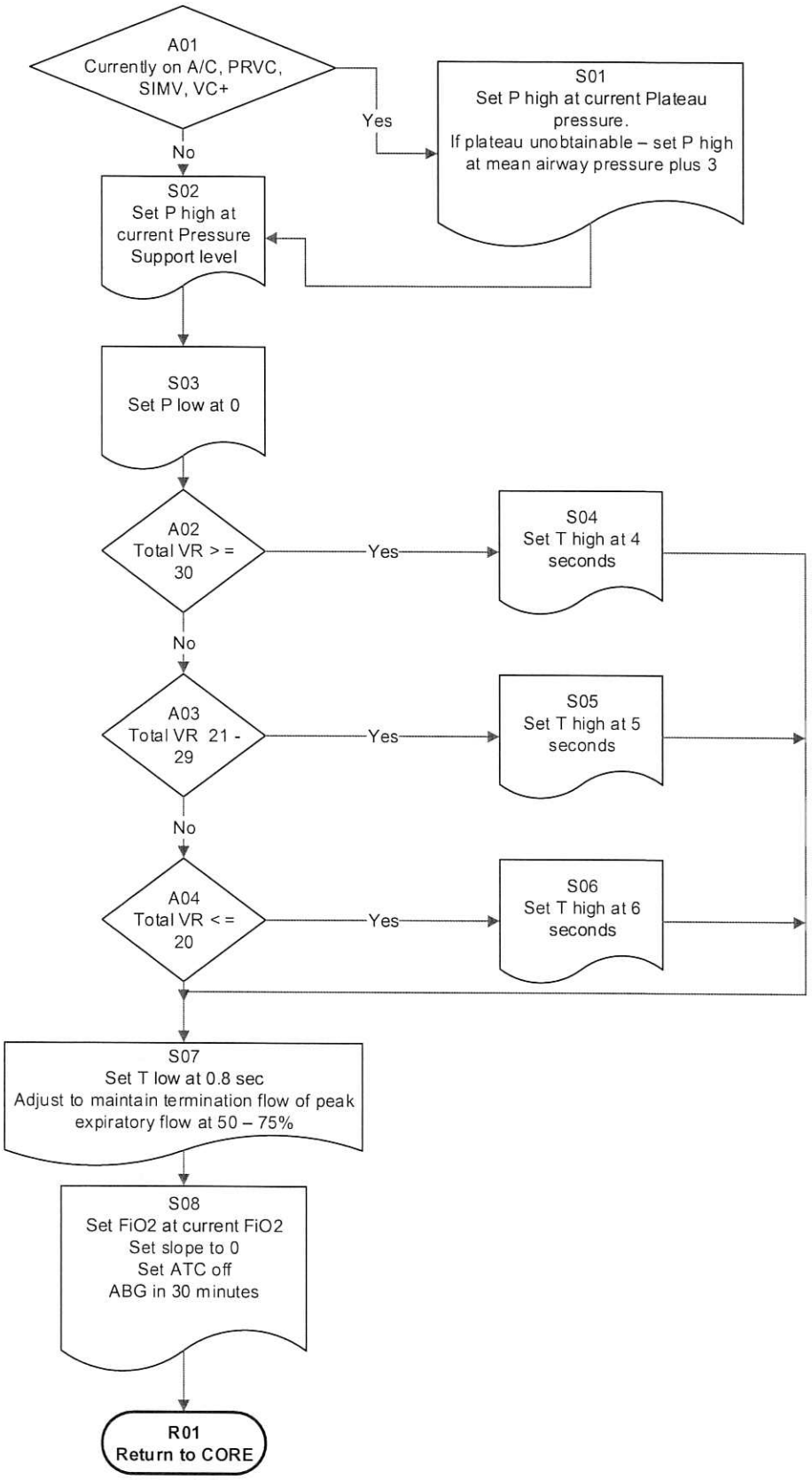
*Adapted from Habashi protocol

F02. Initial APRV settings

APRV Traditional

Note:
*Maintain a minimum of 5 cmH2O between P high and P low

Setting	Min	Max
T high	3sec	12 sec
T low	.5 sec	1.8 sec
P high	5	30
P low	0	0



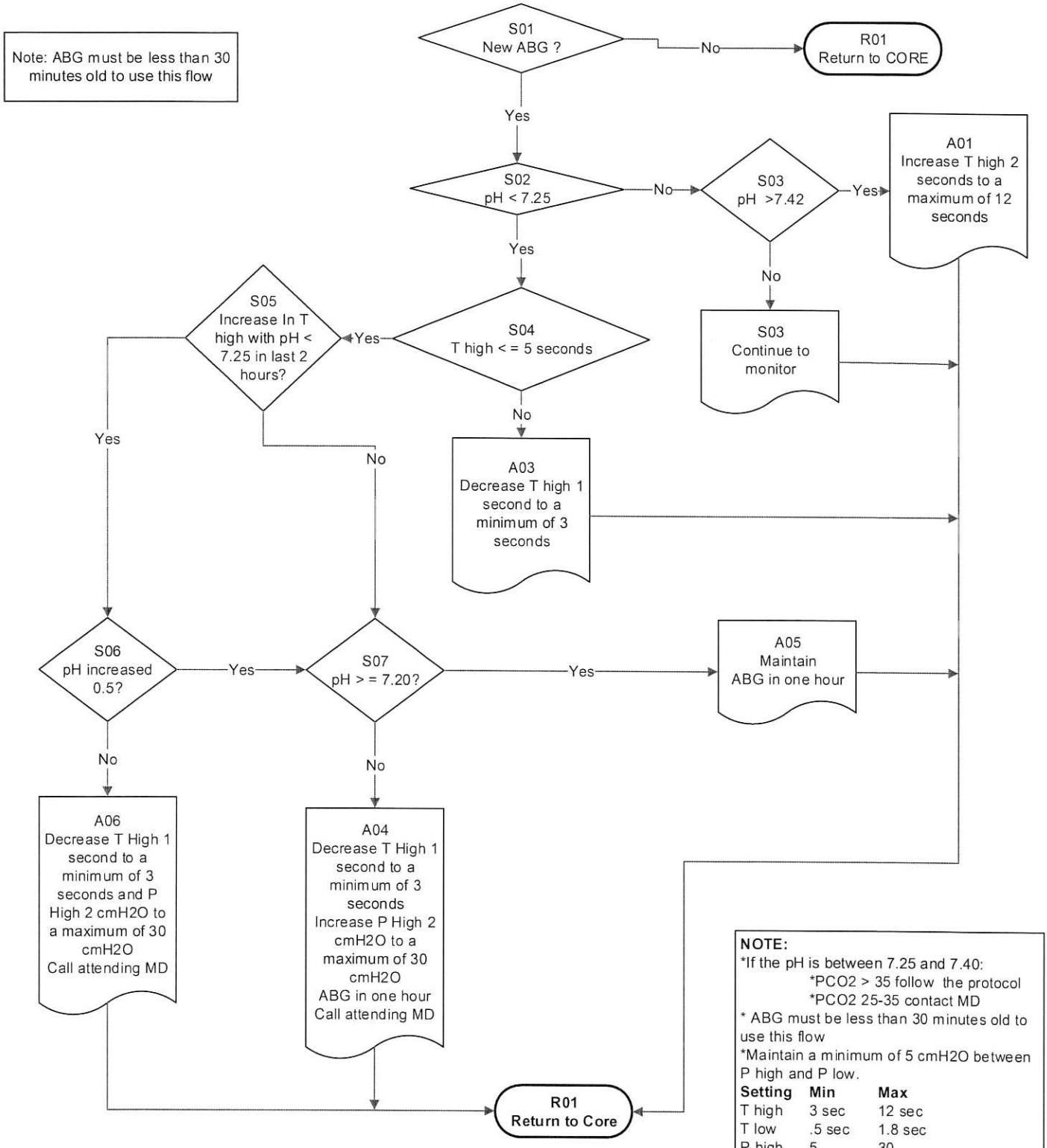
06/24/2013

Adapted from Habashi APRV protocol

F03. pH Adjustment

APRV Traditional
Ventilation Cells

Note: ABG must be less than 30 minutes old to use this flow



NOTE:

*If the pH is between 7.25 and 7.40:
*PCO2 > 35 follow the protocol
*PCO2 25-35 contact MD

* ABG must be less than 30 minutes old to use this flow

*Maintain a minimum of 5 cmH2O between P high and P low.

Setting	Min	Max
T high	3 sec	12 sec
T low	.5 sec	1.8 sec
P high	5	30
P low	0	

Adapted from Habashi Protocol

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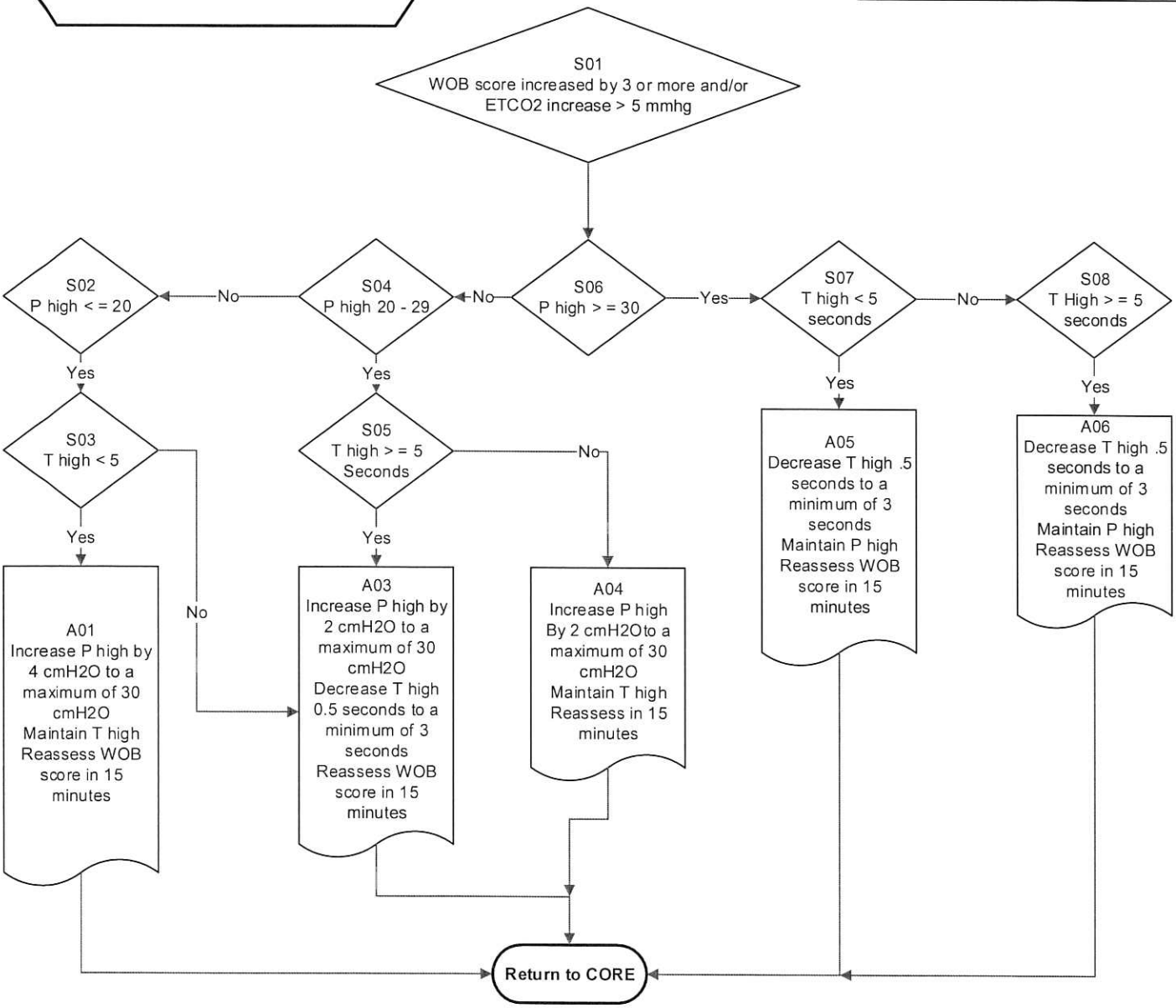
F04. Work of Breathing Assessment

APRV Traditional



Meta Rules

* Do not increase or decrease P high by more than 4 cmH2O each time the protocol is run.
*Do not increase or decrease T high by more than 2 seconds each time the protocol is run.

Setting	Min	Max
T high	3sec	12 sec
T low	.5 sec	1.8 sec
P high	5	30
P low	0	

06/24/2013

Adapted from Habashi Protocol

F05a. Improve Oxygenation

APRV Traditional

After intervention based on cell Return to CORE

SpO2 < 87 or paO2 < 55

P High	FiO2 = 0.4	FiO2 = 0.5	FiO2 = 0.6	FiO2 = .7	FiO2 = .8	FiO2 = .9	FiO2 = 1.0
8	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
9	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
10	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
11	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
12	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
13	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
14	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
15	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
16	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
17	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
18	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
19	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
20	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
21	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
22	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
23	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
24	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
25	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
26	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
27	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
28	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cm H2O, FiO2 0.1	↑ P high 2 cmH2O
29	↑ FiO2 0.1	↑ FiO2 0.1	↑ P high 1 cmH2O & FiO2 0.1	↑ P high 1 cmH2O & FiO2 0.1	↑ P high 1 cmH2O & FiO2 0.1	↑ P high 1 cmH2O & FiO2 0.1	↑ P high 1 cmH2O
30	↑ FiO2 0.1	↑ FiO2 0.1	↑ FiO2 0.1	↑ FiO2 0.1	↑ FiO2 0.1	↑ FiO2 0.1	Call MD

F05b. Optimize Oxygenation

APRV Traditional

After intervention based on cell Return to CORE

SpO2 > 93 or PaO2 > 68

P High	FiO2 = .4	FiO2 = .5	FiO2 = .6	FiO2 = .7	FiO2 =.8	FiO2 = .9	FiO2 = 1.0
8	Go to CPAP Weaning	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
9	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
10	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
11	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
12	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
13	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
14	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
15	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
16	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
17	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
18	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
19	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
20	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
21	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
22	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
23	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
24	↓ P high 2 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
25	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
26	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
27	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
28	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
29	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1
30	↓ P high 1 cmH2O	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1	↓ FiO2 0.1

F05c. Maintain Oxygenation

APRV Traditional

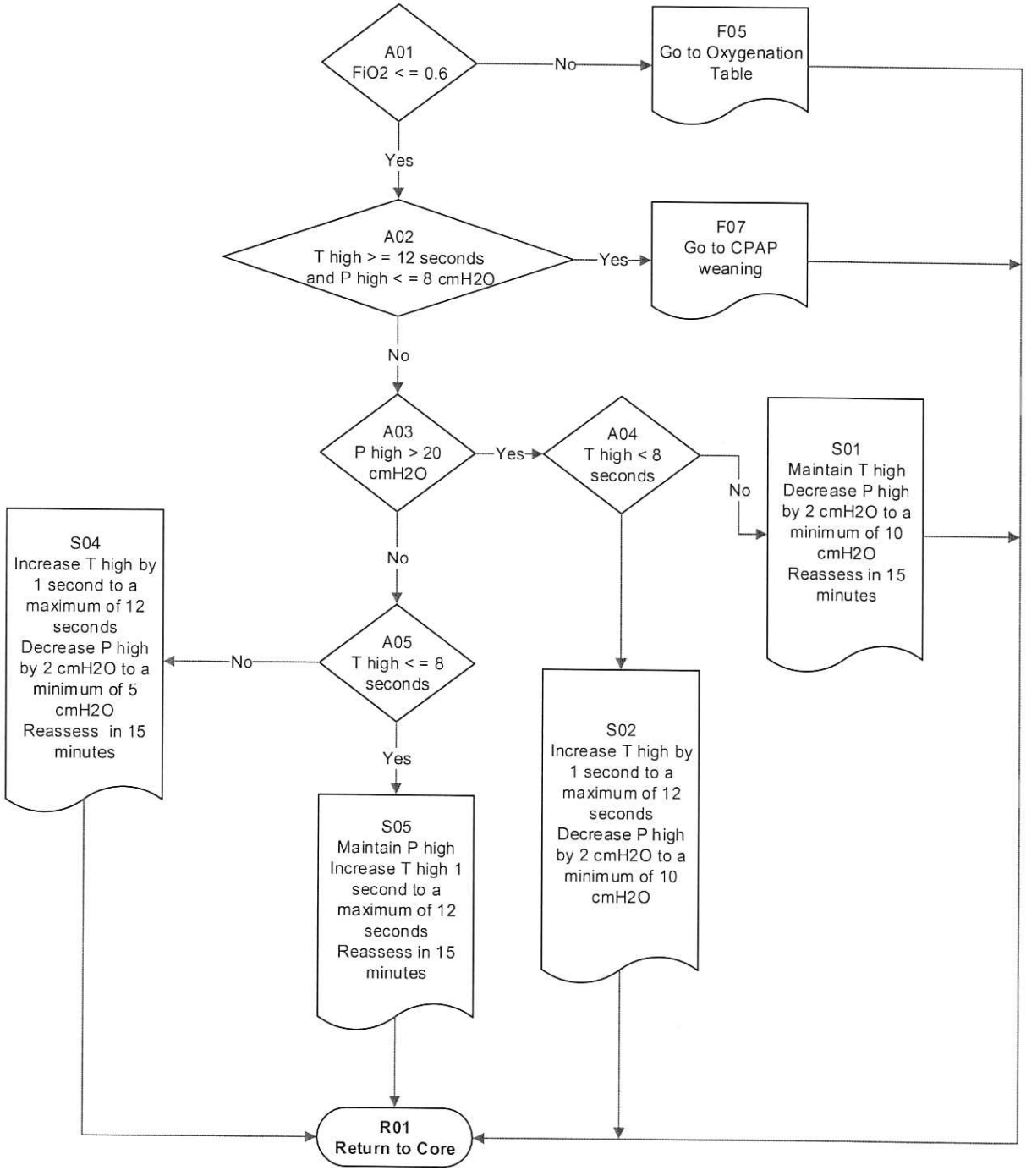
After intervention based on cell, Return to Core

SpO2 88 to 93 or PaO2 55 to 68

P High	FiO2 = 0.4	FiO2 = 0.5	FiO2 = 0.6	FiO2 = 0.7	FiO2 = 0.8	FiO2 = 0.9	FiO2 = 1.0
8	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
9	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
10	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
11	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
12	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
13	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
14	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
15	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
16	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
17	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
18	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
19	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
20	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
21	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
22	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
23	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
24	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
25	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
26	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
27	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
28	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
29	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain
30	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain

F07. P high and T high Titration

APRV Traditional



Meta Rules:

* Do not increase or decrease P high by more than 4 cm H2O every 2 hours.
*Do not increase or decrease T high by more than 2 seconds every 2 hours.

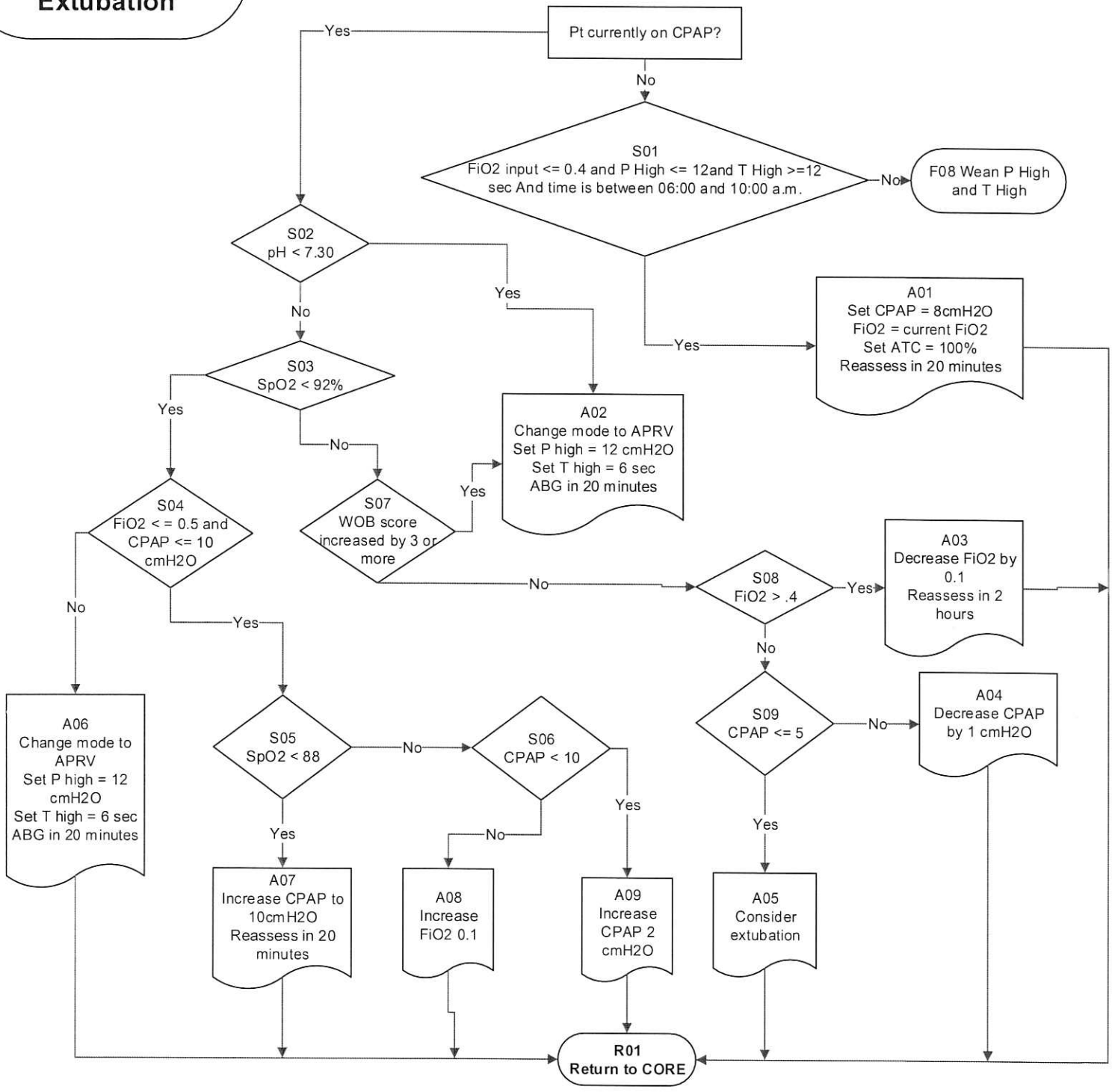
Setting	Min	Max
T high	3sec	12 sec
T low	.5 sec	1.8 sec
P high	5	30
P low	0	

06/24/2013

Adapted from Habashi Protocol

F08. Weaning Protocol to Extubation

APRV Traditional



Reassess
1. WOB – work of breathing score
2. ETCO2
3. SpO2
4. ABG if done

Spontaneous Breathing Goals:
1. SpO2 > 90% or PaO2 > 55
2. Average spontaneous tidal volume >4 ml/kg IBW
3. Spontaneous VR < = 35 bpm
4. pH . = 7.30 if measured

Treat correctable problems before failing patient back to APRV or reassessing
1. Anxiety, pain, delirium
2. Acute brochospasm
3. Mucus plug
4. Excessive sedation
5. Patient position
6. Ventilator circuit problem

06/24/2013

Adapted from Habashi Protocol