

Handling the Pressure

Implementing the new guidelines issued for positive airway pressure titrations

The American Academy of Sleep Medicine recently published clinical guidelines for the manual titration of positive airway pressure in adult and pediatric patients with obstructive sleep apnea. While PAP titration has been a mainstay in sleep medicine for more than 25 years, this document represents the first-ever attempt to delineate standardized recommendations for the procedure.

“We felt that it was long overdue that such clinical guidelines be promulgated even if data in some areas were not sufficient,” said Sairam Parthasarathy, MD, a member of the AASM’s PAP

ROAD MAP TO TITRATION

Major recommendations of the PAP Titration Task Force include:¹

- increasing CPAP until apneas, hypopneas, respiratory effort-related arousals, and snoring are eliminated or the recommended maximum CPAP is reached.
- ensuring all PAP titration candidates receive adequate PAP education, including hands-on demonstration, careful mask fitting, and acclimatization before titration.
- lowering the pressure to a comfortable level if the patient awakens and complains that the pressure is too high.

SCORE CARD FOR TITRATION

You may need to consider performing a repeat PAP titration study if the initial titration does not meet a grade of good or optimal, according to the task force criteria:¹

Optimal: RDI less than 5 for a duration of at least 15 minutes, including measurements during uninterrupted

REM sleep

Good: RDI reduced to 10 or less by 50 percent if the baseline RDI is less than 15, including measurements during uninterrupted REM sleep

Adequate: RDI not reduced to 10 or less, but reduced by 75 percent from baselines, or titration meets optimal or good criteria except during supine REM sleep

Unacceptable: Titration not meeting any of the criteria



Titration Task Force. “At least we could reach a consensus as to how (titration) should be done, and then it could be put out there, tested in the field, and verified or disproved.”

With few PAP titration protocols published in the literature, the task force found a great deal of diversity in sleep professionals’ approaches to titration. Most facilities developed their methods based on clinical experience and judgment. The task force members recognized that maintaining a level of variability in a titration protocol is essential in treating OSA, considering that the disease and treatment devices can affect each patient differently.

“We’re not trying to dictate uniformity,” said task force member David Gozal, MD, FCCP, who is director of the division of pediatric sleep medicine at the University of Louisville.

“We’re recommending a set of standards that can serve as a good evidence- and consensus-based tool to develop your own procedures in the laboratory.”

The task force also defined parameters sleep professionals can use to grade the adequacy of a titration from optimal to unacceptable.

“Before this guideline, there wasn’t a clear score card so to speak — the field had left it to the whims and fancies

of each sleep physician to decide whether a titration was adequately done or not," said Dr. Parthasarathy, assistant professor of medicine in the division of pulmonary and critical care medicine at the Southern Arizona Veterans Administrative Hospital and the University of Arizona in Tucson.

By providing such structure without being rigid, the AASM expects these practice parameters to positively influence the sleep field, patient treatment outcomes, and health care costs. The recommendations are designed to grow and change as new information and perhaps new technology becomes available.¹

"I hope this guideline ultimately serves as a catalyst for discussion, providing opportunities for research and testing the validity of various approaches," Dr. Gozal said. "After all, that is how the field progresses."

You can access the complete guideline at www.aasmnet.org/clinicalguidelines.aspx.

Reference

1. Kushida CA, Chediak A, Berry RB, Brown LK, Gozal D, Iber C, et al. Clinical guidelines for the manual titration of positive airway pressure in patients with obstructive sleep apnea. *J Clin Sleep Med.* 2008;4(2):157-71.

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Cardinal Health

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Yorba Linda, CA 92887
(714) 283-2228; (800) 231-2466

Email:

marketing.rc@cardinalhealth.com

Website: www.cardinal.com

Product line: SNAPP X Direct nasal interface, the Advantage Series[®] nasal mask, Advantage Series[®] full face mask, the Standard Series nasal mask, BreatheX[™] Journey, BreatheX[™]

Company description: Cardinal Health manufactures and supplies products and services designed to help health care professionals reduce their costs, improve safety and productivity, and deliver better patient care.

Covidien

6135 Gunbarrel Ave.
Boulder, CO 80301
(303) 305-2400; (800) 635-5267

Website: www.covidien.com

Product line: Puritan Bennett GoodKnight[®] 420 Series CPAP /bilevel devices

Company description: Covidien offers Puritan Bennett products, a global brand of respiratory-related medical products, serving patients from hospital to home.

DeVilbiss Healthcare

100 DeVilbiss Dr.
Somerset, PA 15501
(814) 443-4881; (800) 338-1988

Fax: (800) 552-7379

Email: cs@devilbissshc.com

Website:

www.devilbisshealthcare.com

Product line: DeVilbiss IntelliPAP CPAP systems

Company description: DeVilbiss Healthcare develops, manufactures, markets, and services a broad portfolio of respiratory products, including oxygen therapy equipment, pulmonary drug delivery systems, and sleep apnea therapy solutions.

Customer service: Educational DVD includes introduction to CPAP therapy, how to use and care for the IntelliPAP unit. Enhanced instruction guide provides an overview of OSA, benefits of therapy, acclimating to therapy, and resources that can help.

evo Medical Solutions

2636 289th Place
Adel, IA 50003
(515) 993-5001; (800) 759-3038

Fax: (515) 993-4172

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Website: www.evomedical.com

Fisher & Paykel Healthcare

15365 Barranca Pkwy.
Irvine, CA 92618
(949) 453-4000; (800) 446-3908

Fax: (949) 453-4001

Email: information@fphcare.com

Website: www.fphcare.com

Product line: SleepStyle[™] family of CPAP and interface solutions

Company description: Fisher & Paykel Healthcare designs and manufactures heated humidification products and systems for respiratory care and the treatment of obstructive sleep apnea.

Customer service: Support for Fisher & Paykel Healthcare products is available via telephone during normal business hours, 24/7 on www.vigar8.com, or via instructional DVD videos.

Invacare Corp.

1 Invacare Way
Elyria, OH 44035
(440) 329-6000; (800) 333-6900

Fax: (440) 326-3911

Email: bmessenger@invacare.com

Website: www.invacare.com

Product line: Sleep, portable oxygen concentrator, HomeFill[®] oxygen system, oxygen concentrators, aerosol

Company description: Invacare Corp. is a global manufacturer and distributor of home and long-term care medical products that promote recovery and active lifestyles.

Philips Respironics

1010 Murry Ridge Ln.
Murrysville, PA 15668
(724) 387-5200; (800) 345-6443

Fax: (724) 387-5010

Website: www.philips.com/respironics

Product line: M Series CPAP and BiPAP systems, BiPAP autoSV system

Company description: Philips Respironics develops, manufactures, and distributes products and programs that serve the global sleep and respiratory markets.

ResMed Corp.

14040 Danielson St.
Poway, CA 92064
(858) 746-2400; (800) 424-0737

Fax: (858) 746-2920

Email: reception@resmed.com

Website: www.resmed.com

Company description: ResMed manufactures medical equipment for the screening, treatment, and management of sleep-disordered breathing and other respiratory disorders.

A WORD FROM ADVANCE

We invite comments about the Positive Airway Pressure Systems Buyers Guide so that future efforts may better serve *ADVANCE* readers. Please forward comments to Sharlene George, Editor, *ADVANCE for Managers of Respiratory Care*, 2900 Horizon Dr., King of Prussia, PA 19406; email: sgeorge@advanceweb.com; fax: (610) 278-1425; phone: (610) 278-1400, ext. 1324.

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—Buyers guide compiled
by Colleen Mullarkey

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Company name	Cardinal Health	Covidien			DeVilbiss Healthcare			evo Medical Solutions
Product name	BreatheX™ Journey	GoodKnight 420G CPAP System	GoodKnight 420S CPAP System	GoodKnight 420E Auto-CPAP System	GoodKnight 425 Bi-Level Device	IntelliPAP™ AutoAdjust® CPAP system	IntelliPAP™ Standard CPAP system	everest® 2 CPAP
Warranty	Two years, one year on battery	Two years	Two years	Two years	Two years	Three years on IntelliPAP unit; two years on humidification heater	Three years on IntelliPAP unit; two years on humidification heater	Two years
Dimensions (height x length x width) in inches	4 x 6.5 x 11	3.1 x 7.9 x 5.7	3.1 x 7.9 x 5.7	3.1 x 7.9 x 5.7	3.1 x 7.9 x 5.7	6.4 x 8.4 x 6.5	6.4 x 8.4 x 6.5	6 x 5 x 5
Weight	2.5 lb.	Approx. 1.5 lb.	Approx. 1.5 lb.	Approx. 1.5 lb.	Approx. 1.5 lb.	4.45 lb. with humidifier and PAP	4.45 lb. with humidifier and PAP	2.2 lb.
Power requirements (AC/DC)	AC charger	Yes	Yes	Yes	Yes	Universal power supply: DC operable	Universal power supply: DC operable	100-240 VAC, 50-60 Hz, 19 VDC
Overall noise level (dBA)	Less than 32	31 at 10 cm H ₂ O	31 at 10 cm H ₂ O	31 at 10 cm H ₂ O	31 at 10 cm H ₂ O	26	26	31
Operating specifications								
Mode of operation	CPAP				Spontaneous (425S or ST), timed (425ST only)	Conventional CPAP or AutoAdjust modes	Conventional CPAP	CPAP
Indications for use	OSA	OSA	OSA	OSA	OSA	DeVilbiss IntelliPAP™ Model DV5 Series for OSA in patients 66 lb./30 kg. and above	DeVilbiss IntelliPAP™ Model DV5 Series for OSA in patients 66 lb./30 kg. and above	OSA
Operating pressure range (cm H₂O)	5 to 12	4 to 20	4 to 20	4 to 20	Bilevel: 3 to 25	3 to 20	3 to 20	4 to 20
Adjustable starting ramp pressure	3.5	4	4	4	4	Selectable	Selectable	Adjusts from 4 to 1 cm H ₂ O less than the therapy pressure setting
Pressure adjustment increments (cm H₂O)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Ramp time (minutes)	15	0 to 30	0 to 30	0 to 30	0 to 30	0 to 45	0 to 45	5 to 45, in 5-minute increments
Features								
Alarms (audio/visual)						X	X	
Automatic start/stop						X	X	
Automatic leak compensation		X	X	X	X	X	X	X
Automatic altitude compensation		X	X	X	X	X	X	X
Detection of apnea/hypopnea			X	X		X		
Pressure delay function	X	X	X	X	X	X	X	
Remote programming capabilities			X	X	X	X	X	X
Soft exhalation technology		X	X	X	X			
Memory	None	Yes	Yes	Yes	Yes	SmartLink™ Therapy Management System	SmartLink™ Therapy Management System	13 months daily compliance storage
Compliance meter	Yes	Yes	Yes	Yes	Yes	SmartLink™ Therapy Management System enables remote monitoring of patient CPAP usage and evaluation of the effectiveness of CPAP therapy	SmartLink™ Therapy Management System enables remote monitoring of patient CPAP usage and evaluation of the effectiveness of CPAP therapy	Total therapy hours, therapy sessions less than or equal to eight, six, and four hours
Downloadable compliance information	No	No	Yes	Yes	Yes	Yes	Yes	Optional DataRest compliance system and data card
Filters	Coarse particle	Yes	Yes	Yes	Yes	Air inlet and fine particle filters	Air inlet and fine particle filters	Washable foam air filter
Humidifiers	No	Yes	Yes	Yes	Yes	DeVilbiss heated humidifier	DeVilbiss heated humidifier	Optional integrated humidifier
Heated humidification	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accessories and other features	Breathe X face mask; battery operation, portable	Breeze SleepGear CPAP interface, DreamFit nasal mask, ADAM interface, SilverLining3 data management software	Breeze SleepGear CPAP interface, DreamFit nasal mask, ADAM interface, SilverLining3 data management software	Breeze SleepGear CPAP interface, DreamFit nasal mask, ADAM interface, SilverLining3 data management software	Breeze SleepGear CPAP interface, DreamFit nasal mask, ADAM interface, SilverLining3 data management software	DeVilbiss FlexSet® Mask 9354D, Shallow Mask 9354S, Gel Mask 9354G; Serenity® Mask 9352D, Shallow Mask 9352S, Gel Mask 9352G, Gel Shallow Mask 9352GS; InnoMed Nasal-Aire II K2A; Bravo BRV600; Hybrid Dual Airway Interface HYB500	DeVilbiss FlexSet® Mask 9354D, Shallow Mask 9354S, Gel Mask 9354G; Serenity® Mask 9352D, Shallow Mask 9352S, Gel Mask 9352G, Gel Shallow Mask 9352GS; InnoMed Nasal-Aire II K2A; Bravo BRV600; Hybrid Dual Airway Interface HYB500	Heated humidifier, battery, mobile power adapter, compliance module; optional integrated battery

Company name	Fisher & Paykel Healthcare		Invacare Corp.	ResMed Corp.				
Product name	SleepStyle™ 200 Series	SleepStyle™ 600 Series	Polaris EX	VPAP III	VPAP III ST	VPAP III ST-A	VPAP Adapt SV	VPAP Malibu
Warranty	Two years	Two years	Two years	Two years	Two years	Two years	Two years	Two years
Dimensions (height x length x width) in inches	10.8 x 6.7 x 5.5	10.7 x 6.7 x 6.9	5.2 x 8.5 x 8.5	5.6 x 10.6 x 9.1	5.6 x 10.6 x 9.1	5.6 x 10.6 x 9.1	5.6 x 11.5 x 9.8	5.6 x 10.6 x 9.1
Weight	4.4 lb.	4.6 lb.	4.2 lb.	4.6 lb.	4.6 lb.	5.1 lb.	8.14 lb.	5.1 lb.
Power requirements (AC/DC)	AC	AC	120 V, 60 Hz	100-240 V, 50-60 Hz/12 VDC input	100-240 V, 50-60 Hz/12 VDC input	100-240 V, 50-60 Hz/12 VDC input	100-240 V, 50-60 Hz/12 VDC input	100-240 V, 50-60 Hz/12 VDC input
Overall noise level (dBA)			35	33	33	31	Less than 30	Less than 30
Operating specifications								
Mode of operation	CPAP	CPAP	CPAP	CPAP, spontaneous	CPAP, spontaneous, spontaneous/timed, timed	CPAP, spontaneous, spontaneous/timed, timed	CPAP, ASV	CPAP, Vset, spontaneous
Indications for use	Adult OSA	Adult OSA	OSA	Adult OSA	Adult OSA	Adult OSA	Adult OSA, central sleep apnea, mixed sleep apnea, periodic breathing	Adult OSA
Operating pressure range (cm H ₂ O)	4 to 20	4 to 20	4 to 20	2 to 25	2 to 25	2 to 30	4 to 20	3 to 25
Adjustable starting ramp pressure	No	No	Yes	Yes	Yes	Yes	CPAP mode only	Yes
Pressure adjustment increments (cm H ₂ O)	1	1	1	0.2	0.2	0.2	0.2	0.2
Ramp time (minutes)	Proportional	Proportional	0 to 30	0 to 45	0 to 45	0 to 45	0 to 45	0 to 45
Features								
Alarms (audio/visual)						X	X	
Automatic start/stop				X	X	X	X	X
Automatic leak compensation	Available with some models	Available with some models	X	X	X	X	X	X
Automatic altitude compensation	Available with some models	Available with some models		X	X	X	X	X
Detection of apnea/hypopnea				X	X	X	X	X
Pressure delay function			X	X	X	X	X	X
Remote programming capabilities				X	X	X	X	X
Soft exhalation technology			X	X	X	X	X	X
Memory			Yes	365 days of use, record parameters including leak, pressure, VT, RR, MV, AHI, and AI	365 days of use, record parameters including leak, pressure, VT, RR, MV, AHI, and AI	365 days of use, record parameters including leak, pressure, VT, RR, MV, AHI, and AI	365 days of use, record parameters including leak, pressure, VT, RR, MV, AHI, and AI	365 days of use, record parameters including leak, pressure, VT, RR, MV, AHI, and AI
Compliance meter			Yes	Usage data, efficacy data	Usage data, efficacy data	Usage data, efficacy data	Usage data, efficacy data	Usage data, efficacy data
Downloadable compliance information	Compliance Maximizer™ software	Compliance Maximizer™ software	Yes	Use ResScan to download leak, pressure, VT, RR, MV, AHI, and AI	Use ResScan to download leak, pressure, VT, RR, MV, AHI, and AI	Use ResScan to download leak, pressure, VT, RR, MV, AHI, and AI	Use ResScan to download leak, pressure, VT, RR, MV, AHI, and AI	Use ResScan to download leak, pressure, VT, RR, MV, AHI, and AI
Filters	Yes	Yes	Particulate and pollen	Two-layered, powder-bonded, polyester non-woven fiber	Two-layered, powder-bonded, polyester non-woven fiber	Two-layered, powder-bonded, polyester non-woven fiber	Two-layered, powder-bonded, polyester non-woven fiber	Two-layered, powder-bonded, polyester non-woven fiber
Humidifiers	Integrated	Integrated	Yes	Integrated	Integrated	Integrated	Integrated	Integrated
Heated humidification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accessories and other features	Conversion kits for cold or heated humidification, standard humidification chamber, Compliance Maximizer download serial cable, Titration Maximizer software; Ambient Tracking Plus®	Standard and extended life humidification chambers, ThermoStart™ heated breathing tube, Compliance Maximizer download serial cable, Titration Maximizer software; ThermoStart™ technology	Carrying case, Twilight masks; SoftX, Quick Code compliance system	Restraxx wireless remote monitoring; TiControl, Vsync leak compensation	Restraxx wireless remote monitoring; TiControl, Vsync leak compensation	Restraxx wireless remote monitoring; TiControl, Vsync leak compensation	Restraxx wireless remote monitoring; Truly adaptive backup rate; smooth, comfortable delivery; Vsync leak compensation	Restraxx wireless remote monitoring; TiControl; smooth, comfortable delivery; Vsync leak compensation; Autoset auto-adjusting pressure

Company name	Philips Respironics						
Product name	BiPAP Auto with Bi-Flex	BiPAP AutoSV	BiPAP Plus with Bi-Flex	REMstar Auto with A-Flex	REMstar Plus with C-Flex	REMstar Pro with C-Flex	SleepEasy
Warranty	Two years	Two years	Two years	Two years	Two years	Two years	Two years
Dimensions (height x length x width) in inches	3.125 x 7.5 x 5	4.4 x 9.75 x 6.63	3.125 x 7.5 x 5	3.125 x 7.5 x 5	3.125 x 7.5 x 5	3.125 x 7.5 x 5	5.5 x 10 x 7.5
Weight	2.2 lb.	Less than 4 lb.	2.2 lb.	2.2 lb.	2.2 lb.	2.2 lb.	3.5 lb.
Power requirements (AC/DC)	100-240 VAC, 12 VDC	100-240 VAC, 12 VDC	100-240 VAC, 12 VDC	100-240 VAC, 12 VDC	100-240 VAC, 12 VDC	100-240 VAC, 12 VDC	100-240 VAC
Overall noise level (dBA)							
Operating specifications							
Mode of operation	Auto-adjusting bilevel	Servo ventilation	Bilevel	Auto-adjusting CPAP	CPAP	CPAP	CPAP
Indications for use	Adult OSA	Adult patients with mixed, complex, and central apnea and periodic breathing	Adult OSA	Adult OSA	Adult OSA	Adult OSA	Adult OSA
Operating pressure range (cm H ₂ O)	4 to 25	IPAP max: 4 to 30; IPAP min: 4 to 30; EPAP: 4 to 25	4 to 25	4 to 20	4 to 20	4 to 20	4 to 20
Adjustable starting ramp pressure	4 to EPAP		4 to EPAP	4 to CPAP	4 to CPAP	4 to CPAP	4 to CPAP
Pressure adjustment increments (cm H ₂ O)	0.5		0.5	0.5	0.5	0.5	0.5
Ramp time (minutes)	0 to 45 in 5-minute increments		0 to 45 in 5-minute increments	0 to 45 in 5-minute increments	0 to 45 in 5-minute increments	0 to 45 in 5-minute increments	0 to 45 in 5-minute increments
Features							
Alarms (audio/visual)	X		X	X	X	X	
Automatic start/stop	X	X	X	X	X	X	
Automatic leak compensation	X	X	X	X	X	X	
Automatic altitude compensation	X	X	X	X		X	
Detection of apnea/hypopnea	X	X		X		X	
Pressure delay function	X		X	X	X	X	X
Remote programming capabilities	X	X		X	X	X	
Soft exhalation technology	X		X	X	X	X	
Memory	Display: seven- and 30-day averages, summary usage; SmartCard: six months at three usage sessions/day; seven days in-depth analysis	Six months at three usage sessions a day; seven days in-depth analysis	Therapy meter	Display: seven- and 30-day averages; summary usage; SmartCard: six months at three usage sessions/day; seven days in-depth analysis	Display: seven- and 30-day averages; SmartCard: nine months at three usage sessions/day; seven days in-depth analysis	Seven- and 30-day averages, summary usage; SmartCard: six months at three usage sessions/day; seven days in-depth analysis	Therapy meter
Compliance meter	Breathing detection		Breathing detection	Breathing detection	Breathing detection	Breathing detection	Breathing detection
Downloadable compliance information	Date/time, hours of use, usage patterns, AHI, leak, snore, FOSQ	Date, time, duration at pressure, short-term detailed events, long-term trends	Total therapy hours, usage sessions less than four hours	Date/time, hours of use, usage patterns, AHI, leak, snore, FOSQ	Date/time, hours of use, usage patterns, FOSQ	Date/time, hours of use, usage patterns, AHI, leak, snore, FOSQ	DTotal therapy hours, total blower hours, usage sessions > 4
Filters	Pollen and ultra-fine	Pollen and ultra-fine	Pollen and ultra-fine	Pollen and ultra-fine	Pollen and ultra-fine	Pollen and ultra-fine	Pollen and ultra-fine
Humidifiers	Integrated pass-over and heated	Integrated pass-over and heated	Integrated pass-over and heated	Integrated pass-over and heated	Integrated pass-over and heated	Integrated pass-over and heated	Integrated pass-over and heated
Heated humidification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accessories and other features	DC power, carrying case; Lighted LEDs, mask-off alert, patient reminders, Digital Auto-Trak Sensitivity, direct connect cord for DC operation, Encore ProSmartCard included	DC power, carrying case; Lighted keys on pad, mask-off alert, Digital Auto-Trak Sensitivity, direct connect cord for DC operation, Encore ProSmartCard included	DC power, carrying case; Lighted LEDs, mask-off alert, patient reminders, Digital Auto-Trak Sensitivity, direct connect cord for DC operation	DC power, carrying case; Lighted LEDs, mask-off alert, patient reminders, Digital Auto-Trak Sensitivity, direct connect cord for DC operation, Encore ProSmartCard included	DC power, carrying case; Lighted LEDs, mask-off alert, patient reminders, Digital Auto-Trak Sensitivity, direct connect cord for DC operation, optional Encore ProSmartCard	DC power, carrying case; Lighted LEDs, mask-off alert, patient reminders, Digital Auto-Trak Sensitivity, direct connect cord for DC operation, Encore ProSmartCard	Carrying case; Lighted patient buttons, phone-in compliance, three-position altitude compensation, fine pressure calibration