

Respiratory Knowledge Portal (RKP)

Providing actionable information to help clinicians improve respiratory care processes

NAVIGATING VENTILATOR MANAGEMENT AND WEANING PROTOCOLS IS COMPLEX

Data trending information, multidisciplinary planning, coordination, and effective practice execution are necessary for you to focus more on your patient's health.

Inefficiencies and variance from weaning protocols can lead to prolonged ventilator support and secondary lung injury.

Unplanned, extended ICU care undermines patient comfort, raises care costs, and increases risk of physical and cognitive complications for patients.



Respiratory Knowledge Portal

Respiratory Knowledge Portal (RKP) is a quality improvement data application system used to track and target timeliness and execution of care therapies that may help shorten ventilator length of stay.

Data from the ventilator pairs with mathematical models to see both current and historical information. RKP then produces proprietary management dashboards and reports.

When used daily, RKP provides tools that may help improve patient management and process management strategies.

Report views provide intelligence and insight for the user, opening the door to help make more efficient operational decisions:

- Assessment and trends of weaning protocols
- Identify staff efficiency of care delivery
- Identify patient outcome response
- Reduce time and labor of manual data entry





Comprehensive suite of analytics

RKP provides a comprehensive set of analytics, delivering actionable information to help clinicians improve respiratory care processes and consistency with established protocols.



Daily rounding dashboards

Enhance patient management and may help reduce prolonged ventilator length of stay

RKP daily rounding dashboards help ICU clinicians increase efficiency in managing their patients and may help reduce prolonged ventilation length of stay by aiding:

- · Identification of patient readiness to wean
- Execution of wake up breathing initiatives
- Prevention of secondary ventilator lung injury
- Avoidance of preventable adverse events

These daily rounding dashboards include:

- Patient View
- Marker View
- Sedation Analytics
- Neonatal Analytics
- VAE Assessment





Patient readiness to wean rounding dashboards

Quick and valuable patient information at your fingertips

Extubating timing is variable from patient to patient. Delays can result in VILI, VAE, and diaphragm dysfunction. Premature extubating can result in loss of airway, respiratory muscle fatigue and defective gas exchange.¹

Rounding dashboards allow clinicians to view patient status and location, with ventilator setting detail that can be configured into EMR documentation.

Setting	Latest Value	Trend (Last 24 Hrs)	Metric	Latest Value	Trend (Last 24 Hrs)
FIO2 (%)	70		FIO2 (%)	57	S
PEEP (cmH2O)	10		Minute Ventilation (L)	6.8	
Set Rate (bpm)	16		PEEP (cmH2O)	9	~~~
AAC On	0		RSBI (bpm/L)	46	\sim
Apnea Interval (sec)	20		Spontaneous Tidal Volume	295.1	
Blas Flow (L/min)	2		Total Rate (bpm)	16	
Demand Flow	1		Work of Breathing Measured	0.63	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Diameter (mm)	7.5		(Joules/L)	33	~
Flow Trig (L/min)	1		Mand Rate (hnm)	7	A T
High Ppeak (cmH2O)	60	<u> </u>	Mand Vte (mL)	485	
High Rate (bpm)	26		PEFR (L/min)	20	X
High Ve (L)	10		PIFR (L/min)	32	nm
High Vte (mL)	650		Pmean (cmH2O)	7	
Humidifier	1		Ppeak (cmH2O)	13	X
ILV Mode	OII				~

Detailed view of ventilator setting trend lines and changes.

Colored tile views indicate patient severity, ventilator settings, and number of markers.



Spontaneous Breathing Trial (SBT) and Sedation Awakening Test (SAT) rounding dashboards

Consistent and coordinated execution

Evidence supports using trials to assess the patient's ability to breathe. The 2001 weaning guidelines strongly recommend duration of SBT should be at least 30 minutes but not to exceed 120 minutes, to judge tolerance.⁴







Daily periods and SBT timelines indicating occurrence, action time, and duration.





Markers 06/25/18 13:43 ABCDE Set Ve high alarm limit is non-compliant with operational policy 06/25/18 13:10 Spontaneous Breathing Trial Attempt > 45 Minutes 06/25/18 11:13 Set Ppeak high alarm limit is non-compliant with operational policy 06/25/18 06:53 Spontaneous Breathing Trial Attempt > 45 Minutes 06/25/18 06:17 SAT Duration Greater Than Maximum Configured Duration F 06/24/18 12:50 Set Ve low alarm limit is non-compliant with operational policy **Recent Changes** 06/25/18 08:13 Propofol to 10 mcg/kg/min from 5 mcg/kg/min 06/25/18 08:05 Propofol to 5 mcg/kg/min from Stopped 06/25/18 06:17 Propofol to Stopped from 5 mcg/kg/min 06/25/18 06:09 Propofol to 5 mcg/kg/min from 15 mcg/kg/min

Propofol cessation and spontaneous respiration data correleates with a detailed summary of time related markers and mode changes.

Markers Dashboards

Compliance review for best practices

Markers are generated by ventilator data flows, enabling clinicians to see alarms, low tidal volumes, limited pressure thresholds and safety variables configured during the RKP set up.

All Markers	Eckland, Erin (71 F)	Underhurst, Uwe (46 M)	Ingles, Ingrid (50 F)			
Missed SBT 3 patients	ICU A RM 01 BD 01 Visit V67960 Number of Active Markers: 5	ICU A RM 01 BD 02 Visit V67920 Number of Active Markers: 3	ICU A RM 02 BD 03 Visit V68180 Number of Active Markers: 4			
Late SAT	SAT Occurred Outside the 03/13/15 10:19 Configured Protocol Period	SAT Duration Greater Than 03/13/15 08:27 Maximum Configured Duration	Set Ppeak high alarm limit is 03/13/15 03:33 non-compliant with operational			
2 patients	Set Ve high alarm limit is non- 03/13/15 06:48	Increased Sedation 03/12/15 15:25				
Missed SAT 1 patient	compliant with operational	· · · · · · · · · · · · · · · · · · ·	Increased Sedation 03/12/15 20:55			
Short SAT 1 patient	Odelfield, Octavian (85 M) ICU A RM 02 BD 04 Visit V67980 Number of Active Markers: 1 1	Tamarack, Tim (43 M) ICU A RM 04 BD 10 Visit V67940 Number of Active Markers: 5	Falkner, Fabian (72 M) ICU B RM 06 BD 15 Visit V50199283 Number of Active Markers: 1			
Long SAT	Patient is Trending Toward a VAE 03/13/15 00:00	Increased Sedation 03/13/15 08:20	No SBT During the Configured 03/12/15 15:00			
1 patient	Event - Day I	Set Ve high alarm limit is non- 03/13/15 08:13				
SAT w/o Titration 1 patient		policy				

Gain access to a summary of all events with the All Markers view.

Tiles display markers and timelines for each patient.

MRN	Account ID	Patient Name	Marker Time	Status	
CPID172451	V50199283	Falkner, Fabian	03/11/2015 04:48	Active	Set Ppeak high alarm limit is non-compliant with operational policy
CPID172496	V67920	Underhurst, Uwe	03/06/2015 11:20	Active	Weaning Candidate - No SBT Attempt
CPID154235	V67960	Eckland, Erin	03/13/2015 10:19	Active	SAT Occurred Outside the Configured Protocol Period
CPID172496	V67920	Underhurst, Uwe	03/13/2015 08:27	Active	SAT Duration Greater Than Maximum Configured Duration
CPID177438	V67940	Tamarack, Tim	03/13/2015 08:20	Active	Increased Sedation

Markers can be viewed in a table format for additional detailed searching options.

Ventilator Associated Events (VAE) and CDC Surveillance

Simplifying VAE management and documentation

VAE is estimated to increase hospital LOS by 14 days and increase care cost by \$41,000 per episode.² Early identification translates into proactive management.

VAE Surveillance 🔹								
Patient		03/11/15	03/12/15	03/13/15				
Smith, James	FiO2							
5 days on vent	PEEP		- F	3				
Townsley, Peter	FiO2		1	•				
7 days on vent	PEEP	aprv	aprv	aprv				
Adams, Roger	FiO2							
3 days on vent	PEEP							
Sanders, Henry	FiO2	N.	a la constante da constante constante da con					
9 days on vent	PEEP							



VAE Surveillance dashboard

The VAE Surveillance dashboard enables clinicians to prioritize management of patients who are trending towards a VAE and those who have met or exceeded CDC criteria to avoid a costly episode.

When a patient meets and sustains the CDC Pneumonia Surveillance criteria for 48 hours, the patient's name flows into the Criteria Met dashboard for further evaluation

VAE	Criteria	Me	t 🔻								
Patient			VAC	iVAC	PVA	>					
Foxworthy, M Discharge Date: 03/13/15 9 days on vent			~	*	×	_					
Thomas, Tim 9 days on vent			~	?	?						
Jones, Richard 6 days on vent	Episode S	Episode Summary									
o days on vent	Start Date	End Date		Event date		AC	IVAC		PVA	P	Care Area
Brokerson, Frank	3/1/2015	3/11/	2015	3/9/2015	2	'es	(?	±	(?)	±	ICU-01
10 days on vent		Ter WE WE Ne VI	mp >= 38 C o 3C >= 12,000 w antimicrobia AC Assessment re Cancel	r <= 36 C cells/mm3 or <= al agent(s) is star t Completed	= 4,000 ce rted, and is	s/mm3 continu	ed for > 4 ca	lendar	days		

Question marks (?) trigger access to reports for further assessment.

An "X" indicates that assessment completed with negative results and a check mark indicates positive results.

Process management and performance

Efficiency improvements are simplified with Respiratory Knowledge Portal

Manually generating informative reports can be time consuming and costly, but they are essential for effective process management. RKP generates standardized reports and metrics easily. Process metric and performance reports are key to sustaining weaning protocols helping reduce ventilator length of stay (VLOS).

Process Management Tool	Benefits				
Executive summary	Compares variances to trends in clinical environment & maintain sustainability of weaning protocols				
1st SBT start times by time of day chronograph	Demonstrates efficiencies in workflow practices and detail of hours from ready to wean to first SBT.				
Hours between 1st weaning candidate marker and 1st SBT graph	Evaluate workflow efficiencies to improve time to first SBT				
Ventilation metrics report	Helps clinicians improve with protocol compliance and SAT / SBT coordination. Identify needs and compare goal performance				
Sedation report	Helps clinicians improve protocol compliance geared specifically to Sedation Trial Identify needs and compare goal performance				
Ventilation settings and measurements report	Detailed report about the patient and device information for better ventilation management				
Infographic report	Communicate specific process management goals to clinician and leadership				

Goal performance, need identification, and communication

Process improvement starts with monitoring and discovering

Busy executives can rely on RKP's Executive Summary, infographics, and other displays to supervise process performance, discover problem areas, and monitor effectiveness of process improvement initiatives.

Number of Patients (patient count) Average Vent Days (calendar days) Average Estimated Cost (b toucands per patient) 1 <t< th=""><th>All Patients on Ventilators (total patient count)</th><th>All Patients Avg Vent Days (calendar days)</th></t<>	All Patients on Ventilators (total patient count)	All Patients Avg Vent Days (calendar days)
$\frac{15}{(\text{patient count)}} = \frac{1}{2} + \frac{1}{2$	Weaning Analytics Number of Patients (patient count) 2 2 4 6 1 2 4 6 1	Average Vent Days (calendar days) 2 2 4 5 10 10 15 10
Alarm Setting Analytics Percent of All Patients (%) 20 Percent Non-Compliance (%) patients outside time threshold 20 20 20 22 22	Number of Patients (patient count) 2 4 2 4 4 7	Average Vent Days (catendar days)
	Alarm Setting Analytics Percent of All Patients (%) 0 5 10 15 20 25 0 5 10 15 20 25 0 20	Percent Non-Compliance (% patients outside time threshold)

Executive Summary

Executive Summary comparing data and trends over time from month to month, quarter to quarter to see trends, updated every 24 hours.



RKP has numerous graphing options for tracking key process improvement goals and improving team communications. Graphs can be configured by ICU's or by each individual unit.

Workflow efficiency evaluation

Smooth workflow practices are in the details

A chronogram is a unique way to see efficiencies in workflow practices and detail of hours from ready to wean to first SBT.



Count of SBT's started by hour of day

First SBT start times by time of day

Once a day protocol.

Protocol driven by patient readiness throughout the day.

RKP analysis and metrics

Gaining additional insight into issues and trends

A way to identify the best opportunities to improve your processes is to focus on the most impactful segment of your population. RKP offers convenient analysis on more than 20 metrics by quartiles so that you can drill down to the population segment which may be most responsible for poor performance.

These graphs below show that the average ventilator LOS is 4.7 days, but the impact of the Fourth Quartile, sickest 25%, consumes 66% of staffing resources, with a costly average LOS of 13.1 days .





Reduced ventilator LOS has been shown to reduce risk of adverse events such as Delirium and VAE.

Ventilator days of support by quartile

Shortening the LOS in this group significantly shifts

average, and staff resources for ventilator support.

Average ventilator LOS and average ventilator LOS by quartile

Cross-functional collaboration

RKP is your playbook for success

Combining all the tools needed to keep your practice running at maximum efficiency, RKP brings different departments together to reduce variability from best practices.

	Patient Management (Daily)						
	Patient Dashboards	Physicians, Nurse and Respiratory Therapist have daily visibility and make adjustments accordingly for better patient management					
	SAT/SBT Dashboards	Nursing and Respiratory Therapists (RT) can improve the SBT/SAT coordination and clinical efficiency					
	Markers Dashboards	Care team can focus on non-compliance even					
	VAE Surveillance Trending Dashboard	Clinicians can proactively take action to reduce severity or adverse events					



Process Management (Weekly/Monthly/Quarterly)

Executive summary	Keep track of key performance indicators in a simple one-page view		
Infographics report to view unit performance	Helps communicate sustainability and specific goal achievement		
Key process improvement graphs from Executive Summary's KPI Trends	Trend the variables for decreasing the VLOS and avoidance of adverse event		
Chronogram to understand weaning timing	The workflow of SBT timeliness is critical to getting patient off the ventilator		
Drilling down to quartile from Vent Metric Report	Breaks down population by acuity to focus on the most important segment		

The path to better patient management and process improvement begins with RKP

At Vyaire, we follow a well-defined method to help you succeed





Contact Vyaire today to learn how RKP can benefit you **1.833.327.3284**

vyaire.com



REFERENCES

- 1 MacIntyre N. Evidence-Based Guidelines for Weaning and Discontinuing Ventilator Support. A Collective Task Force Facilitated by the American College of Chest Physicians, The American Association for Respiratory Care, and the American College of Critical Care Medicine. Respiratory Care 2002; 47(1) 69-90.
- 2 Health Research Education Trust. Ventilator-Associated Events(VAE) Change Package: 2016. Health Research and Educational Trust. 2017, February.
- 3 Eric B. Milbrandt, et al. Costs associated with delirium in mechanically ventilated patients. Crit Care Med, 2004 Vol. 32, No. 4. 955-962.

GLOBAL HEADQUARTERS

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