

# Significant help in recognizing sepsis with Horizon Trends

Horizon Trends on Philips IntelliVue monitors reduce time to recognition in pilot study by more than 30%

## Patient monitors and the detection of sepsis

Sepsis is a common, deadly condition, killing an estimated 1,400 people worldwide every day. Severe sepsis, the leading cause of death in the non-coronary ICU, has a mortality rate of 30-50%, while the mortality rate for septic shock is 50-60%.<sup>1</sup> Sepsis is also a financial burden, costing an estimated \$16.7 billion in the US in 2000, with an average cost per case of about \$22,000. Symptoms of sepsis can vary widely and appear similar to many other conditions, making late diagnosis a common occurrence. Because early detection is critical to treating sepsis, screening must be incorporated into clinicians' everyday routines. Technology can help in this effort. Several key vital signs can warn of the onset of severe sepsis and septic shock, and with screen trends on Philips IntelliVue patient monitors configured to display these measurements, clinicians have a "heads-up" view that makes significant changes visually more apparent and instantly recognizable.

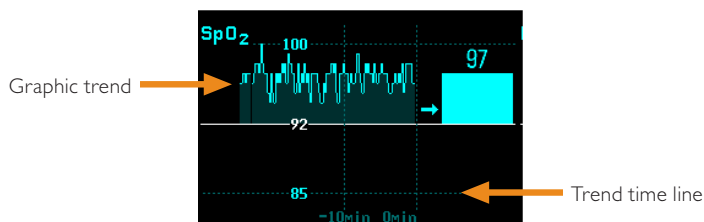
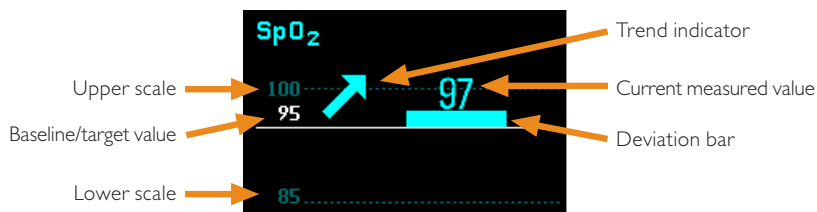
## Horizon Trends: a new way of looking at measurements

Horizon Trends, one of the screen trends display options on Philips IntelliVue patient monitors, provide a graphical representation of changes in vital signs to make deviations clearer at a glance. The Horizon Trend display of a parameter is made up of three components: a measurement bar, an arrow indicator, and a trend graph.

- The **bar graph** displays the current measurement in relation to a clinician-determined baseline which may represent a benchmark or target value.
- The **arrow** indicates the general trend of the patient's measurements over the past ten minutes: sharply up or down, gradually up or down, or steady.
- Lastly, the optional **trend graph** shows the measurements over the last 30 minutes to 12 hours.

With Horizon Trends enabled, clinicians get instantaneous, visual answers to the questions of where a patient's measurements stand in relation to baseline or target values, and in what direction the overall trend of measurements is moving. Horizon Trends saves the time it takes to compare current with past measurements in a chart, while its visual cues make changes clearer to see as they happen.

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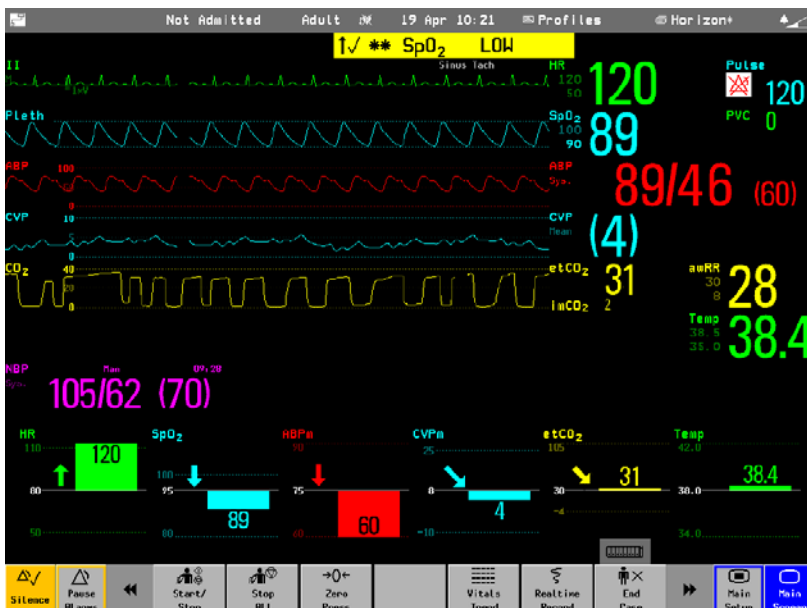


Horizon Trends give a clear indication of a patient's deviation from baselines.

### Early results show effectiveness of Horizon Trends

In a pilot study, Horizon Trends reduced the time nurses took to recognize the onset of sepsis by over 30%. This study was conducted at the AACN National Teaching Institute Critical Care Nursing Conference, May 2005 in New Orleans and at Long Beach Memorial Medical Center's Health Skills Education Center. Both sites used as their patient a simulator called the Human Patient Simulator, or HPS, designed by Medical Education Technology, Inc. of Sarasota, Florida.

The early results of this study are promising: nurses looking at an IntelliVue MP70 monitor without Horizon Trends took 4.1 minutes to recognize the onset of sepsis, while recognition with Horizon Trends took 2.8 minutes, or 31.7% less time. Similarly, Horizon Trends contributed to faster initiation of treatment. Though only a pilot study, these preliminary results suggest the promise of Horizon Trends in speeding up the process of diagnosing and treating severe sepsis and septic shock in the clinical environment. The results are summarized in the table below.



Alongside waveforms and numerics on the monitor screen, Horizon Trends graphically show deviations from a clinician-determined baseline.

	Simulation with standard screen N = 6 groups	Simulation with Horizon Trends screen N = 6 groups
Variable	Mean (standard deviation) time in minutes	Mean (standard deviation) time in minutes
Time between initial assessment and <b>recognition of sepsis</b>	4.1 (1.4)	2.8 (1.3)
Time between onset of sepsis and <b>initiation of fluid bolus</b>	2.4 (1.2)	2.2 (1.3)
Time between onset of sepsis and <b>initiation of vasopressor</b>	4.7 (1.6)	3.7 (1.2)
Time between onset of sepsis and <b>blood culture order</b>	3.5 (2.1)	3.3 (1.8)

### The use of simulators in clinical research

One of the questions the study's coordinators wished to answer was whether a high-fidelity simulation would prove useful in conducting this kind of research. The Human Patient Simulator is a full-sized mannequin with complex internal systems that produce highly realistic imitations of human physiology. The chest rises and falls with each breath, the pupils dilate under light, the pulse can be felt at several points on the body. Nurses can insert IVs and infuse fluids and watch for the simulator's realistic response. In this study, patient monitors displayed the simulated vital signs, and when nurses determined that those vital signs suggested severe sepsis, they could perform the appropriate interventions on the simulator. The HPS allowed the study's coordinators to present nurses with a controlled, reproducible scenario of a developing case of sepsis and to measure the time it took them to make treatment decisions.

### What nurses are saying about Horizon Trends

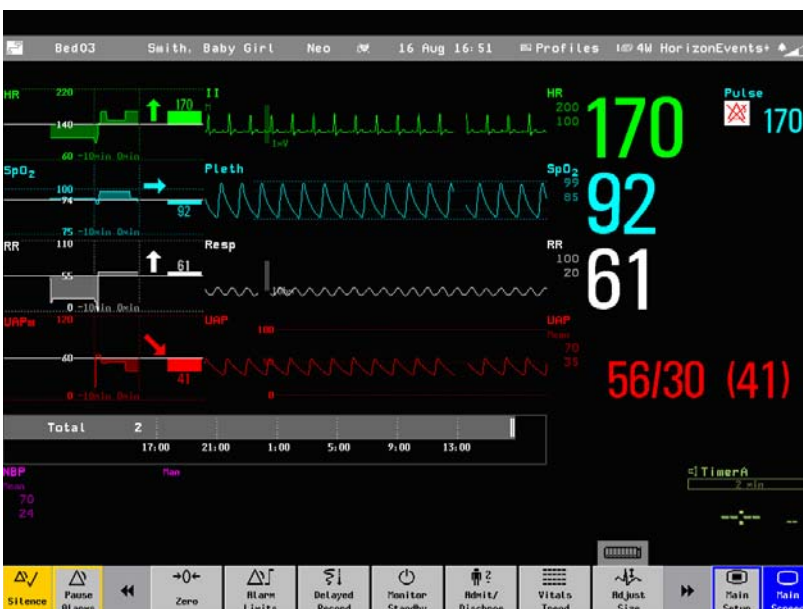
The usefulness of any technology is proven by the clinicians who put it to the test in demanding medical situations. Philips IntelliVue monitors are in use every day in hospitals and outpatient clinics all over the world, and Horizon Trends is one feature rapidly gaining acceptance as a time- and effort-saving tool.

In clinical settings, caregivers often glance briefly at monitor screens as they pass patients' rooms, looking for signs of danger. Horizon Trends provide for this practice by making even subtle changes clear at a glance. Further, the trend graph display provided by Horizon Trends gives a summary of where the patient's measurements have been over the past 10 minutes, saving nurses from having to refer back to the chart to put a measurement in context.

One ICU nurse described her unit's use of Horizon Trends for patients with head injuries requiring pentobarbital-induced comas. With Horizon Trends displayed for Bispectral Index (BIS) measurement and BIS ratio, ICU clinicians set a baseline to watch as they titrate pentobarbital. At another site, NICU nurses have set Horizon Trends to display alongside the waveforms, where Horizon Trend's arrow indicators help them to see acute changes more clearly.



Nurse educators interact with the lifelike Human Patient Simulator during a recent pilot study



IntelliVue display options allow users to arrange the placement of Horizon Trends to fit their practice.

Monitoring Situation	Useful Horizon Trends Parameters
Conscious sedation	ETCO <sub>2</sub> , HR, Resp. Rate
Ventilator Weaning Trial	Heart Rate, Resp. Rate, ETCO <sub>2</sub> , NBP or ABP
Early Sepsis	HR, Resp. Rate, Temp., ABP mean/systolic
Sepsis Resuscitation Bundle	HR, CVP, SVO <sub>2</sub> , APB mean
Patient going back to sleep in the PACU	Heart Rate, Resp. Rate, ETCO <sub>2</sub>
Pentobarbital-induced coma	BIS, BIS ratio
ST changes from selected ECG leads	ST measurements
Increased Intracranial Pressure	Heart Rate, ICP
Hypovolemia	Heart Rate, Arterial BP, CVP
Titrating vasoactive drugs	Heart Rate, Blood Pressure

By turning Horizon Trends on for certain measurements, clinicians can customize their monitor display to best suit the situation and tasks at hand.

### Horizon Trends and clinical decision support

The amount of time it takes to make treatment decisions can influence outcomes.<sup>2,3</sup> This is especially true of sepsis, for which early detection is critical. Horizon Trends are just one of Philips clinical decision support tools – innovative solutions that summarize and present significant patient information clearly, to help clinicians make quicker, more informed decisions. Other clinical decision support tools available on IntelliVue monitors include Advanced Event Surveillance, which allows clinicians to set values for up to four parameters whose confluence will trigger an alarm and event recording. In the case of sepsis, Advanced Event Surveillance can alert clinicians as soon as sepsis-specific measurements reach pre-defined levels.

#### References

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