

TruTrak+ technology – the proprietary clinical motion algorithm from Datex-Ohmeda

Innovative TruTrak+ technology provides performance even more reliable than traditional oximetry algorithms during conditions of clinical patient motion.*

What is clinical patient motion?

For more than one year, Datex-Ohmeda studied patient motion, focusing on the types, incidence, duration, and severity of motion as it occurs in the clinical setting.

The following key observations were found:

- Clinical motion patterns are irregular in nature, not uniform or continuous
- Infant and adult populations exhibit various “types” of motion affecting oximetry readings differently
- The most frequently observed motions affecting oximetry are composed of clenching/pressing/rubbing and extending/flexing/kicking
- The most difficult motion for oximetry to track is not necessarily when physical movement is greatest

To date, over thirty industry-sponsored laboratory studies have been conducted to test oximetry motion technology. These studies employed mechanical finger-tapping motions in the laboratory to simulate patient motion. The Datex-Ohmeda motion characterization study showed that because all motion is not created equal, the traditional finger-tapping method is not an accurate simulation for actual *clinical* patient motion.

TruTrak+ technology identifies, then corrects for clinical patient motion

TruTrak+ technology, successfully tested in neonate through adult patient populations, enhances oximetry performance using a patented, five-step process to measure pulsatile blood-oxygen saturation.

* For more information, refer to the following publications:

- Tobin RM, Pologe JA, Batchelder PB. A Characterization of Motion Affecting Pulse Oximetry in 350 Patients. *Anesth Analg*. 2002;94,1S,pp s54-60.
- *TruTrak+ Oximetry Technology: A 663 Patient, Multi-Site Performance Evaluation During Clinical Motion*. Louisville, CO: Datex-Ohmeda; 2002.

Make the Right Connection with Total Datex-Ohmeda Oximetry

We ensure your confidence by delivering optimum oximetry performance when our advanced TruTrak®+ technology, intuitive pulse oximetry monitors and modules, and versatile OxyTip®+ sensors and cables are used together.



OxyTip+ sensors and cables



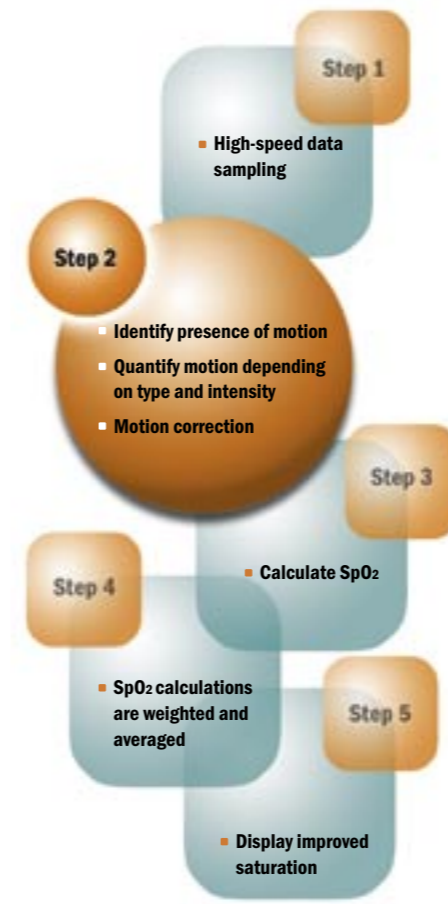
The OxyTip+ sensor line is a consolidation of our sensor designs and connection cables, plus technical and durability upgrades. When used in conjunction with our TruTrak+ enhanced monitors, you are ensured improved performance when patients exhibit clinical motion. We recommend using OxyTip+ adhesive sensors during high-motion conditions. It is important to firmly secure the sensor to the patient sight in order to ensure optimal and accurate SpO₂ readings.



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Make the Right Connection Guide



TruTrak®+ technology – designed to improve pulse oximetry performance during patient motion*



Most common types of actual patient motion during pulse oximetry

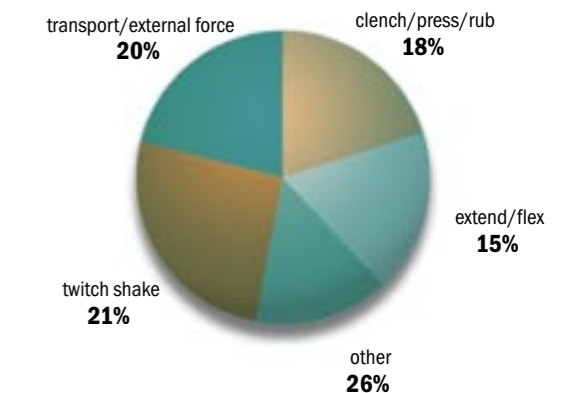
To develop TruTrak+ technology, Datex-Ohmeda researchers studied hundreds of patients, from neonates to adults, in actual clinical settings. Patient motions affecting pulse oximetry were categorized by type with the intention of adding clinical relevance to the simulated patient motions used in testing pulse oximetry performance.

The study concluded that simulated motions for the purpose of testing pulse oximetry should include extend/flex/kick and clench/press/rub motion types, which represent the most common, noisy types of clinical patient motion.

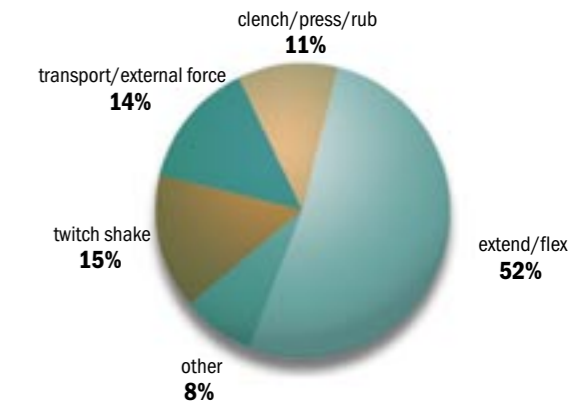
Conversely, “finger-tapping” motion, which has historically been used for testing motion technologies, is not an accurate simulation for actual clinical patient motion.

Most common types of clinical patient motion

most frequent infant motion types



most frequent adult motion types

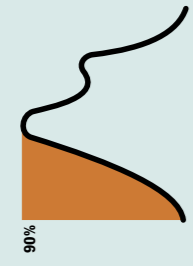


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TruTrak®+ five-step process flow-chart

Step 1: High-speed data sampling

TruTrak+ technology includes high-speed data sampling which takes measurements thousands of times per minute. In addition, it measures all along the waveform — not just at the peaks — so motion artifact is not mistaken for a pulse. Thus, high-speed data sampling causes fewer “pulse search” messages or dashed displays. Once captured this data moves to step 2.

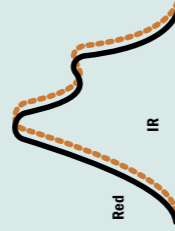


Traditional Oximetry

Multiple SpO₂ Calculations



No motion



Step 2: Motion identification, quantification, and correction

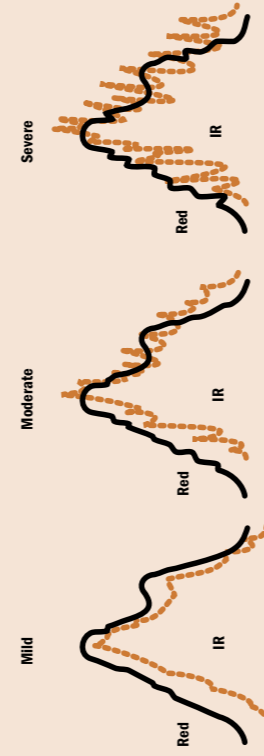
Identification: Pulse oximetry uses two waveforms, red and infrared (IR). In the absence of motion, these two waveforms are in sync. However, during *clinical* patient motion, these waveforms are no longer synchronized and their shapes may not be identical or even similar. TruTrak+ technology determines how well the red and IR waveforms match to determine if motion is present.

When motion is NOT present, TruTrak+ sends the data directly to step 3, which calculates the SpO₂ value. When motion IS present, TruTrak+ isolates the data for quantification and correction.

Motion



Quantification: The amount of mismatch between the waveforms is quantified into categories depending on the intensity of the motion.



Correction: The Datex-Ohmeda motion characterization study¹ found that the most frequent, realistic patient motions affecting oximetry are composed of clenching/pressing/rubbing and extending/flexing/kicking. Some competitors' motion technology use only one method to correct all motions. TruTrak+ selects one of many motion correction algorithms depending on the clinical motion type and intensity. Once the data has been corrected, the SpO₂ can then be calculated in step 3.



Step 3: SpO2 calculation

Using the high-speed data (corrected when necessary), the SpO₂ value is calculated. To further ensure an accurate displayed reading, the SpO₂ value is sent to step 4.



Step 4: SpO2 values are weighted & averaged

TruTrak+ technology compares the most recent SpO₂ value with previous values and weights it according to its degree of correlation. Inconsistent values are assigned lower weights, which minimizes inaccuracies in the SpO₂ calculation. The data points are then multiplied by their weighting factor and averaged over a few seconds. The improved SpO₂ is sent to step 5.



Step 5: Display improved SpO2

Steps 1 and 4 eliminate inconsistent data in the overall SpO₂ calculation. Step 2 actually corrects bad data caused by *clinical* patient motion. The overall result of TruTrak+ is that the displayed saturation reading is more accurate and stable, producing fewer false alarms. Note that the plethysmographic waveform still fluctuates with motion, in order to alert the clinician to a changing condition during motion. With the plethysmographic data in hand, the clinician can then decide if a formal patient assessment is necessary. TruTrak+ technology does not alter or synthesize the displayed waveform. TruTrak+ uses time-dependent measurements, not pulse rate-dependent as used in some competitors' oximetry technologies. Thus, a fluctuating waveform caused by motion does not indicate an inaccurate reading.

