

# Optimizing Diagnosis, Treatment and Clinical Outcomes Hemodynamics Graph for GDT

Goal directed therapy (GDT), a hemodynamic optimization protocol, has been shown to be effective for improving outcomes of patients with septic shock and related shock conditions, including reductions in mortality and shorter length of stay.

## Dr. Suraphong Lorsomradee, MD., PhD.

Associate Professor, Director of TIVA Training Center, Division of Cardiothoracic and Vascular Anesthesia, Division of Liver Transplantation Anesthesia, and Department of Anesthesiology Faculty of Medicine at the Chiang Mai University, Chiang Mai, Thailand



Dr. Suraphong Lorsomradee, a strong advocate of GDT, has shared his clinical experience using a Hemodynamic Graphic display. We present it here to summarize the benefits of this important graphic breakthrough that visually captures therapeutic progress and efficacy by giving the clinician exactly what is needed to best treat the patient. Dr. Lorsomradee has had good experience with Nihon Kohden's

Hemodynamics Graph as a monitoring tool for patients' hemodynamics. He believes that the Graph may be useful in GDT.

## Hemodynamics Graph

There has been growing global demand for advanced monitoring tools with intuitive graphic displays and more non-invasive and continuous measurements and parameters. The Hemodynamics Graph is a monitoring tool that displays comprehensive hemodynamic information on data collected from Nihon Kohden bedside monitors. The Hemodynamics Graph is designed to provide an intuitive approach to diagnostic and therapeutic decision-making during the management of hemodynamics. The unique Graphic display actually consists of 2 graphs that are interrelated: the Target Graph and the Trend Graph (**Figure 1**).



Hemodynamics Graph is available on the following NIHON KOHDEN patient monitors



Life Scope **VS**

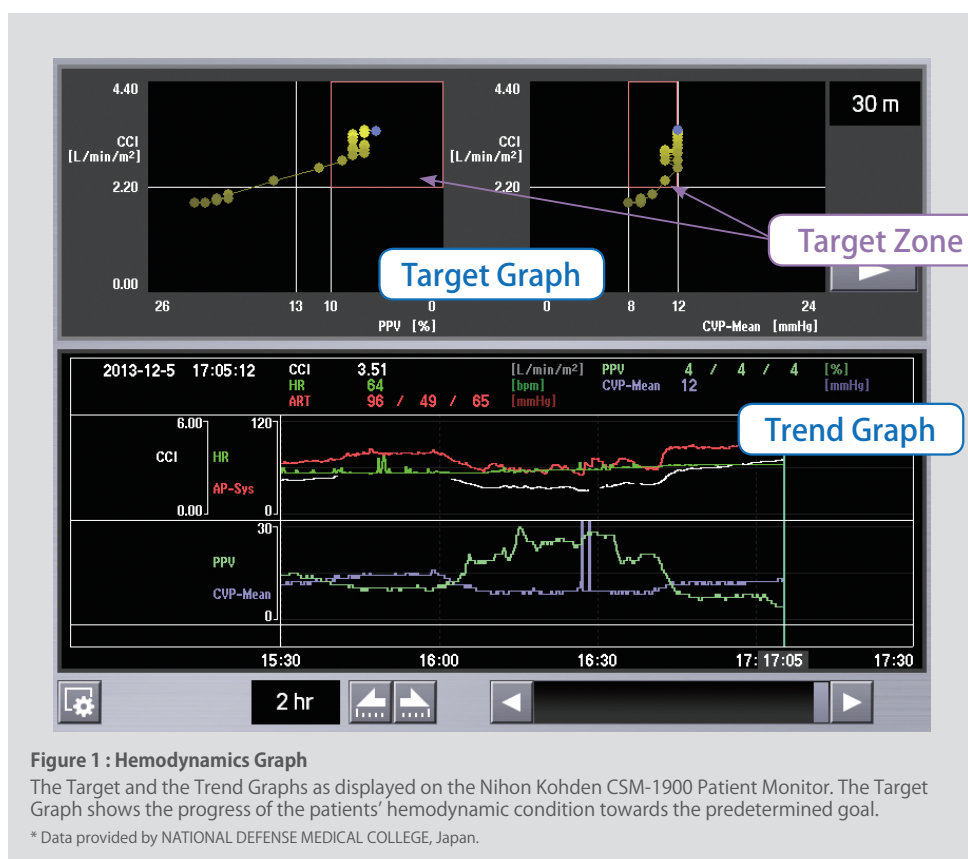


Life Scope **TR**



Life Scope **G9**

## Early Decision Making in Goal Directed Fluid Management



If the Hemodynamics Graph can 'catch' the transition at the early stages of the deterioration of a patient's condition, serious conditions such as sepsis may be avoided by appropriate and timely interventions, reducing healthcare costs and saving patient lives.

### What is goal-directed therapy and why is it effective?

GDT is an optimization protocol to manage the hemodynamic condition of patients with shock, including septic shock. Also, GDT can be a critical part of perioperative hemodynamic management in patients undergoing moderate to high risk surgery. Goal-directed therapy represents a predetermined treatment objective designed to lead to a specific goal. The most common goal of the treatment is to restore adequate microcirculation in shock patients. It is very important to monitor and improve the microcirculation of each organ, especially the brain, heart, lung, kidney and liver. To treat for the same desired outcome, patients can also be managed in various ways other than goal-directed therapy. Many of these other

therapies are time-consuming and overly complicated. Alternatively, goal-directed therapy is a direct and straight-forward approach to improving the outcome of critically ill patients.

### Clinical usefulness of the Hemodynamics Graph in the ER, OR, ICU and other care areas.

The Hemodynamics Graph is useful throughout the course of treatment, following the patient from the emergency room (ER), to the operating room (OR), and to the intensive care unit (ICU). Since the Hemodynamics Graph can monitor both invasive and non-invasive parameters, the graphic display can be used as a quick identifier of severe hemodynamic impairment in the ER, supporting quick treatment decisions specific for the patient. In the OR, depending on the severity of surgery, invasive monitoring is often required. If the surgery is of only moderate or low risk, continuous monitoring using the Hemodynamics Graph to monitor non-invasive parameters can improve patient management before, during, and after

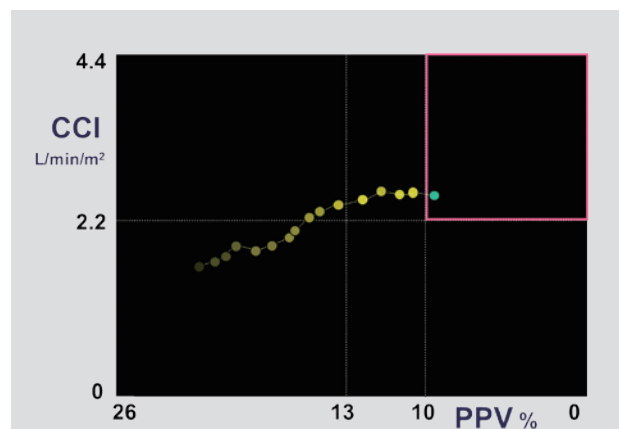
anesthesia. If the patient is moved to the ICU, and after weaning from invasive monitoring, the Hemodynamics Graph can be used to continue monitoring with other, innovative non-invasive parameters, such as with esCCO, a non-invasive and continuous measurement of Cardiac Output.

### Can the Hemodynamics Graph be used for diagnosis?

The Hemodynamics Graph is useful for identifying the characteristics of shock. For example, in the case of hypovolemic shock, using the Target Graph to display dynamic parameters such as cardiac output and static parameters such as blood pressure, PCWP and CVP, can provide the ability to distinguish compensated vs. uncompensated shock, allowing for quicker therapeutic decisions. Patients with compensated shock tend to maintain normal blood pressure and cardiac output (by increasing heart rate), myocardial contractility and systemic vascular resistance. The Hemodynamics Graph provides rapid identification of the immediate condition of the patient, and of equal importance, how the therapeutic interventions are progressing towards the desired goal. By looking at combined parameters in the Trend Graph and Target Graph, the Hemodynamic Graph reveals “where the patient is”, and “where they are going.” The Graphic can help identify early stages of shock and rapidly recognize the uncompensated condition, which leads to earlier decisions as to the best treatment for the patient.

### How can the Hemodynamics Graph be used after diagnosis?

With the Hemodynamics Graph, clinicians can take earlier action for treatment even before laboratory tests confirm the diagnosis. Also, the display enables the confirmation of the effect and progress of treatment. For diagnosis, clinicians would like to know if the patient has cardiogenic shock, septic shock, neurogenic shock, or hypovolemic shock as soon as possible to provide optimum treatment. Note that on occasion cardiogenic shock may occur coincident with hypovolemic shock or septic shock. Monitoring more than 2 parameters using the Hemodynamics Graph can be a very effective way to determine the best treatment path and monitor its effectiveness toward the specific, targeted goals. For example, assessing the patient’s responsiveness to fluid administration can be improved by focusing on the combined display of PPV and esCCI (continuous and noninvasive cardiac index) and determining if care is adequate towards the predefined goal, or if adjustments are required. It’s more efficient to look at 2 parameters,



**Figure 2 : Target Graph with CCI and PPV**

Patient’s responsiveness to fluid therapy can be assessed using the Target Graph with CCI and PPV. The area bounded by the pink lines is the “Target Zone”, the goal of a treatment. These dots depict the course of patient’s condition, with a green dot showing the latest condition. With its simplicity and ease of use, the Hemodynamics Graph captures the clinician’s vision for successful treatment.

such as PPV and CI, together to manage volume status based on the Frank-Starling mechanism (**Figure 2**). If the Hemodynamics Graph indicates that the patient is not transitioning toward to the Target Zone, or is moving in the wrong direction, the main problem may be hypovolemia complicated by another condition, potentially requiring inotropic support or systemic vascular resistance manipulation.

### Other benefits of the Hemodynamics Graph?

The Hemodynamics Graph can provide a visualization of what the physician already ‘sees’ within his own mind, potentially improving team-approached medicine. A simple graphic that captures the full benefit of the physician training, experience, and wisdom is an invaluable tool for patient care. It removes language barriers and communicates, graphically, what is needed for each patient.

In today’s healthcare environment, simple graphs are far superior to complicated displays, tables, and plots that encumber treatment decisions by limiting the clinical input to a select individual or a small group of specialists. For example, by managing a patient using PPV in the ICU, based on setting Target Zones aimed at the patients specific condition, the clinical team (Doctors, Nurses, Respiratory Therapists) can work together as an integrated team with the same goal – to best treat the patient. The Hemodynamics Graph can be useful for sharing therapeutic strategy with all team members involved in designing the best treatment for the patient.

