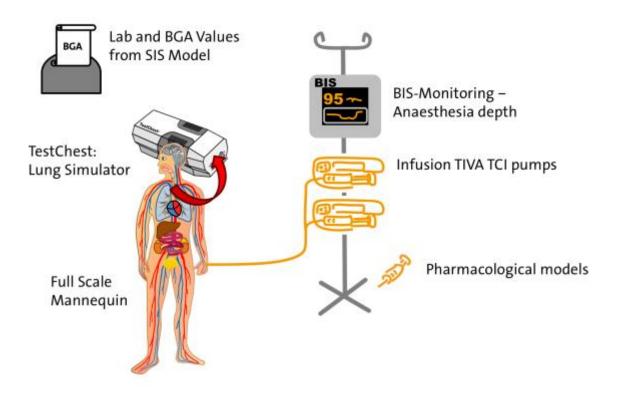# World SIVA - TIVA TCI Training Activities

Target-controlled infusion (TCI) technology is available in most countries worldwide for clinical use in anesthesia. Pharmacokinetic models are used in this infusion mode to calculate infusion rates necessary to reach and maintain the desired drug concentration. The calculated infusion rates during TCI are consistent with manually controlled infusion rates. Nevertheless, there may be unique safety concerns when using this technology under various clinical conditions.

In a recent report Schnider analyzed the available data about safety and complications using TCI. While TCI is reported to be more complex than traditional modes of drug administration, he found no evidence that TCI mode of drug delivery introduces unique safety issues other than selecting the wrong pharmacokinetic model. A look through recent literature shows that selecting the right model and adapting the model to the correct patient data in terms of height, weight and LBM (lean body mass) is very important for the safe use of TCI in the daily practice. Finally, for every single anesthesiologist the first use of TCI is a new adventure. Although he or she may be experienced in administering TIVA (total intravenous anesthesia), there may be several new approaches and a lot of different steps in the usage of the pumps. Once these learned, TCI is indeed a very safe and elegant method.

How to learn TCI? Traditionally there are classes offered where the theory of TCI and pharmacological models is explained using a traditional class room setting. In a number of these classes, the simulation software TIVA Trainer™ was added to the course settings. With this simulation software participants are able to conduct virtual TCI's. The disadvantage still is that TIVA Trainer does not show any physiological reactions of the patient himself. This was the start of a simulation program that was developed starting in 2005. It was a cooperation between Quirino Piacevoli and Fabio Azzerri at the Ospedale San Filippo Neri, Rome, Italy together with the AQAI simulation center in Mainz, Germany. To show the effect of the anesthesia to the patients besides cardiovascular reactions the BIS (Bispectral Index by Medtronic) was used. But how to connect the TCI pumps or the BIS monitor to a patient simulator? This was not possible without the development of special interface software. This interface software is called "SIS" and is a development by AQAI.

Today Laerdal SimMan3G simulators are used in the classes. The following picture gives an overview about the setting:

Lab and BGA Values from SIS Model

TestChest: Lung Simulator

Full Scale Mannequin

BIS-Monitoring – Anaesthesia depth

Infusion TIVA TCI pumps

Pharmacological models

Video recordings are used during the different scenarios to facilitate debriefing session immediately following the scenario. Thus a maximum of learning effect is achieved.

The classes will be held in the Mainz simulation center in Germany. It is also possible to conduct these classes "inhouse", that means at almost any place in the world.

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SIMULATIONSZENTRUM MAINZ

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Curriculum TIVA TCI

The curriculum is realized as a 2-days seminar lasting approx. 8 hours each day. The first day is used to learn about basics of TCI and TCI application, the second day is about special indications, situations and/or patients with certain physiognomy or pathology.

Theoretical lectures will be reduced to the necessary minimum. All contents will be presented as hands on experience using high end patient simulators. The software "TIVA Trainer" will also be used as a teaching tool, which can be experienced by the participants.

The simulation setup consists of full-scale patient-simulator with the necessary anesthesia equipment. TIVA-TCI pumps as well as BIS simulation is directly integrated into the simulation. By this participants can conduct anesthesia and check the effects using standard OR monitoring. It is possible to use different EEG derived parameters as well. Participants also see realistic hemodynamic responses on the patient monitor.

Sessions on the simulator will be video recorded. During debriefing details of the TCI application will be discussed to intense the process of learning.

Basic – Seminar (1. Day) (7h excluding breaks)

Learning objectives: Participants are able to

- understand the basics of TCI, to demonstrate TCI and to use TCI in simulation software
- conduct routine anesthesia with TCI safely
- name and recognize advantages of TCI compared to conventional application of TIVA drugs

Contents:

- Pharmacological basics of TCI (TIVA Trainer „hands on") (60min)
- Applications of TCI (TCI pumps) („Introduction into the use of TCI-Pumps") (30 min)
- Monitoring – BIS – Other EEG-Parameter (30 min)
- Introduction into TIVA/TCI using the patient simulator; Comparison TCI and conventional (BET) application (60 min)
- Participants conduct anesthesia using the patient simulator:
  - Routine, healthy, no complications TCI anesthesia (30 min + 30 min Debriefing)
  - Titration of induction using TCI (30 min + 30 min Debriefing)
  - Recovery, prediction of ROC from the models (30 min + 30 min Debriefing)
  - (Analgo-) sedation with TCI (30 min + 30 min Debriefing)

Advanced – Seminar (2. Day) (7h excluding breaks)

Learning objectives: Participants are able to

- describe interactions between various TIVA drugs and use this information for the adequate control of TIVA with TCI
- select the adequate model for the individual patient and conduct TCI anesthesia in various cases including high risk patients
- transfer the experience of various simulated patients into their daily professional practice.

Contents:

- Interactions of Propofol and Remifentanil respect. various opioides; theory and demonstration with the patient simulator (60 min)
- Various TCI Models (why / how) in theory and practice (TIVA Trainer) (60 min)
- Various patients (participants conduct anesthesia with the patient simulator):
    - ASA IV due to cardiac problems (30 min + 30 min Debriefing)
    - Extreme low/high body weight (30 min + 30 min Debriefing)
    - Extreme age (30 min + 30 min Debriefing)
    - Pediatric TCI applications (30 min + 30 min Debriefing)
    - Long term TCI, e.g. sedation in intensive care (30 min + 30 min Debriefing)