The GiViTI group

In 1991, a group of intensivists convened at the Mario Negri Institute with the ambitious idea of describing and evaluating the Italian system of intensive care medicine. The institute's researchers seized the challenge and GiViTI (the Italian Group for the Evaluation of Interventions in Intensive Care Medicine) was founded. Twenty-six years later, we have a mature, strictly independent organization, involving roughly half of the ICUs in Italy, whose main mission is to improve the quality of care.

The MargheritaPROSAFE Project

With the help of EU grants and regional funding, GiViTI managed to export outside Italy its main project for the continuous evaluation of ICU performance. The MargheritaPROSAFE project is now established in 7 countries and involves ~250 ICUs, collecting data on almost 100,000 patients per year. Its mission is to improve organization and efficacy by leveraging data and medical staff involvement, with the objective of improving evidence-based interventions and sharing best practices at national and international level.

The data are collected by the individual ICUs according to a minimum set of variables (the "Core"), with the option of more closely investigating selected topics (the "Petals"). The dataset is accessible in real time by all the participants, thus allowing continuous evaluation of own performance compared to the other ICUs in the network.

The large amount of recorded data permits GiViTI to build a robust predictive model each year - including more than 100 prognostic factors - designed to evaluate expected mortality for individual patients. Said expected mortality is the basis for computing specific performance indicators for each unit.
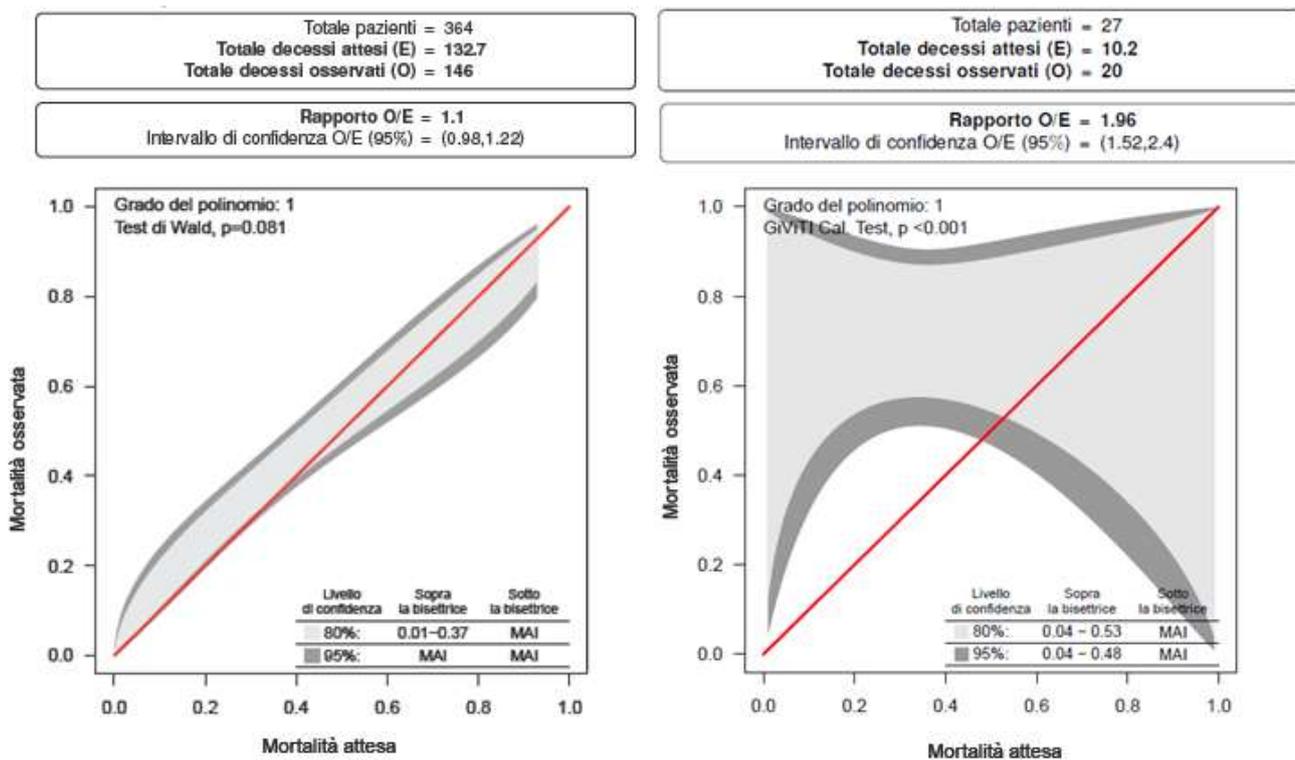
While the participants are able to run analyses independently, GiViTI expertise comes directly into play to address more sophisticated needs or any anomalies observed in the data.

How can data steer behavioral change and improve performance?

- _Case scenario at the ICU level:_ one of the participating ICUs noticed that its patients had higher than expected mortality. By segmenting the patients into more specific cohorts and analyzing the obtained data, GiViTI was able to determine that the problem stemmed from hypercapnic respiratory failure.

In this case study, the GiViTI Calibration belt proved to be crucial. It represents the confidence band that correlates the observed and the expected (according to the average performance) mortality. A statistically significant deviation from the hypothesis of perfect calibration, i.e. when the single ICU performs as the average, occurs when the 95%-CI boundaries of the belt do not encompass the bisector. Any deviation from the bisector means that the outcome observed in that ICU is not in line with the average. In the examples reported, the GiViTI Calibration Belt of all the admitted patients (figure 1, left panel) suggested possible problems (with 80% confidence) in less severe patients (those with expected mortality lower than 0.37), where in fact the observed mortality is higher than expected (the belt is above the bisector). Stratifying this analysis, it became evident that the problem was concentrated on patients with hypercapnic respiratory failure (right panel).

Figure 1. GiViTI Calibration belt of the ICU under consideration, for all the admitted patients (left panel) and those with hypercapnic respiratory failure (right panel)
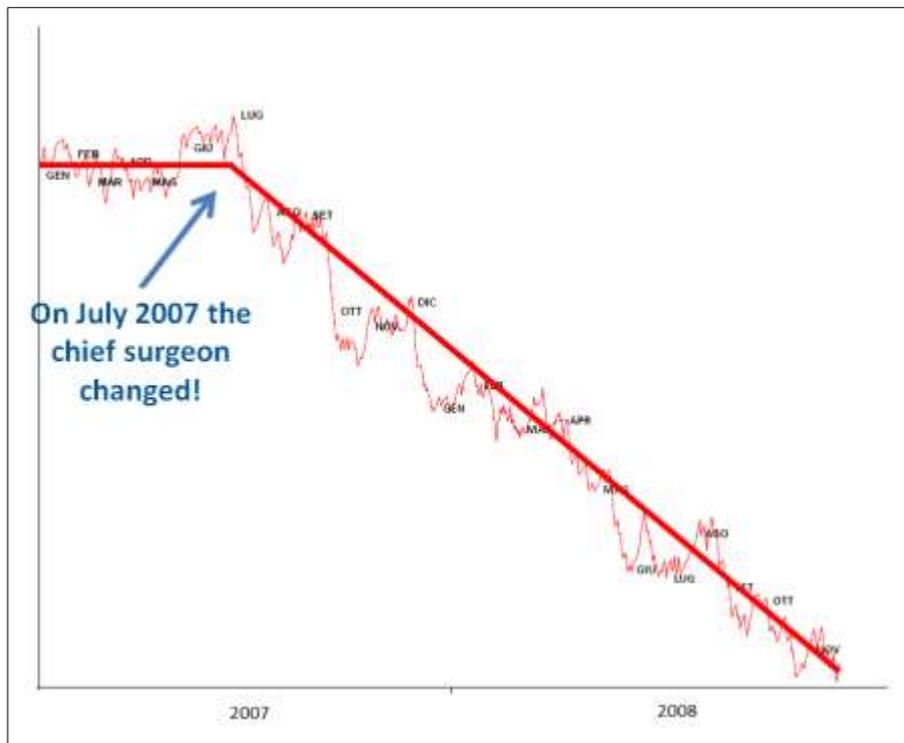

Once the problem had been pinpointed, the network was also leveraged to identify a unit with optimal results on these patients, which could share best practices with the Head of the ICU and his staff.

- *Case scenario at the hospital level*: by comparing performance with the previous year, one ICU observed a worsening in performance that could not be explained by any change in internal practices or patient mix. Deeper analysis revealed a sudden change coinciding with the arrival of the new Chief of Surgery.

  The VLAD was mainly used in this case (figure 2). It shows the performance of each individual ICU (expressed along the y axis) against time (reported on the x axis). When the plot rises, it means that in the period in question the ICU performed better than the average, in terms of lives saved, and vice versa when the plot declines, in terms of lives lost compared to the average performance. In the VLAD reported here, the ICU performed in line with the average till July 2007, and started to perform bad from then on.

Figure 2. VLAD of the ICU, displayed over two years

Root cause analysis showed that the problem lay outside of the ICU, and this allowed the hospital managers to look at the full picture.

The future

Following the success of Margherita PROSAFE, the GiViTI has launched MargheritaTre, an Electronic Health Record for ICUs, specifically designed to serve both the needs of everyday practice and evaluative research.

Additionally, a potential expansion of this model to emergency departments, high-dependency care units and rehabilitation departments is currently under consideration.