



# Learning Curve, Training Program, and Monitorization of Surgical Performance of Peritoneal Surface Malignancies Centers

Shigeki Kusamura, MD, PhD<sup>a</sup>,  
Santiago González-Moreno, MD, PhD<sup>b</sup>, Eran Nizri, MD, PhD<sup>c</sup>,  
Dario Baratti, MD<sup>a</sup>, Stefano Guadagni, MD<sup>d</sup>,  
Marcello Guaglio, MD<sup>a</sup>, Luigi Battaglia, MD<sup>e</sup>,  
Marcello Deraco, MD<sup>a,\*</sup>

## KEYWORDS

- Cytoreductive surgery • HIPEC • Learning curve • Surgical training
- Surgical performance

## KEY POINTS

- Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) is a complex procedure with a steep learning curve (LC).
- Using specific statistics with risk adjustment, it was observed that approximately 137 to 180 cases are necessary for the achievement of proficiency considering radicality and safety. Eighty-six to 100 cases were necessary to ensure short-term prognostic gains in rare peritoneal surface malignancies (PSM).
- Centralization of PSM centers is advisable for rare diseases, such as pseudomyxoma peritonei (PMP) and peritoneal mesothelioma.
- Mentoring is a key factor to shorten the LC and ensure quality of the training in CRS and HIPEC.
- A well-structured training program was implemented in Europe to standardize the treatment, ease the setting up of new centers, and improve the quality of the services.

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<sup>a</sup> Peritoneal Surface Malignancies unit, Fondazione IRCCS Istituto Nazionale dei Tumori di Milano, Via Venezian 1, Milano, Milan cap 20133, Italy; <sup>b</sup> Surgical Oncology, MD Anderson Cancer Center, Calle Arturo Soria, n°270, Madrid, Spain; <sup>c</sup> Department of General Surgery, Tel Aviv Sourasky Medical Center, Sackler Faculty of Medicine, Tel Aviv University, Weizmann Street 6, Tel Aviv, Israel; <sup>d</sup> Department of Biotechnological and Applied Clinical Sciences, Università degli Studi dell'Aquila, Via Giovanni di Vincenzo, 16/B, L'Aquila, Italy; <sup>e</sup> Colorectal Cancer unit, Fondazione IRCCS Istituto Nazionale dei Tumori di Milano, Via Venezian 1, Milano, MI, cap 20133, Italy

\* Corresponding author.

E-mail address: [marcello.deraco@istitutotumori.mi.it](mailto:marcello.deraco@istitutotumori.mi.it)

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## INTRODUCTION

The advent of cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) changed dramatically the approach to peritoneal surface malignancies (PSM). The combined treatment allowed the achievement of durable oncologic results in clinical conditions that were formerly considered amenable only to palliative therapies. This combined treatment is currently accepted as the standard of care for pseudomyxoma peritonei (PMP) and peritoneal mesothelioma.<sup>1-4</sup> and is also applicable in selected cases of peritoneal metastasis (PM) from colorectal and advanced epithelial ovarian cancers.<sup>5-8</sup>

This new therapeutic modality has spread widely around the world and new PSM centers are continuously emerging. However, the annual overall (ie, from main etiologies) estimated incidence of PSM is about 709,941 cases.<sup>9</sup> The following clinical entities were considered in this evaluation: peritoneal mesothelioma, primary peritoneal carcinoma, desmoplastic small round cell tumor, PM from colorectal cancer, PM from gastric cancer, ovarian cancer, and pancreatic cancer. Considering the estimated number of main active PSM centers in the world of 150 (Santiago González-Moreno, personal communication, 2014) and even if liberally assuming a 10 times larger actual number of institutions, each center would need to treat more than 400 cases per year to provide an acceptable response to the global population demand. Therefore, more PSM units are required.

CRS and HIPEC is a resource consuming operation with an estimated cost of up to €39,000 per procedure.<sup>10,11</sup> Moreover, it is a high-risk intervention with perioperative morbidity and mortality rates of about 28.8% and 2.9%, respectively.<sup>12</sup> Consequently, the associated learning curve (LC) is intuitively expected to be steep. Furthermore, the availability of methods for quality control of established centers is of best interest of regional health care systems for the optimization of resources allocation. This article discusses (1) the available methods to monitor surgical performance in the learning and audit phase of a center development, (2) the factors associated with the surgical performance, (3) what type of training program to shorten the learning process of the surgeon, and (4) what aspects related to logistics and infrastructure of the center could be modulated to optimize the achievement of its proficiency.

## THE LEARNING CURVE PROCESS

The process of setting up a new PSM is a complex issue whose main limiting factor is that of the LC. The LC could be conceived as the achievement of proficiency in the performance of surgical procedures. This encompasses not only the technical dexterity, but also the ability to select the right case for the surgery and the excellence in the management of the patient in the postoperative period in a multidisciplinary environment.<sup>13</sup> Several outcomes could be used for LC evaluation: completeness of cytoreduction rates, morbidity-mortality, prognosis, and quality of life. The LC could be applicable not only for individual surgeons but also for PSM institutions.

Different approaches have been used in the literature to assess LC and surveillance of surgical performance. The traditional method is represented by classic frequentist statistics without adjustments. The second approach is represented by statistical process control tests.

## ASSESSMENT OF LEARNING CURVE USING TRADITIONAL FREQUENTIST STATISTICS

Traditional frequentist statistics assess the LC by arbitrarily splitting the cases into different groups. Mohamed and Moran and colleagues<sup>14</sup> reported single-surgeon LC in 100 consecutive cases of CRS and HIPEC for PSM dividing the series into three equal

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