

Impact of ¹⁸F-FDG-PET/CT and laparoscopy in staging of locally advanced gastric cancer – a cost analysis in the prospective multicenter PLASTIC-study.

AUTHORS: Cas de Jongh¹ MD, Miriam P. van der Meulen^{1*} MD PhD, Emma C. Gertsen¹ MD PhD, Hylke J.F. Brenkman¹ MD PhD, Johanna W. van Sandick² MD PhD, Mark I. van Berge Henegouwen^{3,4} MD PhD, Suzanne S. Gisbertz^{3,4} MD PhD, Misha D.P. Luyer⁵ MD PhD, Grard A.P. Nieuwenhuijzen⁵ MD PhD, Jan J.B. van Lanschot⁶ MD PhD, Sjoerd M. Lagarde⁶ MD PhD, Bas P.L. Wijnhoven⁶ MD PhD, Wobbe O. de Steur⁷ MD PhD, Henk H. Hartgrink⁷ MD PhD, Jan H.M.B. Stoot⁸ MD PhD, Karel W.E. Hulsewe⁸ MD PhD, Ernst Jan Spillenaar Bilgen⁹ MD PhD, Marc J. van Det¹⁰ MD PhD, Ewout A. Kouwenhoven¹⁰ MD PhD, Freek Daams^{4,11} MD PhD, Donald L. van der Peet^{4,11} MD PhD, NCT van Grieken^{4,11} MD PhD, Joos Heisterkamp¹² MD PhD, Boudewijn van Etten¹³ MD PhD, Jan-Willem van den Berg¹³ MD PhD, Jean-Pierre Pierie¹⁴ MD PhD, Hasan H. Eker¹⁴ MD PhD, Annemieke Y. Thijssen¹⁵ MD PhD, Eric J.T. Belt¹⁵ MD PhD, Peter van Duijvendijk¹⁶ MD PhD, Eelco Wassenaar¹⁶ MD PhD, Kevin P. Wevers¹⁷ MD PhD, Lieke Hol¹⁸ MD PhD, Frank J. Wessels¹ MD PhD, Nadia Haj Mohammad¹ MD PhD, Geert W.J. Frederix^{1*} MD PhD, Richard van Hillegersberg¹ MD PhD, Peter D. Siersema¹⁹ MD PhD, Erik Vegt^{2,6} MD PhD, Jelle P. Ruurda¹ MD PhD, on behalf of the PLASTIC Study Group.

INSTITUTIONS AND AFFILIATIONS: ¹University Medical Center (UMC) Utrecht, Utrecht, The Netherlands. ^{1*}Julius Center for Health Sciences and Primary Care, UMC Utrecht, Utrecht, The Netherlands. ²The Netherlands Cancer Institute – Antoni van Leeuwenhoek, Amsterdam, The Netherlands. ³Amsterdam UMC, location University of Amsterdam, The Netherlands. ⁴Cancer Center Amsterdam, Amsterdam, The Netherlands. ⁵Catharina Hospital Eindhoven, Eindhoven, The Netherlands. ⁶Erasmus Medical Center UMC Rotterdam, Rotterdam, The Netherlands. ⁷Leiden UMC, Leiden, The Netherlands. ⁸Zuyderland MC, Sittard-Geleen, The Netherlands. ⁹Rijnstate Hospital, Arnhem, The Netherlands. ¹⁰ZGT Hospital, Almelo, The Netherlands. ¹¹Amsterdam UMC, location Vrije University, The Netherlands. ¹²Elisabeth Twee-Steden Hospital, Tilburg, The Netherlands. ¹³UMC Groningen, Groningen, The Netherlands. ¹⁴Medical Center Leeuwarden, Leeuwarden, The Netherlands. ¹⁵Albert Schweitzer Hospital, Dordrecht, The Netherlands. ¹⁶Gelre Hospitals, Apeldoorn, The Netherlands. ¹⁷Isala Hospital, Zwolle, The Netherlands. ¹⁸Maastad Hospital, Rotterdam, The Netherlands. ¹⁹Radboud UMC, Nijmegen, The Netherlands.

SUPPLEMENTARY MATERIAL

Title page supplementary material	Page no. 1
Supplementary Results 1. Costs per staging laparoscopy.	Page no. 2 – 3
Supplementary Results 2. Costs per D2-gastrectomy.	Page no. 3

Supplementary Results 1. Costs per staging laparoscopy.

The bottom-up calculations were €1,537 for total costs per SL, consisting of €975 of surgery costs and €562 of SL related costs for post-SL admission and complications, respectively (Table 1). In addition to the €1,537 bottom-up SL costs, 116 out of 357 SL-patients (32%) underwent histological biopsy and 264 SL-patients (74%) underwent cytology during SL, both with a DHA-tariff of €151 to confirm/exclude distant metastases (€172 averaged per patient), totaling SL-costs at €1,709.

Surgery costs per staging laparoscopy

Total surgery costs noted €975 per SL by counting costs of the use of the operating room (€726), disposable materials (€150), reusable surgical instruments (€82) and laparoscopic equipment (€17) per SL, respectively (Table 1).

The use of the operating room (€726 per SL) detailed the mean surgical duration of SL in the PLASTIC-study (33 minutes; n=246) multiplied with a previously reported €22 minute price of the operating room, which includes costs for using the operating room, maintenance, salary of surgical and anesthesiological personnel, and overhead.²⁰ SL operating time was known for 248 patients (69%), of whom two patients (1%) were excluded calculating the mean surgical duration because the full surgical resection was included in their operating time.

Costs of disposables (€150 per patient) were estimated based on hospital purchasing prices of trocars (€93) and the rinse and suction system (€57).

Reusable surgical instruments were estimated at €82 per SL and consisted of sterilization costs (€80) added with purchasing prices of the (reusable) surgical instruments (averaged €2 per SL). The instrument costs totaled €11,725 by adding the purchasing prices of one full standard SL instrument set (€6,700) plus 7.5% maintenance costs per year assuming a 10-years life-span (€5,025) according to standard hospital policy. By dividing this by the number of business days per year that these instruments were used, which was assumed to be 120 of the yearly 240 operating room business days, and the estimation that 6 SL can be performed per business day, these costs resulted in (rounded) €2 per SL on average.

Mean costs for using laparoscopic equipment during SL (€17) included costs for the laparoscope, camera head, light source, video processor, insufflator, trolley and two monitors with suspension system. Total costs numbered €119,459 by including purchasing prices (€56,255) and 7.5–15% maintenance costs for a 10-years lifespan (€63,204) according to standard hospital policy. Dividing this by 120 business days and 6 SL per business day, this resulted in €17 on average per SL.

Staging laparoscopy related costs

The SL related costs counted €562 per patient (Table 1) by adding the €476 DHA-tariff per day hospital admission post-SL with €86 of mean costs per patient for SL related complications.^{17,18}

Three PLASTIC-patients developed a complication following SL (<1%), all requiring surgical re-intervention as published previously.¹² These complication costs totaled a mean of €9,517 per SL-related complication due to the surgery duration (in minutes) multiplied by the €22 previously reported operating room minute price, the prolonged hospital admission and the diagnostic and therapeutic procedures, resulting in additional costs of on average €86 per patient undergoing SL.

Supplementary Results 2. Costs per D2-gastrectomy.

Total costs per D2-gastrectomy (€19,308; Table 2) consisted of surgery costs (€7,354) and gastrectomy-related costs until 30 days after surgery (€11,605 hospital costs and €349 surgical re-interventions); or €22,925 per D2-gastrectomy up to 90 postoperative days as additional scenario analysis (€15,222 hospital costs and €349 surgical re-interventions).

The unit prices of total and distal D2-gastrectomy via laparoscopic and open approach were calculated bottom-up in a previous prospective randomized controlled trial at €8,124 for total and €7,353 for distal laparoscopic D2-gastrectomy, and €6,584 for total and €5,893 for distal open D2-gastrectomy.⁸ Translated into the proportion performed total (34%) and distal (37%) laparoscopic and total (15%) and distal (15%) open D2-gastrectomies in the PLASTIC-study, the weighted average D2-gastrectomy unit price in the PLASTIC-cohort balanced €7,354 in total.

The gastrectomy-related costs from all 30-day postoperative hospital resource totaled €11,605, consisting of hospital (€4,726) and intensive care unit (€3,739) admissions, imaging (€539) and other diagnostics (€1,982) for complications, visits to outpatient clinics or paramedics (€602) and other costs (€17). For the 90-day scenario analyses, these costs totaled €15,222 by adding hospital (€6,201) and ICU (€4,641) admissions, imaging (€818) and other diagnostics (€2,325), visits to outpatient clinics or paramedics (€1,041) and other costs (€196).

The costs per surgical re-intervention totaled €2,478 at a mean duration of 109 minutes.²⁰ The surgery duration could be retrieved for 32% of reoperations. This translated into an average cost of €349 per patient as re-operations occurred in 14% of operated PLASTIC-patients.