

**PRO CARE**  
PROJECT ON CANCER OF THE RECTUM

Belgian Cancer Registry



---

**PRO CARE**

---

**FINAL FEEDBACK**

---

**2006-2014**

---

**Definitions**

---

Version 0.2  
29/10/2015

## Table of Contents

Introduction .....	3
Part 1: PROCARE indicators 2006-2014.....	4
1.1. Methods .....	4
1.1.1. Descriptive numbers.....	4
1.1.2. Data cleaning.....	5
1.1.3. Funnel plot.....	7
1.2. Demographic Data.....	8
1.3. Diagnosis and staging.....	8
1.4. Time to first treatment.....	12
1.5. Neoadjuvant treatment .....	13
1.6. Surgery .....	16
1.7. Pathology.....	24
1.8. Adjuvant treatment.....	28
1.9. Follow-up .....	29
Part 2: PROCARE completeness 2006-2011 .....	30
2.1. Introduction .....	30
2.2. Methods.....	30
2.2.1. Data sources .....	30
2.2.2. Treatment data and centre allocation .....	30
2.2.3. Results .....	31
Part 3: Population based survival outcomes 2006-2011 .....	32
3.1. Introduction .....	32
3.2. Methods.....	32
3.2.1. Data sources .....	32
3.2.2. Survival outcomes.....	33
3.2.3. Adjustment models.....	33
3.2.4. Forest plot.....	34

# Introduction

This document accompanies **the final feedback** on the results of central registration about the management of patients with rectal cancer within PROCARE 2006-2014. It contains a list of the general and more specific definitions used to calculate the different items of the report.

This document adopts the structure of the feedback report:

- Part 1: PROCARE indicators 2006-2014
- Part 2: PROCARE completeness 2006-2011
- Part 3: Population based survival outcomes 2006-2011

# Part 1: PROCARE indicators 2006-2014

This section presents data registered in PROCARE concerning patients of the team to which the report is addressed on the one hand (if a sufficient number of patients have been registered for that team), and data of the complete PROCARE database on the other hand. They are presented in tables and figures.

The results presented in this section are based on all data registered in the **PROCARE database** in the period 2006-2014.

Note that these results cannot be generalised to the general Belgian population of rectal cancer patients, due to the selection bias in the PROCARE dataset [Jegou D et al., "PROCARE. Completeness and registration bias in PROCARE, a Belgian multidisciplinary project on cancer of the rectum with participation on a voluntary basis." Eur J Cancer (2014) 51, 1099-108]. The completeness for PROCARE and your team is given in Part 2 of this feedback report.

## 1.1. Methods

### 1.1.1. Descriptive numbers

**Number & Frequency:** The absolute numbers (N) in the report correspond to the numerator (N), whereas the relative numbers (%) correspond to the ratio between the numerator and denominator (D).

**Missing data:** Some data are subdivided in subsections. The sum of the percentages corresponding with subsections is 100%. Missing data were not taken into account. *Example: Clinical stage was documented in 6539 patients or 85.6% of the global database. Clinical stage is subdivided into 6 sublevels. The sum of the percentages of these sublevels is 100%. The 1100 patients for whom the clinical stage was missing were not taken into account.*

**Percentiles:** percentile 25<sup>th</sup> (P25), percentile 75<sup>th</sup> (P75) and median are computed for global data in the PROCARE database.

- P25 percentile is the value that has 25% of the measurements below it and 75% above it.

- Median (P50) is the value that has 50% of the measurements below it and 50% above it.

- P75 percentile is the value that has 75% of the measurements below it and 25% above it.

Example, number of patients registered: 25% of the centres have registered less than 16 patients (P25) and 25% of the centres have registered more than 121 patients (P75).

**Quality of care indicators** are indicated by QCI in each section. Further information on QCI can be found at:

[http://procare.kankerregister.be/media/docs/Projecten/Procure/QualityofCare\\_FR.pdf](http://procare.kankerregister.be/media/docs/Projecten/Procure/QualityofCare_FR.pdf)

or

[http://procare.kankerregister.be/media/docs/Projecten/Procure/QualityofCare\\_NL.pdf](http://procare.kankerregister.be/media/docs/Projecten/Procure/QualityofCare_NL.pdf)

### 1.1.2. Data cleaning

The PROCARE database has been cleaned in several aspects before performing analyses for feedback.

#### Inclusion/exclusion criteria:

1. Only invasive adenocarcinomas of the rectum have been included for analysis. This means that other pathologies, such as polyps with noninvasive intramucosal tumour (Tis) or carcinoid tumours, are excluded for analysis. In contrast, ypTis cases have been retained if the cT stage was cT1 or more and/or a biopsy or endoscopic resection proved the presence of an invasive cancer.
2. Cases where the lower limit of the tumour is superior to 15 cm have been excluded for analysis.
3. All patients with synchronous tumours outside of the rectum are excluded for analyses for feedback. A synchronous tumour might influence treatment of the rectal cancer as well as the outcome of the patient.
4. Patients who do not reside in Belgium are excluded from the database used for analysis.

#### Pretreatment staging:

5. cStage (cTNM). Because knowledge of the cStage is crucial in order to determine the treatment, missing cStage and cStage X is not desirable. Records with cStage X and missing cStage were checked:
  - if no information was given for any of the staging imaging techniques (CT, MRI, TRUS or others) and no cTNM summary was given, then **cStage is missing**
  - if no CT, MRI, TRUS or other techniques for staging were performed (e.g. in emergency circumstances) then **cStage is X (TxNxMx)**
  - if CT, MRI, TRUS or other techniques were done, but no tumour was seen, then **cStage is 0**
6. cTNM and pTNM were converted to cStage or pStage missing when no TNM summary was registered and not enough information was given to determine the corresponding stage (e.g. cN or pN missing).
7. The lower limit of the tumour cannot be higher than the upper limit of that same tumour. Patients in which this was the case were checked. Tumour levels were adapted based on information on distal and proximal resection margins.
8. Lower limit of the tumour and categorization in rectal thirds:  
**(low 0 - ≤ 5 cm ; mid > 5 cm- ≤ 10 ; high > 10 cm - ≤ 15 cm)**
  - a) For patients who did not have long course radiotherapy, the level obtained by rigid rectoscopy at surgery (if available) overrules pre-treatment data obtained by colonoscopy.
  - b) For tumours at 6 or more cm above the anal verge as indicated on pre-treatment and/or operative data entry, the lowest level has been accepted for definitive classification.
  - c) For tumours reported to be located in the lower third (≤ 5 cm) either before treatment or at surgery, that were treated by a sphincter saving radical resection (LE/TEMS, APER and Hartmann excluded) with stapled distal anastomosis, the following was checked: lowest level at pre-treatment examination or at surgery (in cm) – (1.5 x the tumour free distal margin in cm as mentioned in the pathology report) must be ≥ 2 cm in female after stapled SSO and ≥ 3 cm in male after stapled SSO.

If the result of this calculation fits with a remaining length of  $\geq 2$  cm in female or  $\geq 3$  cm in male, the reported (lowest) level is accepted and the tumour classified as being located in the distal/lower third. If the result of this calculation would indicate a remaining length of  $< 2$  cm in female or  $< 3$  cm in male, the tumour was classified as being located in the middle third. NB. A factor 1.5 is used because there is shrinkage/shortening of the tumour-free distal margin after fixation and ex vivo measurement.

#### Operative data:

9. The field "type of reconstruction" contains a number of reconstruction types defined as "other" which are in fact reconstruction types, present in the option list. Therefore, those "other" reconstructions were reassigned according to the description provided.
10. TME and PME (type of resection) and type of reconstruction:  
When "TME" is marked for the type of resection, the following resection/reconstruction types are possible:
  - APER (AbdominoPerineal Excision of the Rectum) or Hartmann
  - Restorative Rectum Resection (including all suboptions)
  - IPAA (Ileal Pouch Anal Anastomosis)
  - Proctocolectomy with definitive ileostomy
 When "PME" is indicated for the type of resection, the following reconstruction types are possible
  - High anterior resection + CRA (ColoRectal Anastomosis)
  - Low anterior resection + CRA
  - Inconsistencies were cleaned.
11. APER or Hartmann always include a definitive stoma. Therefore, if a derivative stoma was marked, this was deleted.
12. The approach of surgical exploration, resection and reconstruction can be laparotomy, laparoscopy or converted laparoscopy. The 3 approaches need to follow a certain order e.g. once a laparotomy is performed, all further approaches will be laparotomy. Inconsistencies were cleaned.
13. Discharge date if postoperative death. When a patient dies in hospital, a discharge date is not needed. Therefore discharge dates of patients who died in hospital were deleted. As a consequence, length of stay concerns only patients who left the hospital alive.

#### Radiotherapy and/or chemotherapy:

14. If information about the total dose and the number of fractions of the radiotherapy treatment was missing, it is impossible to determine whether a short or long course was given to the patient, except if the first and last radiotherapy dates are not missing.
15. Neoadjuvant chemotherapy without radiotherapy is very rare in cStage II-III. The medical files were checked and if it was not clear that radiotherapy had been given (e.g. from pathology report) the data manager asked complementary information.

Pathology:

16. In general, the proximal margin should be greater than the distal margin. All forms in which the distal margin was greater than the proximal margin were checked and it was decided whether both margins needed to be reversed or adapted; when available, the pathology report was checked. Also, the total length of the specimen must be larger than the sum of the proximal and distal margins.
17. In a previous version of the data entry set, two rectal cancer regression indices were used: the Dworak regression grade and the Rectal Cancer Regression Grade (RCRG). Both were cleaned as follows:
- A regression grade can only be marked in case of an ypStage and vice versa. Therefore pStages with regression grade and ypStages without regression grade were cleaned.
  - ypStage 0 needs to have a Dworak 4 (or a RCRG 1)
- Furthermore, all “RCRGs” were transformed into “Dworak”.

General data:

18. Checking dates. Dates of first contact, neoadjuvant treatment, surgery and discharge need to be in a logical sequence. The following date-inconsistencies were checked:
- Date of first contact (or biopsy) needs to be before neoadjuvant treatment and surgery date
  - Date of neoadjuvant treatment needs to be before surgery date
  - Date of discharge needs to be after surgery date
- If these dates were missing, the medical files were checked to complete these dates. In most cases the exact dates are mentioned in accompanying documents e.g. pathology protocol. For others, the data manager contacted the submitting physician.

**1.1.3. Funnel plot**

A funnel plot is a scatter plot of the estimate of an outcome variable on different units (hospital, surgeon, geographical area, ...) versus its precision. This precision equals the inverse of the standard error of the estimate (1/SE) or the square of it (1/SE<sup>2</sup>).

The precision on the proportion of a binary outcome (0/1, yes/no, ...) is proportional to the unit size. The funnel plot for a binary proportion therefore obtains an elegant representation: the estimates are plotted versus the number of observations of the units.

Moreover, when a reference or population value can be assigned and a distribution assumed, control limits can be added to the funnel plot. These control limits are the upper and lower values of the expected (100- $\alpha$ )% confidence limits by centre size given the reference value and the distribution ( $\alpha$  often equal to 5 or 1). These control limits allow to compare the variability of the observed estimates versus the expected variability given the reference value and the distribution.

The funnel plots for the binary QCI presented in the report take the observed overall PROCARE result as the population or reference value and use a binomial distribution for the construction of the 95% and 99% funnel limits.

*Interpretation of the funnel plot:* if it is assumed that all units have the same underlying proportion, the funnel plots allow to compare the observed variability among the units to the expected variability.

## 1.2. Demographic Data

No specific remarks on definitions.

## 1.3. Diagnosis and staging

### Date of incidence

Defined by the date of pathological diagnosis (biopsy), if missing by the date of first consultation or hospitalization, if still missing by the date of first treatment (any type).

**Note: it is important to mention the date of the first contact when the diagnosis of rectal cancer was made (by any physician) or the date of pretreatment biopsy. They determine the ‘incidence date’ and are used to calculate the interval to first treatment (therapeutic delay).**

### Level of tumour

If available, the lower limit measured with rectoscopy is taken as lower limit of the tumour in patients without neoadjuvant treatment or with no long course neoadjuvant radiotherapy. If this is not available, the lower limit measured with colonoscopy is taken as lower limit of the tumour.

For patients with long course neoadjuvant radiotherapy the pretreatment lower limit is taken as lower limit of the tumour. If no lower limit is available before neoadjuvant treatment, the lower limit measured at surgery is taken as lower limit of the tumour.

For patients who received neoadjuvant treatment but for whom it is not known whether they received short or long course radiotherapy, the lowest limit of either the pretreatment or the lower limit at surgery is taken.

Proportion of patients with a documented distance from the anal verge (KCE 2008 QCI 1211; process indicator)

Priority sequence to determine lower limit: (1) pretreatment rectoscopy, (2) pretreatment colonoscopy, (3) rectoscopy or colonoscopy at surgery

Level of tumour (lower limit determined by distance from anal verge)

Lower limit tumour (LL)	Level tumour
$\leq 5$ cm	Low
$> 5 - \leq 10$ cm	Mid
$> 10$ cm – $\leq 15.0$ cm	High

### *High*

N: Number of patients in denominator for whom the level of the tumour is superior to 10 cm

D: Number of patients for whom the level of the tumour is known



***Mid***

N: Number of patients in denominator for whom the level of the tumour is superior to 5 cm and inferior or equal to 10 cm

D: Number of patients for whom the level of the tumour is known

***Low***

N: Number of patients in denominator for whom the level of the tumour is inferior or equal to 5 cm.

D: Number of patients for whom the level of the tumour is known

***Missing lower limit:***

N: Number of patients for whom the level of the tumour is missing

D: Number of registered patients

**Proportion of patients undergoing elective surgery that had preoperative complete large bowel-imaging (KCE 2008 QCI 1214; process indicator)**

N: Number of patients in denominator who underwent a total colonoscopy or a complete double contrast enema or virtual colonoscopy

D: Number of patients treated with elective or scheduled surgery

**Proportion of patients in whom a CT of the abdomen and RX or CT thorax were performed before any treatment (KCE 2008 QCI 1212; process indicator)**

N: Number of patients in denominator in whom an abdominal CT and (RX thorax or CT thorax) were performed before any treatment.

D: Number of patients who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

**Use of imaging*****Use of any imaging (CT/MRI/TRUS)***

N: Number of patients in denominator in whom cT and cN was based on imaging (TRUS or MRI or CT)

D: Number of patients with rectal cancer of any stage who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

***Use of TRUS (any stage)***

N: Number of patients in denominator in whom cT and/or cN was based on TRUS

D: Number of patients with rectal cancer of any stage who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

***Use of CT pelvis (any stage)***

N: Number of patients in denominator in whom cT and/or cN was based on CT

D: Number of patients with rectal cancer of any stage who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

***Use of MRI pelvis (any stage)***

N: Number of patients in denominator in whom cT and/or cN was based on MRI

D: Number of patients with rectal cancer of any stage who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

**Use of TRUS in cT1/cT2 (new QCI; process indicator)**

N: Number of patients in denominator in whom cT was based on TRUS

D: Number of patients with cT1 or cT2 rectal cancer, who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

**Use of MRI in cStage II or III (new QCI; process indicator)**

N: Number of patients in denominator in whom cStaging was based on MRI

D: Number of patients with cStage II or III rectal cancer based on any imaging technique, who were registered since the 1<sup>st</sup> of August 2008 who underwent elective/scheduled surgery

**Proportion of patients in whom a TRUS and pelvic CT and/or pelvic MRI was performed before any treatment (KCE QCI 1215; process indicator)**

N: Number of patients in whom cT or cN were based on TRUS and at least one of the two following:

- pelvic CT
- pelvic MRI

D: Number of patients with rectal cancer of any stage who were registered since the 1<sup>st</sup> of August 2008 without missing data for imaging information and who underwent elective/scheduled surgery

**Proportion of patients with cStage II-III RC that have a reported cCRM (KCE QCI 1216; process indicator)**

N: Number of patients in denominator for whom cCRM is reported

D: Number of patients with cStage II-III treated with radical surgical resection

**Tumour clinical Stage**

**Note: for risk adjustment it is important to know the pretreatment cTNM stage**

***cStage 0***

N: Number of patients in denominator with cStage 0

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

Note: patients with cStage 0 are included if pStage is different from pStage 0

***cStage I***

N: Number of patients in denominator with cStage I

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

***cStage II***

N: Number of patients in denominator with cStage II

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

***cStage III***

N: Number of patients in denominator with cStage III

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

***cStage IV***

N: Number of patients in denominator with cStage IV

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

***cStage X***

N: Number of patients in denominator with cStage X (cTx and/or cNx and/or cMx reported as such and – supposedly - meaning that tumour and/or regional nodes and/or metastases were not assessed by any means)

D: Number of patients for whom cStage (incl. cStageX, but not cStage missing) is reported

***cStage missing***

N: Number of patients for whom cStage is missing

D: Number of registered patients

**Proportion of patients in whom a CEA was performed before any treatment (KCE 2008 QCI 1213; process indicator)**

N: Number of patients in denominator for whom CEA serum level before treatment is reported

D: Number of registered patients

**Accuracy of cT/cN staging if no or short radiotherapy (separately presented in 2 tables in section 1.9) (new QCI; process indicator)**

For patients who did not receive neoadjuvant long course radio(chemo)therapy, the (y)pT/(y)pN is shown related to the cT/cN for these patients.

D: All patients with TRUS/CT/MRI with no or short neoadjuvant radiotherapy (without long R(C)T) and for whom the (y)pT and (y)pN is known and for whom the cT and cN is known (excluding patients with c and/or (y)pTx and/or c and/or (y)pNx)

## 1.4. Time to first treatment

### Missing date of biopsy or first consultation

N: Number of patients for whom the date of biopsy and/or the date of first consultation is missing

D: Number of registered patients

### Time between first histopathologic diagnosis and first treatment (KCE QCI 1217; process indicator)

For patients treated by surgery and/or radiotherapy and/or chemotherapy, the time interval in days is computed between the date of pathologic diagnosis and the date of first treatment. If the biopsy date is not available, the date of first contact/hospitalization is used.

- Global: median time from pathologic diagnosis or first contact to treatment independently of the kind of first treatment
- First treatment surgery: median time from pathologic diagnosis or first contact to treatment in patients treated with surgery without neoadjuvant therapy
- First treatment (C)(R)T: median time from pathologic diagnosis or first contact to treatment in patients who received neoadjuvant treatment
- First treatment palliative (C)(R)T: median time from pathologic diagnosis or first contact to treatment in patients who received palliative chemo and/or radiotherapy

## 1.5. Neoadjuvant treatment

### Neoadjuvant radiotherapy

If the radiotherapy form is completed or the pathology or chemotherapy forms indicate that radiotherapy was given, the patient is considered to be treated with radiotherapy.

Short course regimen are 5 x 5, 10 or 13 x 3 Gy (always without chemotherapy).

Long course regimen are 25 or more x 1.8 Gy (with or without chemotherapy).

### Neoadjuvant chemotherapy

If the chemotherapy form is completed or if the pathology or radiotherapy form indicates that chemotherapy was given, the patient is considered to be treated with neoadjuvant chemotherapy.

### Proportion of cStage II-III patients with radical surgical resection that received neoadjuvant pelvic RT (new QCI : process indicator replacing KCE 2008 QCI 1221 and 1222).

#### *Global (all rectal cancers at any level)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage II or III, treated with radical surgical resection with rectal cancer at any level

#### *For high rectal cancer (> 10 cm)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage II or III, treated with radical surgical resection with tumour in upper third

#### *For mid rectal cancer (> 5 - ≤ 10 cm)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage II or III, treated with radical surgical resection with tumour in middle third

#### *For low rectal cancer (≤ 5 cm)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage II or III, treated with radical surgical resection with tumour in lower third

### Proportion of cStage II-III patients treated with a long course of preoperative pelvic RT or chemoradiation, that completed this neoadjuvant treatment within the planned timing (KCE 2008 QCI 1225; process indicator)

N: Number of patients in denominator for whom the radiotherapy treatment was not interrupted for more than five working days

D: Number of patients with cStage II-III who started with long course neoadjuvant radiotherapy which was followed by radical surgical resection

**Proportion of patients with cCRM  $\leq$  2 mm on MRI/CT that received long course neoadjuvant radio(chemo)therapy (new QCI; process indicator)**

N: Number of patients in denominator who received long course neoadjuvant radio(chemo)therapy

D: Number of patients treated with radical surgical resection and for whom cCRM is  $\leq$  2 mm and for whom it is known whether they received neoadjuvant treatment or not

**Proportion of patients with cStage I that received neoadjuvant radio(chemo)therapy (new QCI; process indicator)**

*Global (all rectal cancers at any level)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients treated with radical surgical resection for cStage I rectal cancer

*For high rectal cancer (> 10 cm)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage I, treated with radical surgical resection with tumour in upper third

*For mid rectal cancer (> 5 -  $\leq$  10 cm)*

N: Number of patients in denominator who received neoadjuvant R(C)T

D: Number of patients in cStage I, treated with radical surgical resection with tumour in middle third

*For low rectal cancer ( $\leq$  5 cm)*

N: Number of patients in denominator who received neoadjuvant treatment R(C)T

D: Number of patients in cStage I, treated with radical surgical resection with tumour in lower third

**Proportion of cStage II-III patients treated with neoadjuvant 5-FU based chemoradiation, that received a continuous infusion of 5-FU (KCE 2008 QCI 1224; process indicator)**

N: Number of patients in denominator that received a continuous infusion of 5-FU.

D: Number of patients with cStage II-III treated with radical surgical resection and long course pelvic chemoradiotherapy

**Proportion of cStage II-III patients treated with a long course of preoperative pelvic RT or chemoradiation, that was operated 4 to 12 weeks after completion of the (chemo)radiation (KCE 2008 QCI 1226 adapted; process indicator)**

N: Number of patients in denominator that was operated 4 to 12 weeks after completion of the (chemo)radiotherapy

D: Number of patients with cStage II-III treated with long course neoadjuvant radiotherapy and for whom date of surgery and date of last irradiation are not missing.

*Missing date of first irradiation*

N: Number of patients in denominator for whom the date of first irradiation is missing

D: Number of patients treated with neoadjuvant radiotherapy

*Missing date of last irradiation*

N: Number of patients in denominator for whom the date of last irradiation is missing

D: Number of patients treated with neoadjuvant radiotherapy

***Missing number of fractions***

N: Number of patients in denominator for whom the number of fractions is missing

D: Number of patients treated with neoadjuvant radiotherapy

***Missing total dose***

N: Number of patients in denominator for whom the total dose at ICRU reference point is missing

D: Number of patients treated with neoadjuvant radiotherapy

***Missing radiation compliance***

N: Number of patients in denominator for whom it is not stated whether the radiotherapy treatment was interrupted for more than five working days

D: Number of patients treated with neoadjuvant radiotherapy

***Missing concomitant chemotherapy***

N: Number of patients in denominator for whom it is not stated whether they received concomitant chemotherapy or not

D: Number of patients treated with neoadjuvant long course radiotherapy

## 1.6. Surgery

### Surgical resection and reconstruction

#### 1. Treated with radical surgical resection

A patient treated with abdominoperineal resection (APER or APE), Hartmann's procedure or sphincter sparing/saving radical rectum resection (PME or TME) with reconstruction (SSO) is considered to be treated with radical surgical resection.

#### 2. Treated with sphincter sparing/saving radical rectum resection (PME or TME) with reconstruction (SSO)

A patient is treated with SSO and reconstruction if one of the following is indicated:

- High anterior resection + CRA (ColoRectal Anastomosis above peritoneal reflection)
- Low anterior resection + CRA (ColoRectal Anastomosis below peritoneal reflection)
- Complete rectum resection (TME) + straight CAA (Colo-Anal Anastomosis)
- Complete rectum resection (TME) + colon J pouch
- Complete rectum resection (TME) + coloplasty
- Complete rectum resection (TME) + side-to-end coloanal anastomosis
- Complete rectum resection (TME) + other (specified)
- Total excision of Colon and Rectum with IPAA (Ileal Pouch Anal Anastomosis)

### Mode of surgery

#### *Elective/Scheduled*

N: Number of patients in denominator for whom the mode of surgery is 'elective' or 'scheduled'

D: Number of patients treated with surgical resection (any type) and for whom the mode of surgery is not missing

#### *Urgent/Emergency*

N: Number of patients in denominator for whom the mode of surgery is 'urgent' or 'emergency'

D: Number of patients treated with surgical resection (any type) and for whom the mode of surgery is not missing

#### *Missing mode of surgery*

N: Number of patients in denominator for whom mode of surgery is missing

D: Number of patients treated with surgical resection (any type)

### Approach surgical resection/reconstruction if radical surgical resection

#### *Resection/Reconstruction by laparotomy*

N: Number of patients in denominator for whom the resection/reconstruction approach is laparotomy

D: Number of patients treated with radical surgical resection for whom the surgical approach at resection/reconstruction is known

#### *Resection/Reconstruction by laparoscopy*

N: Number of patients in denominator for whom the resection/reconstruction approach is laparoscopy

D: Number of patients treated with radical surgical resection for whom the surgical approach at resection/reconstruction is known



***Resection/Reconstruction by converted laparoscopy***

N: Number of patients in denominator for whom the resection/reconstruction approach is converted laparoscopy

D: Number of patients treated with radical surgical resection for whom the surgical approach at resection/reconstruction is known

***Missing data on approach for surgical resection/reconstruction if radical surgical resection***

N: Number of patients in denominator for whom the surgical approach at resection/reconstruction is missing

D: Number of patients treated with radical surgical resection

**Proportion of R0 resections (KCE 2008 QCI 1231; outcome indicator)**

R2 status. Resections are classified as R2 if cM equals M1 and/or metastasis are discovered at surgery (and not completely resected). Thus, if the type of resection at surgery is reported to be 'R2' or the simultaneous complete resection of metastases in cStage IV patients is not mentioned, then R status equals 'R2'.

R1 status. Resections are classified as R1 if cM does not equal 'M1' (i.e. in the absence of clinical metastases) and if type of resection at surgery is not 'R2' and if at least one of the following four conditions is present:

- (y)pCRM  $\leq$  1 mm
- distal resection margin  $\leq$  1 mm
- rectum perforation as indicated by the surgeon
- rectum perforation as indicated by the pathologist

R0 status. Resections are classified as R0 if cM does not equal 'M1' and if type of resection at surgery is not 'R2' and if none of the four criteria of R1 status are present.

R status is reported as missing if cM status is missing and/or if data on two or more of the following criteria are missing: tumour free status of the (y)pCRM, the tumour free status of the distal resection margin, rectum perforation as indicated by the surgeon or pathologist.

***R0 resection***

N: Number of patients in denominator with R0 resection

D: Number of patients treated with radical surgical resection and for whom R status is not missing

***R1 resection***

N: Number of patients in denominator with R1 resection

D: Number of patients treated with radical surgical resection and for whom R status is not missing

***R2 resection***

N: Number of patients in denominator with R status equal 'R2'

D: Number of patients treated with radical surgical resection and for whom R status is not missing

***Missing data on R status***

N: Number of patients in denominator for whom R status is missing

D: Number of patients treated with radical surgical resection

**Rate of intra-operative rectal perforation (KCE 2008 QCI 1235; outcome indicator)**

N: Number of patients in denominator for whom the surgeon and/or pathologist reported rectal perforation

D: Number of patients treated with radical surgical resection and for whom perforation of the rectum (yes or no) is reported by either the surgeon or the pathologist

***Missing data on perforation of rectum***

N: Number of patients in denominator for whom perforation of the rectum is not reported by the surgeon and/or the pathologist

D: Number of patients treated with radical surgical resection

**(y)p distal margin involved (positive) after SSO or Hartmann for low rectal cancer ( $\leq 5$  cm) (new QCI; outcome indicator)**

N: Number of patients in denominator for whom the (y)p distal margin is invaded

D: Number of patients treated with Hartmann's procedure or SSO for rectal cancer in the lower third and for whom it is reported whether the (y)p distal margin is free or invaded.

Note: For this indicator, patients with ypStage 0 or (y)pStage X are excluded from the analysis

**Mesorectal (y)pCRM positivity after radical surgical resection (new QCI; outcome indicator)**

Note: The definition of positivity is a mesorectal circumferential resection margin  $\leq 1$  mm.

Note: For this indicator, patients with ypStage 0 or (y)pStage X are excluded from the analysis.

***Global***

N: Number of patients in denominator for whom the mesorectal (y)pCRM is positive

D: Number of patients treated with radical surgical resection for rectal cancer for whom the mesorectal (y)pCRM is known

***For high rectal cancer ( $> 10$  cm)***

N: Number of patients in denominator for whom the mesorectal (y)pCRM is positive

D: Number of patients treated with radical surgical resection (PME and TME) with tumour in highest third for whom (y)pCRM is known

***For mid rectal cancer ( $> 5 - \leq 10$  cm)***

N: Number of patients in denominator for whom the mesorectal (y)pCRM is positive

D: Number of patients treated with radical surgical resection with tumour in middle third for whom (y)pCRM is known

***For low rectal cancer ( $\leq 5$  cm)***

N: Number of patients in denominator for whom the mesorectal (y)pCRM is positive

D: Number of patients treated with radical surgical resection with tumour in lowest third and for whom the mesorectal (y)pCRM is known

***Missing (y)pCRM***

N: Number of patients in denominator for whom the mesorectal (y)pCRM is missing

D: Number of patients treated with radical surgical resection.

## Technique of resection

### *PME*

N: Number of patients in denominator for whom PME (as indicated by the surgeon) is the technique of resection

D: Number of patients with radical surgical resection for whom the technique of resection is known

### *TME*

N: Number of patients in denominator for whom TME (as indicated by the surgeon) is the technique of resection

D: Number of patients with radical surgical resection for whom the technique of resection is known

### *Conventional*

N: Number of patients in denominator for whom the technique of resection is 'conventional', as indicated by the surgeon.

D: Number of patients with radical surgical resection for whom the technique of resection is known

### *Missing technique of resection*

N: Number of patients in denominator for whom the technique of resection is missing

D: Number of patient with radical surgical resection

## Type of resection and reconstruction

### 1) Local excision / TEM(S)

#### *Global*

N: Number of patients in denominator in whom local excision or TEM(S) was performed as the only surgical treatment

D: Number of patients treated with any type of resection

### 2) Proportion of APER, Hartmann's procedure or total excision of colon and rectum with definitive ileostomy (KCE 2008 QCI 1232a adapted; outcome indicator)

#### *Global (QCI)*

N: Number of patients in denominator in whom APER or Hartmann's procedure or total excision of colon and rectum with definitive ileostomy was performed

D: Number of patients treated with any type of resection for rectal cancer at any known level

#### *For high rectal cancer (> 10 cm)*

N: Number of patients in denominator in whom APER or Hartmann's procedure or total excision of colon and rectum with definitive ileostomy was performed

D: Number of patients treated with any type of resection for tumour in upper third

#### *For mid rectal cancer (> 5 - ≤ 10 cm)*

N: Number of patients in denominator in whom APER or Hartmann's procedure or total excision of colon and rectum with definitive ileostomy was performed

D: Number of patients treated with any type of resection for tumour in middle third

***For low rectal cancer ( $\leq 5$  cm)***

N: Number of patients in denominator in whom APER or Hartmann's procedure or total excision of colon and rectum with definitive ileostomy was performed

D: Number of patients treated with any type of resection for tumour in lower third

**3) SSO*****Global***

N: Number of patients in denominator in whom a high or low anterior resection with CRA, or complete rectum resection (TME) with straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction was performed

D: Number of patients treated with any type of resection for rectal cancer at any known level

***High anterior resection + CRA (colorectal anastomosis above the peritoneal reflection)***

N: Number of patients in denominator with high anterior resection + CRA

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Low anterior resection + CRA (colorectal anastomosis below the peritoneal reflection)***

N: Number of patients in denominator with low anterior resection + CRA

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Complete rectum resection (TME) + CAA of any type (global)***

N: Number of patients in denominator with complete rectum resection (TME) + straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Straight CAA***

N: Number of patients in denominator with complete rectum resection + straight coloanal anastomosis

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Coloplasty***

N: Number of patients in denominator with complete rectum resection + coloplasty and CAA

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Colon J-Pouch***

N: Number of patients in denominator with complete rectum resection + colon J-pouch-anal anastomosis

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Side-to-end***

N: Number of patients in denominator with complete rectum resection + side-to-end coloanal anastomosis

D: Number of patients treated with any type of resection for rectal cancer at any known level

***Complete resection of colon and rectum with IPAA (Ileal Pouch-Anal Anastomosis)***

N: Number of patients in denominator with complete resection of colon and rectum with IPAA

D: Number of patients treated with any type of resection for rectal cancer at any known level

#### 4) Missing type of reconstruction

N: Number of patients in denominator for whom the type of reconstruction is missing

D: Number of patients treated with any type of resection for rectal cancer at any known level

#### Distal anastomosis technique after SSO for low rectal cancer ( $\leq 5$ cm)

##### **Stapled anastomosis after SSO for RC in lower third**

N: Number of patients in denominator in whom a stapled anastomosis was performed

D: Number of patients with tumour in lower third treated with SSO and reconstruction and for whom anastomosis technique is reported

##### **Manual anastomosis after SSO for RC in lower third**

N: Number of patients in denominator in whom a manual anastomosis was performed

D: Number of patients with tumour in lower third treated with SSO and reconstruction and for whom anastomosis technique is reported

##### **Missing data on distal anastomosis technique after SSO for RC in lower third**

N: Number of patients in denominator for whom the distal anastomosis technique (stapled/manual) is missing

D: Number of patients with tumour in lower third treated with SSO and reconstruction

#### Derivative stoma after SSO with reconstruction

##### ***After PME***

N: Number of patient in denominator with a primary derivative stoma (constructed at the time of SSO)

D: Number of patients in whom PME and SSO with reconstruction were performed

##### ***Missing data on derivative stoma after PME***

N: Number of patients in denominator for whom it is not stated whether they had a primary derivative stoma (constructed at the time of SSO) or not

D: Number of patients in whom PME and SSO with reconstruction were performed

##### ***After TME (restorative rectum resection)***

N: Number of patient in denominator with a primary derivative stoma (constructed at the time of SSO)

D: Number of patients in whom TME and SSO with reconstruction ('restorative rectum resection') were performed

##### ***Missing data on derivative stoma after TME (restorative rectum resection)***

N: Number of patients in denominator for whom it is not stated whether they had a primary derivative stoma (constructed at the time of SSO) or not

D: Number of patients in whom TME and SSO with reconstruction ('restorative rectum resection') were performed

**Note: for potential improvement it is important to know whether a primary derivative stoma was constructed (i.e. at primary radical surgery with SSO procedure) or not**

**Rate of patients with major leakage of the anastomosis (KCE 2008 QCI 1233; outcome indicator)*****Major leakage after PME + SSO + reconstruction***

N: Number of patients with major leakage of the anastomosis (requiring reoperation for leakage)

D: Number of patients treated with PME (high or low anterior resection with colorectal anastomosis) and for whom it is reported whether there were postoperative complications or not.

***Major leakage after TME + SSO + reconstruction (global, i.e. with or without primary derivative stoma)***

N: Number of patients with major leakage of the anastomosis (requiring reoperation for leakage)

D: Number of patients treated with TME (complete rectum resection (TME) + straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction) and for whom it is reported whether there were postoperative complications or not.

***Major leakage after TME + SSO + reconstruction with primary derivative stoma (constructed at the time of SSO)***

N: Number of patients with major leakage of the anastomosis (requiring reoperation for leakage)

D: Number of patients treated with TME (complete rectum resection (TME) + straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction) with primary derivative stoma constructed at the time of SSO and for whom it is reported whether there were postoperative complications or not

***Major leakage after TME + SSO + reconstruction without primary derivative stoma (constructed at the time of SSO)***

N: Number of patients with major leakage of the anastomosis (requiring reoperation for leakage)

D: Number of patients treated with TME (complete rectum resection (TME) + straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction) without primary derivative stoma constructed at the time of SSO and for whom it is reported whether there were postoperative complications or not

**Proportion of patients with stoma 1 year after sphincter-sparing surgery (KCE 2008 QCI 1232b; outcome indicator)**

N: Number of patients in denominator still having a stoma 1 year after surgery

D: Number of patients treated with TME (complete rectum resection (TME) + straight CAA, coloplasty, pouch, side-to-end CAA, total excision of colon and rectum with IPAA, or another specified type of reconstruction) with a primary (constructed at the time of SSO) or secondary (constructed after SSO) derivative stoma or dismantling of anastomosis still alive 1 year after surgery and for whom follow-up at 1 year or more is known

**30-day mortality (KCE 2008 QCI 1234; outcome indicator)**

N: Number of patients in denominator who died within 30 days after surgery

D: Number of patients treated with radical surgical resection and for whom it is known whether they died within 30 days after surgery and for whom the dates of surgery and survival or death are known

**90-day mortality (outcome indicator)**

N: Number of patients in denominator who died within 90 days after surgery

D: Number of patients treated with radical surgical resection and for whom it is known whether they died within 90 days after surgery and for whom the dates of surgery and survival or death are known

**Postoperative major surgical morbidity with reintervention under narcosis after radical surgical resection (new QCI; outcome indicator)**

N: Number of patients in denominator who presented major surgical morbidity requiring reintervention under narcosis

D: Number of patients treated with radical surgical resection and for whom postoperative data on morbidity/mortality are available

**ASA (only for patients with radical surgical resection)*****ASA 1***

N: Number of patients in denominator having ASA 1

D: Number of patients treated with radical surgical resection and for whom ASA is known

***ASA 2***

N: Number of patients in denominator having ASA 2

D: Number of patients treated with radical surgical resection and for whom ASA is stated

***ASA 3***

N: Number of patients in denominator having ASA 3

D: Number of patients treated with radical surgical resection and for whom ASA is stated

***ASA > 3***

N: Number of patients in denominator having ASA greater than 3

D: Number of patients treated with radical surgical resection and for whom ASA is stated

***Missing data on ASA***

N: Number of patients in denominator for whom ASA is missing

D: Number of patients treated with radical surgical resection

**Median length of hospital stay (in days) after radical surgical resection**

Hospital stay is computed as the number of days between date of radical surgical resection and discharge date for the patients treated with radical surgical resection who did not die in-hospital.

**Missing discharge date**

N: Number of patients in denominator for whom discharge date is missing

D: Number of patients treated with radical surgical resection who did not die in-hospital

## 1.7. Pathology

### **Quality of TME assessed according to Quirke and mentioned in the pathology report (KCE 2008 QCI 1272; process indicator)**

N: Number of patients for whom the external surface of TME was reported in the pathology report sheet

D: Number of patients treated with TME as indicated by the surgeon after the 1<sup>st</sup> of January 2007

#### ***TME severely irregular (since 1/2007)***

N: Number of patients in denominator for whom the mesorectal surface is severely irregular

D: Number of patients treated with radical surgical resection and TME as reported by the surgeon and for whom the TME quality is reported (after 1<sup>st</sup> January 2007)

### **Mesorectal (y)pCRM mentioned in mm in the pathology report if radical surgical resection (KCE 2008 QCI 1275; process indicator)**

N: Number of patients in denominator for whom the mesorectal (y)pCRM was mentioned in mm in the pathology report

D: Number of patients treated with radical surgical resection and for whom a pathology report was completed.

Note: For this indicator, patients with ypStage 0 or (y)pStage X are excluded for analysis

### **Distal margin involvement mentioned after SSO or Hartmann (new QCI; outcome QCI)**

N: Number of patients in denominator for whom it was reported whether the distal resection margin was invaded or not

D: Number of patients treated with Hartmann's procedure or SSO with reconstruction and for whom a pathology report sheet was completed.

Note: For this indicator, patients with ypT0 and ypTis are excluded for analysis

### **Distal tumour-free margin mentioned in the pathology report (KCE 2008 QCI 1273; process indicator)**

N: Number of patients in denominator for whom the length of the distal free tumour free margin was reported in the pathology report

D: Number of patients treated with SSO or Hartmann's procedure and for whom a pathology report sheet was completed.

Note: patients with ypT0 and ypTis are excluded for the analysis

### **Mean distal tumour-free margin after SSO or Hartmann's procedure**

Note: For this indicator, patients with ypT0 and ypTis are excluded for analysis

#### ***For high rectal cancer (> 10 cm)***

Mean distal tumour-free margin (in cm) of patients in the upper third treated with SSO or Hartmann for whom the distal tumour-free margin is known

#### ***For mid rectal cancer (> 5 - ≤ 10 cm)***

Mean distal tumour-free margin (in cm) of patients in the middle third treated with SSO or Hartmann for whom the distal tumour-free margin is known



***For low rectal cancer ( $\leq 5$  cm)***

Mean distal tumour-free margin (in cm) of patients in the lower third treated with SSO or Hartmann for whom the distal tumour-free margin is known

***Missing data on length of distal margin***

N: Number of patients in denominator for whom the distal tumour-free margin is not mentioned

D: Number of patients treated with SSO or Hartmann's procedure

**(y)pT categories after radical surgical resection**

**Note:** if no tumour was found in a radical surgical resection specimen after previous endoscopic or local excision, the (y)pT category of the endoscopic or local excision (was asked and) was used for T-staging whether the patient received (chemo)radiation between local and radical treatment or not.

***ypT0***

N: Number of patients with ypT0

**Note:** this category includes resection specimen of patients in whom no tumour was found after neoadjuvant treatment followed by radical surgical resection

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

**Note:** Patients with pT0 or pTis at endoscopic polypectomy, LE, TEMS or radical resection are excluded from the database for analysis.

***ypTis***

N: Number of patients with ypTis

**Note:** pTis rectal cancer is not included in the PROCARE database.

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

**Note:** Patients with pT0 or pTis at endoscopic polypectomy, LE, TEMS or radical resection are excluded from the database

***(y)pT1***

N: Number of patients with (y)pT1

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

***(y)pT2***

N: Number of patients with (y)pT2

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

***(y)pT3***

N: Number of patients with (y)pT3

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

***(y)pT4***

N: Number of patients with (y)pT4

D: Number of patients treated with radical surgical resection and for whom (y)pT is not missing

***Missing data on (y)pT status***

N: Number of patients treated with radical surgical resection in denominator for whom (y)pT is missing (Tx, Tm)

D: Number of patients treated with radical surgical resection

**(y)pN categories after radical surgical resection*****(y)pN 0***

N: Number of patients in denominator with (y)pN0

**Note:** this category also includes resection specimen of patients in whom no nodes were found after neoadjuvant treatment followed by radical surgical resection

D: Number of patients treated with radical surgical resection and for whom (y)pN is not missing

***(y)pN +***

N: Number of patients in denominator with (y)pN1 or (y)pN2

D: Number of patients treated with radical surgical resection and for whom (y)pN is not missing

***Missing data on (y)pN status***

N: Number of patients treated with radical surgical resection in denominator for whom (y)pN is missing

D: Number of patients treated with radical surgical resection

**Number of lymph nodes examined (KCE 2008 QCI 1274; process indicator)**

The median number of lymph nodes examined is computed for the following conditions:

- no or short course neoadjuvant RT
- long course neoadjuvant RT
- course type missing

**Tumour regression grade (Dworak) mentioned in the pathology report (after long course neoadjuvant treatment) (KCE 2008 QCI 1276; process indicator)**

N: Number of patients in denominator having their tumour regression grade mentioned in the pathology report

D: Number of patients treated with neoadjuvant long course radio(chemo)therapy and surgery (incl. any type of 'local excision')

***(y)pStage after radical surgical resection******ypStage 0***

N: Number of patients in denominator with ypStage 0 or ypTisN0

D: Number of patients treated with radical surgical resection and for whom ypStage is not missing

***(y)pStage I***

N: Number of patients in denominator with (y)pStage I

D: Number of patients treated with radical surgical resection and for whom (y)pStage is not missing

***(y)pStage II***

N: Number of patients in denominator with (y)pStage II

D: Number of patients treated with radical surgical resection and for whom (y)pStage is not missing

***(y)pStage III***

N: Number of patients in denominator with (y)pStage III

D: Number of patients treated with radical surgical resection and for whom (y)pStage is not missing

***(y)pStage IV***

N: Number of patients in denominator with (y)pStage IV

**Note:** including patients with cM+ based on imaging and/or intra-operative findings

D: Number of patients treated with radical surgical resection and for whom (y)pStage is not missing

***(y)pStage X***

N: Number of patients in denominator with (y)pStage X due to (y)pTx and/or (y)pNx and/or cMx.

D: Number of patients treated with radical surgical resection and for whom (y)pStage is not missing

***Missing data on (y)pStage***

N: Number of patients in denominator for whom (y)pStage is missing

D: Number of patients treated with radical surgical resection

## 1.8. Adjuvant treatment

### **Proportion of (y)pStage III patients with R0 resection that received adjuvant chemotherapy starting within 3 months after surgery (KCE 2008 QCI 1241; process indicator)**

N: Number of patients in denominator receiving adjuvant chemotherapy within 3 months after surgery

D: Number of patients treated with R0 radical surgical resection for (y)pStage III and for whom the start date of adjuvant chemotherapy is known

### ***Missing data on adjuvant chemotherapy for (y)pStage III after R0 resection***

N: Number of patients in denominator for whom the date of the start of adjuvant chemotherapy is not known

D: Number of patients treated with R0 radical surgical resection for (y)pStage III

### **Proportion of (y)pStage II-III patients with R0 resection that started adjuvant chemotherapy for (y)pStage II or III within 3 months after surgery (KCE 2008 QCI 1243; process indicator)**

N: Number of patients in denominator receiving adjuvant chemotherapy within 3 months after surgery

D: Number of patients treated with R0 radical surgical resection for (y)pStage II or III and for whom the start date of adjuvant chemotherapy is known

### **Missing data on adjuvant chemotherapy for (y)pStage II or III after R0 resection**

N: Number of patients in denominator for whom the date of the start of adjuvant chemotherapy is not known

D: Number of patients treated with R0 radical surgical resection for (y)pStage II or III

## 1.9. Follow-up

### Number of follow-up forms registered per follow-up time period.

For each follow-up period: 12,24,36,48,60 months.

N: Number of patients in denominator for whom the follow-up form is completed

D: Number of patients alive at the time of follow-up and without previously reported local recurrence or metastasis

**Note. Regular submission of follow-up data is essential for calculation and assessment of important quality of care indicators such as disease-free survival, late grade 4 toxicity after radio(chemo)therapy. Detailed follow-up data should have been provided at least annually.**

## Part 2: PROCARE completeness 2006-2011

### 2.1. Introduction

The completeness results presented in this section are based on the Belgian Cancer Registry (BCR) database coupled with data on diagnostics and treatment ('facturatiegegevens'), delivered by the InterMutualistic Agency (IMA) for the incidence years 2006-2011.

The *crude participation rate* is the registration rate over the full incidence period 2006-2011.

The *specific participation rate* is the inclusion rate during the time period each team was "actively" registering, taking into account late entry or teams that have stopped to register.

### 2.2. Methods

The methodology of this part is taken from the PROCARE completeness study [Jegou D et al., "Completeness and registration bias in PROCARE, a Belgian multidisciplinary project on cancer of the rectum with participation on a voluntary basis", *Eur J Cancer* (2014) 51, 1099-108].

#### 2.2.1. Data sources

Three databases were used: the population-based Belgian Cancer Registry (BCR) database, the InterMutualistic Agency (IMA) database and the PROCARE database. All patients with rectal cancer (coded as C20, ICD-10) with an incidence date between **January 1, 2006 and December 31, 2011** were selected from the BCR database. In order to make the BCR and PROCARE databases comparable, the following patients were excluded: non-adenocarcinomas, non-invasive adenocarcinomas (pTis), patients with synchronous primary cancer (within 3 months), no previous colorectal tumour and non-Belgian citizens.

A lower upper limit for rectum cancer is used as an inclusion criterion within PROCARE compared to the standard BCR registration, the consequence is a small underestimation of the participation rate. On average this underestimation will be the same for all centres. The accuracy of the participation rate estimation is about 5%. This accuracy was evaluated by checking individually the allocation of around 100 patients in a hospital over 2 incidence years.

#### 2.2.2. Treatment data and centre allocation

The IMA database allowed identification of (neo)adjuvant treatment and type of surgery. The time window allowed for (neo)adjuvant treatment was set at 3 months prior to or after the date of surgical resection.

The IMA database also provides the centre where treatment was performed. Patients were assigned to the centre where the surgery was performed or where chemotherapy was administered if the primary tumour was not resected. If the centre of surgery was missing then the centre where the (neo)adjuvant was chemotherapy administered was assigned. If the centre of (neo)adjuvant chemotherapy was missing then the centre where the radiotherapy was administered was assigned. If no centre of radiotherapy was known, the centre of colonoscopy was assigned. If all treatment information was missing, the patient was assigned to the centre that delivered the MOC/COM form.

Completeness of PROCARE registration was evaluated on the entire period (crude participation) and represented the coverage of PROCARE during the period 2006-2011. The completeness was also evaluated in a specific way. The specific participation represents the percentage of patients included in PROCARE with an incidence date between the first and the last patient registered by a specific centre and evaluates the potential registration bias for that centre.

### **2.2.3. Results**

The crude and specific participation rate of your team and the full PROCARE database stratified by patient and tumour characteristics, treatment scheme and vital status at 3 year is given in table 13.

A comparison of the specific participation rate stratified by gender, age group, clinical stage and treatment scheme of your team to PROCARE is visualised in figure 5.

The variability of the specific participation rate over centres versus their number of PROCARE registrations is given in figure 6 and 7.

# Part 3: Population based survival outcomes 2006-2011

## 3.1. Introduction

This section presents survival results based on the **Belgian Cancer Registry (BCR) database** for the incidence years 2006-2011 coupled with IMA data. Your complete centre patient population is therefore taken into account, and centre specific **population based results are given**. Your results are compared to the Belgian national level over the same incidence period.

Remark that survival results given in the previous yearly PROCARE reports were only based on patients effectively registered into PROCARE and could not be generalised to the complete rectum cancer patient population on the national level. Generalisation of your PROCARE team results to the overall rectum cancer patient group of your centre was not possible, unless all your patients were registered into PROCARE or a representative sample of your rectal cancer patient population was entered into PROCARE (see Part 2, PROCARE Completeness).

Survival outcomes considered in this report are

- observed survival (OS)
- relative survival (RS)
- 30- and 90-day postoperative mortality

Survival results are given for the complete centre patient population as well as for the centre patient group that underwent radical resection.

## 3.2. Methods

### 3.2.1. Data sources

Due to the PROCARE bias, the survival results are based on the national cancer registry database, giving population based results. Rectal cancer cases in the Belgian population with an incidence date between January 1, 2006 and at December 31, 2011 were selected for the survival analysis. The inclusion and exclusion criteria were matched as closely to PROCARE as possible: Belgian residents with an invasive adenocarcinoma rectum cancer diagnosis, excluding multiple primary rectum cancer tumours or synchronous invasive tumours ( $\pm$  3 months around the rectum cancer incidence date).

Patients with missing survival time or region (Brussels Capital, Flanders or Wallonia) were excluded. The incidence date was used as the date of start (at risk) for the calculation of the survival time. Survival status was obtained through cross-link with the Crossroads Bank for Social Security, with a vital status date at October 1<sup>st</sup>, 2014.

The IMA database allowed identification of (neo)adjuvant treatment and type of surgery. The time window allowed for (neo)adjuvant treatment was set at 3 months prior to or after the date of surgical resection.

The IMA database also provides the centre where treatment was performed. Patients were assigned to the centre where the surgery was performed or where chemotherapy was administered if the primary tumour was not resected. If the centre of surgery was missing then the centre where the (neo)adjuvant was chemotherapy administered was assigned. If the centre of (neo)adjuvant chemotherapy was missing then the



centre where the radiotherapy was administered was assigned. If no centre of radiotherapy was known, the centre of colonoscopy was assigned. If all treatment information was missing, the patient was assigned to the centre that delivered the MOC/COM form.

### **3.2.2. Survival outcomes**

#### **3.2.2.1. Observed survival (KCE 2008 QCI 1111; outcome indicator)**

Observed survival was calculated from the date of incidence until the date of death or until the last known vital status derived from the Belgian Crossroads Bank for Social Security on October 1<sup>st</sup>, 2014. The Kaplan-Meier method was used to estimate observed survival proportions at 5 year since diagnosis.

#### **3.2.2.2. Relative survival (KCE 2008 QCI 1112; outcome indicator)**

The relative survival is the ratio of the observed survival to the expected survival of a comparable group from the general population which is matched to the cancer patients with respect to a set of main factors influencing survival. The expected survival was estimated from the Belgian life tables stratified by age, gender, calendar time and region and the relative survival was calculated using the Ederer II method, aggregated in time intervals of 12 months.

#### **3.2.2.3. Postoperative mortality (KCE 2008 QCI 1234; outcome indicator)**

Postoperative mortality is calculated as the fraction of patients that did not survive 30 (90) days since surgery (not including the surgery day itself). Two (three) patients were censored within 30 (90) days since surgery and were removed for the postoperative mortality analyses.

### **3.2.3. Adjustment models**

Due to difference in patient and tumour baseline characteristics (patient case mix) which can influence survival outcome, units can not directly be compared on the basis of the unadjusted survival results. In order to correct as much as possible for patient case mix, adjustment analyses were performed for the survival outcomes.

Where applicable, the following baseline characteristics were taken into account for the adjustment model building:

- Gender
- Age
- Clinical stage
- WHO score
- Radical resection applied or not (not applicable for analyses considering the patient group with radical resection)

#### **3.2.3.1. Observed survival**

Cox regression models were used to perform the adjustment of the Observed Survival. Non-proportional hazards effects in any of the adjustment covariates were identified in a univariable way and were accounted for by introducing an interaction with a time-dependent covariate splitting the time axis in 2 intervals, resulting in a piecewise proportional hazards model. Interactions between predictors were evaluated in a 'stepwise forward selection' model building procedure ( $\alpha_{in}=0.01$ ).

Adjusted observed survival results are reported if your team has at least 50 patients eligible for survival analysis and a minimum follow-up of 5 year. Patients of too small units are taken into account in the adjustment model by grouping these centres into a fictive centre.

The adjusted observed survival proportion at 5-year for a given centre is calculated according to a direct standardisation approach: the cox regression model results are used to predict the observed survival for all patients if those patients would all be treated in that unit.

The centre specific adjusted observed survival results are visualised by a forest plot (see § 3.2.4 for a general description of a forest plot) of the adjusted Hazard Ratio (HR) for death of any cause. The reference value is the hazard ratio for “the average patient”, obtained as a weighted sum of the centre specific hazard ratios, using the number of patients per centre as weights.

### *3.2.3.2. Relative survival*

Relative survival proportions were estimated after aggregation over gender, age, region and calendar year strata. Poisson models for the number of observed deaths grouped by the adjustment covariates were applied to adjust for patient case mix. Interactions between predictors were evaluated in a ‘stepwise forward selection’ model building procedure ( $\alpha_{in}=0.01$ ).

Adjusted relative survival results are reported if your team has at least 100 patients eligible for survival analysis and a minimum follow-up of 5 year. Patients of too small units are taken into account in the adjustment model by grouping these centres into a fictive centre.

The adjusted relative survival proportion at 5-year for a given centre is calculated according to a direct standardisation patients: the adjustment model results are used to predict the relative survival for all patients if those patients would all be treated in that unit.

The centre specific adjusted relative survival results are visualised by a forest plot see § 3.2.4 for a general description of a forest plot) of the adjusted Relative Excess Risk (RER) for cancer related death. The reference value is the relative excess risk for “the average patient”, obtained as a weighted sum of the centre relative excess risks, using the number of patients per centre as weights.

### *3.2.3.3. 30- and 90-day postoperative mortality*

Logistic regression models were applied to adjust the probability of postoperative death for patient case mix. Interactions between predictors were evaluated in a ‘stepwise forward selection’ model building procedure ( $\alpha_{in}=0.01$ ).

Adjusted postoperative mortality results are reported if your team has at least 50 patients eligible for analysis. Patients of too small units are taken into account in the adjustment model by grouping these centres into a fictive centre.

The adjusted postoperative mortality proportion at 30 or 90-day for a given centre is calculated according to a direct standardisation approach: the adjustment model results are used to predict the mortality fraction for all patients if those patients would all be treated in that unit.

The centre specific adjusted postoperative mortality results are visualised by a forest plot (see § 3.2.4 for a general description of a forest plot) of the adjusted odds ratio (OR) for post-operative death. The reference value is the odds ratio for “the average patient”, obtained as a weighted sum of the centre odds ratios, using the number of patients per centre as weights.

## **3.2.4. Forest plot**

A forest plot is a scatter plot showing an estimate (an outcome variable, a regression parameter, ...) with its confidence interval on the vertical axis versus unit ranking or a different unit property on the horizontal axis. The forest plot contains a horizontal reference line to which the confidence intervals per unit can be compared.

Forest plots are given in the feedback report to present the risk adjusted survival outcome results. An arbitrary ranking of units is used on the horizontal axis.

*Interpretation of the forest plot:* If the reference line cuts the confidence interval, the estimate for that unit is not significantly different from the reference (at the confidence level applied, mostly 95%). If the confidence interval does not contain the reference value, the estimate for that centre is significantly different from the reference (at the significance level applied).