
This white paper was produced in collaboration with Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, Máxima Medical Center, Eindhoven, The Netherlands.

Dr. Gerrit Slooter is a paid consultant of Johnson & Johnson Medical Devices Companies.
Acknowledgments

This white paper has been developed by Johnson & Johnson Medical Devices Companies (JJMDC) in collaboration with Dr. Gerrit Slooter.

Dr. Gerrit Slooter, M.D., Ph.D.
Surgical Oncologist, Máxima Medical Center

This paper describes the journey undertaken by Dr. Gerrit Slooter and his team to improve the outcomes of colorectal surgery at Máxima Medical Center (MMC) in Eindhoven, The Netherlands; they achieved a significant reduction in complications, shorter hospital stay, better quality of life and delivered cost savings.¹

Key elements that have led to this success are:

• the utilization of a multidisciplinary approach involving all stakeholders (doctors, nurses, management, and patients) across the pathway;
• high compliance to enhanced recovery principles;
• improvement of patient-related risk factors including prehabilitation (a four-pillar program to improve the patients’ condition before surgery).

Dr. Slooter and his team are widely published in the fields of improvements in patient care and prehabilitation. They organized the 2018 World Prehabilitation Conference in Eindhoven, The Netherlands, and initiated the International Prehabilitation Society.² MMC is the colorectal reference center for JJMDC, where they showcase their Colorectal Care 3.0 program on patient pathway innovations and prehabilitation to other healthcare institutions. This program is designed to help multidisciplinary teams from other hospitals to improve their care pathway from referral to the end of follow-up, 5 years after surgery. Dr. Slooter and his team wish to continue sharing their knowledge in colorectal care and prehabilitation and learn from others mutually, in order to further improve patient care.

Stop talking, start walking.
– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC
Máxima Medical Center Before the Implementation of Enhanced Recovery Principles

MMC is one of the largest healthcare providers in the Southeastern Brabant region of The Netherlands, located at two sites in Veldhoven and Eindhoven. Since 2015, the center has been at the forefront of developments and quality assurance for colorectal surgery in The Netherlands. In part, this is due to the introduction of multidisciplinary involvement in designing the treatment pathway with the hospital’s management and other specialties.

MMC has an extensive history in laparoscopic surgery, being one of the first hospitals in The Netherlands to offer a laparoscopic solution for all bowel operations since 2004. Since then, the hospital has played an important part in the nationwide rollout of laparoscopic colorectal surgery by:

• acting as a training institute in advanced colorectal laparoscopic surgery;
• organizing masterclasses;
• organizing national conferences on laparoscopy such as the annual Johnson & Johnson Expert Meeting on Colorectal and Liver Surgery;
• representing medical professionals on national boards such as the Dutch Society of Endoscopic Surgery and the Workgroup for Innovative and Endoscopic Surgery.

In 2015, the center reflected on the results of the 2012–2014 national level audit. The Department of Colorectal Surgery concluded that the hospital’s outcome parameters for colorectal surgery were at an average level and could be improved to better reflect a center at the forefront of colorectal care. MMC considered the National Dutch Institute for Clinical Auditing average to be a benchmark along with average outcome parameters for laparoscopic surgery from international literature. Particular outcomes that the center was motivated to further improve are illustrated below.

Complications, such as anastomotic leaks, represent a significant burden on colorectal care. They have a considerable impact on a patients’ quality of life, as well as on the burden of all healthcare providers involved in the care pathway. These outcomes meant that 1 in 12 patients were likely to require a further operation and a temporary or permanent stoma.

Complications within 30 days post-surgery:

- 26.5% of patients had complications
- mean comprehensive complication index (CCI) of 10

Anastomotic leaks:

- 8.0% of patients experienced anastomotic leak

The economic burden of anastomotic leaks on a hospital is also considerable. At MMC, the extra pressure exerted on facilities can lead to a 3 to 4-fold increase in the cost of care, compared to the cost of care for a patient without anastomotic leakage.

Anastomotic leaks are of particular concern to surgeons involved in laparoscopic colorectal surgery. Surgeons at MMC have reported experiencing a considerable mental burden associated with supporting patients and their caregivers through such a serious complication.

"It is the complicated cases we remember, while we forget the patients we cure."

– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC

MMC outcomes data for 2012–2014 based on 190–200 surgical operations for colorectal cancer patients per year, of which >90.0% were performed laparoscopically*
Máxima Medical Center and Enhanced Recovery Principles

Since 2004, MMC has delivered peri-operative care for laparoscopic colorectal surgery according to enhanced recovery principles (see Appendix for more information), including the Enhanced Recovery After Surgery (ERAS®) protocols. The ERAS® protocols comprise evidence-based measures designed to reduce the stress response and limit the burden of surgery on patients.

Important measures include:
• no long-acting sedatives before the operation and pre-operative carbohydrates;
• restrictive fluid management during the operation;
• temperature management;
• no gastric tube or abdominal drain after the operation;
• early mobilization and feeding following the operation (on the day of surgery).

The center introduced all 23 recommended ERAS® protocols and this coincided with the wide introduction of laparoscopic surgery. As a result, colorectal care progressed from old principles to evidence-based medicine. The center called this the Colorectal Care 1.0 program.

In 2014, MMC determined that its compliance with enhanced recovery principles was suboptimal. Internal investigation indicated that ERAS® protocols were being adhered to in only 30% of patient treatments. The center was therefore motivated to improve compliance with enhanced recovery principles. As such, improvement in overall colorectal care was the responsibility of all key stakeholders across the treatment pathway.

Máxima Medical Center’s Approach to Improving Care

In 2015, MMC convened 140 internal stakeholders across the colorectal care pathway. This inaugural meeting was dedicated to the new colorectal care pathway and focused on compliance with a fully integrated approach to pre-, peri-, and post-operative care. As a result, the Colorectal Care 2.0 program was established. Monthly, cross-functional training in peri-operative care was used to reinforce the importance of all aspects of the treatment pathway and fully integrate key stakeholders working across different departments. In particular, the training highlighted that patient risk factors are the most important reason for the onset of complications (as published by MMC based on their hospital cohort).8,9 Adjusting modifiable risk factors in patients was therefore the most important starting point for improving outcomes in colorectal care.

The improvement processes were driven by the Pathway Director and Surgical Oncologist Dr. Gerrit Slooter, M.D., Ph.D. He was responsible for:

1. Monitoring pathway compliance and outcomes of patient care
2. Advising the organization on process improvements
3. Implementing the agreed improvements
Additionally, the center appointed three nurse specialists (Case Managers) to ensure improvements to the processes for colorectal care were in line with current scientific research. The Case Managers are responsible for:

- Education and counselling; optimizing patient-centered care
- Monitoring and organizing individual patient care in detail
- Collecting, processing and analyzing patient feedback; advising the Pathway Director

Through the mutual exchange of information, as part of an international collaboration, colleagues from Montréal General Hospital and McGill University in Canada were also engaged to help design the improvement processes, including lean management systems.

**Introduction of Prehabilitation to Enhanced Recovery Principles**

Prehabilitation can be defined as the multimodal preparation of patients prior to surgery. The addition of a 4-week period of prehabilitation to the enhanced recovery principles completed the Colorectal Care 3.0 program. In 2016, the MMC Colorectal Care 3.0 program was set in place, following the initiation of a clinical study for prehabilitation. Together with Professor Dr. Francesco Carli, Dr. Slooter and Stefan van Rooijen established an international consortium aimed at carrying out a randomized controlled trial in colorectal prehabilitation in more than 700 patients with colon cancer (the PREHAB study); 50 patients from MMC participated in a pilot of this study.

All patients who were enrolled in the prehabilitation program improved their functional performance before surgery. Four weeks after surgery (follow-up as defined by the study protocol), 86.0% of patients who underwent prehabilitation reached their pre-operative health status (as measured by six strength and fitness tests) compared with 40.0% of patients in the control group.\footnote{5}

Colorectal Care 3.0 was an integral part of the hospital’s success in driving integration to deliver improved outcomes. Introducing this protocol ensured that the care pathway encompassed all treatment from the point of diagnosis to the end of patient follow-up.

MMC is continuing to drive improvement to their colorectal care pathway beyond Colorectal Care 3.0.

In 2018, MMC started to implement prehabilitation in other care pathways including liver surgery, bladder surgery, and lung surgery, amongst others. Furthermore, the center and Dr. Slooter continue to collaborate on the widespread implementation of prehabilitation principles at a national level; they are currently working with health system partners such as insurance companies and national authorities to set this in place. In June 2018, MMC organized the 2nd World Prehabilitation Conference in Eindhoven, The Netherlands and during this conference the International Prehabilitation Society was established. The 2019 event will be held July 2 to 3 at the British Museum in London, UK.

**Improved Outcomes Through the Colorectal Care 3.0 Program**

As a result of MMC’s implementation of its Colorectal Care 3.0 program, by the end of 2017 a considerable improvement in colorectal care had been observed, compared with 2012. Specifically, outcomes that previously reflected suboptimal care were markedly improved, including, and most importantly, the number of anastomotic leaks.
MMC outcomes data for 2015–2017 compared with 2012–2014, based on 190–200 surgical operations for colorectal cancer patients per year, of which >90.0% were performed laparoscopically*

These outcomes meant there was a reduction in the need for intensive post-operative care from 1 in 12 patients to 1 in 40 patients.

*Data from MMC daily practice as referred to by Dr. Slooter in an interview on 5 December 2018.

Other examples of how the implementation of improvement processes has delivered improved outcomes at MMC:

**Temperature Management**

Through better education, monitoring, and the introduction of a thermal jacket, patients are now operated on at normothermia (37.0°C). Before implementation, temperature was 35.5°C. Preventing peri-operative hypothermia is beneficial in reducing post-operative complications and can be cost-effective.

**Correction of Anemia**

Gastroenterologists are actively participating in the pathway. The day after endoscopy they start iron injections in anemic patients. In the weeks leading up to the operation, anesthesiologists check that hemoglobin (Hb) levels have risen sufficiently to 7.0 mmol/L (11.3 g/dL), instead of the limit used before implementation of 5.0 mmol/L (8.1 g/dL). This not only raises the Hb level but also improves the patient’s overall condition and their ability to benefit from prehabilitation.

**Optimal Patient Information**

All protocols and patient information folders have been renewed. The Case Managers now guide patients through the pathway and support the doctors in the decision-making process. They provide detailed information throughout the whole pathway. Patient involvement is optimized by individual support in the pre-, peri-, and post-operative phases.

**Expectation Management**

Since the content of the entire pathway is known to all caregivers at MMC, they can disseminate the same information. This means that patients know exactly what they can expect from the center’s caregivers and how they can contribute to improving their own recovery. Patients are informed that they can be discharged 2 days after surgery, providing there are no complications. More than 50% of patients will be discharged after 4 days. If these expectations are not clear to patients and their family, discharge could potentially be delayed because home support has not been prepared.

**Colorectal Care 3.0 Course**

Dr. Slooter and his team provide the Colorectal Care 3.0 Course on patient pathway innovations and prehabilitation.

“We have helped multidisciplinary teams from many countries to redesign their colorectal pathway based on ERAS® principles and improvement of patient risk factors. It is our ambition to share our knowledge and protocols to help others make their care value-based and patient-centered pathways.”

– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC

Through the improvement of each patient’s condition, and the re-emphasis of enhanced recovery principles, MMC reflects that patient outcomes for laparoscopic surgery have been elevated to the high standards expected of a specialist center.
The Support of Johnson & Johnson in the Implementation of Enhanced Recovery Principles

Johnson & Johnson Medical Devices Companies (JJMDC) is committed to translating what is most valued by patients into value-based solutions for hospitals. The Company’s ambition is to continue building collaborative partnerships with hospitals worldwide, to help achieve colorectal care pathway improvement.

This ambition is delivered through the CareAdvantage program, which is a data-driven, holistic partnership approach to help healthcare providers realize better care by aligning The Company’s broad capabilities to specific needs.

JJMDC believes that solutions start with listening, which is reflected in the way the Company operates:

Needs Identification
JJMDC defines challenges with its partners and performs analyses to define opportunities where it can help.

Co-creation
JJMDC works together with its partners to understand how your needs can be addressed using the unique capabilities that stem from being part of the Johnson & Johnson family of companies.

Desired Results
JJMDC implements a tailored approach to deliver results and measurable impact through comprehensive services and solutions ecosystem, which is connected by purpose and design.

As part of the CareAdvantage family of services, Patient Pathway capabilities are built with patients at the center. The Company offers custom designed pathway capabilities for comprehensive disease management that guide the coordination of care, standardization of key practices, and engage patients from hospital to home. This is supported by content, services and technology shaped to improve outcomes and patient experience, while eliminating inefficiencies and reducing cost of care.

JJMDC’s capabilities leverage broad organizational knowledge and expertise to help its partners with challenges they may be facing as they shift to a value-based healthcare model to include:
• developing and implementing care pathways across multiple therapeutic areas;
• understanding how to improve consumer and patient engagement;
• reducing waste and achieving additional operational efficiencies within the peri-operative and supply chain areas.

Through CareAdvantage, we help hospitals and healthcare providers achieve the ‘triple aim’

- Improve outcomes
- Increase patient satisfaction
- Reduce costs

To find out more about how Johnson & Johnson Medical Devices Companies can help you improve your patient pathway, contact emeaicareadvantage@its.jnj.com.
References

1. MMC hospital data on file as referred to by Dr. Slooter in an interview on 5 December 2018.


6. MMC hospital data on file as referred to by Dr. Slooter in an interview on 5 December 2018.


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Appendix

Enhanced Recovery for Colorectal Care

Enhanced recovery is the process of delivering continuous improvement across the entire acute care pathway, centered on shared decision-making between the patient and their healthcare team. Enhanced Recovery After Surgery (ERAS®) is an evidence-based care improvement process for surgical patients that was pioneered by Professor Henrik Kehlet in Denmark in the 1990s. Professor Kehlet demonstrated that key steps in the admission, pre-, peri-, and post-operative phases, can accelerate recovery and improve clinical outcomes in colorectal surgery.2–4

Recommended Steps for Colorectal Enhanced Recovery Principles

Pre-admission items
General pre-operative medical assessment and optimization is intuitively important and can include:
- pre-admission information, education and counselling;
- pre-operative optimization including smoking cessation;
- prehabilitation;
- pre-operative nutritional care;
- management of anemia.

Pre-operative items
Pre-operative optimization is necessary before colorectal surgery. This can include:
- prevention of nausea and vomiting;
- pre-anasthetic medication;
- antimicrobial prophylaxis and skin preparation;
- bowel preparation;
- pre-operative fluid and electrolyte therapy;
- pre-operative fasting and carbohydrate loading.

Intra-operative items
There are a number of protocols outlined for optimal intra-operative care in colonic surgery including:
- standard anesthetic protocol;
- intra-operative fluid and electrolyte therapy;
- preventing intra-operative hypothermia (definition: <36.0°C);
- surgical access including laparoscopic surgery;
- drainage of the peritoneal cavity and pelvis.

Post-operative items
To ensure colorectal care is optimized following the operation, and to establish whether the care protocol has been successfully implemented, the following steps should be considered:
- no gastric drainage;
- post-operative analgesia (in laparoscopic surgery) – specifically the avoidance of opiates such as morphine to enable early mobilization;
- thromboprophylaxis;
- post-operative fluid and electrolyte therapy;
- urinary drainage;
- prevention of post-operative ileus;
- post-operative glycemic control;
- post-operative nutritional care;
- early mobilization;
- auditing.
Healthcare funding, resourcing, and (in some European countries) reimbursement challenges mean that the original aims of enhanced recovery to reduce length of stay and improve post-operative recovery are increasingly relevant in modern surgery. Furthermore, as patient experience is now an integral part of an optimized management protocol, establishing enhanced recovery principles that in turn reduce the financial burden on healthcare systems, without compromising patient safety and improving quality of life, would be widely welcomed.

Implementation of enhanced recovery principles, like ERAS®, can result in major improvements in clinical outcomes and cost, making them an important example of value-based care applied to surgery.

Prehabilitation for Colorectal Care

Prehabilitation is one of the key steps involved in enhanced recovery principles and is designed to utilize the period between diagnosis and surgery to prepare the individual patient as effectively as possible and optimize treatment outcomes. Máxima Medical Center is a national and international leader in this area and, as such, prehabilitation plays an important role in colorectal care at the center.

Prehabilitation is a pre-operative conditioning intervention that has been shown to improve patient outcomes in colorectal care when compared with rehabilitation started after surgery.

Patients who undergo prehabilitation have shown improvement in pre-and post-operative walking distance, as well as pre-operative physical fitness, compared with those who only start rehabilitation post-surgery.

Prehabilitation comprises four main components:

- **Exercise**
  - Personalized training three times per week:
    - endurance: 20–30 minutes high intensity;
    - resistance: upper and lower body strength;
    - flexibility: stretching and core stability.
  - The other days of the week, it is recommended that patients perform cycling or brisk walking.

- **Nutritional Care**
  - Dietary changes based on nutritional intake assessment. This also includes supplementation of vitamins and proteins in order to achieve a total intake of 1.5 g/kg/day to enhance exercise.

- **Smoking Cessation**
  - Individual approach including nicotine replacement.

- **Anxiety-coping Intervention**
  - Mental support, relaxation techniques, and optimal patient information.

Throughout the care pathway, patients should routinely receive dedicated information, education, and counseling, including tasks that patients should be encouraged to fulfill. This has been shown to improve:

- procedural fear and anxiety;
- peri-operative feeding;
- early post-operative mobilization;
- pain control;
- respiratory physiotherapy;
- post-operative recovery and rate of hospital discharge.

*As observed in current practice.*
The Benefits of Implementing Enhanced Recovery Principles

The purpose of change, as delivered through the implementation of enhanced recovery principles and prehabilitation, is to improve clinical outcomes, patient experience, quality of elective care pathways, and staff experience. As a result, this can lead to significant reductions in hospital length of stay and cost-efficiency savings through release of resource.\(^9\)

The benefits of enhanced recovery principles extend to all specialisms involved in the colorectal care pathway, with improvements in the patient experience positioned clearly at the center.

Reasons to Implement Enhanced Recovery Principles

Benefits for patients

Productivity benefits

Quality of care benefits

Benefits for staff/care teams

Enhanced recovery principles demand a positive approach from the whole health community, including primary and secondary care, surgeons, anesthetists, nurses, and allied healthcare professionals. Embedding enhanced recovery principles requires investment and commitment for which hospitals will be rewarded with improved patient outcomes and cost efficiencies.

References


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