

# Checklist in colorectal surgery – proposal of experts of the Polish Club of Coloproctology and National Consultant in general surgery

## Authors' Contribution:

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## ABSTRACT

A checklist is a collection of information that helps reduce the risk of failure due to limitations in human memory and attention. In surgery, the first Surgical Safety Checklist (SSC), created under the supervision of WHO (World Health Organization), was established in 2007 and covers three stages related to the patient's stay in the operating theater and operation: 1. Prior to initiation (induction) of anesthesia; 2. before cutting the skin; 3. before the patient leaves the operating room. Colorectal surgery is particularly at high risk for complications and relatively high mortality. Elimination or, more likely, reducing the risk of complications by standardizing perioperative procedures may be particularly important in this group. The introduction of "dedicated" colorectal checklist surgery seems to be justified. The checklist proposed by the authors in colorectal surgery is divided into four stages, in which conscientious completion of checklists is intended to reduce the potential risk of complications due to hospitalization and surgical treatment. The presented checklist is obviously not closed, as a new publications or recommendations appear, some points may be modified, new issues may be added to the checklist. At present, however, it is a tool considering the well-known and confirmed elements of intraoperative procedures, the compliance of which may significantly reduce the rate of adverse events or surgical complications.

## KEYWORDS:

Checklist, colorectal surgery, surgical complications

## INTRODUCTION:

Checklists help decrease the risk of mistakes resulting from the limitations of the human memory and attention. There are different sorts of checklists ranging from simple "to-do lists" to more complicated schedules that indicate the order in which particular activities should be performed. The main advantage of checklists is that they document tasks that should be performed in a particular order.

Checklist were first used after an aircraft accident that took place in 1935 in Dayton, United States of America, in which a Boeing aircraft crashed due to pilot error, i.e., failure to perform a key take-off procedure.

After that accident, four sorts of aviation checklists were introduced, i.e., take-off, flight, before landing, and after landing checklists. These checklists listed tasks that should be performed by all pilots on all flights.

Subsequently, checklists found their use in other fields.

In 2007, the Surgical Safety Checklist (SSC) was developed under the auspices of the World Health Organization (WHO). This checklist concerns the three following surgery stages:

1. before induction of anesthesia
2. before skin incision
3. before patient leaves operating room

Before proceeding to another stage, a checklist coordinator has to confirm that the operating team has completed the tasks of the preceding stage.

Standardization of surgical procedures, e.g. with checklists such as the SSC, aims to reduce the risk of adverse events, intraoperative and postoperative complications, and patient mortality [1].

Individual centers can benefit from modifications of the WHO SSC in order to suit their local settings and surgery types performed [2]. It is crucial to consider work organization at each center and their real capabilities of fulfilling each checklist point [3]. However, modifications of the WHO SSC are controversial because of a lack of evidence justifying the extent of changes that would guarantee checklist effectiveness [4]. Hospitals are now required to use checklists on accreditation and insurance grounds.

Although the evidence strongly supports the use of surgical checklists, it is worth noting that some reports suggest that the WHO SSC may not be effective, especially in institutions with complex organizational structures that have their own systems of supervising medical procedures [5] or in pediatric institutions that use general surgical checklists [6]. However, such cases are exceptional.

Checklists build good habits and improve work organization among resident physicians and young specialist physicians [7].

Colorectal surgery is associated with a high complication risk and a relatively high mortality; therefore, risk mitigation by way

**Tab. I.** Checklist for colorectal surgery – proposal of the Polish Coloproctology Club and the National Consultant in General Surgery

<b>AT PATIENT ADMISSION</b>		
Has the patient's nutritional status been assessed?	TAK	NO
If the patient is malnourished, has a nutritional plan been implemented?	YES	NO
Has the patient been asked about allergies?	YES	NO
Has the patient been informed not to shave the operating area before surgery?	YES	NO
Is the patient pregnant? (in women of childbearing age or with irregular menses, an HCG-based pregnancy test should be performed)	YES not	NO applicable
Has the current biochemistry panel been checked?	YES	NO
Has the diagnosis been verified? (complete medical documentation, pathological report, imaging of the abdomen, chest x-ray)	YES	NO
Having been informed of a potential need to place a stoma, does the patient consent to proposed surgery?	YES	NO
Have the need and mode of glycemia control been specified?	YES	NO
Has the venous thromboembolism risk been assessed? Has adequate prophylaxis been administered?	YES	NO
<b>BEFORE TRANSFERRING PATIENT TO OPERATING ROOM:</b>		
Has the surgery course been explained to the patient?	YES	NO
Has the intended incision been specified?	YES	NO
Has stoma location been specified?	YES not	NO applicable
Has the bleeding risk been assessed? If anticipated blood loss is greater than 500ml, has appropriate blood transfusion products been ordered?	YES	NO
Czy określono schemat profilaktyki antybiotykowej?	YES	NO
Has antibiotic prophylaxis been specified?	YES	NO
<b>IN OPERATING ROOM BEFORE SURGERY:</b>		
Has the ambient temperature in the operating room been checked? (Optimal temperature range of 22-24°C)	YES	NO
Has imaging studies been prepared for consultation?	YES	NO
Has warm fluid for rinsing the peritoneal cavity been prepared?	YES not	NO applicable
Has stoma equipment been prepared?	YES	NO
Has potential nutritional access, gastric or enteral, been prepared? (necessary equipment)	YES not	NO applicable
Has an adequate hernia belt been prepared? For surgeries that involve abdominal wall surgery, large hernias, or anticipated large abdominal wall defects.	YES not	NO applicable
Has the necessary equipment for microbiology studies been prepared?	YES	NO
If necessary, has a urinary catheter been placed?	YES not necessary	NO
Have wound type and operating site infection risk been specified?	YES	NO
Is there a need to use methods of reducing superficial site infections? If so, has the necessary equipment been prepared? (antibacterial sutures, foil sleeve for wound protection, vacuum dressing, if available)	YES not	NO applicable
Do operating team members know each other? If NO, introduce team members to each other and assign their roles and competences.	YES	NO
Have the anticipated extent of surgery and complications with adequate management thereof been specified?	YES	NO
Has the surgeon specified expectations regarding the equipment/tools?	YES	NO
Has the anesthesiologist confirmed administration of antibiotic prophylaxis/treatment?	YES	NO
<b>IN OPERATING ROOM AFTER SURGERY:</b>		
Has the number of dressings and tools been checked?	YES	NO
Has the need for prolonged antibiotic administration been verified?	YES	NO
Has adequate analgesia been implemented?	YES	NO
Has the need to maintain gastric tube been specified?	YES	NO
Have adequate samples been sent for histology and microbiology studies?	YES	NO no material
Has adverse events related to the used equipment occurred?	YES	NO
Does the procedure description include drain placement sites?	YES	NO
If necessary, has the mode and duration of nutritional support been specified?	YES	NO

of standardizing perioperative procedures through development of dedicated checklists can be particularly important in colorectal surgery. The existing colorectal surgery checklists are effective in reducing surgical wound infection risk, e.g. the list developed by Sullivan and Castleberry [8,9]. Also, checklists developed for postoperative patient education can lead to a significant re-admission rate reduction in patients with ileostomy [10].

We developed a colorectal surgery checklist, which concerns four surgery stages, in order to reduce risks related to hospitalization and treatment. TABLE

Some checklist points are self-explanatory, whilst others that were developed based on research evidence will be explained below.

Malnourishment is found in 50% of hospitalized patients [11], and it should be assessed in each patient before planning nutritional support in the perioperative period. Based on the American Society for Parenteral and Enteral Nutrition consensus [12,13], malnutrition can be diagnosed when any two of the following features are found: insufficient energy take, body mass loss, muscle mass loss, subcutaneous fat loss, local or systemic fluid accumulation - which may often mask body mass loss, or functional state decline measured with hand strength. Early recognition of malnutrition and nutritional support reduce the risk of malnutrition-associated complications such as infections, poor wound healing, pressure ulcers, excessive bacterial colonization of the gastrointestinal tract, and excessive loss of nutrients with stool.

Adverse drug reactions (ADR) account for 3-6% of all hospital admissions, and they occur in 10-15% of hospitalized patients, leading to prolonged hospitalization and increased morbidity and mortality. WHO defines an ADR as "a response to a drug which is noxious and unintended, and which occurs at doses normally used in man" [14]. Type A ADRs, which account for up to 80% of all ADRs, are predictable and dose-dependent; for instance, pharmacological side effects such as bleeding due to non-steroidal anti-inflammatory drug (NSAID) use. Type B ADRs are unpredictable and non-dose-dependent, and account for 15-20% of all ADRs; for instance, immune and hypersensitivity reactions to drugs or non-immune reactions [15]. ADRs should not be mistaken with adverse drug events (ADE) [16] because ADEs, being a broader term, refer also to events related to drug dispensing errors or interactions with other drugs or foods.

Early surgical field shaving by the patient is a controversial issue, and there is no evidence from large studies that would support shaving one day before surgery over shaving on the operating table just before surgery. Shaving should be performed with special equipment, and not with simple lancets; also, shaving should be performed by qualified medical personnel [17].

Based on large studies from the United States of America, approximately 0.34-2.2% of pregnancies are not recognized in the early period after conception. Because anesthesia and perioperative stress can have a negative impact on the fetus, non-urgent surgeries should be scheduled after delivery. If surgery is necessary, the second trimester is regarded as the safest period for surgical procedures in pregnant women [18, 19, 20, 21]. Thus, pregnancy tests should be considered in preoperative checklists despite an additional cost.

Stoma placement risk is inherent for colorectal surgery. Although there are no exact data on the frequency of stoma placement in patients after colorectal surgery, approximately 150,000 stomas are placed annually in the United States, and 77% of patients operated on for rectal cancer in the United Kingdom have stomas. Thus, all patients should be informed of the risk of stoma placement after colorectal surgery and what lifestyle changes it entails [22,23].

Recent studies report that patients with perioperative hyperglycemia have an increased risk of septic complications, including superficial site infections (SSI), sepsis, and death. Importantly, this increased risk was observed only in patients with hyperglycemia that were not diagnosed with diabetes, and not in patients diagnosed with and treated for diabetes. This could be explained by a greater tolerance to elevated glucose levels and consequent lower susceptibility to hyperglycemia-related complications in patients with diabetes. Thus, adequate perioperative glycemia control is indicated also in patients not diagnosed with diabetes [24].

Venous thromboembolism (VTE) risk is increased in older patients and patients with cancer, history of VTE, varicose veins, thrombophilia, or obesity. Colorectal surgery is associated with an increased VTE risk due to surgery types that often involve specific patient position (e.g. Lloyd-Davies position) and diseases associated with high VTE risk, such as colon cancer and inflammatory bowel diseases. One should also keep in mind that VTE risk in patients who undergo abdomen or pelvis surgery is also increased after discharge. Laparoscopic surgery seems to be associated with low VTE risk; clinically overt VTE risk in the perioperative period is less than 1% [25,26].

Preoperative antibiotic prophylaxis targeted at aerobic and anaerobic bacteria, either oral or intravenous, or oral and intravenous, reduces wound infection risk in patients after colorectal surgery. If administered at the right dose and at the right time, prophylactic antibiotics can reduce wound infection risk by 75%. It is not clear whether oral antibiotics can be efficacious when used in patients with unprepared intestines; therefore, intravenous antibiotic prophylaxis is used in most institution according to local regimens [27]. Ambient temperature in the operating room, which has an impact on patient body temperature, can influence the risk of complications such as surgical wound infection, delayed wound healing, bleeding, and cardiovascular events. Based on the current literature, an optimal ambient operating room temperature is 22-24°C [28,29].

## DISCUSSION

Surgical checklists, including colorectal surgery checklists, not only are useful from a clinical standpoint, but they also serve as legal documents that confirm performance of any recommended procedures, which reflects due diligence on the part of the surgeon with respect to prevention of complications. Moreover, checklists are now required by various accreditation bodies. Clinical effectiveness of checklists, including profiled checklists, is well documented, and their use is becoming more popular. Thus, it is worrying that there is a lack of recommended checklists for colorectal surgery endorsed by medical societies or experts. Herein, we present a checklist for universal use in colorectal surgery. It was prepared by experts of the Polish Coloproctology Club and

the National Consultant in General Surgery.

Some of the checklist points are self-explanatory. Others pertain to issues that seem to be well-known and documented, but still not appreciated in clinical practice; for instance, the role of adequate preoperative and postoperative nutrition, which should be given to malnourished and normal-weight patients before surgery [30] and administered preferably via the enteral route in the postoperative period [31].

Although certain checklist points might not be obvious, they should be kept in mind when preparing the patient for surgery. For instance, the surgeon should make sure whether women of childbearing age are pregnant, which still is not routine practice [32]. This issue might be important in young female patients with menstrual cycle abnormalities, such as patients with inflammatory bowel disease. Because patients can sometimes be unaware of pregnancy, routine use of pregnancy tests should be considered in patients scheduled for some surgeries, especially elective surgeries.

Also, we should re-consider an old idea to use hernia belts imme-

diately after surgery [33] although there is no clear evidence that would support this strategy. Although early use of hernia belts did not reduce the risk of wound bleeding, eventration, or postoperative hernia, it did improve patient comfort and well-being [34]. Thus, hernia belt use seems justified in patients who undergo surgery associated with large skin defects or large hernias, which might lead to tissue tensions.

Several of the checklist questions refer to potential surgical site infections. These questions help determine surgical site infection risk, and indicate strategies aimed at reducing that risk such as antibiotic prophylaxis, antibiotic therapy, antibacterial sutures, or vacuum wound dressing for closed wounds. It has been demonstrated that standardized procedures, including use of checklists, reduce surgical site infection risk [35], which is important because surgical site infections are common and can be effectively managed.

Our checklist can be improved as new evidence and recommendations appear. Currently, the checklist considers well-documented intraoperative procedures that can significantly reduce the occurrence of adverse events and surgical complications.

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