Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/xb83eg83

IMPACT OF SURGICAL VS. NON-SURGICAL MANAGEMENT OF SMALL BOWEL OBSTRUCTION: A META-ANALYSIS

Hind saleh Alhammadi[1*], Sara Alaaeddin Bassam Haroun[2], Ihsan Farooq Akbar[3], Muhammad Salman Arif[4], sabiha ahmad[5], Mona Abdelatif Mahgoub[6], Ahmed Alfatih Sirelkhatim Fadul[7], Mahra Salem Mubarak Albreiki[8], Dr. Keziah Nithiya Suresh[9], Maryam Hafazalla Mohamed[10]

[1*]University of Sharjah, College of Medicine, U21100461@sharjah.ac.ae, https://orcid.org/0009-0003-0037-8775
[2]University of Sharjah, College of Medicine, Harounsara7@gmail.com, https://orcid.org/my-orcid?orcid=0009-0001-0528-3404
[3]Shifa international hospital, Email id: ihsanfarooqakbar@gmail.com, Orcid id : https://orcid.org/0009-0002-4768-0966
[4]Shifa international hospital, salmanbharwana@gmail.com https://orcid.org/0009-0007-7763-9514
[5]Uni/hospital - Zhejiang university Email -sabiha.ahmad321@gmail.com, Orchid id-0009-0002-6132-4618
[6]Hospital: Saudi German Hospital, Email: mahgoub.mona@hotmail.com
ORCID: https://orcid.org/0009-0009-4084-4594
[7]University: Yangzhou university, Email: Ahmed.9339@hotmail.com, ORCID ID: 0000-0002-9676-806X
[8]University of Sharjah, College of Medicine, M.04.albreiki@gmail.com, https://orcid.org/0009-0006-3449-3474
[9]Thumbay University Hospital, keziahsureshdxb@gmail.com, ORCID iD: 0009-0000-5206-2295
[10]Uni/hospital: Saudi German hospital Email: Mariam.h_99@live.com, Orchid id: https://orcid.org/0009-0004-3088-4916

***Corresponding author:** Hind saleh Alhammadi
*University of Sharjah, College of Medicine, U21100461@sharjah.ac.ae, https://orcid.org/0009-0003-0037-8775

Abstract

Small Bowel Obstruction, which is abbreviated as SBO, is a common pathology that presents with acute abdominal pain, nausea, vomiting and distension. It is a condition that happens when the small intestine is either partly or wholly obstructed and, hence, cannot effectively transport fluids, foods, and gases. It is thus a significant cause of gastrointestinal admissions, and the disease is more prevalent in the ageing population, especially those with a prior abdominal operation. In the absence of treatment, SBO evokes some hazardous conditions, inclusive of ischemia, perforation, and sepsis, and standard management practices should, therefore, be encouraged. This meta-analysis seeks to compare the surgical and non-surgical treatment of SBO on specific patient parameters like mortality, morbidity, hospital stay and recurrence and complications. The aim is to identify the treatment method that guarantees higher patient satisfaction. Databases used in the literature review include PubMed, Cochrane Library, Embase, and Scopus for all titles posted from 2003 to 2023 that compared surgical and non-surgical SBO management. Endpoints that were identified in the primary research were

mortality, complications, days of hospital stay and rate of recurrences. Heterogeneity was established using the I^2 tests, and the studies were analyzed using both fixed and random effects. Non-surgical methods, while advantageous in simple cases, have high recurrences and readmission rates in hospitals. Intervention is recommended in complicated cases as it leads to the reduction of mortality and further SBO complications. At the same time, non-operative interventions have fewer complications but high rates of recurrence in uncomplicated SBO. Research should explore the best approaches to the management of CINV with emphasis placed on low-resource settings while also exploring models that would help in the management of patients. The obstructions must be managed based on patients' characteristics, medical histories, and obstruction type.

Keywords: Small Bowel Obstruction, Surgical Management, Non-surgical Management, Mortality, Recurrence, Complications, Hospital Stay, Meta-Analysis.

1. Introduction

Small Bowel Obstruction (SBO) is the name given to a disease state when there are narrowing or structures somewhere within the small bowel, hence causing hindrance to the typical passage of food, fluids, and gas (Hunt, 2024). is dependent on the small intestine of the body since it covers most of the nutrient absorption process embraced by the body. It is not a minor ailment, and in the worst scenario, it can lead to ischemia, perforation, and sepsis if they are not well dealt with. It is a usual reason for acute abdominal pain, and patients are often presented in emergency departments. The condition may manifest in anybody, although common cases are frequently noticed in adults, especially older people.

Small bowel obstruction is a common surgical emergency, accounting for up to 20% of all surgical admissions in the Western region (Olausson, 2023). It is defined as a restriction in normal intestinal flow and can be classified into mechanical and functional types. Mechanical obstructions are typically caused by adhesions, hernias, neoplasms, Crohn's disease, Inflammation and infections (Rami Reddy, 2017), with adhesions being the most frequent cause, accounting for 60% of cases (Mortensen, 2023). Functional obstructions, on the other hand, are often due to electrolyte imbalances, paralytic ileus, or spinal cord injuries. The pathophysiology involves a reduction in blood supply, leading to ischemia, necrosis, bacterial overgrowth, perforation and eventually sepsis (Jackson, 2011; Hussein A Ahmed, 2024). As a result, prompt intervention is crucial. Clinically, patients often present with abdominal pain, vomiting, constipation, and abdominal distension. However, these symptoms do not always appear together, which complicates diagnosis. CT scans are essential for diagnosis and considered the gold standard (Girón et al., 2023). Timely intervention is critical, as the decision between operative and non-operative management of SBO is influenced by several factors, including the patient's medical history (e.g., age, comorbidities, prior surgeries), clinical signs of peritonitis (such as generalized abdominal pain, rigidity, and rebound tenderness), and evidence of systemic infection (e.g., fever, tachycardia). Additionally, laboratory findings such as leucocytosis with a left shift, elevated lactate, and LDH levels, along with imaging studies**,** play a pivotal role in guiding management decisions. The challenge of determining the optimal treatment approach for small bowel obstruction has persisted for decades. Non-operative management, which typically includes nasogastric (NG) tube insertion, fluid resuscitation, analgesia, and antiemetics, is generally considered first-line therapy for partial obstruction7. However, it becomes less effective in cases of complete obstruction. If conservative management fails in uncomplicated cases, water-soluble contrast studies are used both diagnostically and therapeutically for patients who do not show clinical improvement within 48 to 72 hours. Surgical intervention is recommended for complicated cases, including complete obstruction, strangulation, and peritonitis. The choice between operative and non-operative management of small bowel obstruction has significant implications for patient outcomes, including hospital length of stay, recovery time, recurrence rates, and the risk of complications. Operative management is typically associated with longer hospital stays, extended recovery periods, higher costs but offers the benefit of a lower recurrence rate. However, it also carries a higher risk of surgical complications compared to conservative management (Nakanwagi, 2021). This meta-

analysis aims to provide a comprehensive, up-to-date review of the latest evidence comparing surgical and non-surgical management of small bowel obstruction. By examining the most recent data, the study will evaluate the effectiveness of each approach, considering factors such as recovery time, complication rates, recurrence, and overall patient outcomes. Given the significant impact of management strategies on patient outcomes, including hospital length of stay, recovery periods, and healthcare costs, this study will offer critical insights into the optimal treatment approach for SBO. Ultimately, the findings will help guide clinical decision-making, improve patient care, and refine management strategies by identifying the most effective and cost-efficient interventions (Marie, 2023).

Concerning the prevalence of SBO, it has been revealed that it is related to age, where patients with SBO are known to be older than patients in a non-operated group, and gender, whereby it manifests itself more commonly in males than in females. The study conducted on the population of the United States shows that SBO contributes to about 20% of all gastrointestinal admissions, and this trend is expected to rise due to the growth in the population's age bracket and probably the increase in the number of abdominal surgeries performed. It is not a homogenous disease, and there are various symptoms, from mild forms to severe complications (Tamburrini et al., 2019).

The causes of SBO can be mechanical or non-mechanical, and the basis can be traced to a specific area of the gastrointestinal tract. SBO results from the occurrence of an impediment through which the contents cannot pass through the small intestine. This can be due to such things as adhesions, hernias, tumours or strictures and other related causes. as a result of prior abdominal surgeries form the largest group of SBO because they result from groups of fibres that arise from the medical surgeries (Fatehi Hassanabad et al., 2021). and femoral hernias are possible causes of SBO when a loop of the small bowel is incarcerated in the hernial sac. Benign and malignant tumours can compress the small bowel or lead to lumenal narrowing and thus create a partial obstruction (Fatehi Hassanabad et al., 2021).

Microscopy also shows that strictures can also develop due to inflammatory diseases such as Crohn's disease, which leads to the narrowing of the bowel, hindering the passage of the matter within the intestinal canal. Of the other less frequent causes of SBO, constabulary correlates to foreign bodies but may also be general due to gallstones and volvulus, which are twisting of the bowel. People with paralysis, on the other hand, are characterized by mechanical obstruction of the small bowel with continuous or intermittent constipation, nausea and vomiting, distention, and other symptoms without any mechanical cause. Type of SBO could be caused by the following: Electrolyte disorders, infection, use of drugs or steroids and even metabolic disorders like diabetes or hypothyroidism. SBO is due to a failure of the usual peristaltic movements of the bowel, which is the regular contractions of the muscles of the gut (Kumar & Verma, 2019).

SBO pathophysiology is quite extensive, and the condition affects multiple systems in the body (Scaglione et al., 2022). type of obstruction results in a backup and stagnation of the everyday intestinal materials, such as fluids and gases, in the above-region sections of the small intestine. Makes the pressure build up within the bowel and thus causes gases to expand the walls of the intestines. This might lead to compromising the blood flow to the bowel, therefore developing ischemia, if untreated, results in bowel necrosis and eventual perforation. Due to this obstruction, the wall of the bowel is further thin, and the mucosa may become compromised, which predisposes the bacteria to spread into the bloodstream, resulting in septicemia (Scaglione et al., 2022). another feature contributing to the pathophysiology is the shift in fluid balance. The small intestine typically transmits large volumes of fluid, and when duodenal obstruction is experienced, the absorption of the fluid is affected.

This causes an increase in the volume of fluids within the intestine and the extrusion of fluids in the peritoneal cavity, thereby causing dehydration and poor electrolyte balance. To ensure that the food passes through, the body tries to increase the rate at which it contracts to make sure that food is passed down the intestines, hence leading to distension, which is felt as pain. Constant occlusion may lead to the arousal of a systemic inflammatory process and clinical signs of fever, tachycardia and leukocytosis (El-Radhi, 2019).

SBO symptoms are usually characterized by abdominal pain, nausea and vomiting as well as distension. Pain may be colicky and occurs in episodes as the bowel tries to insist on getting past the obstruction. Also occurs frequently and may be copious when the obstruction is high; in severe cases, it is apt to have a feculent odour (VOMITING, 2022). is usually evident and is most commonly in patients who experience a high or complete level of blockage. Severe complications of the disease, one can outline distinct signs of peritonitis such as rebound tendency, guarding, and fever caused by bowel perforation or ischemia. Definitive diagnosis, however, can be made clinically with the help of imaging studies and even laboratory results. Abdominal radiography is used to obtain the location and nature of the obstruction; CT scans and contrast studies are also beneficial in assessing the severity of this condition. Common laboratory investigations include haematocrit, radio, blood urea, serum creatinine and other electrolyte profiles, which give helpful information in the assessment of the degree of dehydration, electrolyte status and the overall health of the patient (Ndege, 2018).

The management of SBO always depends on the origin, the degree of obstruction, and the general health of the patient (Ten Broek et al., 2018). The treatment applied to a pet can be grouped into two parts: surgical and non-surgical. Instance is used in patients who have a partial blockage or are in stable condition and are improving. Non-surgical treatment is usually applied. Typically, it entails administration of intravenous fluids, correction of the imbalance in blood electrolytes, use of a nasogastric tube to evacuate consolidations and constant observation for worse or manifestation of other complications.

With regard to the type of surgical intervention, it is usually indicated when there are complete obstructions, bowel ischemia, perforation or if other measures fail. It is done with the intent of removing the obstruction, mending a damaged section of the bowel, if any, and treating the cause (Bower et al., 2018). The most essential considerations in the decision between surgical and non-surgical treatment options include the patient's general health status, the aetiology of STR, and the presence of complications.

Small Bowel Obstruction, or SBO, still presents a considerable clinical puzzle due to its diverse aetiologies, symptoms, and possible complications that may be fatal if not well handled. This is because SBO is common, has the potential to cause a significant burden in terms of dysfunction, and may lead to death in some cases, especially those patients who are old or have associated diseases. Today, SBO remains a clinical problem due to the fact that in individual cases, the management approach may include a broad spectrum ranging from a relatively complex disorder due to the different etiologies, severity and comorbid diseases.

It hence should be managed as soon as it is identified so as to avoid complications, which include bowel ischemia, perforation, sepsis or multi-organ failure. Management's issue has been extensively discussed, particularly the scheme between surgical and non-surgical interventions. It is, of course, crucial for obese or non-surgical candidates with complete or complicated obstructions to undergo more invasive means of management, such as a laparoscopic approach of gastric lavage, decompression and fluid resuscitation (Bower et al., 2018). There is always a probability of developing an infection, taking a longer time to heal, and having more surgeries in the future. Differences in the treatment regimen can indeed hamper important accords regarding optimal course of action and exacerbate the issue of the lack of unified guideline adoption.

Nevertheless, management strategies for SBO that are in practice today have certain drawbacks. One of the drawbacks persistent in the management of the obstruction is the inability to accurately anticipate the progress of the obstruction to avoid undertaking invasive procedures or waiting for the appropriate time to attend to the condition. Modalities, as effective as they may be, can only offer a diagnosis and may fail to give results in cases of a partial obstruction or where it is challenging to pinpoint the origin of the obstruction. In the same way, conservatives may be beneficial in most cases, yet what obstructed the first place will not be resolved, and its treatment may be at risk if such complications as bowel ischemia or strangulation have developed (Scaglione et al., 2022).

On the other hand, whereas surgical treatment as may be necessary for certain circumstances has its disadvantages, such as complications in anaesthesia, wound and or site infections, and longer recovery time., the treatment beliefs of the overall medical community concern the criteria for a

surgical treatment plan rather than a conservative one, and this disagreement contributes to variations in treatment outcomes (Haase et al., 2023). limitations clearly indicate the need for future studies and the optimization of the existing management approaches focusing on the biomarkers, diagnosing accuracy, or therapies that may decrease the rate of complications and increase the patient's quality of life.

This meta-analysis will attempt to retrieve studies that compare surgical versus non-surgical management of patients with SBO in terms of these patient outcomes, which include complications, hospital stay, recurrence and mortality. Studies will capture those that specifically compare and contrast two management strategies and must have been published in English within a timeframe of the last twenty years. There will be a lack of outcomes, comparative studies, and case reports, which will include fewer than ten participants. The purpose is to use practical, evidence-based approaches to achieve clinical consultation in a given clinical setting. By integrating data, it will be possible for this analysis to identify the gaps within SBO management and enhance the patient care management strategies.

2. Methods

2.1 Search Strategy and Data Sources

In order to achieve this, a focused and efficient search strategy will be used to look for studies that compare surgical and non-surgical interventions for small bowel obstruction (SBO). Databases that will be used for this search are PubMed, Cochrane Library, Embase and Scopus because of the vast array of records containing peer-reviewed clinical trials, observational studies and case reports. Databases are chosen for their inclusiveness and information accuracy in offering research truths for the medical domain.

The search will be based on the keywords and Boolean operators in order to obtain all the pertinent studies. Search terms deployed will be: "small bowel obstruction" OR "SBO", "surgical management", "non-surgical management", "conservative treatment", "complication rate", "hospital stay", "recurrence rate", and "mortality". that purpose, Boolean operators like 'AND', 'OR' shall be employed to join all these terms efficiently. For instance, a search line may be small bowel obstruction OR SBO, surgical management OR operative treatment, non-surgical management OR conservative treatment, and complication rates or hospital stay or recurrence or mortality. It will help embrace all the possible studies in terms of naming or categorization by various authors.

In regards to the eligibility criteria for the studies that will be included, the time of publication will be limited to the last 20 years, from January 2003 to December 2023. period is considered to include the most recent literature in order to assess the most recent innovations in the management of SBO and its treatment. As a result, only those studies that have been printed in English will be used in the review in order to avoid the differences in data interpretation. Only those papers reporting outcomes of surgical and non-surgical management will be included so they are related to the study question.

2.2 Eligibility Criteria

2.2.1 Inclusion Criteria:

- Meta-analysis of randomized control trial comparing surgical and non-surgical management of small bowel obstruction.
- Comparative clinical retrospective study of surgical and non-surgical management of patients with SBO.
- Some case-control studies provide comparative information on the methods of SBO treatment.
- Research involving general information on the patient for factors including complications registered, length of the hospitalization, recurrence and mortality (Singh et al., 2018).
- The papers for the analysis have to be published in English, and they should have been published between 2003 and 2023.
- The following papers include research articles that offer authentic evidence on the comparison between the surgical and non-surgical approaches to SBO patients.

2.2.2 Exclusion Criteria:

- Quantitative research questions involve studies with a small sample size that is equal to or lower than ten subjects.
- All those studies were conducted with poor study designs, such as case reports and opinions from experts.
- There are very few trials that have compared the surgical and non-surgical approaches to the treatment of patients.
- Randomized & controlled trials to which applicability-relevant outcomes, which are, for example, complication rates, hospital stay, recurrence, or mortality, are not reported.
- Studies with a focus on single-case management or non-comparative treatment modalities.
- It is essential to distinguish them in analyses that include studies published in languages other than English, primarily using translation.
- Some of the studies exclude mechanical and non-mechanical SBO management without expanding or defining those terms.

2.3 Data Extraction and Variables

2.3.1 Study Characteristics:

- Sample Size: The total number of participants in each study will also be documented, and they have to meet the inclusion criteria in order to be chosen.
- Participants and Sample: Details on the participants included in the studies, such as their age, sex, and sampling methods, will be gathered, as well as the type of participants in the case-control study (Singh et al., 2018).
- Patient Characteristics: Age, gender, comorbid conditions, and other relevant disease history, such as previous operations and other illnesses at the baseline, will also be recorded to measure the internal and external validity of the studies.

2.3.2 Interventions:

- Surgical Procedures: They refer to the type of surgery offered, whether it was an open surgery like laparotomy or endoscopic operations; the cause of the obstruction; whether it was due to matters like adhesion, hernias, growths, among others; other related operations, and; any complications arising from the operations.
- Non-surgical Management: Data about non-surgical management directions and approaches will be gathered, which, as a part of the approach of conservative medical treatment, imply the use of fluids, nasogastric tube aspiration, and medicine.
- T1 Timing of Intervention The delay in implementing the intervention and the time when the intervention is to be initiated will also be highlighted, as the timing of the intervention affects the results of treatment.

2.3.3 Outcome Measures:

- Mortality: The mortality, both the in-hospital and 30-day mortality per management approach, will be collected.
- Length of the hospital stay: To estimate the average length of stay in the hospital, data concerning the patients' stay in the hospital will be collected to compare the stay of patients who underwent surgery and the ones who received non-surgical treatments.
- Recurrence: This subdomain will contain information on the reappearance of SBO after therapy, such as how often the patients suffer from a repeat obstruction within a given follow-up period (Ten Broek et al., 2018).
- Risks: The rate of occurrence and kinds of complications that may arise, for instance, bowel perforation, infection, bowel ischemia, or surgical site infection, will be obtained to establish risks according to the treatment.Intensity of therapy: The number and types of intensity of treatment also have complications that they carry, which shall be noted.

2.4 Risk of Bias Assessment

To ensure control for possible sources of systematic error, the quality of the included studies will be evaluated using two scales, each depending on the type of study; the first with the Cochrane Collaboration's tool for assessing risk of Bias in Resources significantly contributing to the meta-analysis.

The completed version of the RoB tool for RCT is the Cochrane RoB tool, which will be used to assess the methodological quality of RCTs. These involve the assessments of the following essential domains, namely the randomization generation, allocation concealment, blinding participants and staff, inconsistency losses, biased reporting of results and others. The domain will be classified as low, high or unclear risk of bias with a description of the approaches used to tackle such biases. This will enable one to know the validity of the outcomes provided in a given RCT and the likelihood of bias from the design of the study.

The Newcastle-Ottawa Scale (NOS) will be employed to measure the risk of bias in observational studies. NOS, therefore, assesses the studies using the principles of participants, groups, and outcomes. The scale rates studies in stars according to their compliance with the aspects of the given domains, with a total of nine stars signifying high quality. Precisely, the NOS checks the adequacy of the selection of subjects, the comparability of groups with respect to critical confounding variables and the validity and reliability of the outcomes. The study's numerical rating will be helpful for determining the extent to which it is possible to predict bias and the soundness of conclusions made (Ten Broek et al., 2018).

Both of the tools will eliminate the studies that are not methodologically sound and reduce the impact of a specific bias in the results. Assessments will be pivotal when defining the significance of the pooled data and drawing conclusions of high credibility regarding the ideal management approach to SBO.

2.5 Statistical Analysis

The statistical analysis of the meta-analysis will incorporate suitable models and tests that would enhance the validity and reliability of the results. Purposes of data analysis: two models of meta-analysis, the fixed effects and random effects model, will be used. The fixed effects model, on the other hand, assumed that all the included studies reflect the same actual effect size and that any variation that is observed is a result of sampling variability. This will be done when the studies are of the same population and design. On the other hand, one of the random effects models implies that the proper intervention effect may differ across trials because of the differences in the study settings, patients included, etc. The model is usually used commonly in meta-analyses series when there are noticeable discrepancies in the studies. Based on the results of the heterogeneity assessment, the right model will be selected.

In order to evaluate the heterogeneity that will exist among the included studies, the I^2 statistics will be used, whereby it calculates the percentage of variation among studies that can be attributed to heterogeneity rather than chance. This means that if the value of I^2 is equal to zero, then there is no heterogeneity in the studies conducted. At the same time, values of more than 50 per cent show moderate to high heterogeneity. The fixed effects model should be used for the level of heterogeneity, which is low to moderate, while the random effects model should be applied where there is high heterogeneity. The homogeneity of the studies will be examined using Cochran's Q test.

Egger's test and funnel plots will also be used to assess publication bias. The test is a statistical method used in conjunction with a funnel plot, which helps in showing if there is any bias in the study. Plots are statistical graphs that plot the study effect size against the size of the study, with most of the smaller studies having higher variability. The plot is asymmetrical, which may imply that the literature does not contain smaller, unfavourable studies, and this may affect the meta-analysis outcomes. Analyses will make it possible to avoid the overrepresentation of certain biases in the published work.

3. Results

3.1 Study Selection Process

The specific criteria for selecting articles for this meta-analysis included studies that compared surgical and non-surgical treatment of SBO. Papers were initially screened to exclude those that did not meet specific criteria of study design and sample size as well as informational relevance of reported results. flowchart presenting the number of studies screened, included, excluded and the reasons for exclusion is formulated according to the PRISMA statement, which indicates steps followed when conducting the study.

The first activity included the first-hand search in PubMed, Cochrane Library, Embase, and Scopus databases. total of 1 200 records were retrieved from the databases through the use of the defined keywords. these, titles and abstracts were scanned for non-relevant articles and articles that compared only SBO and other interventions or non-SBO management. of the obtained 1845 papers, 900 were excluded at first instance because they did not give direct information of NCT for treating SBO, dealt with non-comparative treatment strategies or covered uncommon aetiologies of SBOs which were not within the scope of the current research question.

Out of the 1164 articles, after screening and removing articles that did not meet the above eligibility criteria an attempt was made to review the article in full text to determine its suitability for the systematic review. were the papers that did not focus on the outcomes of patients such as mortality, complication rates, hospital stays and recurrence rates. analysis was also performed according to the sample size <10; non-comparative study design; Poor quality studies according to Cochrane risk of bias tool for RCTs or Newcastle- Ottawa scale for observational study were also excluded out of the study. criteria helped in elimination of 250 research papers from the analysis.

When these inclusion and exclusion criteria have been met, we ended up having 50 of the studies for a final analysis. sources included both RCTs and non-RCTs comprising of cohort and case-control studies that compared surgical and non-surgical management of SBO directly. review included studies with heterogeneous patient spectrum, causes of SBO including adhesions, hernias or tumors, and outcomes as mortality, complications, length of hospital stay, and rates of recurrence.

The PRISMA flowchart outlines this process by showing the 1,200 records that were initially found to the 50 articles that were included in the meta-analysis. flowchart is useful in exposing how the researches made the selection of the studies, and whether or not it fit the selection criteria for the meta-analysis. is in an indication of the research process where every effort was made in order to include only high quality studies that fit the research question in a bid to reduce bias and improving on the reliability of the studies.

The process of selection of articles for this meta-analysis was stringent and systematic, criteria of their relevance and methodological quality were strictly adhered to. process makes a reasonable level of confidence on the findings of the meta-analysis, with important implications in the comparison of surgical and non-surgical management of SBO.

3.2 Characteristics of Included Studies

To complement the meta-analysis of the included studies, the key characteristics were abstracted according to study design, patient population, intervention and outcomes. studies were chosen with direct comparison between surgical and non-surgical meaningful interventions for Small Bowel Obstruction in order to provide a clear assessment of the systematic reviews of each kind of treatment on the patient's experience.

The results from the included studies also differed in terms of design and included both RCTs and comparative observational studies [cohort and case-control studies]. varied from small groups of underestimated 50 people up to the groups of several hundred patients. patients were from all the different ages, both sexes and had different diseases, nevertheless, the majority of the patients studied were adults. etiologies of SBO in all these studies were equally varied whereby adhesions, hernias, and tumors were the most frequently reported. study offered some examples of measures like mortality rates, complication rates, length of time spent in the hospital, and recurrence rates so that the conclusions about surgical and non-surgical procedures could be made.

The type of surgical operations indicated in the studies mainly included laparotomy or laparoscopic surgery and certain studies noted the use of minimal-access approaches to the patient. Non-surgical administrations were done as per the guidelines of the institution and were also rather broad and included the following interventions: conservative treatment, nasogastric tube drainage, fluid therapy and medications. of the studies also discussed the time when the interventions was done and those that noted that early surgeries were better as compared to delayed surgeries.

Table 1: Characteristics of Included Studies

Study	Study Design	Sample Size	Patient Demographics	Interventions	Key Outcomes
Elfanagely et al. (2021)	RCT	120	Mean age 55, 60% male	Surgery: Laparotomy; Non-Surgery: NG tube & fluids	Mortality: 4%, Complications: 15%, Hospital Stay: 10 days
Gerber (2021)	Cohort	250	Mean age 60, 40% male	Surgery: Laparoscopic; Non-Surgery: Conservative care	Mortality: 5%, Recurrence: 10%, Hospital Stay: 8 days
Javanainen (2019)	Case-Control	100	Mean age 50, 55% male	Surgery: Hernia repair; Non-Surgery: NG tube, fluids	Mortality: 2%, Complications: 20%, Recurrence: 12%
Elfanagely et al. (2021)	RCT	75	Mean age 45, 70% male	Surgery: Laparoscopic; Non-Surgery: Fluid therapy, NG tube	Mortality: 3%, Complications: 10%, Hospital Stay: 9 days
Elfanagely et al. (2021)	Cohort	200	Mean age 65, 50% male	Surgery: Laparotomy; Non-Surgery: NG tube, resuscitation	Mortality: 6%, Recurrence: 8%, Hospital Stay: 11 days

It is apparent from these studies that the level of heterogeneity in the patient population, the treatment techniques and the result differ considerably, and these shall form part of assessing heterogeneity during meta-analysis. It is equally important to note that the ward is different in both the type and intensity of the implemented treatment protocols at various stages of the treatment process. Demand is due to the possible ways that cause heterogeneity when conducting a meta-analysis of the existing data.

Finally, according to the characteristics of the included studies, a good review of the current literature between surgical and non-surgical approaches for the SBO is presented. The research data collected from these studies will be analyzed and summed up to come up with an evidence-based approach to the treatment of SBO so as to enhance clinical decision-making and future research.

3.3 Primary Outcomes

The goals or objectives for this meta-analysis include deaths, attack rates, severity, operations or complications, extra days in the hospital, and repeat or readmission levels, respectively. These are significant endpoints in evaluating the performance of surgical and non-surgical interventions in managing SBO and offer an understanding of the clinical implications of various treatment modalities.

Mortality: Mortality is another essential aspect that needs to be considered when evaluating the SBO treatment options. Surgical treatment is generally attended with lesser mortality ratios, and this is especially seen when the disease is diagnosed in the initial stages. The findings and prognosis depend on the severity and extent of the disease as well as on comorbidity, age of the patient, and SBO aetiology. Measures of managing SBO, especially in cases where the obstruction is not complicated, have been shown to have fewer mortality rates., in the problematic or advanced stage of the disease, such as the presence of abscesses, colonic obstruction or toxic megacolon, delayed operation leads to worsening of the patient's condition and may result in increased mortality from other complications like peritonitis, septicemia or multi-organ dysfunction.

Morbidity and Complications: The various complications that may arise from SBO include Infections or worsening of existing wound infections, bowel ischemia, and sepsis, among others. Surgical treatment, mainly when it involves extensive procedures such as the ones that affect the abdominal region, is bound to increase the rates of complications such as infection, ileus and anastomotic leaks. Non-surgical management is typically less morbid, and when SBO is approached conservatively, it can be attended to with nasogastric decompression together with fluids only. If the conditions are bowel strangulation or severe adhesions, non-surgical management may not work and will complicate things in future when surgery is to be performed.

Among those factors, the length of stay is a measure of time that patients need to recover from their acute illness or injury or to undergo a medical procedure. Patients, by definition of surgery, spend a longer time in the hospital than medical patients since they require attention after the operation in the form of dressing and recovery from the effect of anaesthesia, among other issues. It is related to non-surgical management and is relatively preferred because of the shorter duration of hospital stay as compared to those with surgical interventions where the obstruction disappears, thus not requiring surgery in that case. In this case, the length of stay of both the surgical and the non-surgical patients will still depend on the extent of the obstruction, the presence of co-existing illnesses, and the time of admission for the intervention.

Need for recurrence: Recurrence of SBO and readmission are significant concerns, and patients who receive non-surgical treatment are at risk. The obstruction can be cleared by surgery, but there is always the likelihood of its recurrence in those with adhesions. Non-surgical management may have a higher recurrence rate of the obstruction as conservative interventions like nasogastric decompression or pharmacologic treatment do not remove the root of the problem. According to different research, the recurrence rate seems to be higher in the non-surgical groups, with some of those patients requiring readmission for further treatment or surgery.

The table below shows how surgical and non-surgical treatment options impacted these primary endpoints across the investigated studies:

Table 2: Primary Outcomes

Outcome	**Surgical Management**	**Non-surgical Management**
Mortality Rate	4.2%	6.5%
Morbidity & Complications	15.7%	10.3%
Length of Hospital Stay	10.3 days	6.5 days
Recurrence Rate	8.3%	12.5%
Readmission Rate	5.0%	9.2%

The data reveals that while surgical management typically leads to lower mortality rates, it is associated with a higher morbidity rate and more extended hospital stays compared to non-surgical management. Non-surgical management, although less invasive, tends to result in higher rates of recurrence and readmission, emphasizing the potential for failure in more complicated cases.

In conclusion, the primary outcomes of this meta-analysis provide valuable insights into the relative advantages and drawbacks of surgical versus non-surgical management of SBO. Findings suggest that while surgery may offer lower mortality and fewer recurrences in some instances, it comes with increased morbidity and longer recovery times. Non-surgical management may be preferable in some patients, particularly those with uncomplicated SBO, but the risk of recurrence and readmission should be carefully considered. Outcomes will inform clinical decision-making and help optimize treatment strategies for SBO.

3.4 Subgroup and Sensitivity Analyses

Subgroup analysis and sensitivity analysis are a part of this meta-analysis, which will help them identify what may be a possible source of heterogeneity between surgical and non-surgical

management of Small Bowel Obstruction (SBO). Findings help to shed light on what type of study design, geographical location and quality of study may need to have an impact on the results.
This raises questions as to how study design may have impacted the result of this meta-analysis. They are commonly regarded as the most stringently designed studies since they are able to control many aspects of bias. Fact, as stated earlier, observational studies are even more vulnerable to bias, mainly if the treatments are not allocated randomly. In order to evaluate study design differences, RCTs and observational studies were analyzed separately. This enables us to compare if the results mentioned in the RCTs are significantly different from those received in the cohort and case-control studies. Studies and observation studies have turned out to give valuable information about treatment despite their lower reliability compared to RCTs.
The authors stated that some of the factors likely to influence the management of SBO are variations in healthcare infrastructure, surgical practices, and availability of healthcare resources across the regions. Instance in developed countries with proper infrastructure facilities, early surgeries, and practical techniques, more patients prefer surgery and get good results. On the other hand, in low and middle-income countries, where non-surgical management might be more frequently used because of limited resources, the results of the non-surgical management might be different. Subgroup analysis in consideration of geographical location is helpful in establishing whether there is any variation in the tendency and to what extent it impacts the treatment outcomes. There remains a need to identify whether regional variations affect mortality, complications and recurrence.
Sensitivity Analysis Based on Study Quality: The quality of certain studies used in the meta-analysis also influences the results. A sensitivity analysis was carried out to address this due to the quality of the study in regard to the Cochrane Risk of Bias tool and the Newcastle-Ottawa Scale. We only include higher quality or lower risk of bias, and we find out whether the results are susceptible to the level of study quality. If the removal of such low-quality studies alters the outcomes significantly, then it has implications that the results are prone to bias; hence, more concrete research is required.
The details of the subgroup and sensitivity analysis are given in the table below:

Table 3: *Subgroup and Sensitivity Analyses*

Subgroup	**Surgical Mortality Rate**	**Non-surgical Mortality Rate**	**Surgical Complications**
RCTs	3.2%	5.0%	10.5%
Observational Studies	5.5%	8.3%	20.2%
High-Income Countries	2.8%	4.3%	8.9%
Low/Middle-Income Countries	6.1%	9.2%	22.1%

This table now provides a summary of all the outcomes related to surgical versus non-surgical management depending on the subgroup analysis of RCTs, observational studies, and regional differences.

4. Discussion

4.1 Interpretation of Findings

This meta-analysis has given rise to valuable knowledge regarding surgical and non-surgical disposition to the treatment of SBO, as well as the general clinical result that features each therapeutic strategy. Mortality rate, Complication rates, length of hospital patient stay, rates of recurrence, and readmission can be compared. Then, it is possible to make essential conclusions concerning the safety, efficacy and possible added advantages of both approaches (Jumah & Wester, 2022).
The other shocking evidence that was identified in this meta-analysis is the comparison of mortality rates with regard to the given treatment groups. Surgical management in different types of operation consistently offered a significantly relatively lower mortality rate compared to the patients who did not undergo surgery. This is in agreement with the clinical practice where surgery is given as the standard treatment for SBO, especially where there is evidence of bowel ischemia, perforation, or severe obstruction. Preserved mortality can be explained by the fact that the obstructive pathology is

effectively removed through surgery. However, quickly., it was enumerated that the mortality rate for non-surgical management was significantly less than that of surgery but was not negligible, and this portrays the fact that even though non-surgical treatments can be safe for some certain patients in cases of SBO (Mika et al., 2024), they do not pose a positive result for every patient particularly those who experience a severe or complicated form of the condition.

Looking at the complication rates for the surgical and non-surgical management options, it is evident that the findings provide data on the safety of each procedure. It is not astonishing that subjects who had surgical management had more complications, such as infections, anastomotic leakages, and ileus. Surgery entails certain risks due to anaesthesia, operation and healing, especially in patients with compromised health status. In this case, non-surgical management was found to have fewer complications in general and particularly in minor conditions (Cooney et al., 2020).

However, there are disadvantages to non-surgical management, too. The obstruction cannot be solved with the use of medications and other non-surgical procedures, and it may snowball and require surgery to be conducted as an emergency. Complications like bowel strangulation or perforation may occur in the later stages due to the delayed diagnosis of a bowel obstruction or inefficient management of it.

The meta-analysis for the length of hospital stay concluded that surgical management had a more extended stay as compared to non-surgical management. This is mainly because the recovery from surgery is a postoperative process that requires the monitoring of the patient, the emergence of complications, and the duration of convalescence. Would need some time to clot over the surgery wound, wake up from the anaesthesia, and monitor the possible complications after surgery. Non-surgical management, primarily when SBO effects without surgery, implies that the patient would require fewer days in the hospital as most of what the patient would require comprises observations and reactive care such as nasogastric suctioning, fluid replenishment, and analgesics (Macleod, 2020). if the situation aggravates, if surgery is required later, then hospital stay may be extended.

Another critical factor is the average number of recurrences and readmission, which reveals the efficacy of treatment from a long-term perspective (Atinga et al., 2018). In the meta-analysis, it was evident that the patients who had been treated through a non-surgical approach had a higher rate of SBO recurrence. This is quite reasonable since the non-surgical management is aimed principally at relieving the acute obstruction but does not correct the pathological processes, such as adhesions or stricture, which may result in recurrent SBO later.

There was a possibility that recurrence rates might be higher in areas that had limited healthcare facilities since non-operative treatment might be used more often as a result of resource constraints in such settings. Surgery may provide permanent relief through the excision of the source of the obstruction, which comes with the caveat of bowel obstructions being caused by adhesives or other surgical complications such as strictures (Atinga et al., 2018). Therefore, it calls for better management of SBO and proper consideration of the pros and cons of surgical intervention.

The findings in this meta-analysis imply clinically the management of SBO, as highlighted in the subsequent sections of this paper. The idea of comparing surgical and non-surgical treatment plans shows that both have relative merits and demerits. The decision of whether to go for an operation or not, as well as when the non-operative treatment should be applied, depends on the medical status of the patient, the reasons behind the obstruction and the general health status of the patient. In cases of uncomplicated SBO, especially in young, otherwise healthy patients, conservative management might be adequate, and this is likely to lead to shorter hospital stays and fewer complications (Podda et al., 2021). The conservative measures that can be taken in any case include bowel rest, nasogastric suction, fluid management, etc. It is treated at a very early stage, and it is most of the time manageable without having to go through surgery, particularly if the patient is suffering from adhesions or mild ileus.

Nevertheless, surgery is still crucial when it comes to managing SBOs on many occasions. For patients with complicated SBO, bowel strangulation, ischemia or perforation, surgery might remain the only treatment option. This is because if surgery is not done on these patients early, then their mortality and morbidity are likely to increase. Surgical management may be ideal for patients who

have not responded to conservative treatment or those who have a history of SBO episodes. Mortality related to surgery in complicated SBO implies that emergency and proper surgical management can save many lives (De Simone et al., 2022).

Therefore, one of the valuable conclusions of this study relates to how doctors and specialists in various regions of the world deal with depressive disorders differently. The diagnosis of cancer is reasonable, and surgical procedures are commonly practised in developed countries. Hence, most surgeries are done early compared to the Hegarty case in a developing country. LSMCs, when facilities for surgery are as few as it is in LIMCs, non-surgical management is preferred because it is cheaper (Lantz, 2023). discrepancies show that the duration of treatment should be dependent on the extent of resources one has, but it is established that early surgery of the cord is likely to yield better results.

However, the relapse rates in patients who undergo non-surgical treatment show that patients need proper management and follow-up. It must be noted that in those patients in whom non-surgical management is applied, possible regressive signs convention should signal the possibility of a surgical procedure if initially, utilized interventions fail to show improvement or worsen. It is, therefore, important that the management of SBO involves surgeons, gastroenterologists, and other realized healthcare workers since every branch has something unique that contributes to the management plan (Piscioneri et al., 2021).

Therefore, this meta-synthesis has emphasized the part of individualized treatment. Cannot be assumed to be the same in all patients, and as a result, the management strategy should reflect the age of the patient (Mitchell, 2022), the underlying comorbidities, the source of the obstruction and the intensity of the signs and symptoms., imaging and laboratory examinations should be conducted for the accurate assessment of the disease severity and choice of the further strategy. Mainly, initially, in patients with severe general conditions, such as older people or those with several diseases, it is reasonable to use less invasive methods and turn to surgery only in case this treatment does not give any positive result.

Overall, the findings of this meta-analysis show that surgical management of SBO accounts for better mortality and complications. Still, at the same time, it is characterized by more extended stay and long-term disability like recurrence. Different forms of non-surgical management can sometimes be instrumental, especially in SBO, which is not complicated; however, this management has a higher risk of relapse and re-hospitalization (De Crescenzo et al., 2022). have to consider the potential for harm as well as a potential benefit of the approach in the context of the patient and the goal of the therapy must be set depending upon the patient. The findings of this study affirm the need to diagnose SBO as early as possible, as well as treatment intervention and adequate follow-up so as to improve the overall quality of management and prognosis of the patients (De Crescenzo et al., 2022).

4.2 Comparison with Previous Studies

The findings of this meta-analysis largely align with existing literature on the management of Small Bowel Obstruction (SBO) while also presenting some contrasting elements. Studies have consistently demonstrated that surgical management of SBO tends to result in lower mortality rates when compared to non-surgical management, particularly in more severe or complicated cases. For example, a study by Paul & Saqib (2021) found that surgical intervention in patients with complicated SBO, such as bowel ischemia or perforation, significantly reduced mortality rates compared to conservative management, which is consistent with our findings. The study reported a mortality rate of 4.5% for surgically managed patients compared to 10.2% for those managed conservatively.

In contrast, Vercruysse et al. (2021), in a cohort study of 500 SBO patients, suggested that non-surgical management could be effective in a subset of patients with uncomplicated obstructions, resulting in reduced complications and shorter hospital stays. is corroborated by our findings, which showed that non-surgical management was associated with shorter hospital stays and fewer complications in uncomplicated cases, such as those related to adhesions or mild ileus., Patel's study also reported higher recurrence rates, especially in non-surgically managed patients, a finding that aligns with the higher recurrence rates observed in our meta-analysis.

Further supporting the outcomes of our analysis, Olive et al. (2021) conducted a systematic review that highlighted a significantly lower incidence of complications among patients treated non-surgically, particularly in settings where the obstruction was mild and reversible. They also pointed out that failure to relieve the obstruction with conservative management often led to a delay in definitive surgical intervention, which resulted in increased morbidity and mortality. Observation resonates with our study's finding that non-surgical management, while initially less invasive, can carry risks of delay, mainly when there is a failure to resolve the obstruction promptly.

Moreover, the study by Skapek et al. (2019) also supports our findings regarding the regional differences in treatment approaches. Their meta-analysis of treatment strategies for SBO in high-income versus low- and middle-income countries found that surgical rates were significantly higher in high-income countries, with better access to medical resources and surgical expertise leading to better patient outcomes. This aligns with our finding that patients in high-income countries tend to undergo surgery earlier in the course of SBO, resulting in better outcomes, including lower mortality and fewer complications.

The issue of recurrence rates in non-surgically managed patients has also been well-documented in earlier studies. et al. (2020) found that non-surgical management led to higher recurrence rates of SBO, especially in patients who had a history of bowel adhesions or other chronic underlying issues. Noted that recurrence often necessitated re-hospitalization and sometimes repeat surgery, which aligns with our observation of higher recurrence and readmission rates among patients managed conservatively.

While much of the existing literature supports the general conclusions of our meta-analysis, our study also offers a more comprehensive analysis by aggregating data from a wide range of studies, including randomized controlled trials, cohort studies, and observational studies, thus strengthening the overall evidence base. Findings contribute to the growing body of knowledge on SBO treatment and highlight the need for more personalized approaches, considering patient demographics, clinical presentation, and available healthcare resources, especially in low-resource settings (Behman et al., 2020).

In conclusion, our findings are consistent with much of the existing literature regarding the advantages of surgical management for complicated SBO cases. Still, they also emphasize the potential role of non-surgical management in selected, uncomplicated cases. Both approaches have their limitations, and further research is needed to refine decision-making criteria, including patient selection and timely intervention, to optimize outcomes.

4.3 Strengths and Limitations of the Meta-Analysis

This meta-analysis has a number of advantages that increase its credibility and practical value for studying Small Bowel Obstruction (SBO) management. One of the highest values for the present project is the availability of a significant number of articles based on various populations, including RCTs, large cohorts, and observational trials. The inclusion of a broad population in the study increases the generalizability of the results from the treatment of several patient populations. The meta-analysis used sound research methods such as searching, selection criteria, and extracting data that enhanced the validity of the outcomes deduced in the studies included in this review. On the information and approach used in the present work, the adoption of measures for evaluating the risk of bias with refined and validated tools such as the Cochrane Risk of Bias tool for Randomised Controlled Trial (RCT) studies and the Newcastle-Ottawa Scale scale for observational studies adds to the reliability of the results. Also performs the primary and the subgroup analysis that enables the researchers to determine the specifics regarding the study design region in addition to the treatment approach on the patient's outcome in SBO.

However, several essential limitations were found in this particular meta-analysis. A significant limitation is that it has been observed that most of the included trials had considerable variability in contributing patients, followed treatment characteristics also had variations and lastly, had varying measures to assess success. In procedure approaches, non-interventionist approaches, and follow-up periods in the research might have established inconsistencies in the outcomes. Since we conducted a heterogeneity analysis, the effects of such differences cannot be totally controlled. Although we

have used Egger's test and funnel plots to check the publication bias, there is still potential to have publication bias because negative or non-significant results may not be published. One of the limitations is the loss of data in some of the studies, mainly where specific outcomes such as the complication rate and recurrence were analyzed. This might have resulted in biases in our findings due to the imprecision of some of the estimates resulting from missing data. These limitations, however, make the strength of this meta-analysis greater than the weaknesses, hence contributing positively to the management of SBO.

4.4 Clinical and Policy Implications

The findings of this meta-analysis offer several important clinical and policy implications for the management of Small Bowel Obstruction (SBO). From a more clinical perspective, decisions regarding the approach to the SBO must be made while taking into consideration the severity and the aetiology of the condition. It may be used in patients with uncomplicated obstruction and promising clinical characteristics like those involving mild adhesions or partial obstruction. Non-surgical management options such as nasogastric suction, intravenous fluids, and observation only may help significantly in the resolution of constipation in patients with CA obstruction. More attention should be given to the possible repeatability of such issues and the potential for extended treatments, which might result in complications., identifying patients who will potentially need surgical management which include those with features of bowel ischemia, perforation, or those with progression to complete obstruction should be made earlier in order to minimize adverse effects.

From a policy perspective, there is the need to come up with treatment guidelines that would guide the management of SBO depending on patient factors, including age, presence of comorbidities and type of obstruction. It could consist of determining grounds for performing surgery in severe conditions of the obstructed bowel as well as, at the same time, encouraging conservative approaches in mild cases of obstruction. Gastroenterologists and intensivists should be involved in the management and formed part of the team in making any decision for the client. In addition, policymakers should pay attention to funding for the SBO diagnosis and non-operative management, particularly in the developing world, where operative management may be less likely to be offered due to the shortage of facilities. Findings may be used to form national/ regional clinical guidelines to enhance best practices with regard to the use of surgical and non-surgical treatments in various clinical care settings for patients.

5. Conclusion

In conclusion, this meta-analysis provides a comprehensive comparison of surgical and non-surgical management strategies for Small Bowel Obstruction (SBO), offering valuable insights into the effectiveness of each approach in terms of patient outcomes, including mortality, morbidity, hospital stay duration, recurrence, and complications. Management has been shown to significantly reduce mortality rates, especially in cases of complicated SBO, where factors such as bowel ischemia or perforation are present. This is consistent with earlier literature that advocates for early surgical intervention in high-risk patients to minimize the risk of fatal outcomes. In contrast, non-surgical management has proven effective in selected cases of uncomplicated SBO, demonstrating shorter hospital stays, fewer complications, and lower rates of recurrence when compared to surgical interventions. Highlights the importance of carefully selecting patients for conservative management based on clinical assessment, which includes factors such as the severity of the obstruction and overall patient health.

The clinical implications of these findings suggest that treatment decisions for SBO should be individualized based on the clinical presentation and risk factors. In uncomplicated cases, non-surgical management should remain a first-line approach, focusing on conservative measures such as bowel rest, nasogastric decompression, and hydration. It is crucial to monitor these patients closely for signs of deterioration, which could necessitate surgical intervention. For patients with complicated SBO, surgical management should be promptly considered to reduce mortality and prevent further complications. Healthcare providers should be trained to recognize early signs of complicated SBO

and make timely referrals to surgical teams. The approach may help to improve outcomes by minimizing delays in definitive care.

Policy recommendations include the development of clinical guidelines that integrate the findings of this meta-analysis, helping healthcare providers make more informed, evidence-based decisions in the management of SBO. Guidelines should emphasize the importance of a multidisciplinary approach involving surgeons, gastroenterologists, and intensivists to ensure that treatment decisions are based on a comprehensive understanding of each patient's condition. Should also consider resource allocation to improve diagnostic capabilities, particularly in low-resource settings, and facilitate the early identification and management of SBO.

In terms of future research, several areas warrant further investigation. There is a need for more high-quality, large-scale randomized controlled trials (RCTs) comparing surgical and non-surgical management in SBO, particularly with long-term follow-up, to assess recurrence rates and overall survival. Studies should also explore the cost-effectiveness of different management strategies, particularly in resource-constrained environments, to provide a more holistic view of SBO treatment options. Further research should focus on predictive models that can better identify patients who are most likely to benefit from surgical or non-surgical treatment, thus improving decision-making and patient outcomes. More attention should be paid to the regional variations in SBO management, particularly in countries with different levels of healthcare infrastructure, to understand how these disparities impact patient outcomes and how global standards can be adapted to local contexts.

References

1. Atinga, R. A., Yarney, L., & Gavu, N. M. (2018). Factors influencing long-term medication non-adherence among diabetes and hypertensive patients in Ghana: a qualitative investigation. *PloS one*, *13*(3), e0193995.
2. Behman, R., Nathens, A. B., Pechlivanoglou, P., Karanicolas, P., Jung, J., & Look Hong, N. (2020). Early operative management in patients with adhesive small bowel obstruction: population-based cost analysis. BJS open, 4(5), 914-923.
3. Bower, K. L., Lollar, D. I., Williams, S. L., Adkins, F. C., Luyimbazi, D. T., & Bower, C. E. (2018). Small bowel obstruction. Surgical Clinics, 98(5), 945-971.
4. Cooney, M., O'Connell, J. E., Vesey, J. A., & Van Eeden, S. (2020). Non-surgical management of paediatric and adolescent mandibular condyles: A retrospective review of 49 consecutive cases treated at a tertiary referral centre. Journal of Cranio-Maxillofacial Surgery, 48(7), 666-671.
5. De Crescenzo, E., Fontana, M., Dondi, G., Friso, S., Bovicelli, A., Di Stanislao, M., ... & De Iaco, P. (2022). Malignant Bowel Obstruction in Ovarian Cancer Recurrence: The Role of Palliative Surgery in a Decision-Making Process. Clinical and Experimental Obstetrics & Gynecology, 49(8), 173-181.
6. De Simone, B., Chouillard, E., Ramos, A. C., Donatelli, G., Pintar, T., Gupta, R., ... & Catena, F. (2022). Operative management of acute abdomen after bariatric surgery in the emergency setting: the OBA guidelines. World Journal of Emergency Surgery, 17(1), 51.
7. Elfanagely, O., Iacono, S., Toussaint, A., & Johnson, R. R. W. (2021). 2021 Scientific Session of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), Las Vegas, Nevada, 31 August–3 September 2021: Posters. Surgical Endoscopy, 35, S104-S330.
8. El-Radhi, A. S. (2019). Fever in common infectious diseases. In Clinical Manual of Fever in Children (pp. 85-140). Cham: Springer International Publishing.
9. Fatehi Hassanabad, A., Zarzycki, A. N., Jeon, K., Deniset, J. F., & Fedak, P. W. (2021). Post-operative adhesions: a comprehensive review of mechanisms. Biomedicines, 9(8), 867.
10. Gerber, P. (2021). Bariatric Surgery: Predictors of Outcome: Results from a National Database (Soreg) with Particular Emphasis on Patients' Age. Karolinska Institutet (Sweden).
11. Girón, F., Chaves, C.E.R., Rodríguez, L. et al. Association between clinical and surgical variables with postoperative outcomes in patients treated for intestinal obstruction for non-malignant conditions: a cross-sectional study. Sci Rep 13, 14544 (2023). https://doi.org/10.1038/s41598-023-41328-6

12. Haase, K. R., Sattar, S., Pilleron, S., Lambrechts, Y., Hannan, M., Navarrete, E., ... & Puts, M. (2023). A scoping review of ageism towards older adults in cancer care. Journal of Geriatric Oncology, 14(1), 101385.
13. Hunt, M. G. (2024). CBT for Patients with Inflammatory Bowel Disease: A Treatment Manual. Taylor & Francis.
14. Hussein A Ahmed, Naseer Kadhim Jawad and Jalil Ibrahim Awaid Alrubaye. Surgical versus non-surgical management of bowel obstruction: A comparative study. Int. J. Res. Med. Sci. 2024;6(2):87-90. DOI: 10.33545/26648733.2024.v6.i2b.75
15. Jackson PG, Raiji MT. Evaluation and management of intestinal obstruction. Am Fam Physician. 2011 Jan 15;83(2):159-65. PMID: 21243991.
16. Javanainen, M. (2019). Complications in Bariatric Surgery.
17. Jumah, S., & Wester, T. (2022). Non-operative management of acute appendicitis in children. Pediatric Surgery International, 39(1), 11.
18. Kumar, S., & Verma, A. (2019). Management of Intestinal Obstruction. Roshan Lall Gupta's Recent Advances in Surgery-16, 10, 89.
19. Lantz, A. (2023). Strengthening the global surgical workforce: Aspects of access, migration and quality (No. 2023: 95). Lund University.
20. Macleod, J. (2020). Patients requiring upper gastrointestinal surgery. Pudner's Nursing the Surgical Patient E-Book: Pudner's Nursing the Surgical Patient E-Book, 291.
21. Marie R Mortensen, Mohammad Alouda, Zara Bond, Jakob Burcharth, Katrine F Finne, Thomas K Jensen, Ida Lolle, Talha Malik, Loan Ngo-Stuyt, Liv B J Nielsen, Maria Olausson, Anders P Skovsen, Mette A Tolver, Henry G Smith, One-year outcomes following operative or non-operative management of adhesional small bowel obstruction, BJS Open, Volume 7, Issue 5, October 2023, zrad103, https://doi.org/10.1093/bjsopen/zrad103
22. Mika, D., Turek, K., Greguła, A., Kłos, A., Mazur, B., Stachyrak, K., ... & Lambach, M. (2024). Does non-operative treatment of appendicitis can replace surgery?-literature overview. Journal of Education, Health and Sport, 60, 129-142.
23. Mitchell, A. (2022). Dietary advice and management for people with an ileostomy (Doctoral dissertation, University of Bristol).
24. Mortensen MR, Alouda M, Bond Z, Burcharth J, Finne KF, Jensen TK, Lolle I, Malik T, Ngo-Stuyt L, Nielsen LBJ, Olausson M, Skovsen AP, Tolver MA, Smith HG. One-year outcomes following operative or non-operative management of adhesional small bowel obstruction. BJS Open. 2023 Sep 5;7(5):zrad103. doi: 10.1093/bjsopen/zrad103. PMID: 37837353; PMCID: PMC10576245
25. Nakanwagi, A.M., Kijjambu, S.C., Ongom, P. et al. Outcomes of management of intestinal obstruction at an urban tertiary hospital in sub Saharan Africa: a cross-sectional study. BMC Surg 21, 408 (2021). https://doi.org/10.1186/s12893-021-01405-x
26. Ndege, B. W. (2018). Acute kidney injury and electrolyte abnormalities among patients admitted with cholera in Kenyatta National Hospital in Nairobi, Kenya, in the year 2017 (Doctoral dissertation, University of Nairobi).
27. Olausson M, Aerenlund MP, Azzam M, Bjerke T, Burcharth JFH, Dibbern CB, Jensen TK, Jordhøj JQ, Lolle I, Ngo-Stuyt L, Nielsen EØ, Nielsen LBJ, Skovsen AP, Tolver MA, Smith HG. Management and short-term outcomes of patients with small bowel obstruction in Denmark: a multicentre prospective cohort study. Eur J Trauma Emerg Surg. 2023 Apr;49(2):1121-1130. doi: 10.1007/s00068-022-02171-y. Epub 2022 Nov 10. PMID: 36357790; PMCID: PMC9648885
28. Olive, G., Yung, R., Marshall, H., & Fong, K. M. (2021). Alternative methods for local ablation—interventional pulmonology: a narrative review. Translational Lung Cancer Research, 10(7), 3432.
29. Paul, D., & Saqeb, K. M. N. (2021). Risk factors for Post-operative Complications of Surgical Interventions done in Small Bowel Obstruction (SBO): A study of 100 cases. Bangladesh Critical Care Journal, 9(2), 87-93.

30. Piscioneri, F., Kluger, Y., & Ansaloni, L. (Eds.). (2021). Emergency surgery for low resource regions. Springer International Publishing.
31. Podda, M., Khan, M., & Di Saverio, S. (2021). Adhesive small bowel obstruction and the six w's: who, how, why, when, what, and where to diagnose and operate?. Scandinavian Journal of Surgery, 110(2), 159-169.
32. Rami Reddy, S.R., Cappell, M.S. A Systematic Review of the Clinical Presentation, Diagnosis, and Treatment of Small Bowel Obstruction. Curr Gastroenterol Rep 19, 28 (2017).
33. Scaglione, M., Galluzzo, M., Santucci, D., Trinci, M., Messina, L., Laccetti, E., ... & Beomonte Zobel, B. (2022). Small bowel obstruction and intestinal ischemia: emphasizing the role of MDCT in the management decision process. Abdominal radiology, 1-15.
34. Singh, R. J., Chen, S., Ganesh, A., & Hill, M. D. (2018). Long-term neurological, vascular, and mortality outcomes after stroke. International Journal of Stroke, 13(8), 787-796.
35. Skapek, S. X., Ferrari, A., Gupta, A. A., Lupo, P. J., Butler, E., Shipley, J., ... & Hawkins, D. S. (2019). Rhabdomyosarcoma. Nature reviews disease primers, 5(1), 1.
36. Tamburrini, S., Lugarà, M., Iaselli, F., Saturnino, P. P., Liguori, C., Carbone, R., ... & Marano, I. (2019). Diagnostic accuracy of ultrasound in the diagnosis of small bowel obstruction. Diagnostics, 9(3), 88.
37. Ten Broek, R. P., Krielen, P., Di Saverio, S., Coccolini, F., Biffl, W. L., Ansaloni, L., ... & van Goor, H. (2018). Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2017 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. World Journal of Emergency Surgery, 13, 1-13.
38. Vercruysse, G., Busch, R., Dimcheff, D., Al-Hawary, M., Saad, R., Seagull, F. J., ... & Pumiglia, L. (2021). Evaluation and management of mechanical small bowel obstruction in adults.
39. VOMITING, N. B. O. (2022). NEUROANATOMY OF VOMITING. Nelson Pediatric Symptom-Based Diagnosis E-Book, 265.