

# Bowel obstruction incidence in urinary diversion patients: A meta-analysis study

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## Abstract

**Background:** Bowel obstruction is a common complication that occurs in patient who underwent urinary diversion with an incidence of 0.7%–11%. Although previous studies have published risk factors, prevention and management of postoperative paralytic ileus, and data on urinary postdiversion bowel obstruction in the literature are still scarce and thus require further investigation of the diversion technique which allegedly has differences in pathogenesis, management, and results. To that end, this study conducted a systematic review study to compare two different diversion techniques, namely ileal conduit and continent diversion, especially orthotopic neobladder.

**Methods:** This study is a systematic review by searching study in online databases such as PubMed, EBSCOhost, and ProQuest. Inclusion criteria included are full-text articles, English language, and articles of the past 10 years. After searching, we analyzed quantitatively using the RevMan application for meta-analysis.

**Results:** From 3403 studies, we got 12 studies that were included in the analysis. In a study conducted from the study of van Hemelrijck *et al.* stated that intestinal obstruction has an incidence of 50.73–1000, the third-highest when compared with advanced complications such as death (145.07/1000 population) and urinary tract infections (127.03/1000 population). It was found that odds ratio was 0.64 (0.45–0.91).

**Conclusion:** The ileal conduit and orthotopic neobladder methods have no significant difference in the incidence of intestinal obstruction.

**Keywords:** Bowel obstruction, complication, urinary diversion

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## INTRODUCTION

Urinary diversion is one of the surgical methods that function to change the normal urinary flow to the outer body.<sup>[1]</sup> This procedure is done when there is a blockage of the urinary tract that caused by factors such as malignancy and neurogenic bladder.<sup>[1,2]</sup> Some techniques used in urinary diversion include incontinent diversion (conduit) and continent diversion (catheter)

pouches through the stoma and orthotopic neobladder.<sup>[3]</sup> Each technique has strengths and weaknesses. Ileal conduit has become the gold standard for urine diversion because it has advantages, among others it is easier and faster to make to minimize postoperative complications, while continent diversion has the advantage of sustained diversion that can eliminate the need for external equipment.<sup>[4]</sup>

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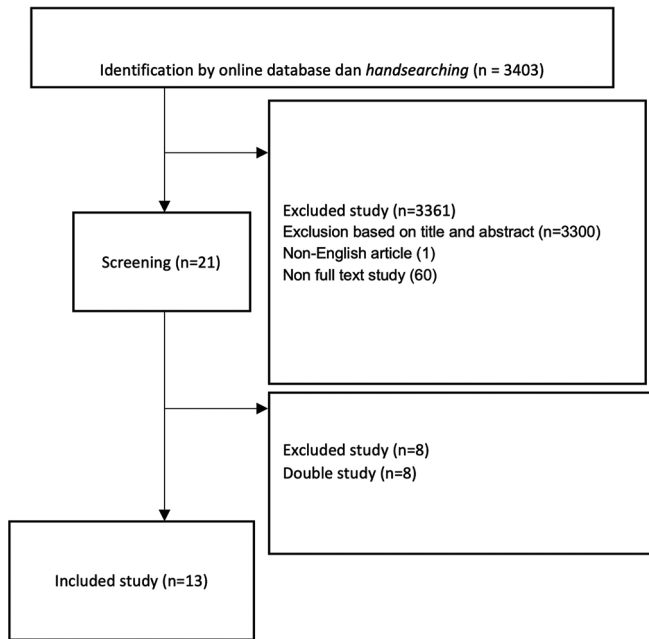
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Urinary diversion is a procedure that has early and final complications. Incidence of urinary diversion complication happens between 0.7% and 11%.<sup>[4,5]</sup> Bowel obstruction after cystectomy and urinary diversion can occur in the early postoperative period as a result of paralytic ileus or mechanical obstruction, or some postoperative time in the form of adhesion from intestinal obstruction. Although a thorough investigation has been published on risk factors, prevention and management of postoperative paralytic ileus, data on intestinal obstruction, adhesions, and surgical techniques in the literature are still scarce and require further investigation. This needs to be done to meet the final goal,

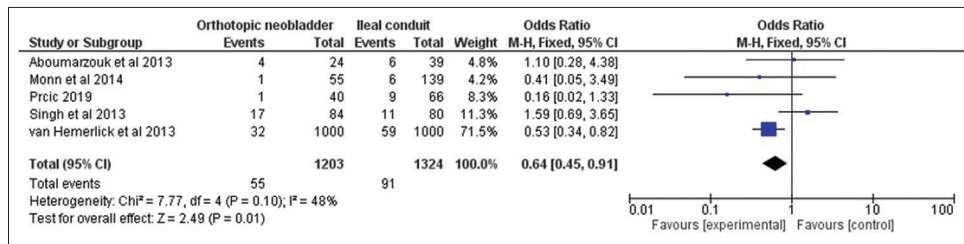
which is to suggest guidelines in cases that need to be done for urine transfer so that it can help to counsel patients and their families to make optimal decisions before surgery and obtain an explanation and approval. Patient explanation and approval are important to obtain before undergoing an action, especially surgery. Patients need to be informed about the procedure to be undertaken, the process of healing, treatment process, lifestyle changes, and complications of the action. To provide optimal information and avoid problems, especially in the era of the Jaminan Kesehatan Nasional/ Indonesia's National Health Insurance (JKN), several efforts should be made to increase patient knowledge of the disease and the actions that will be undertaken. The acceleration of patient recovery and reduction in time spent in the hospital were important factors for the success of treatment in the JKN era. Both of these factors are influenced by the choice of surgical techniques that allow patients to recover faster without any further complications.

**METHODS**

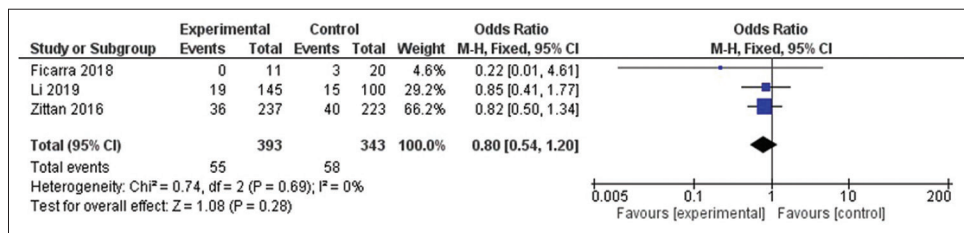
This study is a systematic review in patient with bowel obstruction that undergoing urinary diversion by searching online databases such as PubMed, EBSCOhost, and ProQuest. In this study, we used a cohort study design and randomized control trial because it is an appropriate study to determine the comparison of the incidence of intestinal obstruction in patients undergoing urinary diversion by several methods. The keywords used in this study are “urinary diversion AND ileal conduit AND complication AND intestinal obstruction or bowel obstruction AND leakage AND adhesion” In this study, we used several inclusion criteria such as the last 10 years journals, full-text, research design retrospective, and randomized controlled



**Figure 1:** Systematic search for systematic review studies in accordance with the PRISMA process



**Figure 2:** Forest plot of the ileal conduit versus orthotopic neobladder method



**Figure 3:** Forest plot of the conventional versus modified ileal conduit method

trials and have Population, Intervention, Comparator and Outcome (PICO) requirements including patients with intestinal obstruction after ileal conduit and urinary diversion [Figure 1]. Studies that do not meet the above criteria are immediately excluded from a systematic review. The searching strategy can be seen in Table 1.

**RESULTS**

After searching the article using keywords provide, we got 3403 studies. We then excluded 3300 studies based on title, author's name, and abstract. From 103 studies, we excluded 82 studies so that we get 21 studies studied. Of these studies, 13 studies were included in the quantitative analysis. The characteristics of this study are then presented in Tables 2-4. We divide it into two: studies that describe the ileal conduit method and

studies that compare ileal conduit with orthotopic neobladder and compare studies with intestinal preparation and without intestinal preparation. In Table 4, we also included studies about on different method of ileal conduit.

**Synthesis of the result**

After the study, we found that there was a difference in the incidence of intestinal obstruction between the ileal conduit method and orthotopic neobladder which was 0.64 (0.45–0.91) and not statistically significant ( $P = 0.10$ ) [Figure 2], but the Z-test had a statistically significant result ( $Z = 2.49$ ,  $P = 0.01$ ). In addition, we also found differences in the incidence of bowel obstruction in patients undergoing ileal conduit with conventional techniques and modified techniques 0.80 (0.54–1.20), but these results were not statistically significant ( $Z = 1.08$ ,  $P = 0.28$ ) [Figure 3].

**Table 1: Studies that show the incidence of ileal conduit and orthotopic neobladder with intestinal preparation and without intestinal preparation**

Article	Study design	Year	Location	Subject		Age		Incidence	
				Bowel preparation	Without bowel preparation	Bowel preparation	Without bowel preparation	Bowel preparation	Without bowel preparation
Xu et al.	RCT	2010	China	47	39	70.24±19.3	71.36±18.65	Ileus 1: (2.1%) Sepsis 1: (2.1%) Anastomosis leakage: 1 (2.1%) Death: 1 (2.1%) UTI: 18.05% SBO: 5.7% Leakage: 0 Death: 2.86% SBO: 16.2% Fascial dehiscence: 2.7% Anastomosis leakage: 0 Infection: 0	Ileus: 2 (5.1%) Sepsis: 0 Anastomosis leakage: 1 (2.6%) Death: 1 (2.6%) UTI: 12% SBO: 0 Leakage: 1.3% Death: 5.3% SBO: 12.1% Fascial dehiscence: 3.03% Anastomosis leakage: 0 Infection: 0
Large et al.	Prospective cohort	2012	USA	105	75	71.2 (60.4–76.5)	70 (57.7–76.9)		
Raynor et al.	Retrospective cohort	2013	USA	37	33	68.6 (33–88)	65.8 (44–87)		

UTI: Urinary tract infection, SBO: Small bowel obstruction

**Table 2: Studies that comparing ileal conduit with orthotopic neobladder**

Article	Study design	Years	Location	Subject		Age		Incidence	
				Ileal conduit	Orthotopic neobladder	Ileal conduit	Orthotopic neobladder	Ileal conduit	Orthotopic neobladder
Singh et al.	Prospective study	2013	India	80	84	58.7±8.96	56.1±7.26	SBO: 13.75% Urinary leakage: 6.25% Wound infection: 8.75% Pneumonia: 11.25% Bowel obstruction: 5.91% UTI: 13.06% Hernia inguinal: 11.25% Death: 18.16%	SBO: 20% Urinary leakage: 19.05% Wound infection: 5.95% Pneumonia: 11.90% Bowel obstruction: 3.19% UTI: 13.96% Hernia inguinal: 15.46% Death: 8.49%
Van Hemelrijck et al.	Prospective study	2013	England	4727	1573	67.29	61.46	Sepsis: 5.13% Ileus: 15.39% Urine leak: 0 Lymph leak: 5.13% Bowel obstruction: 4.32% Ileus: 33.09% DVT: 2.16% Bowel leakage: 1.44% SBO: 13.6% Bacterial infection: 96.9%	Sepsis: 4.17% Ileus: 16.67% Urine leak: 11.25% Lymph leak: 4.17% Bowel obstruction: 1.82% Ileus: 16.36% DVT: 1.82% Bowel leakage: 1.82% SBO: 2.5% Bacterial infection: 17.5%
Aboumarzouk et al.	Prospective study	2013	Poland	39	24	60 ±7.11	57 ±8.68		
Monn et al.	Retrospective cohort	2014	USA	139	55	72.6 (10)	59.6 (9)		
Prcic et al.	Retrospective study	2019	Bosnia	66	40		40–80		

UTI: Urinary tract infection, SBO: Small bowel obstruction, DVT: Deep vein thrombosi

**Table 3: Study on different methods of orthotopic neobladder**

Article	Study design	Year	Location	Subject		Age		Incidence	
				Ileal	Sigmoid	Ileal	Sigmoid	Ileal	Sigmoid
Mostafa <i>et al.</i>	Prospective and retrospective study	2013	Egypt	40	40	62.22±7.45	62.30±9.40	Leakage: 2.5% Urinary Obstruction: 2.5% Ileus: 12.5% DVT: 12.5%	Leakage: 17.5% Urinary Obstruction: 2.5% Ileus: 7.5% DVT: 2.5%
Miyake <i>et al.</i>	Prospective cohort	2013	Japan	144	90	65.5	64	Ileus: 8.3% Pyelonephritis: 7.6% Bowel leak: 3.47% DVT: 2.08%	Ileus: 11% Pyelonephritis: 10% Bowel leak: 3.3% DVT: 2.22%

DVT: Deep vein thrombosi

**Table 4: Study on different methods of ileal conduit**

Article	Study design	Year	Location	Subject		Age		Incidence	
				Ileal conduit	Modification	Ileal conduit	Modification	Ileal conduit	Modification
Zittan <i>et al.</i>	Retrospective study	2016	USA	223	237	40	35.6	Ileus: 18% Wound infection: 13.1% UTI: 0.9%	Ileus: 15.2% Wound Infection: 12.7% UTI: 0.8%
Ficarra <i>et al.</i>	Prospective study	2018	Italy	37	30	74 (69-79)	73 (67.7-78.2)	Anemia: 18.9% UTI: 2.7% SBO: 8.1% Sepsis: 2.7%	Anemia: 16.7% UTI: 10% SBO: 0 Sepsis: 0
Li <i>et al.</i>	Retrospective study	2019	China	100	145	62 (30-89)	62 (18-88)	Bowel obstruction: 15% Renal function disturbance: 14% UTI: 5% Anastomosis leakage: 3%	Bowel obstruction: 13.1% Renal function disturbance: 13.9% UTI: 6.89% Anastomosis leakage: 2.76%

UTI: Urinary tract infection

## DISCUSSION

In several studies, it was found that the incidence of intestinal obstruction was higher in ileal conduit compared to orthotopic neobladder.<sup>[5-7]</sup> However, the results of studies of van Hemelrijck *et al.*, Aboumarzouk *et al.*, and Monn *et al.* show differences in complications that are not statistically significant. Only one study from Prcic and Begic stated that the ileal conduit method had a higher incidence of intestinal obstruction complications when compared to orthotopic neobladder which showed a significant value with  $P < 0.005$ .<sup>[8]</sup>

Different results were shown in a study by Singh *et al.* which shows that the incidence of small bowel obstruction in the orthotopic neobladder group is higher when compared to the ileal conduit group (17/84 vs. 11/80). The incidence of small bowel obstruction is higher when compared to the incidence of other complications such as pneumonia (9/80) and infection at the wound site (7/80).<sup>[9]</sup>

The ileal conduit method has variants such as the conventional method and the modified method. Modification method based on different techniques on the ileal conduit. The type of modification carried out by Ficarra *et al.*, compared with rectosigmoid transposition to the left ureter.<sup>[10]</sup> Li *et al.* compared making a stoma intracorporeally using a distal segment of the ileum.<sup>[11]</sup>

These studies did not show a significant difference in the state of obstruction. However, there was a significant difference in anastomotic complications which were higher in the conventional ileal conduit compared to the modified method.<sup>[11]</sup>

In orthotopic neobladder method that compared to ileal neobladder method and sigmoid neobladder, Mostafa *et al.* stated that the incidence of small bowel obstruction in ileal neobladder method is slightly higher than in sigmoid neobladder (5/40 vs. 3/40). In general, the two did not have a significant difference in complications of bowel obstruction, but sigmoid orthotopic had lower postoperative complications.<sup>[13]</sup> While another study conducted by Miyake *et al.* showed that the complications of the two neobladder methods were not significantly different.<sup>[14]</sup>

Bowel obstruction is a complication that often occurs after an abdominal surgery. Based on Hartmann's definition, the occurrence of intestinal obstruction can be defined as the inability to digest solid food with abdominal distension, and difficulty in entering the nasogastric tube.<sup>[14]</sup> The incidence of intestinal obstruction is caused by several conditions. In a study conducted by Varkarakis *et al.*, small bowel obstruction in patients undergoing the most diversionary

urine procedure was caused by anastomotic leakage and the second most common cause was adhesion.<sup>[1]</sup>

Anastomotic leakage has a high morbidity and mortality because it can cause septic shock in patients. A study states that the presence of anastomosis involves bacterial and immune system infections. Anastomosis infection can be caused by anastomosis dehiscence or pre/intraoperative contamination. The complications of anastomosis include various clinical manifestations ranging from bleeding and stricture to leakage and perforation. Patients can show a broad spectrum of symptoms that can arise acutely, delayed, or chronically. Anastomotic leak can appear acutely as septic shock or with much milder symptoms such as discomfort or small bowel obstruction.

Adhesion is a condition characterized by the presence of fibrous tissue in an organ or cavity that should be separate. This condition is caused by unbalanced fibrinolysis due to postoperative wound formation. Fibrin works to heal injured tissue, and once produced, is stored along the surface of the peritoneum. Under normal circumstances, fibrin matrix formation during wound healing is only temporary, and degradation of fibrinous film adhesion caused by proteases released locally from the fibrinolytic system occurs locally within 72 h postinjury. Thus, the process of fibrinolysis is not limited to intravascular thrombus degradation; but also has an important role in tissue remodeling and repair.<sup>[15]</sup> There are several ways that can be done to prevent bowel obstruction after the procedure. General conditions optimization, nutritional status, and prevention of infection/sepsis need to be considered. Anastomosis and intraoperative tissue handling must also be done well. Preoperative bowel preparation was thought to be one of the actions, but several studies have shown that preparation before surgery does not result in clinical significance in reducing the incidence of complications of intestinal obstruction.<sup>[16-19]</sup>

In this study, we found several weaknesses such as limited number of articles used and lack of exploration of the causes of complications of intestinal obstruction in patients undergoing urinary diversion.

## CONCLUSION

We can conclude that there is no significant difference in bowel obstruction incidence between orthotopic neobladder method and ileal conduit.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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