# Impacts of Urinary Diversions Associated with Cystectomy on the Quality of Life of Cancer Patients: Systematic Review and Meta-Analysis

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*Impactos das Derivações Urinárias Associadas à Cistectomia na Qualidade de Vida de Pacientes Oncológicos: Revisão Sistemática e Metanálise*

Impactos de las Derivaciones Urinarias Asociadas con la Cistectomía en la Calidad de Vida de los Pacientes con Cáncer: Revisión Sistemática y Metaanálisis

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ABSTRACT

**Introduction:** Bladder cancer (BC) originates in the epithelium of the inner surface of the urinary bladder and involves hematuria and nonspecific symptoms of the lower urinary tract. The management of invasive BC is commonly performed by radical cystectomy with urinary diversion, with emphasis on the ileal conduit (IC) and continent diversion (CD) methods. **Objective:** To comparatively analyze the impacts on the quality of life of patients undergoing IC and CD associated with cystectomy for BC. **Method:** Systematic literature review with meta-analysis, which followed the recommendations of the PRISMA 2020 protocol. Data were collected from the online databases BVS, Scopus, PubMed, Web of Science, Embase, Cochrane Library and SciELO, organized by Rayyan QCRI and analyzed for their quality of evidence by the Joanna Briggs Institute critical scale. The meta-analysis was developed using the Review Manager 5.4.1 software. **Results:** Seven studies were included in the Review, of which four met the criteria for meta-analysis. In the analysis, no significant summary differences were identified between IC and DC in the "Global Health Scale", "Functional Capacity" and "Cognitive Capacity". The performance of DC prevailed in the "Physical Capacity" and "Emotional Capacity" domains. In contrast, a greater benefit of IC was observed in the "Social Capacity" of the individuals. **Conclusion:** Thus, although DC presented better results in the late postoperative period in some areas, the two methods presented similar results in a general analysis, evidencing the need for an individualized choice according to the patient's profile.

**Key words:** Urinary Bladder Neoplasms/surgery; Surgical Oncology; Urinary Diversion/methods; Quality of Life; Sickness Impact Profile.

RESUMO

**Introdução:** O câncer de bexiga (CB) origina-se no epitélio da superfície interna da bexiga urinária e abrange hematúria e sintomas inespecíficos do trato urinário inferior. O manejo do CB invasivo é comumente realizado por meio da cistectomia radical com derivação urinária, com destaque aos métodos do conduto ileal (CI) e do desvio continente (DC). **Objetivo:** Analisar comparativamente os impactos na qualidade de vida de pacientes submetidos ao CI e ao DC associados à cistectomia para o CB. **Método:** Revisão sistemática da literatura com metanálise, que seguiu as recomendações do protocolo PRISMA 2020. Os dados foram coletados das bases de dados on-line BVS, Scopus, PubMed, *Web of Science*, Embase, *Cochrane Library* e SciELO, organizados pelo Rayyan QCRI e analisados quanto a sua qualidade de evidência pela escala crítica do *Joanna Briggs Institute*. A metanálise foi desenvolvida por intermédio do *software Review Manager 5.4.1.* **Resultados:** Foram incluídos sete estudos na revisão, dos quais quatro atenderam aos critérios para a metanálise. Na análise, não foram identificadas diferenças sumárias significativas entre o CI e o DC na "Escala de Saúde Global", na "Capacidade Funcional" e na "Capacidade Cognitiva". A realização do DC prevaleceu nos domínios "Capacidade Física" e "Capacidade Emocional". Em contrapartida, foi observado um maior benefício do CI na "Capacidade Social" dos indivíduos. **Conclusão:** Dessa forma, apesar do DC ter apresentado melhores resultados no pós-operatório tardio em alguns âmbitos, os dois métodos apresentaram resultados semelhantes em uma análise geral, evidenciando a necessidade de uma escolha individualizada de acordo com o perfil do paciente.

**Palavras-chave:** Neoplasias da Bexiga Urinária/cirurgia; Oncologia Cirúrgica; Derivação Urinária/métodos; Qualidade de Vida; Perfil de Impacto da Doença.

RESUMEN

**Introducción:** El Cáncer de Vejiga (CV) se origina en el epitelio de la superficie interna de la vejiga urinaria y abarca hematuria y síntomas inespecíficos del tracto urinario inferior. El manejo del CV invasivo comúnmente se realiza mediante cistectomía radical con derivación urinaria, con énfasis en los métodos del conducto ileal (CI) y la derivación continente (DC). **Objetivo:** Analizar comparativamente los impactos en la calidad de vida de los pacientes sometidos a CI y DC asociados a la cistectomía por CV. **Método:** Revisión sistemática de la literatura con metaanálisis, que siguió las recomendaciones del protocolo PRISMA 2020. Los datos fueron recopilados de las bases de datos en línea BVS, Scopus, PubMed, *Web of Science*, Embase, *Cochrane Library* y SciELO organizados por Rayyan QCRI y analizados en cuanto a su calidad de evidencia por la escala crítica del *Instituto Joanna Briggs*. El metaanálisis se desarrolló utilizando el *software Review Manager 5.4.1.* **Resultados:** Se incluyeron siete estudios en la revisión y cuatro cumplieron los criterios para metanálisis. En el análisis no se identificaron diferencias sumarias significativas entre el CI y DC en la "Escala de Salud Global", en la "Capacidad Funcional" y en la "Capacidad Cognitiva". La realización de DC prevaleció en los dominios "Capacidad Física" y "Capacidad Emocional". Sin embargo, se observó un mayor beneficio del CI en la "Capacidad Social" de los individuos. **Conclusión:** Así, aunque la DC presentó mejores resultados en el posoperatorio tardío en algunos ámbitos, los dos métodos presentaron resultados similares en un análisis general, destacando la necesidad de una elección individualizada según el perfil del paciente.

**Palabras clave:** Neoplasias de la Vejiga Urinaria/cirugía; Oncología Quirúrgica; Derivación Urinaria; Calidad de Vida; Perfil de Impacto de Enfermedad.

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## INTRODUCTION

Bladder cancer (BC) originates in the epithelium of the inner surface of the urinary bladder, with histomorphological presentation as adenocarcinoma and squamous cell and small cells carcinoma. Its clinical manifestation is strongly associated with macro and microscopic hematuria, present in 78.3% and 13.7% of the cases, respectively, in addition to unspecified symptoms of the lower urinary tract[1,2].

The oncogenesis of BC is multifactorial with well-defined risk factors as smoking which is associated with nearly 50% of the cases. In addition, other factors as low-fruit diet, prolonged occupational exposure to carcinogenic agents, genetic predisposition and alcohol use are also related to physiopathogenic mechanisms[3].

According to the Global Cancer Observatory (GLOBOCAN)[4], 613,791 new cases of BC have been registered in 2022 worldwide. In this same year, BC was the ninth neoplasm most prevalent in the world, accounting for 3.1% of new cases of cancer and 2.3% of deaths by this disease globally. Brazil recorded 11,370 new cases in 2021 and 4,929 deaths in 2020, nearly 70% of which in males, the sixth most common type of cancer for this population[5].

Cystoscopy and collection of histopathologic specimens support the diagnosis of patients with BC. The therapy of choice is surgery after the type of neoplasm is determined – muscle invasive (MIBC) or non-muscle invasive (NMIBC) BC. In that line, MIBC is usually managed through radical cystectomy followed by orthotopic neobladder[6,7] with urinary diversion, particularly by the methods of ileal conduit (IC) and continent diversion (CD).

Patients with BC face challenges related to the natural course of the disease and treatments currently available, mainly surgical therapies associated with urinary diversions. Complaints and impacts on quality of life postsurgical procedures reported by the patients differ depending on some variables as sex, age and socioeconomic conditions. Quality of life is understood as the intersection of multiple domains and the patient's health context, usually measured through scales and questionnaires[8].

Negative alterations associated with the principal methods of urinary diversion directly affect the quality of life, self-esteem, difficulty of continuing labor functions, interpersonal relations and others, whose dimension influences the quality of life reported[9,10]. This article is justified by the relevance of the theme over the quality of life of the patients and improvement of the surgical approach within the neoplastic context according to Ghosh et al.[11] systematic review.

The objective of the present study is to compare analytically the impacts on the quality of life of patients submitted to IC and CD associated with cystectomy of BC.

## METHOD

Systematic literature review with meta-analysis consisting in structured and methodic literature survey of studies addressing a health-related theme and statistical analysis[12]. The strategy PICO was adopted – (P: patients; I: intervention; C: comparison; O: outcome) – based on the following research question: "What are the impacts on the quality of life of patients submitted to ileal conduit (IC) and continent diversion (CD) associated with cystectomy of bladder cancer (BC)?".

The recommendations and guidelines of the protocol Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020[13] were adopted to minimize biases and registered at the International Prospective Register of Systematic Reviews (PROSPERO)[14] code CRD42024566561. Approval by the Institutional Review Board was waived because only secondary data have been utilized in compliance with Directive 510[15] dated April 7, 2016 of the National Health Council.

Data were searched at the online databases Virtual Health Library (VHL) − Latin America and Caribbean Health Sciences Library (LILACS) − Scopus, US National Library of Medicine National Institutes of Health (PubMed), Web of Science, Excerpta Medica Database (Embase), Cochrane Library − Cochrane Central Register of Controlled Trials (CENTRAL) − and Scientific Electronic Library Online (SciELO).

Descriptors of the Medical Subject Headings (MeSH) and variations in other languages have been applied. Boolean operators AND and OR were utilized to ensure the correct combination of the terms: ("Neoplasms of the Urinary Bladder " OR "No-muscle invasive bladder cancer" OR "Transitional Cell Carcinoma") AND (Therapeutic OR "Surgical Oncology" OR Cystectomy OR "Urinary Diversion" OR Ureterostomy) AND ("Quality of Life" OR "Indicators of Quality of Life" OR "Profile of the Impact of the Disease").

Articles were selected in three stages: (1) search at the databases with application of filters and descriptors, in addition to exclusion of duplicates; (2) screening based on titles and abstracts and (3) selection after full reading of the remaining studies[16,17]. Two authors conducted the three stages independently and another author revised and resolved outstanding discrepancies. The software Rayyan QCRI[18] was utilized for screening, organization and storage of the references and other materials utilized for the study development.

The inclusion criteria were full articles available in any language published from July 2014 and June 2024 that met the research question and utilized the European Organisation for Research and Treatment of Cancer Questionnaire – Core 30 (EORTC QLQ-C30)[19].

EORTC QLQ-C30 is a 30-item generic standardized instrument developed by the EORTC to measure the quality of life of oncologic patients in international clinical trials. The questionnaire groups individual capacities (physical, emotional, cognitive, social and roles), symptoms scale (fatigue, pain, nausea/vomit) and global health scale[19].

The exclusion criteria were review articles, guidelines, books, thesis, dissertations, editorials, annals of congress, letters to the editor and errata, in addition to studies addressing BC related urinary diversions without IC and CD comparators and low-evidence studies.

The investigators evaluated the relevant aspects based on inclusion criteria and adequacy to the theme and created a summary. The studies were structured according to the number of the study, authors, year of publication, type of the study, origin country, sample and main findings.

The critical appraisal tools of the Joanna Briggs Institute (JBI) were applied to evaluate the design, execution and analysis of the studies[20].

Initially, the data were organized in a Microsoft Excel 2016 database through which the studies that best met the research question were selected. Later, the findings were categorized according to the data extracted from the publications included. Qualitative analysis followed four stages: 1) full reading; 2) description of the data and elaboration of the summary chart; 3) thorough reading and 4) analysis of the studies' content.

The software Review Manager 5.4.1[21] was applied for the meta-analysis based on the responses to the questionnaire EORTC QLQ-C30. For the outcomes "global health scale" and "individual capacities", a continuous variable with calculation of the differences of the scores evaluated and confidence interval of 95% was adopted. Outcomes were statistically significant when $p < 0.05$. The heterogeneity was measured by the test $I^2$: whether $I^2 \leq 25$, the studies were classified as homogeneous; whether $I^2 > 25$ and $< 75$, heterogeneity was considered moderate and whether $I^2 \geq 75$, the studies were considered highly heterogeneous[22].

## RESULTS

1,953 articles have been identified at the databases (693 at VHL, 615 at Scopus, 560 at PubMed, 67 at Web of Science, 10 at Embase, five at Cochrane Library and 3 at SciELO). However, 1,003 duplicates were excluded, resulting in 950 publications evaluated through reading of titles and abstracts; eventually, 15 articles were eligible for full reading.

Five studies were excluded for not meeting the research question and three for not utilizing the questionnaire EORTC QLQ-C30. Eventually, seven articles were analyzed through the JBI critical appraisal tools, of which four were included in the meta-analysis. Figure 1 portrays the flowchart PRISMA.

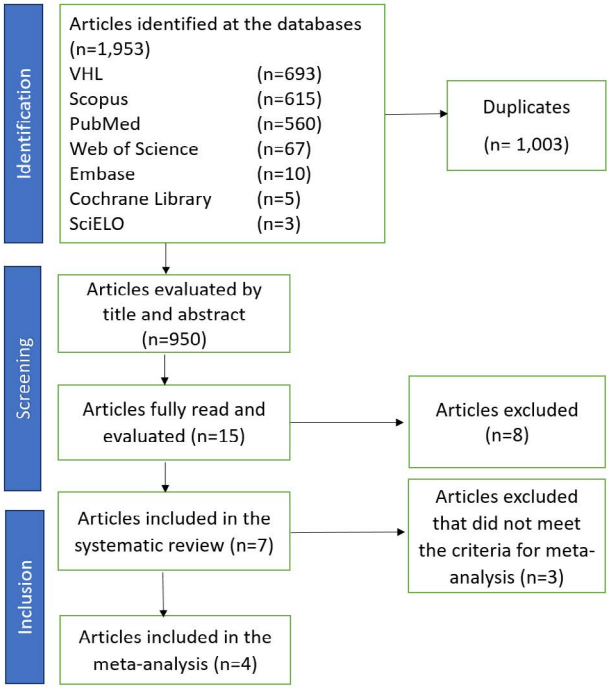


**Figure 1.** Flowchart PRISMA
**Source:** The authors, adapted from PRISMA 2020[13].

Because there were no exclusions while investigating the risk of bias through JBI critical appraisal tools, seven highly scientific reliable studies formed the final sample. Chart 1 portrays the scores of each article according to JBI scale.

The main aspects of the studies are presented in Chart 2[23-39].

The meta-analysis (forest plots in Figures 1 and 2) revealed differences between the methods IC and CD depending on the variables considered. Negative values mean statistical advantages in CD questionnaire while positive values mean advantages for IC[20].

## DISCUSSION

The impacts of different urinary diversions on the quality of life of oncologic patients are challenging in regard to the selected method post cystectomy. The results

**Chart 1.** Analysis of risk of bias of the studies selected according to the Joanna Briggs Institute scale

| Study type | Study Number | Joanna Briggs Institute scale | | | | | | | | | | | Risk of bias |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Q.1 | Q.2 | Q.3 | Q.4 | Q.5 | Q.6 | Q.7 | Q.8 | Q.9 | Q.10 | Q.11 | |
| Cohort | S1 | Y | NA | Y | Y | N | Y | Y | Y | Y | Y | Y | **Low** |
| | S2 | N | NA | Y | Y | Y | Y | Y | Y | Y | NA | Y | **Low** |
| | S3 | N | NA | Y | Y | N | Y | Y | Y | N | N | Y | **Moderate** |
| Cross--sectional | S4 | Y | Y | Y | Y | Y | U | Y | Y | NA | NA | NA | **Low** |
| | S5 | Y | Y | Y | Y | Y | Y | Y | Y | NA | NA | NA | **Low** |
| | S6 | Y | Y | Y | Y | Y | N | Y | Y | NA | NA | NA | **Low** |
| | S7 | Y | Y | Y | Y | Y | Y | Y | Y | NA | NA | NA | **Low** |

**Captions:** Q.1-Q.11 = questions 1 to 11 of the risk of bias critical appraisal tools of the Joanna Briggs Institute; Y = yes; N = no; UN = uncertain; NA = not applicable.
**Note:** Risk of bias was classified as high when 49% of the scores were yes, moderate, when 50% to 60% were yes and low when 70% were yes

**Chart 2.** Articles included in the systematic review

| SN | Author, year | Study type | Country | Sample | Main findings |
|---|---|---|---|---|---|
| 1 | Bahlburg et al.[23], 2024 | Cohort | Germany | 842 (447 IC and 395 CD) | Moderate to high compromise of quality of life at immediate postoperative radical cystectomy with urinary diversion. Urinary continence and psychosocial suffering improved significantly during rehabilitation of inpatients[23] |
| 2 | Clements et al.[24], 2023 | Cohort | USA | 411 (205 IC and 206 CD) | Damages of quality of life at three or six months post-operation, except sexual functioning and body image of IC patients[24] were undetected |
| 3 | Muller et al.[25], 2023 | Cohort | Germany | 230 (51 IC and 179 CD) | No significative differences of quality of life and emotional well-being have been found in IC and CD patients 12 months post-operation. Noticeable differences of rate of return to work were undetected[25] |
| 4 | Zahran et al.[26], 2017 | Cross-sectional | Egypt | 145 (61 IC and 84 CD) | CD patients did not present better statistical performance for HRQOL than IC patients. In addition, CD patients exhibited worst scales of symptoms according to EORTC-QLQ-C30 for IC[26] |
| 5 | Cerruto et al.[27], 2017 | Cross-sectional | Italy | 322 (148 IC and 174 CD) | CD had better results in cognitive and emotional domains, further to stable intestinal function. Males had less complications as nausea and pain[27] |
| 6 | Biardeau et al.[28], 2020 | Cross-sectional | France | 40 (23 IC and 17 CD) | Significant differences of quality of life and functional results of IC and CD patients were not found, only a minimally higher score for CD in activities of the daily life[28] |
| 7 | Siracusano et al.[29], 2018 | Cross-sectional | Italy | 73 (49 IC and 24 CD) | Long-term significant differences among IC and CD patients were not found, except financial differences that appear to affect the latter more[29] |

**Captions:** SN = study number; IC = ileal conduit; CD = continent diversion.

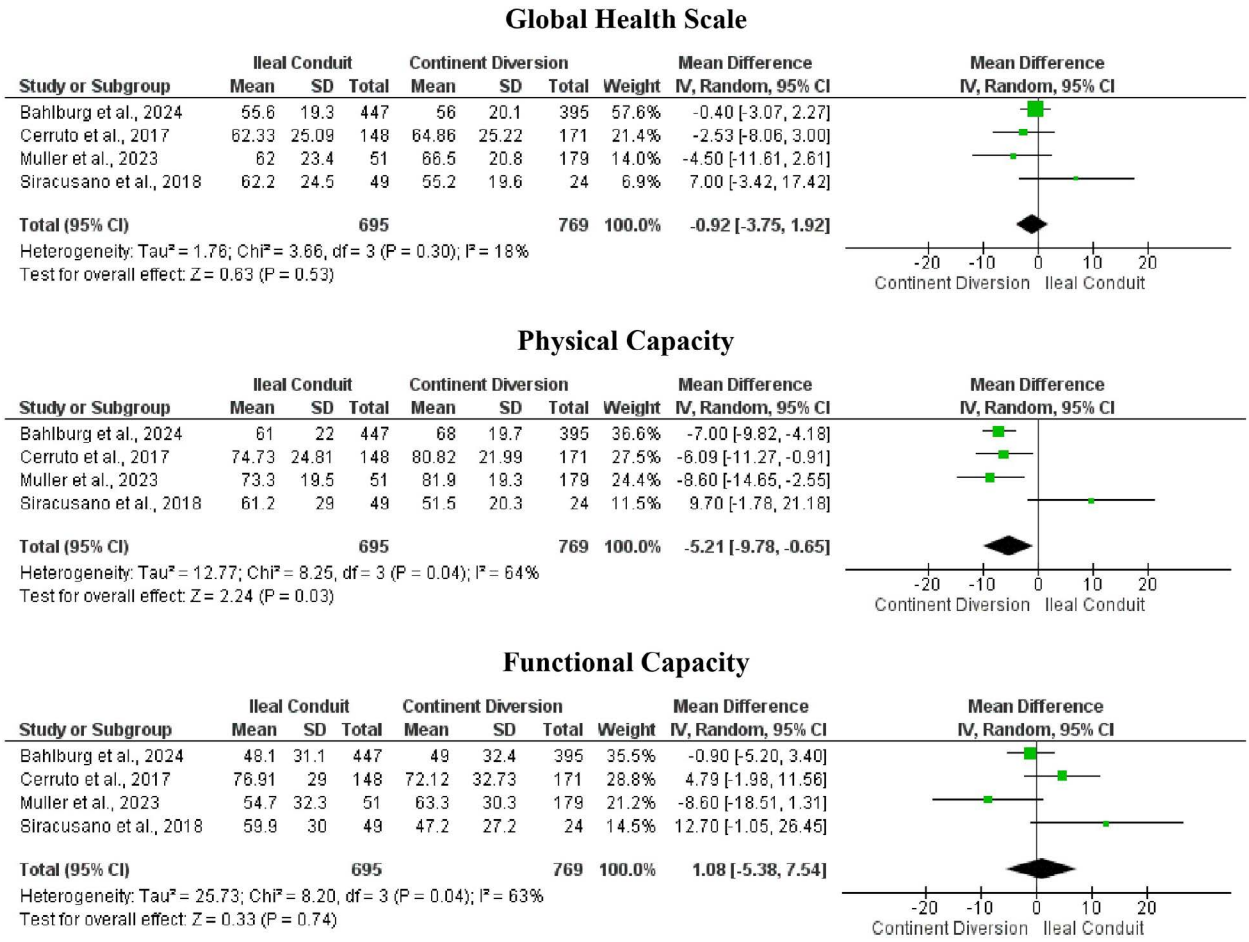


**Figure 2**. Comparative forest plot of EORTC QLQ-C30 scores for individuals submitted to CD and IC
**Captions:** EORTC QLQ-C30 = European Organisation for Research and Treatment of Cancer Questionnaire - Core 30; CD = continent diversion; IC = ileal conduit.

of the present review, according to the questionnaire EORTC QLQ-C30, suggest an increase in nearly all the domains evaluated for patients post urinary diversion[24,30].

The global health scale corresponds to the patients full perception of their health and quality of life through general psychometric self-evaluation[31]. The results of this meta-analysis (Figure 2) showed a negligible difference (-0.92[-3.75; 1.92]) among individuals submitted to CD and IC without clear predominance of one modality of urinary diversion. In addition, the two modalities resulted in improved quality of life after physiotherapy rehabilitation referred by 39.7 x 55.8 for CD and IC respectively according to EORTC QLQ-C30 ($p < 0.001$) as concluded by Muller et al.[25].

CD predominated in the domain physical capacity (Figure 2) compared with IC (-5.21[-9.78; -0.65]). Siracusano et al. did not find statistical prevalence of CD (9.70[-1.78; 21.18]) in the only study of the meta-analysis with a sample of women, which was corroborated by Messer et al.: female gender is independently associated with worst symptomatologic prognosis for both modalities of urinary diversion[29,32].

An 18-month prospective post-operation cohort study by Singh et al.[33] concluded that there was no prevalence of any of the methods of urinary diversion in relation to functional capacity[33]. The difference found in the meta-analysis (Figure 2) was minimal between IC and CD (1.08[-5.38; 7.54]), since nullity is a possibility of the statistical model[23]. Possibly, patients' symptoms similarity contributed for the minimal difference between two urinary diversions[34].

Emotional capacity (Figure 3) of patients submitted to radical cystectomy evaluated by the presence of psychological disorders was more preserved than CD expressed through a significant statistic difference between the methods utilized (-5.99[-8.73; -3.24]).

In counterpart, the studies of Bahlburg et al.[23] and Siracusano et al[29] did not show difference between the diversions (-8.30[-18.12; 1.52] and (-8.10[-21.35; 5.15]), possibly due to prolonged follow-up, based on initial improvement with psychologic support during intra-hospital rehabilitation, but the symptoms stabilized for both methods[23,29] 6 and 12 months after surgery.

The findings of Hedgepeth et al.[34] revealed that there was a gradual rise of the rates of body image for both diversions in

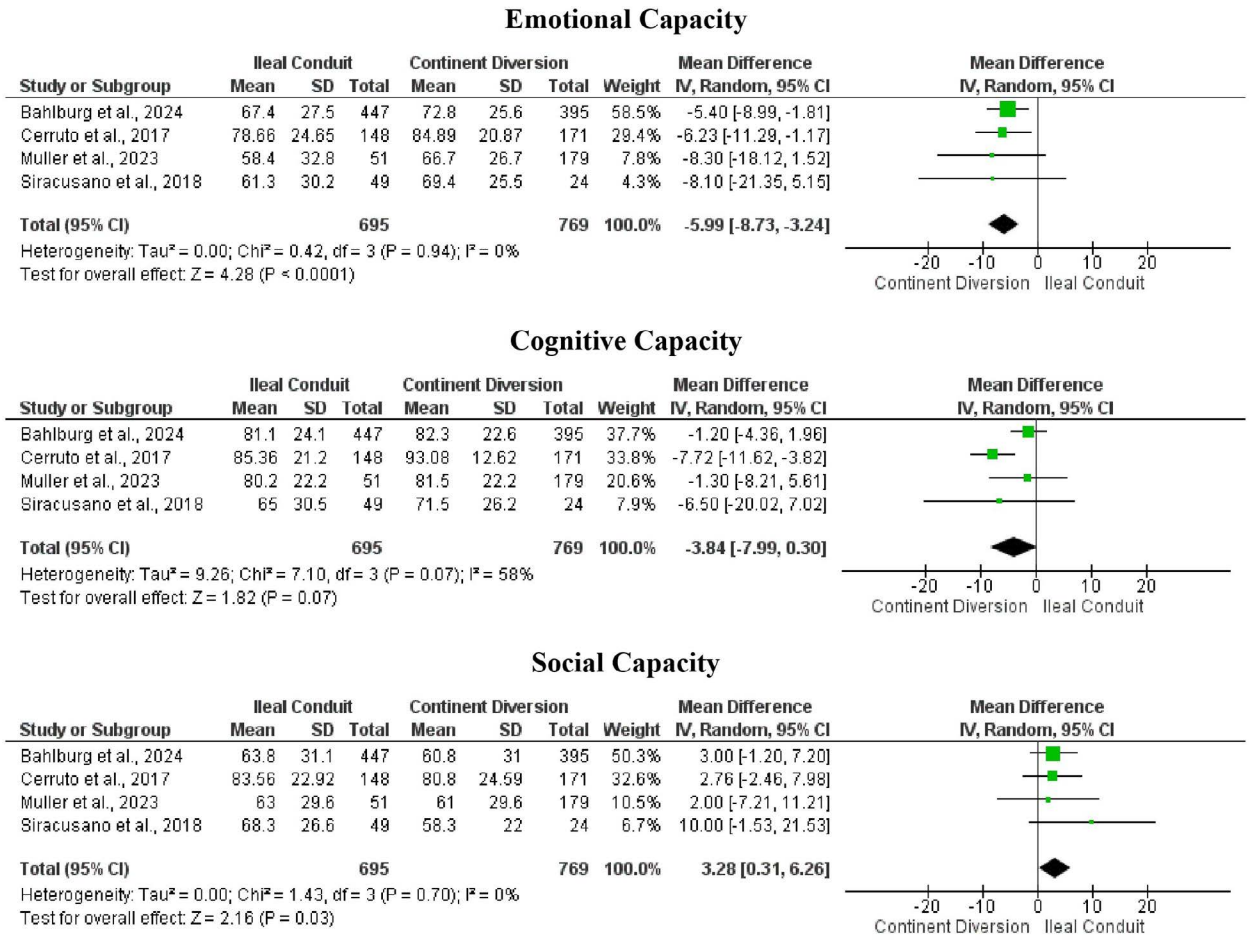


**Figure 3.** Comparative forest plot of individuals submitted to CD and IC according to EORTC QLQ-C30
**Caption:** EORTC QLQ-C30 = European Organisation for Research and Treatment of Cancer Questionnaire – Core 30; CD = continent diversion; IC = ileal conduit.

time, a potential sign of indirect psychological improvement since self-perception influences emotional well-being[34,35].

Cognitive capacity (Figure 3) consisting in subjective perceptions involving memory and concentration did not show significant statistic difference in the current meta-analysis (-3.84[-7.99; 0.3]). However, caution is advised since the studies investigated utilized highly heterogeneous samples ($i^2$=58%).

Only the study of Cerruto et al.[27] showed superiority of CD in cognitive function, however, sex, age, Body Mass Index, staging and time of follow-up of BC would be associated with statistical increase[27].

Given the importance of maintaining social interactions and impact of the experience with the disease lived by the patients submitted to radical cystectomy, it was observed that IC was superior than CD in regard to social capacity (Figure 3) (3.28[0.31; 6.26]), however, nullity was a possibility for all the studies included.

Concurrent with the current meta-analysis, the study of Zahran et al. showed that CD is closely related to the development of urinary incontinence in females, revealing a relation between urinary incontinence and limitation of social activities[26,36].

Urinary diversions in oncologic patients associated with radical cystectomy allows the reclaiming of aspects of quality of life earlier compromised. However, the method of choice of urinary diversion is associated with different response profiles of the patient functional status, because depending on the type of surgery proposed, one domain of quality of life can predominate over others[30,33,34].

Caution is advised while analyzing the results of this review with meta-analysis because of the study limitations: (1) scarce clinical trials addressing the theme systematically; (2) remarkable heterogeneity of the casuistic and methodology of the studies, hampering a more objective analysis and (3) possible subjectivity of the patients' responses.

## CONCLUSION

The differences among the IC and CD methods have been shown in the present study, but CD produced

more optimistic results for late post-operation, particularly for "physical capacity". However, the two modalities have similar results for most of the variables analyzed, emphasizing the necessity of making patient-centered choices.

Therefore, high order randomized clinical trials with standardized methodologies and questionnaires are required for better consolidation of the analysis of advantages and disadvantages of CD and IC for each population. With this, the quality of life of patients submitted to urinary diversions associated with cystectomy for BC can be best addressed and managed.

## CONTRIBUTIONS

Lucas Quaresma Martins, Lucas Ferraz de Souza Monteiro and Beatriz Lobato Cañizo Pereira contributed to the study design, acquisition, analysis and interpretation of the data, writing and critical review. Valéria Rebouças Cordovil and Rui Wanderley Mascarenhas Junior contributed to the study design, data analysis and critical review. All the authors approved the final version for publication.

## DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

## DATA AVAILABILITY STATEMENT

All subjacent contents are included in the manuscript.

## FUNDING SOURCES

None.

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