

RESEARCH ARTICLE

Preoperative educational materials improve the short-term quality of life of patients with urinary cancer

Yajian Li^{1,2} | Guanghua Huang³ | Wenjuan Cheng^{1,2} | Jiajie Wen^{1,2} |
Xueer Chen^{1,2} | Yanhua Du^{1,2} | Hongzhe Shi^{1,2}

¹Department of Urology, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

²Beijing Key Laboratory of Urologic Cancer Cell and Gene Therapy, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

³Department of Thoracic Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

Correspondence

Yanhua Du
Email: duyanhua1986@163.com

Hongzhe Shi
Email: shihongzhe_cicams@163.com

Abstract

Background: This study aimed to evaluate the short-term influence of preoperative educational materials on the quality of life in patients with newly diagnosed urinary cancer before surgery.

Methods: Patients with urinary cancer were retrospectively enrolled from April 2020 to March 2021. Quality of life was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 version 3.0 on the day of admission and after patients read the education materials. Propensity score matching was applied to match baseline characteristics in subgroup analyses.

Results: A total of 180 patients were enrolled. Most of them were male with renal cancer. Sleep disturbance ($p = 0.004$), appetite loss ($p = 0.013$), fatigue ($p = 0.002$), constipation ($p = 0.029$), and physical function ($p = 0.006$) showed statistically significant differences post-intervention. Subgroup analyses suggested that improvements in sleep disturbance, fatigue, and physical function persisted in the younger group (≤ 60 years old), while bladder cancer patients showed improvements in physical function and cognitive function.

Conclusion: Preoperative educational materials were associated with short-term improvements in specific quality of life domains among patients with urinary cancer. Younger age and bladder cancer diagnosis appeared to be potential effect modifiers.

KEYWORDS

patient education, quality of life, urinary cancer

1 | INTRODUCTION

Urinary cancer is one of the leading causes of cancer-related deaths worldwide. Prostate, bladder, and renal cancer account for 7.3%, 3.0%, and 2.2% of new cases and 3.8%, 2.1%, and 1.8% of new deaths, respectively, in 2020 worldwide^[1]. Incidence rates have risen in China in recent decades^[2-4]. Beyond its epidemiological scale, a newly diagnosed cancer imposes a substantial psychological burden, profoundly affecting patients' quality of life (QoL). The

initial feeling and subsequent adjustment could be characterized by denial, anger, bargaining, depression, and acceptance^[5]. Denial can lead to misunderstandings, poor physician-patient alignment regarding curability (41.4%) and treatment goals (69.0%)^[6,7]. A study found 39.3%, 28.0%, and 31.4% of newly diagnosed prostate cancer patients have depression, state anxiety, and trait anxiety^[8]. Another study revealed that female patients were likely to have heavier distress burdens than male^[9]. Recent studies have demonstrated that poor psychological states negatively

Yajian Li and Guanghua Huang contributed equally to the study.

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correlate with QoL, especially in the domain of pain, fatigue, dyspnea, and insomnia^[8,10]. The core issue might be the sense of illness uncertainty, which is a mental state of doubt and unpredictability about diagnosis, treatment efficacy, side effects, or long-term survival^[11].

To address this problem, our center developed educational materials guided by principles from Leventhal's Common-Sense Model and the concept of reducing illness uncertainty, which hypothesize that providing structured information helps patients form a comprehensive recognition of their illness, reduce stress, and promote adaptive coping behaviors^[11,12]. The materials cover symptoms, treatment strategies, and lifestyle advice. Although prior studies have examined the long-term QoL improvement resulted by surgical, pharmacological, social interventions, and perioperative counseling, the short-term effect of educational interventions remains understudied^[13-15]. In this study, we applied the well-validated European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) version 3.0 (simplified Chinese version) to assess QoL changes in patients with urinary cancers before and after reading educational materials^[16,17].

This retrospective study aimed to investigate the short-term effect of educational materials on the QoL in urinary cancer patients using the EORTC QLQ-C30 version 3.0.

2 | MATERIALS AND METHODS

This was a single-center, retrospective cohort study analyzing prospectively collected data from patients with urinary cancer who admitted to the Department of Urology at the Cancer Hospital of Chinese Academy of Medical Sciences from April 2020 to March 2021. All patients were informed upon admission that the routine care included receiving education handbooks and completing questionnaires. Patients had the right to decline to complete the questionnaires, which did not affect their receipt of routine care. Inclusion criteria were: (1) voluntary participation; (2) education level above primary school; (3) literacy; (4) no mental diseases or consciousness disorders; and (5) newly diagnosed with a malignant urological tumor and scheduled for surgery. Patients with inconsistent postoperative pathological reports were excluded.

The intervention included three handbooks for renal, prostate, and bladder cancers. The handbooks were developed by a multidisciplinary team including senior urologists and oncology nurses, guided by the aforementioned theoretical frameworks. The content was based on up-to-date clinical guidelines, textbooks, and openly published literature, covering epidemiology, symptoms, treatment, postoperative recovery, follow-up, and lifestyle advice. The handbooks (12-16 pages) used a question-and-answer format with plain language and illustrations. EORTC QLQ-C30 version 3.0 was used to measure QoL. It consisted of 30 items across 9 symptom or economic

domains and 5 functional domains^[18]. Scores were linearly transformed to 0-100 points. Minimally clinically important differences (MCIDs) have been established for only a limited number of cancers. We adopted previously published MCID values from two large-scale studies including patients with urinary cancer^[19,20]. When a domain-specific MCID was unavailable, an MCID of five points was assigned based on clinical expertise derived from other cancer types.

Trained investigators distributed the questionnaires, provided neutral instructions, and addressed any procedural questions. Patients completed the EORTC QLQ-C30 questionnaire themselves. The timing of the surveys was standardized for all participants and specifically for this study. The first assessment occurred on admission immediately after administrative procedures. Patients were asked to provide basic information like sex, age, and cancer type in a one-on-one manner and then received the cancer-specific materials. Patients were instructed to read the materials thoroughly. A second assessment was conducted 24 h later, before surgery. Patients were encouraged to write down their questions on the second questionnaire. The investigators would retrieve the questionnaire and perform a brief verbal check to confirm the patients had received and looked through the materials. The distribution and collection of questionnaires were mainly based on an online platform (Wenjuanxing). For those unfamiliar with or unable to use digital devices, paper-based questionnaires were also available. Questionnaires with completion time < 3 min were excluded.

Data were analyzed using descriptive statistics. Subgroup analyses were performed by age (cut-off: 60) and cancer type. Due to the small number of prostate cancer patients ($n=14$, all male), which hindered baseline matching, only patients with renal or bladder cancer were included for the cancer-type analysis. Propensity score matching (PSM) analysis was applied to minimize the baseline characteristics imbalance. PSM analysis was performed by MatchIt R package with 1:1 matching for age and 1:3 matching for cancer type via nearest-neighbor matching and a caliper of 0.02. Standardized mean difference (SMD) was calculated before and after PSM. An SMD value < 0.1 after PSM indicated good matching. The differences of means of two samples were tested by the Student's *t* test for data with normal distributions or Wilcoxon test for skewed data. The Wilcoxon signed-rank test was used for paired comparisons. The chi-square or Fisher's exact test was used to analyze group differences of categorical variables. Analysis of variance was used to compare mean values of data with normal distributions across 3 groups, and post hoc analysis revealed intergroup differences further. A *p*-value < 0.05 indicated significant difference. For outcomes that reached statistical significance, post-hoc Cohen's *d* values (*d*) were calculated, and 95% confidence intervals (CI) were obtained by bootstrap resampling. The R Project for Statistical Computing version 4.0.2 was used to analyze the data (RRID: SCR_001905).

3 | RESULTS

Of the 180 enrolled patients (mean age 56.85 years old, range 22–82; 69.44% male), most had renal cancer ($n = 102$, 56.67%) (Table 1). Mean questionnaire completion time decreased from 487 seconds in the first assessment to 382 seconds in the second, likely due to the increased familiarity. The most burdensome concerns for patients were sleep disturbance, financial difficulties,

constipation, and fatigue. Meanwhile, the emotional functioning was reported to be adversely affected. Sleep disturbance ($p = 0.004$, $d = 0.22$, 95% CI: 0.08–0.36), appetite loss ($p = 0.013$, $d = 0.19$, 95% CI: 0.05–0.31), constipation ($p = 0.029$, $d = 0.17$, 95% CI: 0.03–0.28), fatigue ($p = 0.002$, $d = 0.21$, 95% CI: 0.06–0.35), and physical function ($p = 0.006$, $d = 0.22$, 95% CI: 0.08–0.37) showed statistically significant improvements from the first assessment to the second assessment (Table 2), but these changes did not meet their respective MCIDs.

In age-based analysis (Table S1), sex and cancer type were balanced states after PSM ($p > 0.05$ and $SMD < 0.1$) in a cohort of 124 patients. At baseline, the younger group showed better physical function (93.66 vs. 88.92, $\Delta > MCID$, $p = 0.043$, $d = 0.37$, 95% CI: 0.02–0.70) and cognitive function (93.82 vs. 88.17, $\Delta > MCID$, $p = 0.046$, $d = 0.36$, 95% CI: 0.02–0.67) than the older group. These differences persisted in the second assessment (both $\Delta > MCIDs$, $d = 0.45$ and 0.49, respectively). After the intervention, the younger group also demonstrated significant improvements in sleep disturbance ($\Delta > MCID$, $p = 0.009$, $d = 0.35$, 95% CI: 0.13–0.57), fatigue ($p = 0.023$, $d = 0.29$, 95% CI: 0.06–0.51) and physical function ($p = 0.030$, $d = 0.25$, 95% CI: 0.03–0.49) (Table 3).

In cancer-type analysis (Table S2), renal cancer showed significantly differences in sleep disturbance ($p = 0.017$), fatigue ($p = 0.012$), and physical function

TABLE 1 Patients' characteristics.

Characteristic	Number
Age, mean (SD)	56.85 (11.98)
Sex, n (%)	
Male	125 (69.44)
Female	55 (30.56)
Types of cancer, n (%)	
Renal	102 (56.67)
Bladder	28 (15.56)
Prostate	14 (7.78)
Others	36 (19.99)

Abbreviation: SD, standard deviation.

TABLE 2 Quality of life assessed by EORTC QLQ-C30 in all patients.

Domains, mean (SD)	First	Second	p^a	MCID ^b
Dyspnea	6.11 (15.14)	6.30 (14.86)	0.856	1.39
Sleep disturbance	17.41 (24.27)	13.33 (21.02)	0.004	5.63
Appetite loss	7.59 (15.29)	5.19 (12.62)	0.013	3.84
Constipation	11.67 (23.50)	9.44 (20.32)	0.029	5.00
Diarrhea	4.81 (14.58)	4.26 (12.22)	0.464	5.00
Financial difficulties	14.81 (23.95)	13.15 (22.70)	0.168	5.00
Fatigue	10.37 (14.88)	8.40 (12.63)	0.002	5.76
Nausea and vomiting	1.30 (8.35)	1.11 (6.25)	0.930	1.86
Pain	6.94 (13.86)	6.85 (13.96)	0.929	4.31
Physical function	92.00 (11.78)	93.78 (10.18)	0.006	3.64
Role function	94.26 (14.02)	95.00 (13.29)	0.503	6.31
Emotional function	87.55 (14.33)	88.15 (13.39)	0.455	4.65
Cognitive function	90.46 (15.56)	91.94 (13.70)	0.094	2.44
Social function	91.11 (19.01)	91.94 (14.47)	0.874	5.41
Global QoL	78.19 (18.98)	77.96 (19.03)	0.408	5.00

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; MCID, minimally clinically important differences; QoL, quality of life; SD, standard deviation.

^a p -value for Wilcoxon signed-rank test.

^bCollected from the publications of Bourke et al. and Musoro et al.

TABLE 3 Quality of life assessed by EORTC QLQ-C30 in analysis by age subgroups.

Total Domains, mean (SD)	≤ 60 years old			> 60 years old			p^b	p^c
	62 First	Second	p^a	62 First	Second	p^a		
Dyspnea	5.38 (12.36)	4.30 (11.27)	0.530	5.91 (16.56)	7.53 (18.52)	0.331	0.838	0.244
Sleep disturbance	17.74 (26.11)	10.22 (21.42)	0.009	14.52 (23.86)	11.29 (19.97)	0.148	0.474	0.773
Appetite loss	4.84 (13.29)	2.15 (8.26)	0.120	5.91 (14.19)	4.84 (13.29)	0.565	0.664	0.179
Constipation	8.60 (19.02)	7.53 (17.51)	0.374	15.05 (26.08)	11.29 (21.71)	0.120	0.118	0.290
Diarrhea	3.23 (11.63)	2.69 (9.15)	0.850	4.84 (14.59)	3.76 (10.64)	0.484	0.497	0.547
Financial difficulties	16.67 (25.43)	14.52 (23.86)	0.282	15.05 (25.38)	12.37 (23.56)	0.212	0.724	0.614
Fatigue	9.68 (13.86)	7.17 (10.47)	0.023	12.37 (18.12)	10.57 (15.90)	0.210	0.355	0.162
Nausea and vomiting	0.81 (3.61)	0.27 (2.12)	0.346	1.34 (10.58)	0.54 (2.97)	1.000	0.706	0.563
Pain	7.53 (12.69)	6.45 (11.83)	0.293	6.72 (16.38)	7.26 (16.70)	0.821	0.760	0.757
Physical function	93.66 (10.41)	95.81 (7.66)	0.030	88.92 (14.93)	90.86 (13.51)	0.136	0.043	0.013
Role function	96.24 (11.06)	97.58 (7.90)	0.676	90.86 (19.01)	92.74 (18.26)	0.302	0.057	0.058
Emotional function	88.04 (12.86)	89.38 (12.46)	0.362	87.50 (15.07)	86.83 (14.28)	0.700	0.831	0.291
Cognitive function	93.82 (11.78)	95.43 (11.36)	0.115	88.17 (18.70)	88.71 (15.90)	0.834	0.046	0.008
Social function	91.13 (18.29)	93.01 (12.28)	0.143	90.59 (23.30)	91.13 (17.26)	0.750	0.887	0.486
Global QoL	81.72 (18.59)	80.65 (18.28)	0.622	73.25 (18.79)	75.13 (20.16)	0.174	0.013	0.113

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation.

^a p -value for Wilcoxon signed-rank test.

^b p -value for Wilcoxon test in the first assessment.

^c p -value for Wilcoxon test in the second assessment.

($p = 0.002$), while bladder cancer patients improved in the role function ($\Delta > \text{MCID}$, $p = 0.006$). No significant changes were observed in prostate cancer patients. Due to baseline imbalances in age ($p = 0.001$) and sex ($p = 0.023$), a PSM analysis was performed, and 25 renal and 15 bladder cancer patients were selected. After matching (Table S3), two groups achieved similar outcomes in both assessments. The physical function (90.93 vs. 93.60, $p = 0.042$, $d = 0.32$, 95% CI: 0–0.84) and cognitive function (91.33 vs. 94.67, $p = 0.048$, $d = 0.00$, 95% CI: 0–0.48) of bladder cancer patients showed significant improvements after reading the educational materials, while renal cancer patients showed no significant changes (Table 4). Effect sizes were small despite statistical significance.

4 | DISCUSSION

Patients with urinary cancer may suffer from physical and psychological symptoms due to the paucity of understandings of the disease. We hypothesized that proper patient education could fill this gap and improve patients' QoL. This study suggests that preoperative educational materials may be associated with short-term

improvements in specific QoL domains, such as sleep disturbance, fatigue, and physical function, in patients with urinary cancer. Subgroup analyses indicated that younger patients and those with bladder cancer might derive greater benefit.

Overall, patients reported a global QoL score close to 80, indicating relatively good status. However, they experienced high levels of distress in multiple domains, including sleep disturbance, financial difficulties, constipation, fatigue, and poor emotional function. These findings aligned with a large population-based study ($n = 266\,505$) which founded that cancer patients commonly exhibited lower physical function, higher distress, and reduced QoL compared to those without cancers^[21]. Similarly, Shin et al. found that urinary cancer survivors experienced lower appetites, reduced physical function, greater pain and more frequent financial difficulties than health controls, which were consistent with our observations^[22].

Although emotional function did not change significantly post-intervention, it remains clinically important due to its close link to physical symptoms. A systematic review revealed that cancer patients often experienced symptom clusters, which were presented as emotional distress, fatigue, pain, and sleep problems^[23,24].

TABLE 4 Quality of life assessed by EORTC QLQ-C30 in the analysis by cancer subgroups.

Total Domains, mean (SD)	Renal cancer			Bladder cancer			p^b	p^c
	25 First	Second	p^a	15 First	Second	p^a		
Dyspnea	8.89 (19.79)	4.44 (11.73)	0.424	14.67 (23.73)	9.33 (15.28)	0.071	0.422	0.297
Sleep disturbance	8.89 (15.26)	8.89 (15.26)	1.000	10.67 (18.56)	8.00 (14.53)	0.424	0.886	0.867
Appetite loss	4.44 (11.73)	6.67 (13.80)	1.000	8.00 (17.43)	2.67 (9.23)	0.072	0.582	0.283
Constipation	17.78 (27.79)	4.44 (11.73)	0.089	16.00 (21.77)	10.67 (15.87)	0.072	1.000	0.199
Diarrhea	4.44 (17.21)	4.44 (11.73)	1.000	1.33 (6.67)	1.33 (6.67)	1.000	0.712	0.298
Financial difficulties	13.33 (24.56)	13.33 (24.56)	1.000	16.00 (27.42)	14.67 (25.60)	0.773	0.769	0.822
Fatigue	8.15 (10.68)	7.41 (9.07)	0.669	12.00 (15.02)	8.89 (11.56)	0.171	0.470	0.865
Nausea and vomiting	1.11 (4.30)	1.11 (4.30)	1.000	4.00 (16.86)	1.33 (4.61)	1.000	0.878	0.903
Pain	3.33 (6.90)	4.44 (7.63)	0.773	3.33 (9.62)	4.00 (8.71)	0.766	0.605	0.700
Physical function	90.67 (10.63)	92.89 (8.15)	0.257	90.93 (11.84)	93.60 (9.52)	0.042	0.768	0.569
Role function	93.33 (10.54)	98.89 (4.30)	0.120	96.00 (12.06)	94.67 (11.51)	0.854	0.155	0.242
Emotional function	96.11 (6.19)	95.00 (9.34)	0.666	87.67 (14.46)	88.00 (12.75)	0.836	0.069	0.085
Cognitive function	92.22 (15.26)	92.22 (13.90)	1.000	91.33 (12.84)	94.67 (10.45)	0.048	0.540	0.567
Social function	97.78 (5.86)	94.44 (8.13)	0.233	91.33 (15.31)	90.00 (15.96)	0.571	0.221	0.686
Global QoL	73.89 (22.46)	81.11 (17.39)	0.126	79.33 (20.14)	79.67 (19.85)	0.622	0.486	0.886

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation.

^a p -value for Wilcoxon signed-rank test.

^b p -value for Wilcoxon test in the first assessment.

^c p -value for Wilcoxon test in the second assessment.

Similarly, our patients also experienced such cluster. A mini-review reported that distress rates of 20%, 12%, and 30% in renal, bladder, and prostate cancer patients, respectively^[25]. Another study found depression, anxiety, and posttraumatic stress disorder in 77.5%, 69.3%, and 25.2% of newly diagnosed bladder or renal cancer^[26]. Emotional well-being is strongly tied to treatment compliance and prognosis, underscoring the need for integrated physical and psychological care.

Sleep disturbance, appetite loss, constipation, fatigue, and physical function elicited statistically significant differences in the whole cohort after the intervention. Although patients may have good rest after admission, it is still difficult to improve the QoL in these aspects simultaneously. We reckoned that the observed changes were mainly generated by relieving stress and enhancing communication after reading educational materials according to the Leventhal's Common-Sense Model and the concept of reducing uncertainty in illness. The provision of structured materials could replace the uncertainty surrounding the diagnosis and impending surgery with a clear roadmap of the process. Understanding what to expect post-operatively can enhance patients' perceived control, self-efficacy, and reduce stress which was a known

contributor to sleep disturbances, fatigue, appetite loss, and other cognitive, and behavioral responses^[27-29]. Moreover, the materials may serve as a catalyst for more effective and focused doctor-patient communication, allowing patients to ask informed questions and alleviating anxieties that arise from misunderstandings, which is supported by the literature published by Zhou et al. and Lorusso et al.^[30,31].

Differential effects were observed across age and cancer-type subgroups. In age-based analysis, younger patients showed greater improvement in the QoL, likely due to better strength, less frailty, and quicker rehabilitation^[32]. Symptom scores were comparable at baseline between age groups. Consistent with Novara et al. and Chambers et al., age significantly influenced survival and functional status of patients with renal or prostate cancer^[32,33], highlighting its role in QoL and supporting the use of age-adjusted clinical strategies. In cancer-type analysis, patients with bladder cancer appeared to benefit more from the intervention. Initial analysis suggested renal cancer patients improved in multiple domains, but this group was also younger, which was a known confounding factor. After PSM analysis to balance baseline characteristics, improvements in physical function and cognitive function were observed only in

the bladder cancer group. Cognitive function, reflected in concentration and memory, may be influenced by psychological stress which impairs cognitive control process and episodic memory^[34,35].

The observed effect sizes for the educational intervention were relatively small. It was consistent with the nature of the intervention, which was a low-intensity, single-exposure provision of information. While the changes were statistically significant, their clinical meaningfulness is uncertain, as the mean differences did not exceed established MCID thresholds in certain QoL domains. This suggests that while preoperative education may have a measurable positive impact on specific patient-reported outcomes, the magnitude of this effect was modest in the short term. These findings were not unexpected. Low-cost interventions like ours were not designed to produce large effects but rather to offer a scalable and feasible approach to potentially improve the patient experience. The small effect sizes of our intervention underscore that more intensive support strategies may be necessary to achieve more clinically impactful improvements in QoL for patients with urinary cancer.

Our study had several limitations. The retrospective nature of this study may introduce selection bias, potentially overestimating intervention effects due to higher participation among engaged or health-literate patients. The absence of a concurrent control group such as a group not receiving the handbook limited the ability to establish causality. Instead, we employed a pre-post intervention design using patients as their own controls. The observed improvements could be confounded by factors such as the adaptation to the hospital environment, routine care, or repeated testing. Although PSM was used for subgroup comparisons, potentially confounding variables such as disease severity, comorbidities, socioeconomic status, and social support were not available in this retrospective dataset. The short-term follow-up prevented us from drawing any conclusions about the sustainability of the observed benefits over time. No formal verification was conducted to confirm that patients had read and understood the educational materials. The small sample size limited statistical power, warranting cautious interpretation of these results. The use of EORTC QLQ-C30 may not have adequately captured changes in psychological-cognitive functions. Future studies should consider more targeted instruments.

5 | CONCLUSIONS

In this retrospective analysis, distributing educational materials preoperatively was associated with short-term improvements in sleep, fatigue, and physical function in patients with urinary cancer, particularly in younger

patients and those with bladder cancer. This simple method could be applied routinely and extensively. Nevertheless, there is a critical need for further validation through prospective randomized controlled trials with robust control arms and extended follow-up.

AUTHOR CONTRIBUTIONS

Yajian Li contributed to conceptualization, data curation, and writing—original draft; Guanghua Huang contributed to formal analysis, methodology, and writing—original draft; Wenjuan Cheng contributed to data curation, investigation, and writing—review and editing; Jiajie Wen contributed to data curation, investigation, and writing—review and editing; Xueer Chen contributed to data curation, investigation, and writing—review and editing; Yanhua Du contributed to resources, supervision, and writing—review and editing; Hongzhe Shi contributed to conceptualization, resources, supervision, and writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This observational study did not involve direct interaction with human subjects or the collection of biological samples. All data used were anonymized. This study was exempt from formal ethics approval. Individual consent was not obtained due to its retrospective design.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.