Updated assessment of neobladder utilization and morbidity according to urinary diversion after radical cystectomy: A contemporary US-population-based cohort

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Abstract

Background: In this paper, we examine contemporary utilization rates and determinants of neobladder (NB) after radical cystectomy (RC) relative to ileal conduit (IC), as well as provide an updated assessment of postoperative morbidity and mortality between NB and IC.

Methods: Relying on the Nationwide Inpatient Sample (NIS), we abstracted patients who underwent RC between 2000 and 2010. Subsequently, NB and IC recipients were identified. Use of NB was assessed after accounting for case-mix. Propensity-based matched analyses were used to account for treatment selection biases. Generalized linear regression analyses focused on intra- and postoperative complications, prolonged length of stay, blood transfusions and in-hospital mortality.

Results: The utilization rate of NB was 6.9% in 2000 and 9.1% in 2010 ($p < 0.001$). Younger, healthier, privately-insured and wealthier male individuals were more likely to receive a NB. High-volume hospitals were more likely to offer NB. In the post-propensity matched cohort, urinary diversion type failed to be significantly associated with the examined endpoints, except for intra- and postoperative complications (IC vs. NB odds ratio [OR]: 1.15, $p = 0.04$).

Interpretation: Despite comparable morbidity and mortality odds between NB and IC, as of the most contemporary year of the study (2010), IC remains the preferred urinary diversion type. Several sociodemographic factors were associated with NB.

Introduction

Radical cystectomy (RC) is the treatment of choice for individuals diagnosed with muscle-invasive bladder cancer.[1,2] Despite improved perioperative outcomes in recent years,[3] RC remains associated with non-negligible morbidity and mortality.[4-6] Bladder removal is followed by a reconstruction, traditionally an ileal conduit (IC), where an ileal tube provides urine draining to a cutaneous stoma.

Although there are advantages with IC (i.e., simplicity, shorter operative time), it may cause a decrease in a patient's body image and, subsequently, a decline in quality of life.[2,7] Consequently, efforts have been concentrated on providing alternative urinary diversion (UD) techniques. One of these efforts include an orthotopic neobladder (NB), a procedure that closely mimics the physiological storage and voiding functions of a urinary bladder;[8] this procedure is well-established.[9] In spite of the obvious benefits associated with NB,[2] its uptake has been relatively slow. Gore and colleagues postulated that the slow adoption of NB might be due to concerns regarding morbidity and mortality associated with the procedure.[10] To alleviate such concerns, the authors demonstrated comparable postoperative outcomes between IC and NB following RC.[10]

Since this article by Gore and colleagues, there have been no other reports on the updated utilization data of NB, as well as morbidity and mortality relative to IC. The present study provides a contemporary assessment of utilization rate of NB and postoperative outcomes, using a population-based cohort of individuals treated with either NB or IC, at RC for bladder cancer.

Methods

Data source

The present study relied on the Nationwide Inpatient Sample (NIS) database, which was developed as part of the Health Cost and Utilization Project (HCUP). It includes discharge

data collected via federal state partnerships. As of 2010, the NIS contained data of 7 800 441 discharges from 1051 hospitals located in 45 States, approximating a 20% stratified sample of community hospitals within the United States. The NIS is the largest all-payer inpatient care database, including Medicare, Medicaid, private insurance, and the uninsured, that is publicly available in the United States.[11]

Sample population

Patients with a primary diagnosis of bladder cancer were identified via ICD-9-CM (International Classification of Diseases, 9th Edition, Clinical Modification) code 188 (bladder cancer) and 233.7 (carcinoma in situ [Cis]). Those with a RC procedure code (ICD-9-CM 57.71 and 57.79) and a UD by IC (56.51) or NB (57.87) were abstracted. Patients with missing data on indication, UD, gender, age, socioeconomic status according to ZIP and expected primary payer for treatment were excluded from further analysis (n = 469).

Baseline patient characteristics

Patient characteristics included age at surgery (in years), gender, race (white, nonwhite, unspecified) and year of surgery. Patient age was primarily coded as a continuous variable, and categorized into the following subgroups: ≤50, 51-60, 61-70, 71-80, ≥80 years. Patients who were younger than 18 years of age were removed from the analyses (n=18).

Charlson Comorbidity Index (CCI) was calculated using a validated algorithm and categorized as 0, 1, 2, ≥3.[12,13] Patients' ZIP income was classified into 4 groups: (1) <$25 000; (2) $25 000-34 999$; (3) $35 000-$44 999; (4) ≥$45 000.[14] Insurance status was based on the expected primary payer, and included Medicare, Medicaid, private insurance, and other, including those who were uninsured.

Hospital characteristics

Hospital volume was defined according to the number of cystectomies performed annually, namely the number of procedures performed overall divided by the number of years the hospital performed the operation, for the entire study period and based on the current database. Subsequently, hospital volume was dichotomized into two groups (medium/low vs. high volume) with a cut-off value at the 90th percentile (≥27 procedures/year).[15]

Hospital bed size was categorized as small, medium and large, based on the urban-rural designation of the hospital and its teaching status.[11,15,16]

In-hospital complications

Complications (intra- and postoperative complications) and blood transfusions during hospitalization following RC were evaluated using ICD-9 diagnostic and procedural codes (available upon request).

Length of stay, and in-hospital mortality

Length of stay (LOS) is calculated by subtracting the admission date from the discharge date.[10,17] Same-day stays, coded as 0, were excluded from current analysis. In-hospital mortality information is coded from disposition of patient. Patients with missing or invalid LOS or in-hospital mortality status were not considered within the current study.

Statistical analysis

First, utilization rate of UD type was assessed over time using a univariable linear regression analysis. Second, using generalized linear regression models, we examined the utilization of NB according to baseline sociodemographic and hospital characteristics. Third, we compared short-term outcomes according to UD type. To limit inherent baseline patient and provider differences between patients receiving a NB and IC, we performed a 3 to 1 propensity-score matched analysis.[18,19] Propensity scores were computed by modelling a logistic regression with the dependent variable as the odds of undergoing a UD with NB, and the independent variables as age, sex, race, ZIP code income, baseline CCI, year of surgery, hospital bed size and hospital volume. Subsequently, covariate balance between the matched groups was examined.

Finally, within the post-propensity matched cohort, generalized linear mixed regression analyses were computed for prediction of in-hospital complications and mortality, blood transfusion and prolonged LOS. All tests were two-sided with a statistical significance of $p < 0.05$. Analyses were conducted using the statistical package for R (the R foundation for Statistical Computing, version 2.13.1) and SPSS Statistics (Version 20.0, IBM, Chicago, IL).

Results

Baseline descriptives

Overall, a weighted estimate of 69 684 patients underwent RC for bladder cancer between 2000 and 2010 (Table 1). Of those, 63 402 received an IC and 6282 received a NB.

Table 1. Weighted baseline descripives of patients who underwent radical cystectomy with a neobladder or ileal conduit for bladder cancer, Nationwide Inpatient Sample, 2000–2010

Characteristic	Pre-propensity score matching			Post-propensity matching		
No. patients, %	69684 (100)			25064 (100)		
	Neobladder	Ileal conduit	SMD	Neobladder	Ileal conduit	SMD
No. patients, % per column	6282 (9)	63402 (91)		6282 (25.1)	18782 (74.9)	
Age (yr), mean (median)	60.8 (61.0)	69.6 (71.0)	-0.887	60.8 (61.0)	61.4 (62)	-0.057
Age, groups						
18-50	15.8	4.5		15.8	13.9	
51-60	30.1	13.6		30.1	31.7	
61-70	36.5	29.6		36.5	34.4	
71-80	16.1	39.4		16.1	18.6	
>80	1.4	12.9		1.4	1.4	
Gender						
Male	90.8	80.6	0.351	90.8	90.9	-0.006
Female	9.2	19.4		9.2	9.1	
Race						
White	67.0	68.5		67.0	66.8	
Nonwhite	8.3	8.8	-0.021	8.3	8.5	-0.010
Unspecified	24.9	22.8	0.052	24.9	24.8	0.005
CCI						
0	71.2	57.2		71.2	71.5	
1	21.6	31.1	-0.232	21.6	21.7	-0.004
2	5.2	7.7	-0.116	5.2	5.0	0.008
≥3	1.9	4.0	-0.150	1.9	1.8	0.013
ZIP code income quartile, $						
1-24.999	13.8	17.0	-0.091	13.8	13.9	-0.003
25.000-34.999	23.7	25.7	-0.046	23.7	23.7	-0.003
35.000-44.999	27.1	26.5	0.009	27.1	27.4	-0.008
≥45.000	35.4	30.8		35.4	34.9	
Primary payer						
Medicaid/other	9.2	7.4		9.2	9.7	
Medicare	35.0	65.9	-0.642	35.0	35.0	0.006
Private	55.8	26.8	0.575	55.8	55.3	-0.001
Hospital volume, mean (median)	6.0	3.0	0.277	6.0	3.5	0.099
Medium/Low volume hospitals	84.1	90.7		84.1	84.1	
High volume hospitals*	15.9	9.3		15.9	15.9	
Hospital bedsize						
Small	35.3	34.9		35.3	35.8	
Medium	30.5	22.8	0.165	30.5	30.2	0.004
Large	32.7	26.9	0.128	32.7	32.4	0.009
Unspecified	1.4	15.4	-1.183	1.4	1.7	-0.027

*Based on 90th percentile hospital volume overall (≥27 procedures/year). CCI: Charlson Comorbidity Index; SMD: standard mean difference.

Utilization of NB

The utilization rate of NB was 6.9% in 2000 and 9.1% in 2010 (+0.3% per year, $p < 0.001$, Fig. 1). In sub-analyses restricting to those who underwent RC between 2005 and 2010, NB varied in an insignificant fashion ($p = 0.326$). NB recipients were younger (median: 61 vs. 71 years, $p < 0.001$), less frequently female (9 vs. 19%, $p < 0.001$), healthier at baseline (CCI 0: 71 vs. 57%, $p < 0.001$), more likely to be privately insured (56 vs. 27%, $p < 0.001$), more often resided in high-income ZIP code residences (≥$45 000: 35 vs. 21%, $p < 0.001$), and more frequently treated at hospitals with a higher annual volume (median: 6 vs. 3, $p < 0.001$) and large bed size (33 vs. 27%, $p < 0.001$).

In multivariable analyses for prediction of NB (Table 2), younger age (odds ratio [OR]: 0.94; $p < 0.001$), privately insured (OR: 1.42; $p = 0.001$), higher income (≥$45 000, OR: 1.42; $p < 0.005$), and increasing hospital volume (OR:

Table 2. Weighted generalized linear model for the prediction of neobladder utilization in patients who underwent radical cystectomy for bladder cancer, Nationwide Inpatient Sample, 2000–2010

Characteristic	No vs. neobladder					
	Univariable analysis			Multivariable analysis		
	OR	CI	*p*	OR	CI	*p*
Age (yr), continuous	0.93	0.92-0.93	<0.001	0.94	0.93-0.95	<0.001
Gender (referent: male)						
Female	0.42	0.34-0.52	<0.001	0.45	0.36-0.56	<0.001
Race (referent: white)						
Nonwhite	0.95	0.74-1.21	0.655	0.87	0.67-1.13	0.293
Unspecified	1.11	0.88-1.40	0.398	1.03	0.83-1.28	0.774
CCI (referent: 0)						
1	0.56	0.48-0.65	<0.001	0.71	0.60-0.83	<0.001
2	0.54	0.41-0.71	<0.001	0.69	0.52-0.92	0.011
≥3	0.38	0.25-0.57	<0.001	0.48	0.32-0.72	<0.001
Indication for surgery (referent: not Cis)						
Cis	1.25	0.95-1.65	0.111	1.12	0.84-1.50	0.442
ZIP code income quartile, $ (referent: 1-24.999)						
25.000-34.999	1.13	0.92-1.40	0.254	1.16	0.93-1.45	0.189
35.000-44.999	1.25	1.02-1.55	0.034	1.31	1.06-1.64	0.014
≥45.000	1.41	1.12-1.77	0.003	1.42	1.11-1.80	0.005
Primary payer (referent: Medicare)						
Medicaid/other	2.39	1.87-3.04	<0.001	0.80	0.60-1.07	0.127
Private	3.92	3.41-4.52	<0.001	1.42	1.22-1.66	<0.001
Hospital volume, continuous	1.02	1.01-1.02	<0.001	1.02	1.01-1.02	<0.001
Hospital bed size (referent: small)						
Medium	1.32	1.14-1.53	<0.001	1.13	0.97-1.32	0.117
Large	1.21	1.05-1.40	0.009	1.10	0.95-1.27	0.204
Unspecified	0.09	0.06-0.15	<0.001	0.31	0.20-0.50	<0.001

CCI: Charlson Comorbidity Index; Cis: carcinoma in situ; OR: odds ratio; CI: confidence interval.

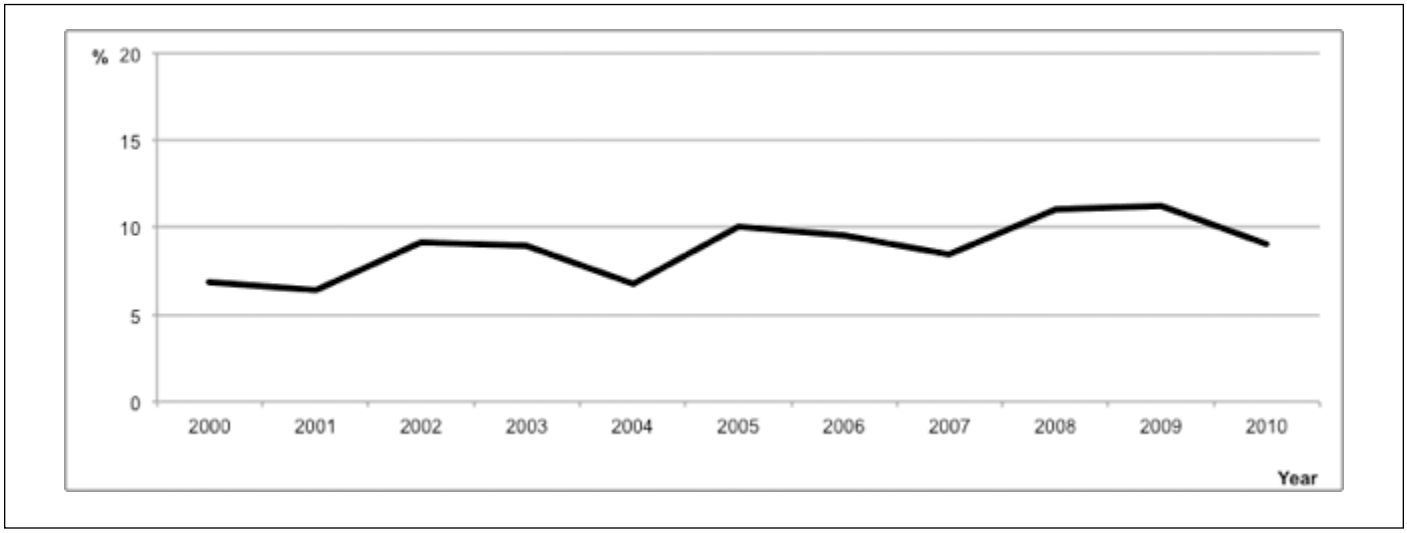

Fig. 1. Utilization rates for neobladder after radical cystectomy, National Inpatient Sample, 2000-2010, (n=69 684).

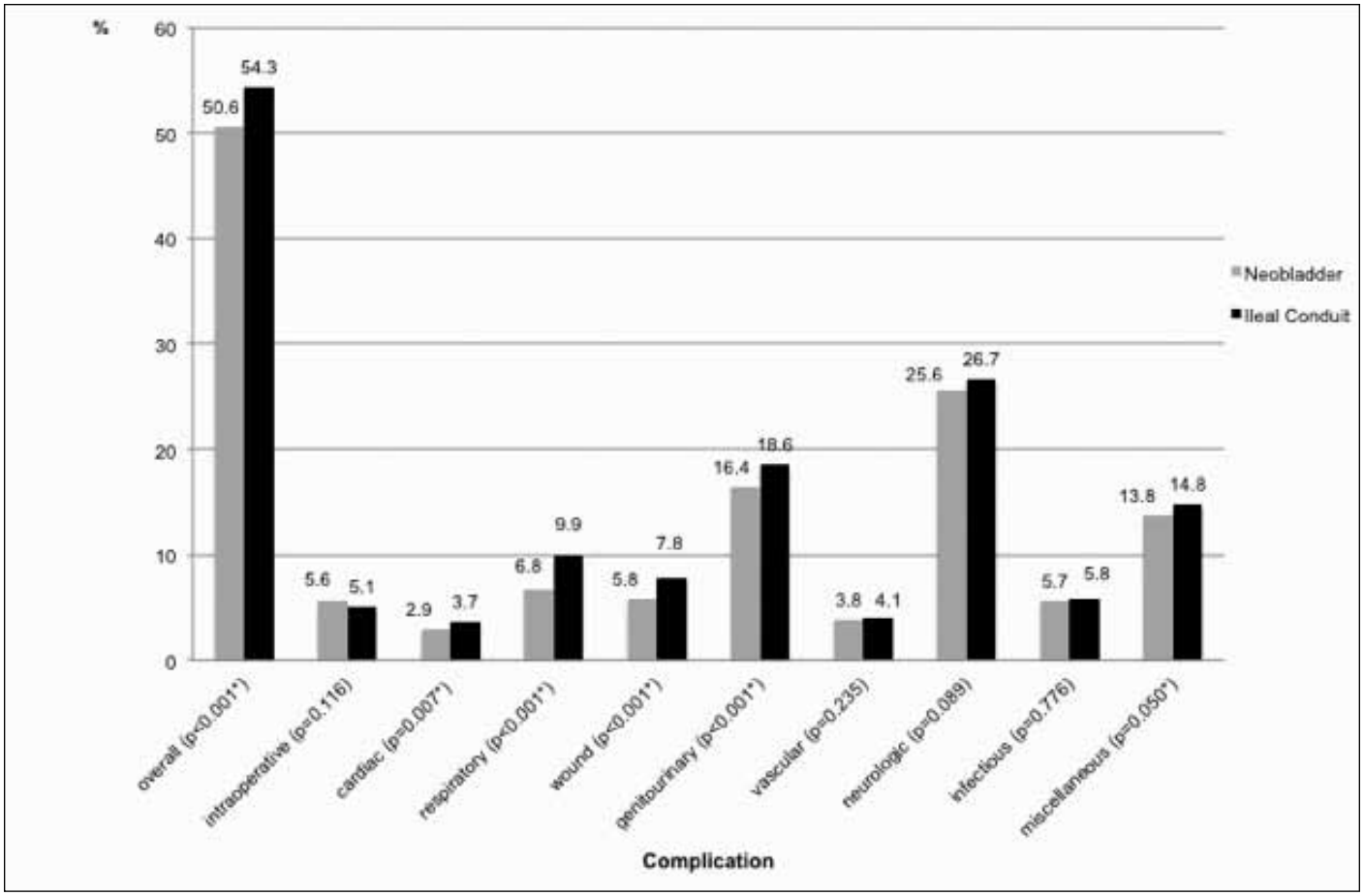

Fig. 2. Bivariate association between urinary diversion type (neobladder vs. ileal conduit) and complications within the post-propensity matched cohort (n=25 064).

1.02; $p < 0.001$) were more likely to be associated with NB. Conversely, females were less likely to receive a NB at RC (OR: 0.45; $p < 0.001$).

Morbidity and mortality

Following propensity-matched analysis, 18 782 IC individuals were matched to 6282 NB recipients. Standardized mean differences between the two groups in terms of patient and hospital characteristics were less than 10%, reflecting a high degree of similarity (Table 1). The remainder of the analyses was conducted in the post-propensity matched cohorts.

Overall, patients who received a NB had a lower occurrence of complications (51 vs. 54%, $p < 0.001$) (Fig. 2). Moreover, blood transfusions (24 vs. 27%, $p < 0.001$ and in-hospital mortality rates (0.8 vs. 1.3%, $p = 0.005$) were lower for NB individuals (Fig. 3).

In multivariable analyses, IC individuals were more likely to experience any complication during hospitalization (OR: 1.15, $p = 0.04$). In contrast, UD type failed to reach statistical significance with respect to all other endpoints (Table 3, Table 4).

Discussion

Previously, concerns related to prolonged operative time, increased technical complexity, as well as the incorporation of a larger bowel segment, may have deterred providers from performing NB instead of IC. To decrease the reluctant consideration of NB, Gore and colleagues systematically examined and compared postoperative morbidity and mortality between NB and IC at RC for patients with bladder cancer, treated between 2001 and 2005.[10] In that report, the authors demonstrated similar complication rates between IC and NB, and anticipated that this may entice more surgeons to consider NB during counselling.

Since then, no other report has examined utilization rates of NB relative to IC, and the associated postoperative complications. To provide a contemporary update, we relied on a nationally representative cohort from the United States, and evaluated the utilization rates of NB versus IC between 2000 and 2010. Furthermore, we describe which patient and hospital characteristics were most related to NB. Finally, we compared morbidity and mortality during hospitalization within this updated cohort.

Table 3. Weighted, propensity score matched generalized linear model for occurence of any complication and in-hospital death of patients who underwent radical cystectomy with a neobladder or ileal conduit for bladder cancer, Nationwide Inpatient Sample, 2000–2010

Characteristic	No vs. any complication						No vs. in-hospital death					
	Univariable analysis			Multivariable analysis			Univariable analysis			Multivariable analysis		
	OR	CI	*p*	OR	CI	*p*	OR	CI	*p*	OR	CI	*p*
Urinary diversion (referent: neobladder)												
Ileal conduit	1.16	1.01-1.33	0.037*	1.15	1.00-1.33	0.044*	1.54	0.75-3.16	0.245	1.50	0.73-3.11	0.272
Age (yr), continuous	1.02	1.01-1.02	<0.001*	1.01	1.00-1.02	0.002*	1.05	1.02-1.08	0.003*	1.02	0.99-1.06	0.188
Gender (referent: male)												
Female	1.09	0.90-1.32	0.369	1.12	0.93-1.36	0.231	1.33	0.61-2.90	0.478	1.30	0.58-2.93	0.521
Race (referent: white)												
Nonwhite	1.15	0.94-1.41	0.187	1.18	0.96-1.46	0.123	2.52	1.25-5.10	0.010*	2.87	1.40-5.90	0.004*
Unspecified	1.17	0.98-1.39	0.087	1.19	1.00-1.41	0.054	1.17	0.63-2.16	0.618	1.22	0.66-2.27	0.529
CCI (referent: 0)												
1	1.28	1.12-1.46	<0.001*	1.23	1.07-1.40	0.003*	0.73	0.37-1.46	0.373	0.64	0.32-1.30	0.220
2	1.42	1.10-1.84	0.007*	1.32	1.02-1.72	0.035*	0.34	0.05-2.51	0.292	0.29	0.04-2.15	0.224
≥3	1.96	1.23-3.12	0.005*	1.96	1.22-3.16	0.006*	3.17	1.18-8.51	0.022*	3.19	1.10-9.27	0.033*
Indication for surgery (referent: not Cis)												
Cis	0.99	0.76-1.28	0.932	1.01	0.77-1.32	0.935	0.37	0.05-2.69	0.325	0.37	0.05-2.75	0.330
ZIP code income quartile, $ (referent: 1-24.999)												
25.000-34.999	0.90	0.75-1.08	0.242	0.90	0.74-1.08	0.256	0.95	0.39-1.97	0.917	1.02	0.40-2.58	0.970
35.000-44.999	0.96	0.81-1.15	0.679	0.97	0.81-1.17	0.767	1.35	0.61-3.00	0.457	1.37	0.60-3.13	0.453
>45.000	0.89	0.75-1.05	0.165	0.91	0.77-1.08	0.284	0.85	0.37-1.97	0.702	0.88	0.36-2.15	0.773
Primary payer (referent: Medicare)												
Medicaid/other	0.783	0.638-0.962	0.020*	0.960	0.760-1.213	0.733	0.400	0.139-1.147	0.088	0.464	0.145-1.480	0.194
Private	0.668	0.589-0.759	<0.001*	0.776	0.667-0.902	0.001*	0.374	0.217-0.644	<0.001*	0.460	0.233-0.909	0.025*
Hospital volume, continuous	1.000	0.994-1.007	0.970	1	0.994-1.005	0.943	0.995	0.982-1.008	0.475	0.995	0.983-1.007	0.424
Hospital bed size (referent: small)												
Medium	0.863	0.750-0.993	0.040*	0.884	0.767-1.018	0.088	1.194	0.598-2.383	0.616	1.277	0.644-2.531	0.484
Large	0.891	0.779-1.019	0.091	0.911	0.796-1.043	0.177	1.509	0.805-2.828	0.199	1.637	0.875-3.066	0.123
Unspecified	1.438	0.900-2.297	0.129	0.949	0.577-1.52	0.837	4.571	1.309-15.957	0.017	1.836	0.419-8.046	0.420

CCI: Charlson Comorbidity Index; Cis: carcinoma in situ; OR: odds ratio; CI: confidence interval.

Our findings are threefold. First, the utilization rate of NB increased by about 0.3% per year. Second, hospitals with a higher annual volume (16 vs. 9%) and those with large bedsize (33 vs. 27%) were inherently more likely to opt for NB than IC at RC. Additionally, NB was less frequently utilized amongst older, sicker and females. In contrast, NB was more often utilized in wealthier individuals and those with private insurance. The findings were confirmed in multivari-

Table 4. Weighted, propensity score matched generalized linear model for the necessity of blood tranfusion during the hospital stay and for a prolonged length of hospital stay of patients who underwent radical cystectomy with a neobladder or ileal conduit for bladder cancer, Nationwide Inpatient Sample, 2000–2010

Characteristic	No vs. blood transfusion						Length of hospital stay					
	Univariable analysis			Multivariable analysis			Univariable analysis			Multivariable analysis		
	OR	CI	*p*	OR	CI	*p*	OR	CI	*p*	OR	CI	*p*
Urinary diversion (referent: neobladder)												
Ileal conduit	1.36	1.13-1.64	0.001*	1.17	0.96-1.41	0.115	1.34	0.80-2.26	0.269	1.50	0.73-3.11	0.272
Age (yr), continuous	1.02	1.01-1.02	<0.001*	1.01	1.00-1.02	0.038*	1.08	1.07-1.09	<0.001*	1.02	0.99-1.06	0.188
Gender (referent: male)												
Female	1.59	1.45-1.75	<0.001*	1.53	1.25-1.87	<0.001*	1.52	0.73-3.19	0.509	1.30	0.58-2.93	0.521
Race (referent: white)												
Nonwhite	1.40	1.10-1.77	0.005*	1.42	1.12-1.80	0.004	3.01	1.13-8.05	0.028*	2.87	1.40-5.90	0.004*
Unspecified	0.88	0.64-1.20	0.409	0.87	0.68-1.12	0.289	1.02	0.59-1.75	0.956	1.22	0.66-2.27	0.529
CCI (referent: 0)												
1	1.16	1.06-1.26	0.001*	1.14	0.97-1.34	0.118	1.20	0.72-2.02	0.116	0.64	0.32-1.30	0.220
2	1.33	1.16-1.53	<0.001*	1.52	1.16-1.98	0.002*	1.33	0.40-4.55	0.796	0.29	0.04-2.15	0.224
≥3	1.40	1.16-1.69	0.001*	2.01	1.27-3.20	0.003*	22.36	1.84-272.29	<0.001*	3.19	1.10-9.27	0.033*
Indication for surgery (referent: not Cis)												
Carcinoma in situ (Cis)	0.74	0.54-1.02	0.002*	0.78	0.56-1.08	0.132	0.46	0.20-1.05	0.067	0.37	0.05-2.75	0.330
ZIP code income quartile, $ (referent: 1-24.999)												
25.000-34.999	0.86	0.70-1.07	0.177	0.90	0.72-1.11	0.323	0.99	0.51-1.91	0.972	1.02	0.40-2.58	0.970
35.000-44.999	0.83	0.67-1.04	0.106	0.87	0.70-1.09	0.225	1.66	0.81-3.40	0.168	1.37	0.60-3.13	0.453
>45.000	0.91	0.71-1.17	0.461	0.99	0.78-1.26	0.932	1.54	0.82-2.91	0.184	0.88	0.36-2.15	0.773
Primary payer (referent: Medicare)												
Medicaid/other	1.03	0.81-1.31	0.816	1.24	0.94-1.64	0.124	0.78	0.29-2.12	0.628	0.464	0.145-1.480	0.194
Private	0.71	0.61-0.82	<0.001*	0.81	0.68-0.97	0.025	0.18	0.10-0.30	<0.001*	0.460	0.233-0.909	0.025*
Hospital volume, continuous	1.01	1.00-1.01	0.023*	1.01	1.00-1.01	0.031*	0.98	0.97-1.00	0.041*	0.995	0.983-1.007	0.424
Hospital bed size (referent: small)												
Medium	0.81	0.69-0.94	0.006*	0.81	0.70-0.95	0.008*	0.54	0.29-1.08	0.159	1.277	0.644-2.531	0.484
Large	0.77	0.66-0.89	0.001*	0.78	0.67-0.91	0.002*	0.57	0.33-1.01	0.052	1.637	0.875-3.066	0.123
Unspecified	1.25	0.77-2.02	0.376	0.88	0.52-1.48	0.628	2.68	0.68-10.58	0.044*	1.836	0.419-8.046	0.420

CCI: Charlson Comorbidity Index; Cis: carcinoma in situ; OR: odds ratio; CI: confidence interval.

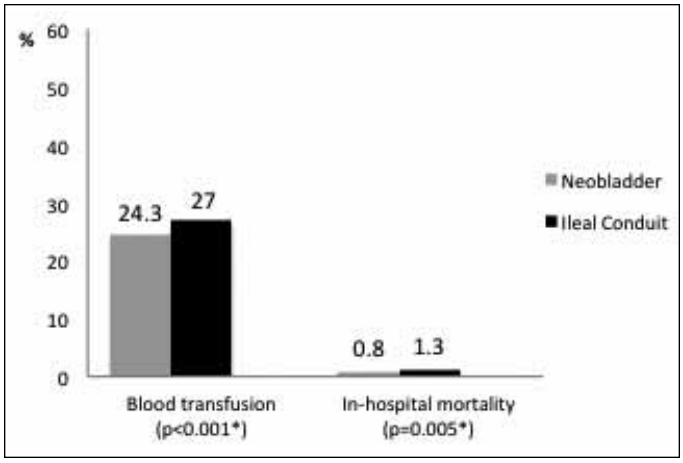

Fig. 3. Propensity-matched transfusion and mortality rates according to urinary diversion (n=25 064).

able adjustment, with the exception of hospital bed size. Third, NB patients experienced comparable postoperative morbidity and mortality.

Taken together, in the contemporary era, our findings support the appropriateness of NB in a select patients, given the comparable morbidity and mortality relative to IC, as previously suggested.[10]

The LOS and in-hospital mortality, as well as the use of NB, remained relatively low in the Gore study, suggesting that the lack of consideration of NB may not simply be related to provider-specific concerns related to outcomes.[10] Instead, the low utilization may be strongly related to the technical complexity of NB itself. Both our study and Gore's showed an apparent underuse of NB at the community level (9.1% to 16.7%) and at hospitals with lower volume; these rates strongly differ from the utilization rates of NB recorded at centres of excellence (28% to 66.2%).[2,4,5] Such observation may merit a re-evaluation of concepts, such as regionalization of care for complex surgery.[20,21] Given that most patients with bladder cancer undergoing RC are treated at hospitals with a lower caseload,[10] the appreciation of NB cannot be expected in upcoming years, unless possible NB candidates are redirected towards hospitals that provide the technique.

While younger and healthier patients at RC represent likely candidates of NB, a higher omission of a continent diversion amongst women was also recorded. This might have been related to concerns of increased risk of postoperative urinary retention with all its consequences amongst females.[22-25] However, previous reports showed that an appropriate surgical technique can result in satisfactory outcomes following female bladder reconstruction.[24,26,27]

It remains unclear if this under-consideration of NB simply stems from the lack of access to high-volume hospitals, where NB expertise is more frequently available, or whether such individuals are inherently denied a NB due to disease aggressiveness, or if an underlying discrimination against the use of NB exists. However, the implications remain that NB can improve functional quality of life and can be a relatively safe procedure, despite the complexity and increased operative time.

Our study does not advocate NB as the standard UD type, but rather identifies disparate use of NB, and stresses that regardless of sociodemographic factors, all patients should have access to it. The decision to opt for a NB, if feasible, needs to be discussed with the patient,[2,28] due to its potential advantages and rigorous care compliance (e.g., regular voiding, pelvic floor rehabilitation[2]).

Our study has limitations. The NIS does not provide any data concerning tumour characteristics, which might have contributed to residual differences between UD groups. Previous reports using the same database were also limited by these factors.[10,17] In addition, the NIS only supplies in-hospital data. The LOS differs from patient to patient, so that we cannot provide a follow-up for a specified amount of time. Finally, the present study is an observational analysis and is therefore affected by all limitations that generally apply to retrospective observational analyses.

Conclusion

Utilization rates of NB are low. Several disparities with respect to sociodemographic characteristics were recorded for access to NB. Future direction should seek to reduce such disparities.

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