

## Male urethral stricture disease in a tertiary hospital in Port Harcourt, Nigeria: a five-year review of features, management and outcome.

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World Journal of Biology Pharmacy and Health Sciences, 2024, 18(01), 214–226

Publication history: Received on 02 March 2024; revised on 10 April 2024; accepted on 12 April 2024

Article DOI: <https://doi.org/10.30574/wjbphs.2024.18.1.0184>

### Abstract

**Introduction:** The aim is to assess the early impact of the current increased use of transurethral endoscopic procedures and emerging technologies on the management of urethral stricture disease (USD) in adult males at the University of Port Harcourt Teaching Hospital (UPTH), Nigeria.

**Material and Methods:** The design of the study was cross-sectional and descriptive. Secondary data of patients treated between 01/6/2017 to 30/6/2022, with confirmed diagnosis of USD were used. Their registration numbers were used to access their records at the Health Records Department of the Hospital. Information obtained included sociodemographic data, aetiology, clinical features, types, sites and diagnostic tests of male USD, uroflowmetry, urethral, and abdominopelvic ultrasonography, cystourethrography results, treatment methods, outcomes, complications and co-morbidities of USD. Data obtained were analyzed with simple statistics and presented.

**Results:** Of 10,450 Urology patients 245 had USD. Data on 224 were found and analyzed. Their age profiles in years were mean, 45.7±18.6; age range 10-95. Married were 174 (77.68%).

Urethral strictures were post inflammatory 126(56.25%); post traumatic 43.75%; bulbar,73(32.59%); bulbomembranous23.22%; posterior urethral 52(23.21%); penile 34(15.18%); and pan urethral 13, (5.18%). At presentation, 105 (46.88%) were hypertensive; 40.2% had UTI with Gram-negative bacilli.

Recurrence of strictures occurred 6 months to one year after DVIU; 2 months to 6 years after urethroplasty. Non-compliance with schedules and follow-up occurred in 111 (49.55%) patients.

**Conclusion:** USD prevalence was 24/1000 urology patients. UTIs were probably healthcare and prolonged catheterization associated. Screening/review of service processes warranted. Lack of validated tools for measurement of outcome or dependent treatment variables made comparative studies unrealistic.

**Keywords:** Urethral stricture disease; Features; Outcome; Tertiary hospital in Port Harcourt; Nigeria.

### 1. Introduction

The male urethra is the part of the urinary tract that extends from the internal meatus at the neck of the urinary bladder to the external urethral meatus at the tip of the glans penis [1]. It is described as comprising an anterior part (bulbar and the penile urethra), and the posterior (membranous and prostatic) parts, all as a continuous tube [1]. The anterior urethra is surrounded by the corpus spongiosum muscle; the membranous urethra passes through the pelvic floor, while the prostatic part is surrounded by the prostate gland [2]. Certain features of the organ affect the nature, pattern

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of occurrence and characteristics of strictures in different parts of the urethra. These include the relative mobility of the penile urethra and its course through the corpus spongiosum, the closeness of the bulbar portion of the urethra to the pubic bone and the perineum, the course of the membranous urethra through the pelvic floor and its relationship to the striated sphincter as well as the fixity of the prostate gland (which transmits part of the urethra) to the posterior part of the pubic bone by the puboprostatic ligaments. All contribute to the aetiology and nature of lesions that may affect the respective parts of the urethra. The pathological processes involved include tissue injury and destruction, tissue ischaemia, inflammation, spongiobrosis and strictures of the anterior urethra (USD). In the posterior urethra narrowing or stenosis of the lumen of the organ occurs due to inflammation, healing and fibrosis [3].

A urethral stricture is an abnormal narrowing with loss of distensibility of part or the whole of the male urethra, usually as a result of spongiobrosis [4]. It is one of the challenges of urological practice. The male urethra sub serves the vital functions of excretion of urine and passage of seminal fluids to the exterior or into the vagina during sexual intercourse. Any narrowing or obstruction of the organ will obstruct the drainage of fluids from the urogenital system.

Within the past one and half decades at our centre (the University of Port Harcourt Teaching Hospital (UPTH) Port Harcourt, Nigeria), there has been increased use of transurethral endoscopic procedures and their accessories for the management of benign and malignant diseases of the prostate, urethra, the urinary bladder, ureters and the kidneys. For instance, there has been more direct vision internal urethrostomy (DVIU) in place of urethral dilatation for passable, short-segment urethral strictures. Many more transurethral resections of the prostate (TURP), transurethral resections of bladder tumours (TURBT), placement of ureteric stents, etc are being performed. We've also had an increased use of buccal mucosal grafts (BMG) for substitution urethroplasty, as well as rotated penile /preputial flaps. These transurethral instruments have the potential to cause iatrogenic urethral injuries that might be complicated by USD. Mostly adult males were involved. Outside the hospital, in its catchment population, there seemed to be increased amounts and patterns of civilian violence, including urethral injuries. It became necessary to carry out a review of our current strategies for the management of urethral stricture disease (USD) over the past decade to determine the possible impact of current emerging technologies on our traditional management of urethral stricture disease at the institution.

This review encompasses some sociodemographic characteristics of the patients, features of urethral stricture disease, types and locations of the strictures, complications of untreated USD, and comorbidities management and outcome. The aim was to determine the relative success or otherwise of our current management of urethral stricture disease.

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## 2. Materials and Methods

This study was cross-sectional and descriptive, using secondary data stored at the Health Records Department of UPTH. The hospital registration numbers of patients treated at the hospital for the period from 01/6/2017 to 30/6/ 2022, were obtained from the registers at the Urology Clinic and Male and Children's Urology Wards of the hospital. The registration numbers were used to trace the case files of the patients at the Health Records Department. Data were collected from each patient's case file, using a common proforma. Information retrieved included sociodemographic data of each patient, aetiology of urethral strictures, presenting complaints, clinical features (signs and symptoms) of urethral stricture disease and urine tests for infection, blood and malignant cells. Uroflowmetry, urethral and pelvic ultrasonography, urethrocytography, and urethrocytostcopy were done for diagnosis of strictures. Other data collected were diagnosed complications of urethral strictures, diagnosed comorbidities, diagnostic and other investigations and results, types and locations of the urethral strictures, methods of surgical and non-surgical treatments, and outcomes of treatment. Records of follow-up after discharge included, post-operative tests of urine flow (uroflowmetry), recurrent symptoms and general well-being of the patients after treatment. For each patient confirmation of diagnosis of USD was done with retrograde urethrocytography and micturating cystourethrography. Data obtained were collated and analyzed with simple statistics. Results were presented in charts, tables, and forms of prose. All ethical regulations were complied with in the execution of this study.

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## 3. Results

Ten thousand four hundred and fifty patients were treated at the urology unit during the study period. Two hundred and forty-five patients (245) were diagnosed with urethral stricture disease. Two hundred and twenty- four case files were found and analyzed. Twenty-one case files were not found. The age range of the patients was 10 – 95 years. The mean age of the patients was  $45.7 \pm 18.6$  years. The prevalence of USD among urology patients was 24/1000.

**Table 1** Age Distribution of Patients with Urethral Stricture Disease in UPTH, Port Harcourt, Nigeria.

AGE (YRS)	NO. OF PTS
0-4	3
05-Sep	1
10-14	5
15-19	8
20-24	8
25-29	15
30-34	22
35-39	33
40-44	20
45-49	14
50-54	20
55-59	19
60-64	14
65-69	19
70-74	14
75-79	3
80-84	2
>85	4
TOTAL	224

PTS, patients; YRS, years.

Post-inflammatory strictures were the most common aetiological types of urethral strictures found in this study. One hundred and forty-eight, 148 (66.07%) of these occurred in patients aged 30 to 59 years (Table 2).

**Table 2** Age and Distribution of Aetiological Factors of Urethral Stricture Disease in Port Harcourt, Nigeria.

AGE (YRS)	POST-INFLAMMATORY STRICTURES (a)	POST-TRAUMATIC STRICTURES				TOTAL H
		IATROGENIC AETIOLOGY		POST-ACCIDENTAL TRUAMA USD (d)	TOTAL-POST TRAUMATIC USD	
		COMPLICATION OF URETHRAL INSTRUMENTATION (b)	COMPLICATION OF SURGICAL TRAUMA (c)			
10 - 14	3	-	7	3	10	13
15 - 19	-	-	-	-	-	-
20 - 24	3	-	3	3	6	9
25 - 29	3	-	3	3	6	9
30 - 34	10	-	-	-	-	10
35 - 39	22	3	3	22	28	50
40 - 44	16	4	3	7	14	30
45 - 49	19	-	3	-	3	22

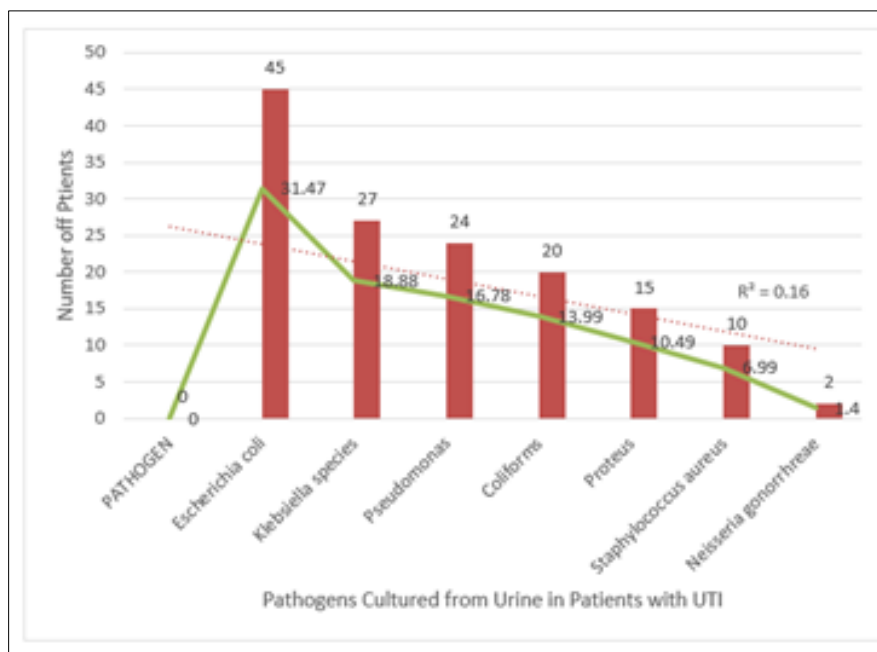
50 -54	13		7	-	7	20
55 - 59	10	-	3	3	6	16
60 - 64	9	-	3	-	3	12
65 -69	9		-	-		9
70 - 74	6	3	-	-	3	9
75 - 79	-	-	6	3	9	9
80 - 84 and above	3	-	3	-	3	6
TOTAL (%)	126 (56.25%)	10 (4.46%)	44 (19.64%)	44 (19.64%)	98 (43.75%)	224(100

Anatomical lengths of the strictures were determined both pre-and postoperatively. Operation notes were gleaned for intraoperative records and compared with the former.

**Table 3** Anatomical Sites and Lengths of Urethral Strictures in UPTH, Port Harcourt, Nigeria

Anatomical sites of the strictures	Number of patients	Percentage
Bulbar urethra	73	32.59
Bulbomembranous urethra	52	23.22
Post prostatectomy bladder neck contractures, fibrosis and stenosis	28	12.50
Posterior urethral fibrosis and stenosis	24	10.71
Penile urethra	34	15.18
Pan urethral strictures	13	5.80
TOTAL	224	100.00
<b>LENGTHS OF THE STRICTURES</b>		
Short segment	47	47.96
Long segment	20	20.41
Multiple strictures	18	18.37
Pan urethral strictures	13	13.26
TOTAL	98	100.00

Pre-treatment urine microscopy cultures and antimicrobial susceptibility testing revealed that *Escherichia coli* was the most common bacterial pathogen that caused UTI among the patients during the study period. Other UTI-causing pathogens were mainly Gram-negative bacilli and coliforms (Figure 1).



**Figure 1** Pathogens cultured on Microscopy, Culture, and Antimicrobial Susceptibility Testing on Urine Samples of Patients with Urethral Strictures and UTI at UPTH, Port Harcourt, Nigeria.

Most of the patients were married (77.68%) and 128 (57.59%) had at least a secondary level of education (Table 3).

Voiding lower urinary tract symptoms were the most frequent features of this condition. (Table 4)

**Table 4** Clinical Features of Urethral Stricture Disease in UPTH, Port Harcourt Nigeria.

Clinical feature	Number of patients	Percentage
Socio-demographic features		
Marital status		
Married	174	77.68
Single	44	19.64
Unknown	6	2.68
Total	224	100.00
Level of Education		
Primary	58	25.89
Secondary	91	40.63
Tertiary	38	16.96
Unknown	37	16.52
Total	224	100.00
SYMPTOMS		
Weak stream of urine	63	11.62
Frequency	60	11.07
Urgency	48	8.86
Straining micturition	48	8.86

Nocturia	39	7.20
Intermittency	39	7.20
Hesitancy	33	6.09
Feeling of incomplete voiding	30	5.54
Terminal dribbling	30	5.54
Urge incontinence	24	4.43
Urethral discharge	27	4.98
Bifurcated stream of urine	18	3.32
Weight loss	12	2.21
Dysuria	10	1.84
OTHERS/Frequency: Loin pains 9; Inability to pass urine 6; Dysuria 6; Waist pains 10; Pedal oedema 6; Confusion and coma 3 Incoherence3; Poorly treated gonococcal Infection 2; dizziness 3; watering can perineum 3.	61	11.24
Total	542	100.00

The most common complications of USD among the patients at presentation were urinary tract infections (UTIs). UTIs occurred in 90 (40.2%) of the patients. The recurrence of UTI in 30 of the patients increased the prevalence of UTI within the population of patients to 120/224 (53.57%) during the study period. Urine microscopy culture and antimicrobial susceptibility testing revealed that *Escherichia coli* was the most common bacterial pathogen that caused UTI within study population during the period of the study, other organisms were mainly Gram-negative bacilli [Table].

There was a high prevalence of comorbid diseases among the patients. Hypertension affected 105 (46.88%) patients at presentation. Other comorbid diseases are presented in [Table 5]

**Table 5** Comorbid Diseases and Complications of Urethral strictures diagnosed at Presentation for treatment of Patients with USD in UPTH, Port Harcourt, Nigeria.

Comorbid disease	Number of patients	Percentage (%)
Hypertension	105	31.53
BPH	72	21.62
Epididymal-orchitis	45	13.51
,Benign Prostatic hyperplasia	24	7.21
Adenocarcinoma of the prostate	15,	4.51
Pelvic fracture	12	3.60
Urethrocutaneous fistula	12	3.60
Diabetes mellitus	10	3.00
Hypertensive heart disease	10	3.00
Hypertensive heart disease	9	3.70
Partial deafness	3	0.01
Hepatitis B Infection	1	0.003
OTHERS: Urethral diverticulum,4; Chronic cerebral infarcts 1; Head injury 3; spondylolithic myelopathy 1; Orthostatic pneumonia 1; Femoral fracture and spondylolisthesis 1; Left ventricular hypertrophy	15	4.51

(LVH) 1; Bilateral renal parenchymal disease 1; chronic subdural haematoma 1; and scrotal abscess 1.		
TOTAL	333	100.00
<b>Complication</b>	<b>Number of patients</b>	<b>Percentage</b>
Urinary tract infection	90	21.33
Acute urinary retention	54	12.80
Obstructive uropathy	36	8.53
Gross haematuria	36	8.53
Chronic kidney disease	33	7.82
Cystolithiasis	30	7.11
Chronic urinary retention	27	6.40
Chronic kidney disease	24	5.68
Inguinal hernia	23	5.45
Cystitis	21	4.97
Urosepsis + Septic shock	20	4.74
Bilateral hydronephrosis	18	4.27
Bladder neck stenosis	10	4.37
Total	422	100.00

### 3.1. Treatment and outcome

Surgical procedures carried out were as follows:

Preliminary suprapubic cystostomy – 135, indicated by failed urethral catheterization to relieve acute urinary retention, acute-on-chronic urinary retention, or chronic retention of urine. Others are direct vision internal urethrostomy (DVIU) (55); anastomotic urethroplasty (40); Substitution urethroplasty (25); Urethral dilatation (30); perineal urethrostomy (3); no record of operation after diagnosis (71). The following observations were made on the evaluation of available data.

1. Following DVIU reduction (clinical observations) of urine flow were made in many patients three weeks after removal of urethral catheters. Recurrence of urethral strictures occurred 6 months to one year after DVIU.

2. Recurrence of urethral strictures was observed after 2 months to 6 years after urethroplasty. Many patients were lost to follow-up after 3 weeks of removal of urethral catheters. One hundred and eleven patients, 111 (49.55%) were lost to follow-up during the period after removal of urethral catheters following evaluation and surgical treatment procedures. These comprised 40 (36.04%) after clinical evaluation; 38 (34.23%) after preliminary suprapubic cystostomy; 15 (13.51%) after urethroplasty; 10 (9.01%) after DVIU; 6 (5.41%) after urethral dilatation; and 2 (1.80%) following perineal urethrostomy. There were no validated tools for the measurement of outcome variables in the management of the patients. Minimal post-operative complications were observed, the most common being the recurrence of urethral strictures.

## 4. Discussion

The male urethra sub serves the important functions of being a conduit for voiding of urine, and urethral glandular secretions and conducting ejaculated seminal fluid from its prostatic part to the exterior, or into the vaginal cavity during heterosexual intercourse. Other additional functions, including the lubrication of the urethra itself by secretions of periurethral glands support these roles. These secretions protect the urethral urothelium from the damaging effects of urine [5]. These functions are essential for the survival of the human race and human reproduction, family bliss and psychosocial well-being. Normal physiological functions of the kidneys, ureters, urinary bladder, male genital organs, and tracts require an unobstructed urinary tract. This review became necessary to evaluate as much as possible the

immediate and early impacts of the increased use of trans-urethral procedures for the treatment of disease of the urinary tract and its associated organs in our hospital.

The age profile of the patients in this study (mean of  $45.7 \pm 18.6$  years, and that 190 (84.82%) of the patients were between the ages of 25 to 74 years), agrees with findings in similar studies in Southern Nigeria [6]. However, urethral stricture disease was not found to have a positive linear relationship with age as observed in other populations [7]. Instead, there was a modal age group of 35-39 years with a peak frequency of 33 (14.73%) patients with USD, followed by a gradual fall in the frequency of USD with age. The differences between the two patterns of USD and age may be multifactorial.

The aetiological factors for USD detected in this study are consistent with findings elsewhere [8]. Post-inflammatory strictures were more prevalent among the patients than post-traumatic urethral strictures. This is similar to the observations of Irikpeta, et al at Irrua, in Southern Nigeria [9]. However, urethral strictures due to Lichen sclerosis observed in different studies were not encountered in this study. Lichen sclerosis is an autoimmune inflammatory lesion that has been known to have a predilection for the genital skin, and is characterized by intense pruritus, pain, skin hypopigmentation, hardening or sclerosis of the affected skin, and causes USD mostly at the penile and bulbar parts of the urethra [10,11].

Urinary bladder neck contractures and stenosis of the posterior urethra were noted in some cases and were clinically challenging. Those cases were encountered as late complications of open prostatectomy, trans-urethral resection of the prostate, and distraction injuries of the posterior urethra with the prostate. Other studies in the literature reported bladder neck stenosis as complications of holmium enucleation of the prostate (HOLEP,) irradiation of the prostate, or ablation of the prostate (HOLAP) [12]. The challenging problem with this lesion has been lack of access to the lesion and restoration of continuity in the urethra as well as the risk of recurrence and UTIs. Our approaches to treatments have been either wedged resection of the stenotic bladder neck by open surgery via the suprapubic approach or transurethral endoscopic incision of the prostate.

Determining the anatomical sites, number and lengths of urethral strictures is one of the vital steps to take during planning of surgical urethral reconstruction. In this study, the bulbar urethra was the most commonly involved part of the urethra. Seventy-three patients (32.59%) had what was considered purely bulbar strictures, while 52 (23.22%) others had extensions of bulbar strictures onto the pelvic floor part of the urethra (membranous urethra). Strictures in such cases might have developed as extensions of the spongiofibrosis of the bulbar urethra to incorporate the membranous part of the urethra, or direct bulbourethral glands infections involving the bulbar urethra and the wall membranous urethra.

The main tools that were used for the diagnosis and classification of urethral strictures in the managements of these patients were retrograde urethrocytography (RUCG) and micturating cystourethrography (MCUG). Urethrocytography was also used but the results were documented in only a few patients' records. RUCG and MCUG as serial contrast studies of the urethra and the urinary bladder are good. They demonstrate in a 2-dimensional picture the three-dimensional profile of the urethra and the urinary bladder. The location and approximate pre-operative length of the lumen of the urethra involved in the stricture can be demonstrated. However, both procedures (RUCG and MCUG) are not infallible. RUCG does not demonstrate the calibre of the posterior urethra; MCUG may not always demonstrate the full calibre of the posterior urethra, even in the absence of organic narrowing. As observed by others RUCG and MCUG, like urethrocytography do not demonstrate the extent of spongiofibrosis and the length of the stricture outside the lumen of the anterior urethra [13]. It was also noted that a pre-stenotic dilatation of the urethra may be superimposed on, and distort parts of the narrowed segment on the contrast radiograph [14]. These scenarios have made the intraoperative demonstration of the length of strictures more reliable, to the detriment of adequate pre-operative planning. Sonourethrography, which is rarely performed routinely in our centre and many centres, has been adjudged the most adequate test for pre-operative demonstration of the lengths of strictures and the full involvement of spongiofibrosis [15].

The approximately  $35^\circ$  (range,  $0^\circ - 90^\circ$ ) physiological anterior curvature of the bulbar urethra predisposes the organ to internal iatrogenic injuries during trans-urethral procedures. Another factor that predisposes this portion of the urethra to injuries is its proximity to the urogenital part of the perineum [16]. This predisposes the bulbar urethra to injuries from external perineal trauma which often compresses the bulbar urethra against the inferior aspect of the pubic bone [17]. Common types of these mechanisms of injuries of the perineum are straddle and impalement injuries.

The mobility of the penile urethra seems to protect it from accidental trauma. However, the trend we have observed currently is what may constitute an increased incidence of penile fractures involving the urethra during mutually



consented sexual intercourse, and penile trauma with urethral injuries during close partnership violence. Some of these injuries heal with urethral stricture disease.

This study was not designed to compare operative techniques. However, certain important findings, the solutions to which could enhance improved management of urethral stricture diseases, were made. These include (i) The high prevalence of UTIs involving highly resistant Gram-negative aerobic bacilli, some of which are often associated with multidrug resistance (ii) The high prevalence of comorbidities especially hypertension and cardiovascular morbidity in the patients (iii) The rather high rate of abscondment of patients from post-treatment follow-up either after clinical assessment, preliminary suprapubic cystostomy, or urethroplasty (iv) The necessity for effective and organized schedule for evaluation and measurement of the outcome of treatment of USD.

Four of the most common bacterial pathogens (species of *E. coli*, *Pseudomonas*, *Klebsiella* and *Proteus* species) isolated from the urinary tracts of patients with UTIs in this study, have been associated with some survival characteristics that would also enhance their capacity to cause hospital-acquired infections in healthcare settings. Despite some subtle specific differences, they are all Enterobacteriaceae [18]. (i) They can spread from person to person directly through interpersonal contacts directly or indirectly through fomites, disinfectant solutions, medical equipment and consumables, ventilators, intravenous catheters, endoscopes, etc. This means that they can spread from healthcare workers to patients and vice versa (ii) A risk factor for infection by these organisms is the presence of catheters. Chronic catheterization, especially of the urinary tract, causes catheter-associated urinary tract infection [19]

*Proteus mirabilis* has the additional feature of producing urease which splits urine urea (carbamide) to form ammonia and CO<sub>2</sub>. Ammonia causes alkalinity of urine which predisposes the patient to the formation of magnesium ammonium calculi (struvite stones) [20]. It also produces proteases and toxins, e.g. haemolysin and mirabilysin with which it is capable of destroying host tissue proteins and causing haemolysis [18, 21]. A curious property of this organism is its ability to swim in fluids and swarm on surfaces with the aid of its flagella [22]. Other features of Enterobacteriaceae include possession of fimbriae with which they adhere to surfaces and capacity for multi-drug resistance.

How the patients in this study acquired UTIs with these organisms should be the subject of another study. However, it is not unlikely that UTIs due to these Gram-negative aerobic bacilli were hospital-acquired or related to the use of catheters, if not as complications of urinary tract obstruction due to the urethral strictures. The large number of patients who had preliminary suprapubic cystostomy following failed urethral catheterization suggests that quite a good number 135 (60.27%) of the patients were on prolonged catheterization. These catheters were changed at frequent intervals, pending definitive urethral operations. The high prevalence of UTIs in these patients and the type of cultured urinary pathogens suggest that screening for risk factors of hospital-acquired infections be carried out at the patient service areas of the urology wards, and clinics. The screening should involve admitted patients, healthcare personnel, beds, equipment, and other facilities including antiseptic solutions used at these point and surgical equipment.

The high rate of non-compliance of patients with post evaluation, and post-treatment schedules observed in this study may be multifactorial. Poverty and a high prevalence of medical and surgical comorbidities within this population of patients (Table) might have contributed. Generally, the system of funding of health services in the country is the out-of-pocket expenditure model at the points of service. Such a system of funding medical services may frequently result in non-compliance with the treatment protocol and catastrophic medical expenditure. Medical and other comorbid conditions as well as pre-treatment complications of USD observed in this study, including hypertension and other cardiovascular diseases, are usually treated to optimize patients for anaesthesia and surgery. They might have delayed definitive surgical treatments and increased the cost of treatments. This observation was also made in another study [9].

Another observation, which is a limitation of this study is the absence of a validated tool or tools for measurement or quantification of outcome of treatment of strictures. The most common features of urethral stricture disease in this study were lower urinary tract symptoms (LUTS). Rourke KF, et al, in a study about the Canadian Urological Association guidelines for the management of urethral strictures, stated that the tools for measurement or quantification of treatment outcomes of USD should contain the following criteria: - "(i) improvement in lower urinary tract symptoms (ii) health-related quality of life (iii) the necessity for further procedures, (iv) complications which may be stricture and/or treatment-related, (v) sexual dysfunction and (vi) Genito-urinary pain" [23].

DVIU and urethral dilatation were done frequently on indications. Fifty-five (55) DVIUs and 30 dilatations were done as the main management procedures of USD during the study period. These did not include DVIU and dilatations done for access for transurethral procedures on the prostate, urinary bladder and the ureters. DVIU was performed 1.83 times as often as dilatation during the study period.

The first idea of DVIU was credited to Jean Civiale (1792-1867) and Maisonneuve, 1848[24]. Jean Civiale was a French surgeon and urologist who founded the first urology service in the world (Necker Hospital in Paris), and in 1823 invented the first Lithotrite [25]. DVIU is an endoscopic procedure in which the urethrotome is used under direct vision to longitudinally incise the urethra from the normal part just above the strictured segment, through the stricture to the normal part of the urethra just inferior to the stricture. The stricture is opened up by the incision. The procedure has strict indications, one of which is that the length of the stricture is short ( $\leq 1.5\text{cm}$ ) isolated, primary bulbar urethral stricture [26, 27]. Success rate is as high as 80% for stricture lengths  $<1\text{cm}$  but falls to 20% for anatomical lengths of the stricture segment of more than 1 cm [28,29] Every centimetre more than 1 cm has an additional risk of recurrence [29]. To obviate the risk of early recurrence of strictures after DVIU many additional measures have been advocated in some surgeons. These include (i) post DVIU repetitive auto-dilatation which has been found to confer no additional benefit [30,31] (ii) post DVIU intralesional steroid injection therapy to delay spongiofibrosis [32,33] (iii) intralesional post DVIU mitomycin C injection which has been shown to confer some advantage over DVIU alone [34,35] although with serious adverse effects.

Although DVIU and urethral dilatation as primary methods of treatment of USD have similar indications, the methods of achieving widening of the narrowed segment of the urethra result in urothelial injury and exposure of the subepithelial tissues to urine and its contents [29]. Urine may then extravasate into the subepithelial tissues and the tissues of the corpus spongiosum. Toxic chemical contents of urine, and uropathogens cause inflammation of the subepithelial tissues spongiofibrosis, scar tissue formation and recurrence of strictures. In this study, poor record keeping, absence of validated tools for treatment outcome as well as paucity of follow-up post treatment data made comparison of these treatment methods difficult. However, Steenkamp JW, et al after a randomized comparative study of DVIU and urethral dilatation for treatment of urethral strictures concluded that there was no significant difference between the outcomes of these procedures [29]

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## 5. Conclusion

The prevalence of urethral stricture disease was 24/1000 among the urology patients. Urinary tract infections, which were probably healthcare-associated were the most common complications. The types of uropathogens isolated, the prevalence of comorbidities and the large number of suprapubic cystostomies suggest that prolonged catheterization probably had causal associations with urinary tract infections in these patients. Screening and review of service processes are recommended. Recurrence of urethral strictures after surgical treatment procedures, though satisfactory, needs further improvement. Validated tools for measurement of dependent treatment variables are necessary in the USD service for further evaluation.

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## Compliance with ethical standards

### *Acknowledgments*

I am grateful to the Head of Department, and the Health Information Management Staff of the Health Records Department, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria for their invaluable support during data collection for this study.

### *Disclosure of conflict of interest*

There is no conflict of interest in this study.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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