ORIGINAL RESEARCH PAPER

Medical Science

CLINICAL AUDIT ON THE DIAGNOSTIC WORKUP AND HISTOPATHOLOGICAL STAGING OF BLADDER BIOPSY SPECIMENS AT BDF HOSPITAL IN BAHRAIN

KEY WORDS: Bladder, Biopsy, Audit, Histopathology

Jenna Paulson, B Phil (Hons.), Cornell University; MPH, Western University; MB BCh BAO (C) RCSI-MUB

ABSTRACT

In this clinical audit, raw patient data was extracted from the Histopathology Patient Record Books and EMR from September 2014 to January 2017, inclusive, at Bahrain Defense Military Hospital in West Riffa, Kingdom of Bahrain.
A comparative best practice guideline, the NICE Bladder Biopsy Clinical Audit Tool, was adhered to throughout the data collection process. Excerpted items included basic patient features such as Age and Sex, and elaborate, pathology-specific details such as Grade and Stage, plus treatment-specific particularities, such as whether Chemotherapy or Immunotherapy were included in the patient management plan.
This paper has 2 principal aims: (1) to assess local practice guidelines around acquisition of bladder tissue specimens for histopathological workup, and (2) to draw conclusions from the patient demographic undergoing bladder biopsy at BDF Hospital, through use of a best-practice clinical tool. Ultimately, this retrospective clinical audit focusses on aspects of diagnostic workup, referral and initial management pathways.

Introduction

In the Kingdom of Bahrain, extensive and comprehensive health care is afforded to the entire population of 1.425 million (The World Bank Group, 2016), and comprises a great array of primary, secondary, and tertiary care services, with preventative, prophylactic, and rehabilitative foci that are available at both publicly funded and private facilities. Healthcare provision is subsidised such that both Bahraini and non-Bahraini persons can receive care from a clinic in their catchment area. Primary health care, which ultimately enables Bahrainis have access to affordable and sustainable community-wide health coverage, is provided via a network of 23 primary health care centres and clinics. These centres are located throughout the five governorates of the Kingdom of Bahrain.

In addition to 13 private health care clinics (Oxford Business Group, 2012), there are 3 government hospitals (Bahrain Property World, 2017): Bahrain Defense Force Hospital (BDF), King Hamad University Hospital (KHUH), and Salmaniya Medical Complex (SMC). SMC has 1200 beds, and provides chiefly secondary health care, which includes dentistry and advanced imaging test access (X-Ray, CT, and MRI). SMC houses more specialised health services, which include psychiatric and geriatric care institutions, plus four maternity health facilities (World Health Organization, 2007).

Public health care is provided by BDF Hospital, the second largest hospital in Bahrain just after the SMC, and has 350 beds. BDF hospital is managed by the Ministry of Defense, and is located in West Riffa, Southern Governorate. BDF serves a catchment area nearly one third of the Bahrain population (Serageldien et al., 2018). This institution provides health services to members of the Bahrain defense force, their families, and a mixed civilian cohort, as well as emergency and highly specialised cardiac care services to the whole population.

Aims and Methods

Student learning outcomes decided at the initiation of the Student Selected Component included the following:

- To collect patient data from histopathology records (Pathology Record Books and EMR) at BDF Military Hospital between the months of December 2014 and January 2017, inclusive.
- To review records and narrow the patient data pool to bladder biopsies taken during this time period.
- To extract records and enter selected data into the NICE Clinical Audit Tool (National Collaborating Centre for Cancer, 2017, p.4) for Bladder Biopsy and use this to streamline results
- To collate the information collected and organise it within the NICE Clinical Audit Tool (See Table 1, Annexes 1 and 2).

Table 1. Clinical audit report. Adapted from NICE, Retrieved August 2, 2017, from https://www.nice.org.uk/guidance/ng2/resources/clinical-audit-tool-excel-3604141. Copyright 2017 by NICE.

Audit standards		Audit results
Report number	%	0/0
Administrative Patient Demographics		
Patient records derived from the 2014-2015 calendar year	10%	8/80
Patient records derived from the 2015-2016 calendar year	35%	28/80
Patient records derived from the 2016-2017 calendar year	55%	44/80
Sex		
Male	91.25%	73/80
Female	8.75%	7/80
Symptoms present prior to bladder Bx		
Haematuria (e.g. microhaematuria, gross)		
Y	60%	48/80
N	40%	32/80
Polyuria		
Y	23.75%	19/80
N	76.25%	61/80
Dysuria		
Y	25%	20/80
N	75%	60/80
Presence or absence of lumbago		
Y	42.5%	34/80
N	57.5%	46/80

Done as part of cystoscopy or TURBT (Cancer Research UK, 2015) procedure?		
Y cys + TUR	83.75%	67/80
Y cys only	13.75%	11/80
N[1]	28.75%	23/80
Details regarding bladder cancer if present in the bladder Bx sample		
Recurrence history		
Y	25%	20/80
N	75%	60/80
Size and number of cancers		
Y, size and number[2]	0%	0/80
Y, size[3] only	58.75%	47/80
N	2.5%	2/80
Histological type		
Papillary transitional cell carcinoma	42.5%	34/80
Invasive	23.53%	8/34
Non-invasive	76.47%	26/34
Invasive papillary transitional cell carcinoma with invasion to prostate	2.5%	2/80
Cystitis	21.25%	17/80
Chronic cystitis	29.41%	5/17
Chronic active cystitis	17.65%	3/17
Polypoid cystitis	17.65%	3/17
Benign ulceration with chronic active cystitis	5.88%	1/17
Chronic follicular cystitis	5.88%	1/17
Cystitis cystica	5.88%	1/17
Cystitis glandularis	5.88%	1/17
Masked acute on chronic cystitis	5.88%	1/17
Mild chronic cystitis	5.88%	1/17
Invasive transitional cell carcinoma	8.75%	7/80
Benign prostatic hyperplasia	6.25%	5/80
Inflammation	2/80	
Mild	50%	1/2
Mild chronic acute	50%	1/2
Other nonspecific	20/80	
Nested variant of urothelial carcinoma of urinary bladder	2.5%	2/80
Nonspecific granuloma	2.5%	2/80
No recurrence, no defects, no extravasation	1.25%	1/80
Oedema with vascular congestion	1.25%	1/80
Polypoidal cryptitis	1.25%	1/80
Urothelial carcinoma	1.25%	1/80
Acutely inflamed granulation tissue	1.25%	1/80
Endometriosis	1.25%	1/80
Intraurothelial neoplasia	1.25%	1/80
Insufficient for opinion	1.25%	1/80
Invasive adenocarcinoma	1.25%	1/80
Keratinising squamous cell carcinoma	1.25%	1/80
Severe dysplasia	1.25%	1/80
Thickened deep muscle	1.25%	1/80
Ureteric papilloma	1.25%	1/80
Urothelial carcinoma with focal areas of squamous metaplasia	1.25%	1/80
Urothelial papillary hyperplasia	1.25%	1/80
Well-differentiated liposarcoma/atypical lipomatous neoplasm	1.25%	1/80
Grade		
Grade 1/well differentiated/low grade	21.25%	17/80
Grade 2/moderately differentiated/intermediate grade	21.25%	17/80
Grade 3/poorly differentiated/high grade	37.5%	30/80
Negative for malignancy	3.75%	3/80
No grade given	1.25%	1/80
Other descriptor given	15%	12/80
Stage[4]		
PTis	1.25%	1/80
PTa	10%	8/80
PT1a	1.25%	1/80
PT1b	2.5%	2/80
PT1	31.25%	25/80
PT1 PMx	1.25%	1/80
PT2a	5%	4/80
PT2	5%	4/80
PT4	2.5%	2/80

PT4a	2.5%	2/80
No stage given	37.5%	30/80
Presence or absence of flat urothelium		
Y	0%	0/80
N	58.75%	47/80
N/A	41.25%	33/80
Predicted risk of recurrence[5]		
Y	25%	20/80
N	75%	60/80
Predicted risk of progression[6]		
Y	1.25%	1/80
N	98.75%	79/80
Treatment options utilised in patient management plan if bladder cancer was present		
TURBT	60%	48/80
Cystectomy	1.25%	1/80
Urinary diversion	1.25%	1/80
Intravesical chemotherapy[7]	6.25%	5/80
Systemic chemotherapy[8]	5%	4/80
Radiotherapy[9]	5%	4/80
Immunotherapy[10]	10%	8/80
Descriptive Patient Characteristics/Comments		
Comorbidities	78/80	
Hypertension	45%	36/80
DM or prediabetic	40%	32/80
Hyperlipidaemia or dyslipidaemia	30%	24/80
ACS (i.e. acute STEMI, NSTEMI or unstable angina)	21.25%	17/80
BPH	15.49%	11/71
OAB	7.5%	6/80
Ischaemic stroke	5%	4/80
H/O angioplasty or other coronary artery stenting	5%	4/80
Hypothyroidism	3.75%	3/80
Renal calculi	3.75%	3/80
Other medications		
Non-NSAID analgesics/antipyretics (e.g. acetaminophen codeine phosphate, paracetamol)	66.25%	53/80
Antibiotics (e.g. cyclosporine, trimethoprim, levofloxacin, cefuroxime, augmentin, ciprofloxacin)	48.75%	39/80
α1 antagonists (e.g. tamsulosin, alfuzosin)	31.25%	25/80
Antihyperglycaemics (e.g. metformin, glargine, lantus, glulisine, gliclazide, mixtard)	23.75%	19/80
M3 antagonists (e.g. solifenacin succinate)	23.75%	19/80
Beta blockers (e.g. atenolol, bisoprolol)	15%	12/80
Statins (e.g. simvastatin)	15%	12/80
Calcium channel blockers (e.g. amlodipine)	13.75%	11/80
Osmotic laxatives (e.g. lactulose) (10/80)	12.5%	10/80
Diuretics (e.g. hydrochlorothiazide, furosemide, spironolactone)	8.75%	7/80
NSAIDs (e.g. diclofenac, aspirin)	8.75%	7/80
Immunotherapeutic agents (e.g. intravesical BCG)	6.25%	5/80
Nitrates (e.g. glyceryl trinitrate)	6.25%	5/80
Proton pump inhibitors (e.g. omeprazole)	6.25%	5/80
5 -reductase inhibitors (e.g. dutasteride)	5%	4/80
Antispasmodics (e.g. hyoscine, oxybutynin)	5%	4/80
ACE inhibitors (e.g. perindopril)	3.75%	3/80
Anticonvulsants (e.g. pregabalin, sodium valproate)	3.75%	3/80
Antiplatelets (e.g. clopidogrel)	3.75%	3/80
Corticosteroids (e.g. prednisolone)	2.5%	2/80
Anticoagulants (e.g. warfarin)	2.5%	2/80
Surgical history (e.g. cardiac, GU, bariatric)		
Y	25%	20/80
N	75%	60/80
Smoker		
Y	6.25%	5/80
N	16.25%	13/80
Exception[11]	77.5%	62/80
Recreational drug/alcohol use		
Y[12]	1.25%	1/80
N	98.75%	79/80

Results

Data analyses were conducted with Excel 2017, Version 15.32, and inherent Function tools to organise the data sheet and draw conclusions therein contained. Descriptive statistics were also utilised (i.e. measures of central tendency, such as mean). This study was approved by the Ethics Committee of the Bahrain Defence Force Military Hospital.

The raw patient data extracted during the clinical audit were chosen using a comparative best practice guideline (NICE, 2017, p. 4), the NICE Bladder Biopsy Clinical Audit Tool (See Annexes 1 and 2). These selected data items focussed on a specific patient population undergoing bladder biopsy at BDF Hospital, who were referred from other departments in the institution (e.g. Urology or Surgery). These items included basic demographic features such as Date of Bladder Biopsy, Age, Sex, Referring Clinician, Ward/Department Referred from, and more advanced, pathology-specific details such as Histopathological Specimen Analysed and Technique of Tissue Extraction Utilised, Histopathological Diagnosis made (e.g. PT4), Grade, Stage, and treatment-specific particularities, such as whether Chemotherapy, Radiotherapy, or Immunotherapy were included in the patient management plan.

Ultimately, data from 80 canvassed patient records yielded important conclusions (See Table 1). First, the majority of referrals for histopathological diagnosis with suspected bladder carcinoma were males (88.8%) and the remainder, females (11.2%). Of all extracted cases, 96.25% were referred from Urology, 3.75% were referred from Surgery, and only 1% of those from the Surgery Day Ward. The top 5 most commonly encountered comorbidities in patients diagnosed with bladder carcinoma undergoing TURBT with guided flexible cystoscopy were hypertension (45%), Type 2 diabetes mellitus (40%), dyslipidaemia (30%), acute coronary syndrome (21.25%), and benign prostatic hyperplasia (13.75%). Strikingly, of all patients with suspected bladder carcinoma, at the time of diagnosis, only 6.25% of patients identified as non-smokers. 16.25% were smokers, and 77.5% declined to disclose their smoking status. The most regularly encountered drug classes taken by the study cohort with suspected bladder cancer included non-NSAID analgesics/antipyretics (66.25%), antibiotics (48.75%), alpha-1 antagonists (31.25%), antihyperglycaemics (23.75%), and M3 antagonists (23.75%). 25% of patients had a past surgical history of either cardiac, genitourinary or bariatric nature, and 75% of patients had no past surgical history.

With regards to symptoms present prior to bladder biopsy, 60% of patients reported haematuria, 23.75% reported polyuria, 25% reported dysuria, and 42.5% reported lumbago. The standard procedure involved in obtaining tissue specimens for procedure for histopathological examination at the BDF Pathology lab is via TURBT and/or cystoscopy procedure (Stephenson, 2016; National Collaborating Centre for Cancer, 2015). Of note, 83.75% of patients underwent only TURBT; 70% of these cases underwent TURBT plus flexible cystoscopy. Only 13.75% of cases did not undergo cystoscopy, and in 28.75% of cases, the technique or method of specimen collection was not reported.

The manner of documenting bladder biopsy histopathological features is crucial to this clinical audit. These details were consistently remarked upon in the BDF Pathology Record Books, a hard copy form of record-keeping, and reported on the (1) Histological Type of bladder specimen; (2) Size and number of cancers; (3) Grade; and (4) Stage. The presence or absence of flat urothelium was not mentioned in the inspected patient records. The most commonly encountered histological type of bladder specimen identified in the pathologist's report was papillary transitional cell carcinoma (42.5%), of which 76.47% of cases were invasive, and 23.53% non-invasive; cystitis (21.25%), of which subtypes included chronic cystitis (29.41%), chronic active cystitis (17.65%), or polypoid cystitis (17.65%); invasive transitional cell carcinoma (8.75%); and lastly, benign prostatic hyperplasia (6.25%)[13]; or was reported as simply 'inflammation' (2.5%), where subtypes included mild and mild chronic acute.. In only 1.25% of cases was the bladder specimen insufficient for opinion, and in 2.5% of cases, no pathological report was found in the records.

1. These cases did not indicate the technique/method of specimen collection employed.
2. Number of cancers was not remarked upon, however location and depth of invasion was always noted (e.g. bladder neck, L. posterolateral, bladder trigone, L. ureteric orifice, NMIBC, MIBC, etc).
3. Size of cancers was inconsistently remarked upon.
4. Staging was done for most histopathological samples where the diagnosis listed mentioned carcinoma of bladder tissue; however, in many cases, no stage was given. In these instances, the biopsy or cystoscopy sample was either (1) not bladder cancer (e.g. endometriosis, cystitis, acutely inflamed granulation tissue, etc); (2) bladder cancer, but no stage was mentioned (or was instead stated in words instead of using the standard TNM staging terminology); or (3) missing data altogether, and the information was found elsewhere (i.e. the patient's EMR). Importantly, nodes and mets were rarely commented on in the pathologist's staging report.
5. Predicted risk of recurrence was not mentioned in the EMR. However, patients presenting with bladder cancer recurrence were mentioned in 20/80 patient records in the EMR, and was always written into the patient notes by either a referring Urologist (19/20) or Surgeon (1/20).
6. In only 1/80 cases did the patient notes written by the Urologist mention a patient (1) with recurrent bladder carcinoma, (2) with inoperable bladder carcinoma, and (3) for whom chemotherapy was contraindicated, due to comorbidities. It may be inferred from the above case, though it was not mentioned explicitly, that the patient's case has an associated poor prognosis.
7. 5/80 cases mentioned use of mitomycin C intravesical injection 24 h following TURBT procedure.
8. Despite patient records mentioning 'chemotherapy' for particular patients, the specific chemotherapeutic regimen was never mentioned (e.g. cisplatin + gemcitabine; carboplatin + gemcitabine; MVAC; or DD-MVAC)
9. 4/80 cases mentioned use of radiotherapy and always where use of chemotherapeutic agents was noted.
10. 8/80 cases mentioned administration of intravesical BCG; there was no mention of immunotherapy provision with interferon or PD1 inhibitors in the EMR.
11. 62/80 cases did not report a history of cigarette smoking or declined to answer.
12. There was only 1 case of reported recreational alcohol use in the patient EMR, where the patient identified as an alcoholic.
13. viz., where a bladder carcinoma was suspected by similar symptomatology or patient presenting complaint that turned out to an unrelated non-malignant pathology.

Importantly, grading and staging of bladder biopsy specimens occurred in all cases where a biopsy specimen was sufficient for a pathological diagnosis to be made. The most frequently identified grades of biopsy specimens were grade 1/well differentiated/low grade (21.25%); grade 2/moderately differentiated/intermediate grade (21.25%); grade 3/poorly differentiated (37.5%); and negative for malignancy (3.75%). In 15% of cases, no grade-specific pathological descriptor was given.

Staging was done for most histopathological samples where the diagnosis listed mentioned carcinoma of bladder tissue; however, in many cases, no stage was given. In these instances, the biopsy or cystoscopy sample was either (1) not bladder cancer (e.g. endometriosis, cystitis, acutely inflamed granulation tissue, etc); (2) bladder cancer, but no stage was mentioned (or was instead stated in words instead of using the standard TNM staging terminology); or (3) missing data altogether, and the information was found elsewhere (i.e. the patient's EMR). Importantly, nodes and mets were rarely commented on in the pathologist's staging report. When a stage was listed, the most frequently encountered stages included: (1) PT1 (31.25%); (2) PTa (10%); PT2a (5%); and finally, PT2 (5%). Overall, 5% of canvassed cancer cases presented with advanced tumors (either regional or distant mets) at the time of histopathological diagnosis (100% in males, where invasion into the prostatic duct occurred in 2/4 instances). 56.25% of patients presented with localised tumors and 1.25% with bladder carcinoma in-situ. The extent of cancer went unreported in 37.5% of patients (83% in males and 17% in females).

Additional details regarding bladder biopsy were mentioned in the patient EMR (See Table 2). These included (1) predicted risk of recurrence and progression; (2) treatment options utilised in

patient management plan if bladder cancer was present; (3) specific chemotherapeutic, radiotherapeutic, or immunotherapeutic regiments utilised. Predicted risk of recurrence was never mentioned in the patient notes on the EMR. However, a significant proportion of patients referred for bladder biopsy had a history of recurrence in 25% of cases. In only 1.25% of cases did a patient record mention risk of progression to a more metastatic, high-grade version of bladder cancer.

Now, as pertains to specialised therapeutic measures for patients with confirmed bladder biopsy and history of recurrence, 6.25% patient records mentioned use of mitomycin C intravesical injection 24 h following TURBT procedure; 5% of cases mentioned use of chemotherapeutic agents, but did not specify the regimen utilised (e.g. cisplatin + gemcitabine, MVAC or other); 5% of cases mentioned use of radiotherapy, and in each case, there was always concurrent use of chemotherapeutic agents; finally, 10% of patient records mentioned use of immunotherapeutic modulators, specifically, administration of intravesical BCG. There was no mention of immunotherapy with interferon or PD1 inhibitors (e.g. nivolumab).

Finally, other descriptive patient characteristics or comments were sporadically mentioned in the EMR. These included notes on comorbidities, medications, surgical history, smoking status, and whether or not the patient was a recreational drug or alcohol user.

Discussion

In the Kingdom of Bahrain, the incidence of bladder cancer is 7.6% of all cancers (See Figure 1), and its associated mortality is 1.5% of all cancers (See Figure 2). It is the fourth leading cause of cancer death in Bahrain, and is preceded by lung (13.8%), colorectal (12.3%), and prostate (8.4%). The 5-year prevalence of bladder cancer in the Kingdom of Bahrain is 10.7% of all cancers in men and women (See Figure 3). In Bahraini males and females, the 5 most frequent cancers were breast, colorectal, lung, leukaemia, and bladder (World Health Organization, 2012).

Bladder cancer is the fourth commonest cancer in the US among men, and occurs thrice more often in males than females. The mean age of diagnosis is 65 years (CanadaQBank, 2016). 90% of all bladder cancers are transitional cell or urothelial carcinomas, and of these, the vast majority are papillary (i.e. non-invasive, superficial in nature, and easily resectable). The minority are squamous cell carcinomas, and are usually preceded by parasitic worm infection (i.e. specifically, S. haematobium), but other important risk factors include increasing age (American Cancer Society, 2016), cigarette smoking, and exposure to certain industrial chemicals (e.g. aromatic amines such as 2-naphthylamine) and exhausts from the rubber and dye industries (Letašiová et al., 2012).

Common presenting symptomatology for patients with suspected bladder cancer include haematuria, dysuria, polyuria, pyuria, and pelvic pain (in advanced cases). Diagnosis is made via cystoscopy, where a camera attached to a cystoscope is inserted into the bladder, and a small biopsy specimen is taken for subsequent histopathological characterisation, grading, and staging. TURBT, or transurethral bladder resection of bladder tumors, occurs when a lesion is excised from within the bladder. Urine cytology may also be used forbye to detect malignant cells.

Based on a 10-year historical report (Al-Madouj et al., 2011) on cancer in the GCC countries between 1998 and 2007, 4212 total cancer cases were reported by nationality and gender for the Kingdom of Bahrain. During that time, there were more cancers reported in Bahraini females (51.8%) than males (48.2%). On the whole, the average incidence for all cancers in GCC countries increases with age; importantly, 9 in 10 persons with bladder cancer exceed age 55 at diagnosis (IACR, 2018). Moreover, of bladder cancers reported by Bahrain between 2003 and 2007, the majority of these diagnoses occurred in males (80.2%) than in females (19.8%). Crucially, of all the GCC countries, Bahrain had the highest rates of bladder cancer in both sexes (Al-Madouj et al., 2011).

Finally, it was revealed that the diagnosis of bladder cancer in GCC states is confirmed most frequently on the basis of histopathology, and much less often via cytological and radiological means (Alsayyad & Hamadeh, 2014). Other confirmatory methods, including clinical, surgical, and cancer biomarkers, were very infrequently used.

Figure 1. Incidence of bladder cancer in Bahrain. Adapted from World Health Organization, Retrieved January 30, 2018, from http://globocan.iarc.fr/ Pages/fact_sheets_ population.aspx. Copyright 2018 by IARC.

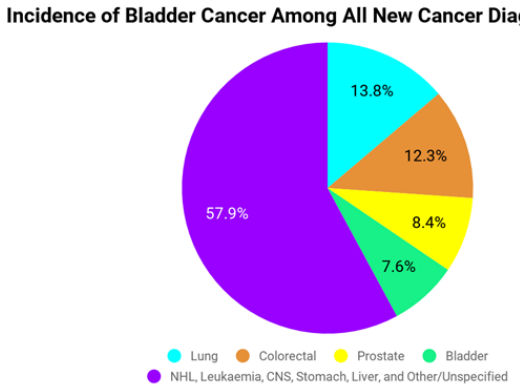


Figure 2. 5-year prevalence of bladder cancer in Bahrain. Adapted from World Health Organization, Retrieved January 30, 2018, from http://globocan.iarc.fr/Pages/ fact_sheets_population.aspx. Copyright 2018 by IARC.

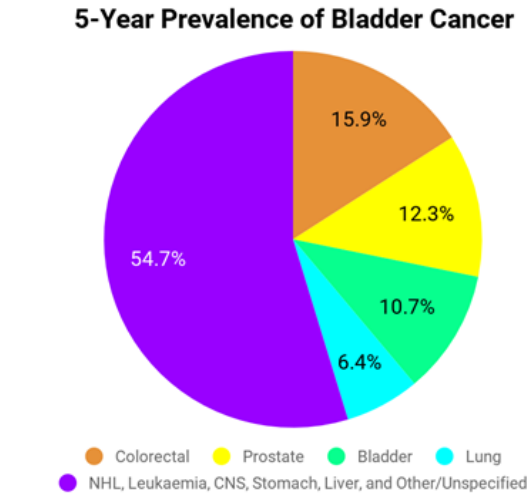
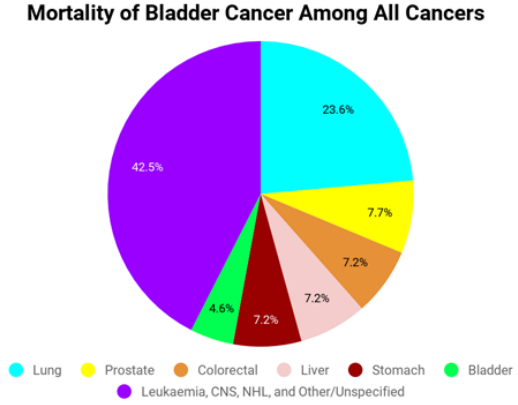


Figure 3. Mortality of bladder cancer in Bahrain. Adapted from World Health Organization, Retrieved January 30, 2018, from http://globocan.iarc.fr/Pages/fact_ sheets _ population.aspx. Copyright 2018 by IARC.



Annex 1. Patient data sheet. Adapted from NICE, Retrieved August 2, 2017, from https://www.nice.org.uk/guidance/ng2/resources/clinical-audit-tool-excel-3604141. Copyright 2018 by NICE.

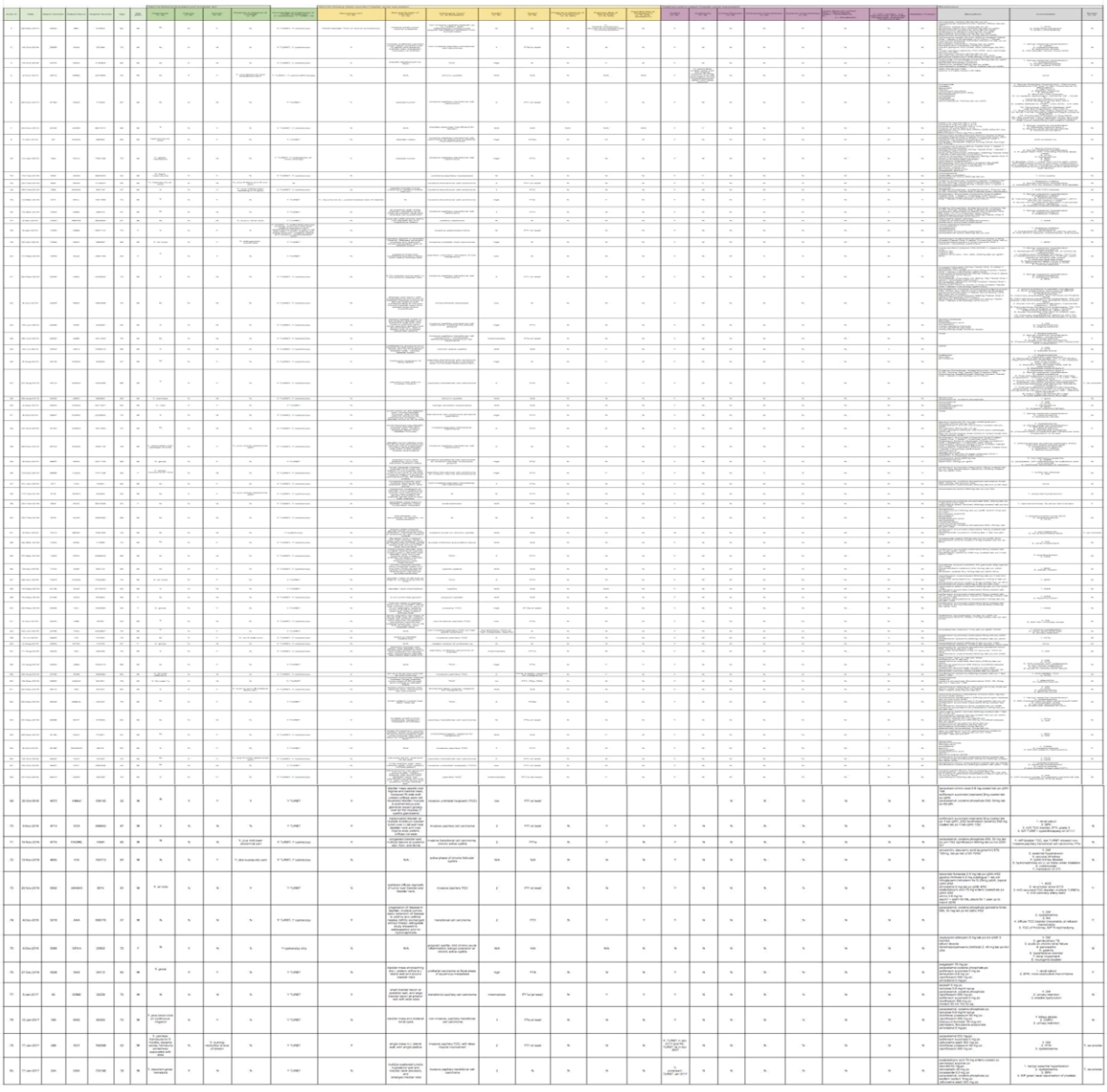
Date	Report Number	Patient Name	Hospital Number	Age	Sex (M/F)	Doctor	Ward/ Dept.	Specimen	Dx	Demographics	
28-Sep-2014	3502	MH	37453	62	M	EM	Uro	A - Bladder (TURBT); B - Scrotal Tumor	A - Non-invasive papillary transitional cell carcinoma; B - well diff. liposarcoma/atypical lipomatous neoplasm	Age Range	22-87
16-Oct-2014	3699	BAA	32148	72	M	AD	Uro	Bladder (TURBT)	Non-invasive papillary transitional cell carcinoma, grade I, PT4 at least	Mean Age	64
19-Oct-2014	3723	MSA	118502	84	M	EM	Uro	Bladder (TURBT)	High grade papillary transitional cell carcinoma	Male	71
2-Nov-2014	3912	GMG	207665	45	M	EM	Uro	Bladder Bx	chronic cystitis	Female	9
13-Nov-2014	4037	MSA2	17353	67	M	AY	Uro	Bladder Tumor Bx	invasive transitional cell carcinoma (high grade), PT1		
20-Nov-2014	4165	MSA3	17353	67	M	AY		Bladder Tumor	invasive papillary transitional cell carcinoma, grade 3, PT1 at least		
23-Nov-2014	4184	JAD	867271	66	M	AD	Uro	Bladder specimen	insufficient for opinion		
10-Dec-2014	4452	EHH	730128	72	M	EM	Uro	Bladder Tumor	invasive high grade papillary transitional cell carcinoma, PT1		
7-Jan-2015	52	NAAA	98692	66	M	EM	Uro	A - Prostate (TURP); B - Bladder Tumor	A - benign prostatic hyperplasia; B- invasive papillary transitional cell carcinoma, high grade invading the superficial muscularis propria (PT2a)		
14-Jan-2015	164	EHH2	730128	72	M	AY	Sur	A - Lymph node; B - Bladder cuff; C - R kidney ureter			
21-Jan-2015	267	AMAM	8574	59	M	EM	Uro	Bladder Tumor	urothelial papillary hyperplasia		
19-Feb-2015	660	WAS	443333	54	M	SH	Uro	Bladder Tumor	mild chronic cystitis		
22-Feb-2015	694	BHM	113521	54	M	HE	Uro	Bladder Tumor	invasive transitional cell carcinoma grade 3 PT1 at least		
26-Feb-2015	788	BAMA	80718	47	M	KH	Uro	Bladder Tumor	invasive transitional cell carcinoma, grade 1, PT1		
12-Mar-2015	977	MHJ	141789	70	M	AY	Sur	A - Bladder Tumor; B - Tumor bed resection	A - invasive high grade transitional cell carcinoma PT2		
15-Mar-2015	1003	EMA	26673	57	M	EM	Uro	Bladder Tumor	invasive papillary transitional cell carcinoma, Grade 1, PT1		
2-Apr-2015	1304	NMHD	453504	27	M	AY	Uro	Bladder Bx	Ureteric papilloma		
5-Apr-2015	1325	KMAR	567110	73	F	EM	Uro	Bladder Tumor	invasive adenocarcinoma, PT1 at least		
20-Apr-2015	1569	NAA	98692	66	M	AD	Sur. Day	A - Bladder Tumor; B - Prostate Tumor	prostate and bladder Bxs; high grade invasive prostatic duct carcinoma		
17-May-2015	1978	MJZ	155149	53	F	EM	Uro	Bladder (TURBT)	papillary urothelial neoplasm of low malig		

30-May-2015	2209	HSA	223923	73	M	EM	Uro	Bladder (TURBT)	benign prostatic hyperplasia + separate grade 3 invasive papillary transitional cell carcinoma of bladder PT1 at least		
4-Jun-2015	2291	NSA	185508	70	M	AD	Uro	Bladder tumor	low grade intraurothelial neoplasia		
18-Jun-2015	2528	RAF	23260	54	M	SH	Uro	A, B - Bladder Tumor	invasive papillary transitional cell carcinoma (high grade), invading the lamina propria PT1		
28-Jun-2015	2622	AME	161453	70	M	KH	Uro	A - Bladder (TURBT); B - Prostate (TURP)	A - invasive papillary transitional cell carcinoma + moderately diff/keratinising squamous cell carcinoma PTa at least; B - benign prostatic hyperplasia		
12-Jul-2015	2761	HEH	708510	56	M	EM	Uro	Bladder (TURBT)	chronic active cystitis		
8-Aug-2015	3018	AMA	52965	57	M	AY	Uro	A - Bladder (TURBT); B - Rt ureteric orifice	A - papillary transitional cell carcinoma, high grade (no lamina propria & muscularis layer in the submitted specimen); B - no malignancy seen		
27-Aug-2015	3412	AMA2	100336	66	M	SH	Sur	Bladder Tumor	papillary transitional cell carcinoma grade 2 PTa		
30-Aug-2015	3420	ARR	65960	56	M	RA	Uro	Bladder Bx	chronic cystitis		
2-Sep-2015	3504	ARAA	601347	62	M	RA	Uro	A - Bladder Bx; B - TURP	benign prostatic hyperplasia		
16-Sep-2015	3726	AMA3	8574	60	M	RA	Uro	Bladder (TURBT)	papillary transitional cell carcinoma grade 1 PTa		
4-Oct-2015	3897	HSA2	223923	74	M	RA	Uro	Bladder (TURBT)	transitional high grade cell carcinoma (invasive papillary) PT1		
27-Oct-2015	4197	AME2	161453	71	M	EM	Uro	Bladder (TURBT)	invasive papillary transitional carcinoma grade 2, PT1. Benign prostatic hyperplasia + chronic prostatitis		
5-Nov-2015	4365	RAF2	23260	55	M	EM	Uro	Bladder Tumor			
29-Nov-2015	4731	KAK	16616	78	M	EM	Uro	Bladder (TURBT)	invasive papillary transitional cell carcinoma grade 2		
8-Dec-2015	4887	MAA	901176	68	M	RA	Day Case	Bladder (TURBT)	invasive transitional cell carcinoma high grade w/ invasion into the muscularis propria, PT2		
13-Dec-2015	4956	FJAA	777138	52	F	EM	Uro	Bladder (TURBT)	papillary transitional cell carcinoma, grade 2 w/ invasion into the lamina propria PT1		
27-Jan-2016	371	FAJ	14641	84	M	TU	Uro	Bladder Tumor	Grade 1 non-invasive papillary transitional cell carcinoma PTa		
11-Feb-2016	618	RAF3	23260	55	M	AD	Uro	Bladder Bx	severe dysplasia, PTis		
23-Feb-2016	820	ZOD	857528	51	F	MO	Uro	Bladder Tumor	endometriosis		
25-Feb-2016	870	MJM	556492	68	M	SH	Uro	Bladder Bx			

6-Mar-2016	1013	MMAK	108169	79	M	EM	Uro	Bladder Bx	Masked acute on chronic cystitis		
9-Mar-2016	1046	OME	9765	53	M	KH	Uro	Bladder (TURBT)	non-invasive papillary transitional cell carcinoma, low grade Pta at least		
10-Mar-2016	1096	YMJ	200967	75	M	MO	Uro	Bladder Tumor	low grade non-invasive papillary transitional carcinoma + high grade dysplasia polypoidal cryptitis		
20-Mar-2016	1240	GAE	17586	71	M	EM	Uro	Bladder (TURBT)	acutely inflamed granulation tissue		
27-Mar-2016	1353	EER	649842	86	M	MO	Uro	Bladder Tumor	invasive papillary transitional cell carcinoma grade 3, PT1		
18-Apr-2016	1744	SSE	60015	56	M	MA	Uro	Bladder Bx	cystitis cystica		
28-Apr-2016	1941	KDKB	733480	75	M	MO	Uro	A - Bladder Tumor; B - TURP	Grade 3 invasive papillary transitional cell carcinoma of bladder w/ invasion to prostate		
12-May-2016	2148	RJR	917673	53	M	MA	Uro	Bladder (TUR)	cystitis		
15-May-2016	2169	AAS	64483	59	F	KH	Sur	Bladder Bx	polypoid cystitis		
22-May-2016	2309	EA	152284	54	F	EM	Uro	A - Bladder Tumor; B - deep B. tumor	high grade invasive urothelial carcinoma PT2a at least		
5-Jun-2016	2540	OM	9765	53	M	EM	Surg	Bladder (TUR)	oedema w/ vascular congestion		
23-Jun-2016	2766	YMJ2	200967	75	M	FA	Uro	Bladder Tumor	polypoidal cystitis		
28-Jun-2016	2823	AAA	696779	56	M	MA	Uro	A, B - Bladder Tumor	Grade 2 invasive papillary transitional cell carcinoma PT1 + non specific granuloma		
3-Jul-2016	2862	YS	10797	73	M	EM	Uro	Bladder (TURBT)	Grade 2 invasive papillary transitional cell carcinoma PT1		
24-Jul-2016	3136	WHS	14702	57	F	MO	Uro	Bladder Bx	nested variant of urothelial carcinoma of the urinary bladder		
2-Aug-2016	3283	WHS2	14702	57	F	TU	Sur	A - Bladder (TURBT) B - Deep resection of bladder tumors	nested variant of urothelial carcinoma w/ focal deep muscle invasion & focal urothelial dysplasia PT2a 'at least' chronic cystitis		
11-Aug-2016	3434	SS	35239	70	M	MA	Uro	Bladder Tumor	papillary urothelial carcinoma of the bladder, intermediate grade/PT1b		
14-Aug-2016	3464	JMA	125415	66	M	EM	Uro	Bladder (TURBT)	High grade urothelial carcinoma, stage PT2		
30-Aug-2016	3726	AM	93181	79	M	FA	Sur	Bladder tumor	TCC, PT1, PNx, PMx		
19-Sep-2016	3955	BSB	168580	82	M	EM	Uro	A&B - Bladder (TURBT)	invasive grade 2 papillary transitional cell ca - PT1b at least, negative for malignancy		
22-Sep-2016	4014	NS	40167	60	M	FA	Surg	Bladder Bx	thickened deep muscle; negative for malignancy		
25-Sep-2016	4048	SMHA	34037	75	M	EM	Uro	Bladder (TURBT)	invasive grade 3 transitional cell carcinoma PT2a at least		
27-Sep-2016	4098	MHF	37453	64	M	RA	Uro	Bladder Tumor	papillary transitional cell carcinoma, PTa at least		
29-Sep-2016	4126	SSH	71441	51	M	FA	Sur	Bladder tumor	Mild inflammation; negative for malignancy		

4-Oct-2016	4196	AMAM2	8574	61	M	FA	Uro	A - Bladder Bx B - Bladder (TURBT)	invasive transitional papillary carcinoma grade 1 PT1 at least		
16-Oct-2016	4352	YSY	10797	74	M	EM	Uro	Bladder (TURBT)	Grade 2 papillary transitional cell carcinoma PT1 at least		
23-Oct-2016	4467	YHY	182536	44	M	EM	Uro	Bladder (TURBT)	low grade invasive urothelial neoplasm (TCC) PT1 at least		
27-Oct-2016	4541	SSM	35239	70	M	FA	Uro	Bladder Tumor	transitional papillary cell carcinoma intermediate grade PT1a (at least)		
30-Oct-2016	4573	HMA	139120	22	M	EM	Uro	Bladder (TUR)	the histological along w/ the immunohistochemistry is highly suggestive of a localised form of cystitis glandularis		
6-Nov-2016	4713	EEA	649842	87	M	EM	Uro	Bladder (TUR)	Grade 2 invasive papillary cell PT1 at least		
10-Nov-2016	4774	FAGM	14641	85	M	FA	Uro	A - Bladder Tumor B - Bladder Bx	Grade 2 invasive transitional cell carcinoma, PT1a, chronic active cystitis		
13-Nov-2016	4830	HIS	130713	61	M	EM	Uro	Bladder (TURBT)	active phase of chronic follicular cystitis		
22-Nov-2016	5002	AMAM2	8574	61	M	FA	Surg	Bladder Tumor	Grade 2 - Invasive papillary transitional cell carcinoma, PT1		
4-Dec-2016	5218	AAA2	696779	57	M	FA	Uro	Bladder Tumor	transitional cell carcinoma, grade 2, PT1		
6-Dec-2016	5266	GFKH	23852	72	F	FA	Uro	A - R posterior Bladder Bx B - L lateral wall C - R lateral wall	A - polypoid cystitis B - mild chronic acute inflammation C - benign ulceration w/ chronic active cystitis		
27-Dec-2016	5558	AAS	24012	60	M	MA	Sur	Bladder (TURBT)	High grade urothelial carcinoma w/ focal areas of squamous metaplasia, PT4		
5-Jan-2017	90	SSM2	35239	70	M	MU	Uro	Bladder Tumor	invasive grade 2/3 papillary transitional cell carcinoma, PT2 at least		
12-Jan-2017	190	MAS	69393	73	M	MO	Uro	Bladder (TUR)	non-invasive, grade 1 papillary transitional cell carcinoma, PTa at least		
17-Jan-2017	249	AEY	158398	53	M	FA	Uro	A - Bladder Tumor B - Deep resection	Grade 2 invasive papillary transitional cell carcinoma - PT1 at least		
17-Jan-2017	254	OAA	733188	78	M	FA	Uro	Bladder Tumor	invasive grade 3, papillary transitional cell carcinoma		

Annex 2. Detailed history data sheet. Adapted from NICE, Retrieved August 2, 2017, from https://www.nice.org.uk/guidance/ng2/resources/clinical-audit-tool-excel-3604141. Copyright 2018 by NICE.



Acknowledgements

The author would like to thank Dr. Veena Nagaraj and Dr. Sara J. Alsaad, staff Pathologists at Bahrain Defence Military Hospital (BDF), and all Pathology Lab technicians, for their steering, guidance, and invaluable help in collecting data for the audit.

The author is pleased to acknowledge Dr. Iqdam Tobbia, who acted as preceptor for the entire audit, provided critical feedback on the final report, in addition to clinical opinions to aid in choice of topic selection, sharpening of project foci, and enhancing overall publication likelihood for the future.

The views expressed in this report are those of the authors. Any errors are the responsibility of the authors.

The author wishes to thank RCSI for provision of a solid 6-week block in which to complete this Clinical Audit, and for the suggestions regarding timeliness, preparation, and diligence necessary to complete the project in the allotted time period. In addition, the author would like to acknowledge the Bahrain Defense Military Hospital for enabling an RCSI medical student to collect patient data on-site and engage with staff members there to develop the project and resulting paper to its highest potential.

Finally, Dr. Iqdam Tobbia was integral to this paper coming to fruition as he allowed for the opportunity to visit the BDF Pathology Lab and begin data collection straightaway; with his practical steering and erudition, he suffused the motivation required to generate a superior product.

References

1. The World Bank Group. (2016, January 1). Population, total. Retrieved from: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=BH
2. Oxford Business Group. (2012) Better care: Encouraging a larger role for the private sector and introducing a new national authority. In: The Report: Bahrain 2012. London, United Kingdom: Oxford Business Group.
3. Bahrain Property World. (2017, January 1). Hospitals, medical clinics and information for expats. Retrieved from: https://www.bahrainpropertyworld.com/expat-information/bahrain-medical-clinics-and-information/
4. World Health Organization. (2007, January 1). Health system profile: Bahrain. Retrieved from: http://apps.who.int/medicinedocs/documents/s17291e/s17291e.pdf
5. Serageldien, M.A., et al. (2018). Quality of life in a sample of patients with major depressive disorder in Bahrain: case-control study. American Scientific Research Journal for Engineering, Technology, and Sciences, 39(1), pp. 126-137.
6. National Collaborating Centre for Cancer. (2017, January 1). Clinical audit tool - NICE. Retrived from: https://www.nice.org.uk/guidance/ng2/resources/clinical-audit-tool-excel-3604141
7. Cancer Research UK. (2015, April 15). Trans urethral removal of bladder tumour (TURBT). Retrieved from: http://www.cancerresearchuk.org/about-cancer/bladder-cancer/treatment/early/trans-urethral-removal-tumour

8. Stephenson, A.J. (2016, July 12). Patient education: bladder cancer treatment; invasive cancer (beyond the basics). Retrived from: https://www.uptodate.com/contents/bladder-cancer-treatment-invasive-cancer-beyond-the-basics#H1
9. National Collaborating Centre for Cancer. (2015, January 1). Bladder cancer: diagnosis and management. Retrieved from: https://www.nice.org.uk/guidance/ng2/evidence/full-guideline-3744112
10. World Health Organisation. (2012, January 1). Population fact sheets: Bahrain. Retrieved from: http://globocan.iarc.fr/Pages/fact_sheets_population.aspx
11. CanadaQBank. (2016, October 4). Bladder cancer. Retrieved from: https://www.youtube.com/watch?v=KFUzHyE5xn8
12. American Cancer Society. (2016, May 23). Bladder cancer risk factors. Retrieved from: https://www.cancer.org/cancer/bladder-cancer/causes-risks-prevention/risk-factors.html
13. Letašiová, S., et al. (2012, June 28). Bladder cancer, a review of the environmental risk factors. Environmental Health, 11(Suppl 1): pp. S11.
14. Al-Madouj, A.N., et al. (2011, September 1). Ten-year cancer incidence among nationals of the GCC states, 1998-2007. Retrieved from: https://www.moh.gov.bh/Content/Files/Publications/GCC%20Cancer%20Incidence%202011.pdf
15. International Association of Cancer Registries. (2018, January 1). Bahrain cancer registry profile page. Retrieved from: http://www.iacr.com.fr/index.php?option=com_comprofiler&task=fieldclass&field=cb_ta
16. Alsayyad J., & Hamadeh, R. (2014). Cancer incidence among the Bahraini population: a five-year (1998–2002) experience. Haematology/Oncology and Stem Cell Therapy, 1(3), pp. 175-182.
17. World Health Organisation. (2012, January 1). Population fact sheets: Bahrain. Retrieved from: http://globocan.iarc.fr/Pages/fact_sheets_population.aspx