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The Role of Photodocumentation in Surveillance Cystoscopy for Bladder Cancer

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ABSTRACT

PURPOSE: To determine if the combination of photodocumentation and electronic medical record keeping led to changes in the management of suspicious lesions in patients with bladder cancer undergoing surveillance cystoscopy.

METHODS: We reviewed the charts of all patients undergoing surveillance cystoscopy for bladder cancer during a 15-month period. We evaluated patients who had photodocumentation of bladder lesions in our electronic medical record (EPIC). Baseline demographics, surveillance data, and biopsy results were collected, and the outcome of photodocumentation was analyzed. A cost base analysis was performed using figures obtained from the billing department.

RESULTS: During the study period, 50 patients underwent flexible cystoscopy for bladder cancer surveillance at our institution. Fifteen were identified who met the study criteria. Using photodocumentation in EPIC, nine patients had well-documented lesions that had no change during the surveillance period with negative urine cytology and therefore did not undergo biopsy. Six patients, however, did undergo biopsy based on a change in the appearance of the lesion. Biopsies demonstrated 3 benign lesions, 2 low-grade transitional cell carcinomas, and 1 muscle-invasive lesion. An economic base analysis demonstrated a cost reduction of 27% and 55% compared with office-based biopsy and transurethral resection of bladder tumor, respectively, by using photodocumentation.

CONCLUSIONS: Photodocumentation of lesions during flexible cystoscopy is a useful tool in bladder cancer surveillance. It provides support for clinical decisions and is a cost-effective way to monitor patients undergoing frequent interventions.

KEYWORDS: Bladder neoplasm; Cystoscopy; Biopsy; Economic

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INTRODUCTION

Bladder cancer is the 4th most common cancer among American men and the 11th most common cancer among American women [1]. The majority of these patients will have non-invasive disease treated with transurethral resection of the bladder tumor (TURBT) and intravesical therapy. Despite these treatments, recurrence rates have been reported as 37%, 45%, and 54% in low, intermediate, and high-risk groups [2]. Flexible cystoscopy is routinely used in the surveillance of patients with

Table 1. Patient demographics in the study population.
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Patient	Sex	Age	Grade	Stage	BCG	CIS
1	M	70	2	Ta	Yes	No
2	M	68	3	T1	Yes	No
3	M	87	2	Ta	No	No
4	M	73	3	T1	Yes	No
5	M	55	3	T1	Yes	No
6	M	70	3	Ta	Yes	No
7	M	80	2	Ta	No	No
8	M	62	2	T1	Yes	Yes
9	M	28	1	Ta	No	No
10	M	80	CIS	Tis	Yes	Yes
11	M	63	Myeloproliferative pattern	—	No	No
12	M	71	Inverted papilloma	—	No	No
13	F	75	1	Ta	No	No
14	M	70	3	Ta	Yes	No
15	M	87	3	T1	No	No

bladder cancer. Several protocols have been recommended with increasing intervals between cystoscopies when no new lesions are found [3]. These regimens rely on descriptive notations regarding areas which may represent early recurrence. Differences in description may lead to excessive biopsies when there is no objective measure to document suspicious lesions.

Photodocumentation has commonly been used by ophthalmologists and dermatologists to monitor suspicious nevi in order to increase accuracy for detecting melanoma [4]. This has been further improved with adoption of electronic medical records that allow documenting and sharing this information with other members of the treatment team. The goal of this study was to evaluate how the use of photodocumentation coupled with electronic medical records affects the decision making and the cost of bladder cancer surveillance in a rather high-volume academic center.

METHODS

We performed a retrospective review of all patients undergoing office-based flexible cystoscopy for bladder cancer surveillance during a 15-month study period using an Institutional Review Board-approved database. Patients with non-muscle invasive transitional cell carcinoma (TCC) of the bladder were treated with TURBT followed by a single dose of immediate postoperative intravesical Mitomycin C. Intravesical BCG was indicated in any high-grade disease, multifocality, presence of carcinoma in situ (CIS) or large tumor (> 5 cm) and rapidly recurrent disease. These patients were then started on a surveillance protocol that included urine cytology and flexible cystoscopy every 3 months for the first year, every 4 months for the second year, every 6 months for the third year, and annually thereafter. Flexible cystoscopy was done using a digital Olympus cystoscope fitted with a camera. During the procedure, any suspicious area was photographed digitally and documented electronically. These photos were uploaded into the patient's medical record (EPIC). Patients without photographic comparisons were excluded from the study. Baseline demographics, surveillance data, and biopsy results were collected for each patient. The outcome of photodocumentation was analyzed and an economic base analysis was performed using related figures from the billing department at our institution.

RESULTS

During the 15-month study period, 50 patients underwent office-based surveillance cystoscopy for bladder cancer. Out of these, 15 patients (30%) met the study criteria. The remaining patients had normal cystoscopic findings or did not have sequential photographs documented in the electronic

Table 2. Results of photodocumentation on management of patients with surveillance cystoscopy for superficial bladder cancer.
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Patient	Change in management	Result of biopsy
1	Biopsy	Chronic inflammation
2	No biopsy	—
3	Biopsy	—
4	No biopsy	Granulomatous inflammation
5	Biopsy	—
6	No biopsy	—
7	Biopsy	Grade 1 Ta
8	No biopsy	—
9	Biopsy	Benign polyp
10	No biopsy	—
11	Biopsy	—
12	No biopsy	—
13	Biopsy	Grade 1 Ta
14	No biopsy	—
15	Biopsy	Grade 2 T2

medical record. The characteristics of our cohort (15 patients) are described in Table 1. The majority of patients (46%) had pathologic stage Ta disease.

During surveillance cystoscopy, the current lesions were compared with prior images stored in the electronic medical record. Based on the comparison, the decision was made to continue with the surveillance protocol or to undergo either office-based biopsy or TURBT. Nine of 15 (60%) patients did not undergo biopsy due to a stable appearance of the lesion (Figure 1). All patients who underwent surveillance without biopsy had a negative urine cytology. During a 2-year follow-up, none of these patients have had a progression of their lesion or change to positive cytology. Six patients (40%) underwent biopsy due to changes in the appearance of suspicious lesions (Figure 2). Of patients for whom biopsies were taken, three cases were benign, two had grade I/Ta disease, and one patient had grade II/T2 disease (Table 2).

A cost analysis was performed using the existing cost information from the billing department. In order to compare the cost of biopsy versus observation, we assumed that all patients with an erythematous lesion would undergo either office-based biopsy or TURBT. If all 15 patients had undergone cystoscopy only, cystoscopy with biopsy, or cystoscopy followed by TURBT, the cost would have been $9,315, $17,100, or $117,360, respectively. Since we were able to eliminate 9 biopsies through the use of photodocumentation, only 6 patients required an additional intervention. Had all 6 remaining patients undergone cystoscopy with office-based biopsy, the cost would have been reduced to $12,429. Alternatively, if TURBT had been required for all suspicious lesions in these 6 patients, the cost would have been $52,533 (Figure 3). Therefore, the overall reduction in cost was 27% and 55% in each group when photodocumentation was used to eliminate unnecessary biopsies or TURBTs.

DISCUSSION

The primary reason for monitoring patients with a history of bladder cancer is to survey the urothelium for development of new tumor or any change in previous lesions. Although new methods in detection of bladder cancer recurrence using biomarkers and fluorescence endoscopy are evolving, flexible/rigid cystoscopy still remains the gold standard technique in bladder cancer surveillance [5] accompanied by urine cytology.

Cystoscopy has a tumor detection rate of greater than 90% and cystoscopic evaluation correctly discriminates between dysplastic/malignant and benign/reactive lesions with a sensitivity and specificity of nearly 100% [6].

Figure 1. Comparison of suspicious, but without change, areas on surveillance cystoscopy (patient 2).
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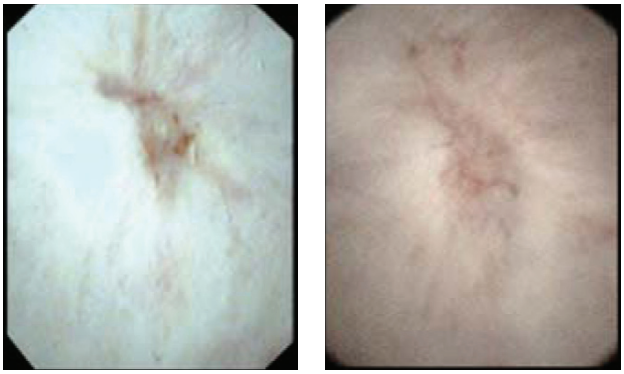

(a) (b)

Figure 2. Comparison of suspicious areas with new changes on surveillance cystoscopy (patient 15).
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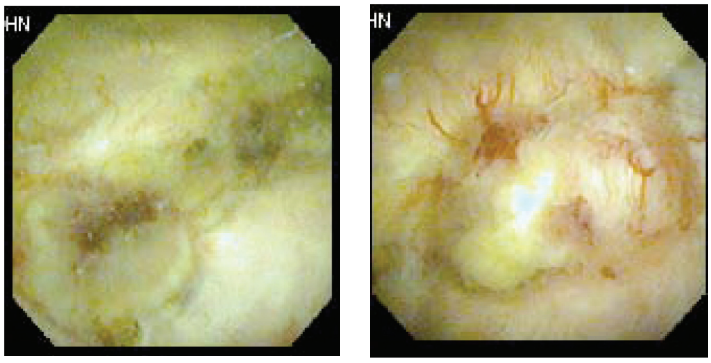

(a) (b)

Herr showed the correlation of outpatient cystoscopy and histological findings [7]. Similarly, Satoh et al. found that cystoscopy was reliable in predicting a muscle-invasive bladder tumor [8], supporting the reliability of cystoscopy in the evaluation of bladder lesions.

The concept of simplifying surveillance programs in patients with non-invasive bladder cancer is not a novel idea. Eliminating the 3-month biopsy in patients with a normal office cystoscopy or an erythematous bladder but a normal cytology was introduced by Dalbagni et al. [9]. This modification decreased the number of endoscopic procedures significantly without compromising the accuracy of the post-BCG evaluation.

There is a discussion in the literature regarding the significance of taking random bladder biopsies, as opposed to sampling visible lesions, in order to detect concomitant dysplasia or CIS. Some evidence indicates that random biopsies may play an important role in the detection of multifocal disease [10, 11], while others argue that it does not contribute to disease stages or the choice of adjuvant therapy [12, 13]. In our study, no patient underwent random biopsies.

Although in the European guidelines on the management of superficial bladder cancer it is mandatory to perform a biopsy of any suspect/new lesion of the bladder, there was no data on the histological findings and the frequency of malignant lesions detected by doing so. To the best of our knowledge, no randomized prospective study has showed the proper approach to abnormal but stable lesions of bladder on surveillance for bladder cancer. In a study by Swinn et al. positive predictive value for malignancy of red patch biopsy was 12%; the majority of these were CIS. They recommended red patch biopsy in patients over the age of 60 years with a previous history of TCC [5].

Guy et al. showed that following BCG therapy shows that the diagnostic accuracy of biopsy in patients with suspicious lesions on cystoscopy with negative urine cytology was only 50% [14]; therefore a high percentage of patients undergo unnecessary biopsy. In our study, 40% of patients underwent biopsy and recurrent disease was found in half of them, which is consistent with prior reports.

One of the most important results of our study is its dramatic cost reduction. Bladder cancer is the most expensive cancer to treat both per patient per year and lifetime costs [15], in comparison to other cancers like invasive cervical cancer [16]. It is noteworthy that the largest component of this cost is due to non-invasive disease [15]. In the Hedelin study [17], approximately 40% of costs were due to TURBTs. The cost of the follow-up cystoscopies was only 13% of the total bladder tumor cost and every third cystoscopy resulted in a therapeutic procedure. At our institution, the cost of TURBT is 6 times that of biopsy/fulguration in the office and 12 times that of surveillance cystoscopy. With the exclusion of TURBT in 60% of this population, the cost reduction for this study was $64,827. Also we have to consider the elimination of TURBT/biopsy complications that would definitely lead to further cost reduction. Given the low diagnostic accuracy of biopsy in patients who have undergone BCG therapy, further reduction in cost may be possible with more detailed documentation of lesions.

Several studies have used conservative management with observation in patients with low grade Ta disease [18, 19, 20].

Figure 3. Cost comparison for patients undergoing surveillance cystoscopy and photodocumentation versus biopsy or TURBT of all erythematous lesions.

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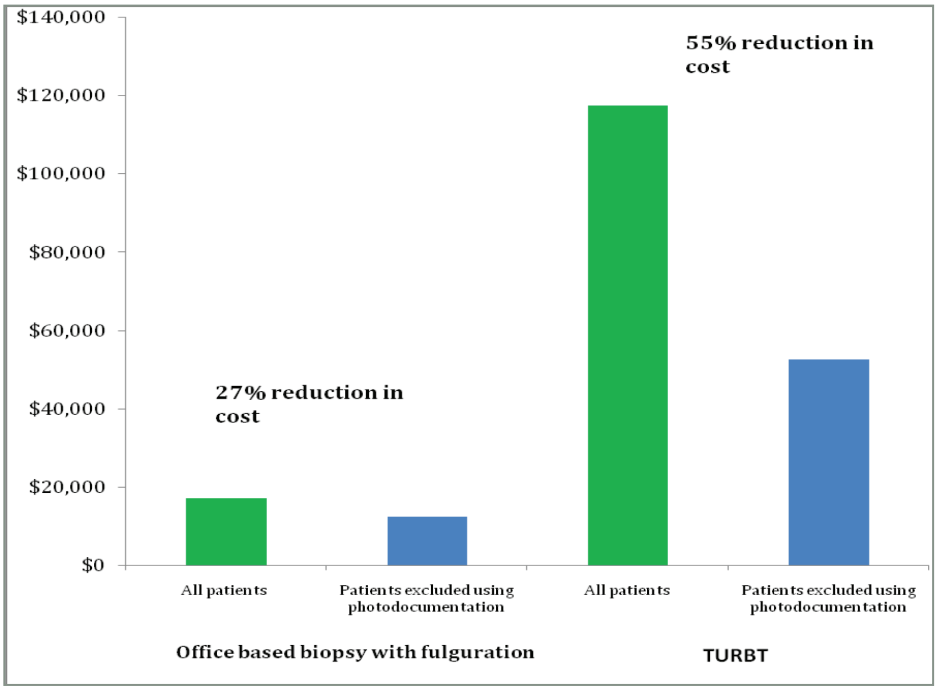

Soloway et al. demonstrated that in a low risk population only 6.7% of patients progressed from a low-grade non-invasive tumor (G I to II/Ta) to a high-grade Ta or T1 disease [21]. No patient in these studies developed muscle invasive disease. The decision to perform biopsy in these patients was based on changes in the appearance of the lesion over time. Photodocumentation is ideal for this type of clinical situation, which may miss subtle differences in the lesions based on interobserver variability or differences in the description of the lesion. It is also an appropriate option for patients with a history of low grade/Ta tumors, especially older ones who have significant medical co-morbidities and are not fit to undergo repeat TURBT/biopsies. However, with such a conservative management strategy, patients must remain under careful cystoscopic and cytological surveillance as there remains some risk for grade and stage progression in this population [18].

During our study, only one patient had muscle invasive disease but he already had T2 disease and failed bladder preserving therapies. His cystoscopy was difficult to interpret due to prior BCG and radiation effects, but photodocumentation clearly showed a difference in the appearance of the lesion and he was taken for TURBT that demonstrated recurrence of his muscle-invasive disease. In patients who underwent observation alone, none developed a positive urine cytology during the study period, nor did they progress clinically.

The limitations of this study include the small sample size, the retrospective nature of the study, and the use of close observation in patients with previous intermediate and high-risk disease. This study represents the initial examination of the use of this technology as an adjunct to currently accepted practices. It does not suggest replacing cystoscopy/biopsy when clinically relevant. The study does however, even with its small sample size, show the significant cost reduction provided by this technology. A 27% reduction in cost for surveillance would be important when applied to the high volume of procedures performed on an annual basis.

Video endoscopy and photodocumentation as well as digital imaging are considered integral parts in the surveillance of patients with superficial bladder cancer. The use of photodocumentation may help clinicians decide when biopsy is likely to yield a positive result by direct comparison of lesions through time, particularly after the use of intravesical BCG. The potential advantages and safety of this protocol need further prospective studies in a larger cohort of patients.

CONCLUSION

Photodocumentation when coupled with the electronic medical record is a powerful tool in bladder cancer surveillance. It is useful not only to improve communication between health providers but also as a way to clearly describe the appearance of suspicious bladder lesions. In addition, it is financially beneficial and may prevent the additional cost and patient discomfort from unnecessary biopsies.

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