

Understanding holmium laser enucleation of the prostate (HoLEP) recovery: Assessing patient expectations and understanding

Mark A. Assmus¹; Matthew S. Lee²; Tim Large¹; Amy E. Krambeck²

¹Indiana University School of Medicine, Department of Urology, Indianapolis, IN, United States; ²Northwestern University, Department of Urology, Chicago, IL, United States

Cite as: Assmus MA, Lee MS, Large T, et al. Understanding holmium laser enucleation of the prostate (HoLEP) recovery: Assessing patient expectations and understanding. *Can Urol Assoc J* 2021 August 26; Epub ahead of print. <http://dx.doi.org/10.5489/cuaj.7328>

Published online August 26, 2021

Corresponding author: Dr. Mark A. Assmus, Indiana University School of Medicine, Department of Urology, Indianapolis, IN, United States; assmus@ualberta.ca

Abstract

Introduction: Although holmium laser enucleation of the prostate (HoLEP) is a highly effective surgery, there is a variable recovery period where patients may experience hematuria, dysuria, or urinary incontinence (UI). Despite preoperative consultation, there is a paucity of literature examining the effectiveness of physician-patient communication in preparing the patient for the postoperative recovery period. We sought to examine recovery expectations as a patient-reported outcome (PRO) metric for HoLEP.

Methods: With institutional review board approval, we queried our electronic medical record and retrospective clinical registry to identify 50 consecutive patients that underwent HoLEP from November 2019 to March 2020 by two endourologists. Patients were provided questionnaires via Twistle[®] ≥6 months postoperatively. Patient demographics and perioperative course was examined in the context of responses. Our primary objective was determining whether patients felt they had a reasonable understanding of the recovery process.

Results: We observed a 92% (46/50) response rate, with an average patient age of 69.4 years (range 55–88). Overall, 91.3% (42/46) felt they had a reasonable understanding of the recovery. Additionally, 97.8% (45/46) were aware of temporary UI, with 87% having ≥1 episodes of UI after catheter removal. We found 47.8% (22/46) of patients expected UI to resolve within 30 days, while 8.6% expected >90 days of UI. All patients were aware of the risk of hematuria, with

93.5% (43/46) expecting resolution within 30 days (<7 days: 47.8%; 7–14 days: 28.3%; 15–30 days: 17.4%).

Conclusions: Although surgical technique continues to improve HoLEP, ensuring adequate physician-patient communication to optimize expectations is crucial. We report patient understanding of HoLEP recovery and areas for future improvement.

Introduction

Bladder outlet obstruction (BOO) secondary to benign prostatic hyperplasia (BPH) is an extremely common disease process with close to 50% of adult males experiencing moderate to severe lower urinary tract symptoms (LUTS) by the eighth decade of life(1). Longitudinal studies and placebo arms from large pharmacologic studies have shown that 3.5-10% of men ultimately proceed to require surgical intervention for BPH management(1). While there are various surgical options, holmium laser enucleation of the prostate (HoLEP) is a guideline recommended durable treatment for all prostate gland sizes.

Although excellent durable outcomes following HoLEP are well established, there is a variable period of recovery in which patients may experience hematuria, dysuria or transient urinary incontinence (tUI) which may be stress, urge or mixed in nature. Fortunately, these symptoms are temporary for the vast majority with 10-year post-HoLEP outcomes of stress urinary incontinence (SUI), urgency urinary incontinence (UII) and reoperation rates of 1%, 0.5% and 0.7%, respectively(2, 3). Despite significant preoperative counseling, postoperative feedback from our patients revealed that there may be room for improved physician-patient communication about the recovery period and where to find reliable resources.

Given the potential information gap identified in our patient population, we sought to formally evaluate and better understand our patient expectations and understanding of post-HoLEP recovery. Overall, there is a paucity of research aimed at patient-perceived expectations of the post-HoLEP recovery period, particularly with respect to lower urinary tract symptoms (LUTS). Most studies exploring patient perceptions focus specifically on the final outcomes of retrograde ejaculation, erectile function, sexual satisfaction or post-HoLEP outcomes beyond the transient recovery period(4-8).

Along with limited research on patient perceptions of post-HoLEP recovery is an abundance of accurate and inaccurate information available on the Internet, which can make it challenging for the general public to determine source credibility(9). Taken together, it is crucial to ensure physician-patient communication of postoperative expectations is clear and that reliable sources of additional information are available, particularly when patients may experience a temporary impairment to quality of life (QOL) domains. Our primary objective was to assess patient understanding and expectations of the post-HoLEP recovery period. Our

secondary objective was to identify areas where physician-patient communication of postoperative expectations could be improved and how to ensure patients had access to reliable resources.

Methods

A ten-part patient questionnaire (Figure 1) was created with input from volunteer patients, clinic urology nurses, medical assistants, urology residents, fellows and staff urologists. Following Institutional Review Board (IRB) approval, this self-developed non-validated questionnaire was then administered to 50 adult (≥ 18 year old) patients physically and cognitively capable of completing the questionnaire who had undergone HoLEP by two endourologists at our center between November 2019 and March 2020. Branch logic was utilized to provide individual questions relevant to respondents understanding and expectations of the post-HoLEP recovery as evidenced by their specific responses. The questionnaires were administered to patients within their postoperative follow up course ≥ 6 months after surgery utilizing their mobile Twistle© application. The Twistle© application enabled text message communication of patient reported surveys and care concerns between the patient and endourology care team(10). Completion of the questionnaire was voluntary, and patients were informed that their decision to participate would have no direct effect on their care, particularly since all patients had completed their surgical intervention and their standard first postoperative follow up appointments.

Patient demographics, questionnaire results and perioperative clinical outcomes were added to an encrypted anonymized REDCap database. As our primary outcome, we assessed whether patients reported having a reasonable understanding of the post-HoLEP recovery process. Secondary outcomes included patient understanding, expectation and perceptions of post-HoLEP recovery including dysuria, UI, hematuria and patient reported ways to improve physician-patient communication of reliable resources. Continuous variables were expressed as mean and range while proportions were used for categorical variables. SPSS(11) statistical program was used for the statistical analysis, including heteroscedastic two-tailed T-Test, Chi-squared test and Wilcoxon rank sum test for non-parametric variables. Statistical significance was set at $p < 0.05$. This manuscript adheres to the SQUIRE 2.0 standards of publishing quality initiatives in medicine(12).

Results

Characteristics

We observed a 92% (46/50) response rate with average age 69.4 years (range 55-88) and mean preoperative prostate size of 91.8mL (range 30.7-237.2mL). Patient demographics and perioperative characteristics are outlined in Table 1. Over one quarter (28.3%) of patients experienced some degree of preoperative UI with 4 patients (8.7%) reporting wearing liners or incontinence products prior to HoLEP. Patients that utilized dual antiplatelet medication or

therapeutic anticoagulation (6/46, 13%) were referred to their prescribing physician for preoperative medical approval and medication planning. None of these patients required perioperative bridging and they were all able to hold antiplatelet or anticoagulants perioperatively.

There were no intraoperative complications and no Clavien-Dindo ≥ 3 complications within 90 days. All patients had their postoperative catheter removed successfully within 24 hours of surgery with 2 patients initially failing same-day trial of void (TOV), but passing successfully on postoperative day 1 (POD1). One patient had Gleason grade group (GGG) 1 prostate cancer detected on prostate biopsy prior to HoLEP and there were 2 new cases of prostate cancer detected on HoLEP pathology (1 GGG1 in $<1\%$ of tissue, 1 GGG2 in 5% of tissue). The two patients with GGG1 prostate cancer elected for continued surveillance with PSA and DRE post-HoLEP. The patient with GGG2 detected on HoLEP pathology had a negative preop prostate biopsy and baseline PSA of 4.26 and following his HoLEP; elected for referral for consideration of treatment.

Objective outcomes

A comparison of baseline preoperative serum laboratory values (Hemoglobin, Creatinine, PSA) and validated patient reported QOL questionnaires (AUASS, QOL Score, BPH Index, MISI, SHIM, GAD-7, EjD) were compared to 3month postoperative outcomes in Table 2. HoLEP provided a significant reduction in serum PSA (5.05 vs. 0.55, $p<0.001$) and improvement in AUASS (24.5 vs. 5.7, $p<0.001$), QOL Score (4.5 vs. 2.0, $p<0.001$), BPH Index (7.7 vs 2.1, $p<0.001$) and MISI (9.1 vs 5.3, $p=0.037$). Objective improvement in uroflow parameters was identified post-HoLEP (Q_{max} 6.1 vs 15.5, $p=0.020$). There was no difference between preoperative and post-HoLEP GAD-7, EjD or SHIM scores.

Understanding

When asked, “Looking back, do you feel you had a reasonable understanding of the overall healing process after this type of surgery?” 91.3% (42/46) selected yes. Of the 4 patients who responded that they did not have a reasonable understanding, 75% responded yes to being aware of all four recovery period symptoms queried (UI, hematuria, dysuria and retrograde ejaculation). Of the respondents who felt they did not have a reasonable understanding, $\frac{1}{4}$ ($n=1$ patient) reported not being aware there may be both retrograde ejaculation and dysuria. Although unaware of possible retrograde ejaculation and dysuria this patient experienced no dysuria postoperatively and reported that he did not feel knowledge of retrograde ejaculation was important prior to surgery.

Patients who reported not having a reasonable understanding of the healing process had shorter expected duration of UI compared to patients who reported a reasonable understanding ($p=0.024$). There was no difference between expected duration of postop hematuria between patients who reported a reasonable understanding of recovery versus those that did not ($p>0.05$).

There was no difference in reported understanding between primary surgeon ($p>0.05$). Comparing objective validated symptom score results between patients who reported a reasonable understanding versus those that did not identified no difference in pre- or post-HoLEP AUASS, MISI Severity, MISI Bother, EjD or GAD-7 scores (p all >0.05). The patients reporting that they did not have a reasonable understanding of HoLEP recovery had worse preop QOL (5 vs. 4.5, $p=0.011$) and BPH Impact (10 vs. 7.5, $p<0.001$) scores along with better postop SHIM scores (22.5 vs. 13.2, $p=0.0082$) compared to those with reasonable understanding.

Urinary incontinence

Overall, 97.8% (45/46) were aware there may be temporary UI with 87% of respondents having ≥ 1 episodes of UI after catheter removal. With regards to symptom resolution, 47.8% (22/46) of patients expected their UI to resolve within 30 days while 8.6% expected >90 days of UI (Figure 2). The patient unaware of the risk of UI reported the degree of not knowing to be 1/10 on a 10-point Likert scale (1=no bother). All patients that were continent at 3 months follow up reported achieving adequate continence prior to their expected duration of postoperative UI. 7 patients had any UI at 3 month follow up and 1 patient had ongoing UI at 6 month follow up.

Hematuria

All patients (46/46) were aware of the risk of transient hematuria after HoLEP with 93.5% (43/46) expecting resolution within 30 days or less. Overall distribution of postoperative hematuria duration was reported as; $<7d$ 47.8%, 7-14d 28.3%, 15-30d 17.4%. 36/46 (78.3%) of patients reported seeing gross hematuria following catheter removal after HoLEP. When postoperative hematuria was observed, 33/36 thought, “I’m not worried,” while two wondered, “Is this normal?” and one patient felt, “Something went wrong in my surgery.” The patient who felt something went wrong reported an expected duration of postoperative hematuria up to 14days with his hematuria resolution occurring on POD 23.

Retrograde ejaculation

Despite preoperative counseling, 10.9% (5/46) reported that they were not aware ejaculate volume may change postoperatively. Of these men, 4/5 (80%) reported that information about retrograde ejaculation is important information to understand prior to proceeding with HoLEP. There was no significant difference in preop or 3 month postop SHIM or EjD scores between patients who reported being aware of possible retrograde ejaculation versus those that were not (p all >0.05). Overall, 41/46 (89.1%) felt that it is important to understand possible changes to ejaculation prior to proceeding with HoLEP.

Dysuria

After catheter removal 32/46 (69.6%) experienced any dysuria, with 65.6% reporting - “as expected”, 28.1% - “Less painful” and 3.1% - “More painful” (Figure 3).

Improving communication

Out of the 46 respondents, 44 provided feedback on ways to improve physician-patient communication. The three most common patient reported ways to improve communication were: 27.3% - handout, 18.2% - spend more time, 18.2% - explain to family member/friend. Only 9.1% felt communication could improve with a HoLEP website (Figure 4). Patients who felt recovery understanding could be improved with recommended online resources or HoLEP website were younger than patients who did not feel that would improve understanding (63.9y vs. 69.7y, $p<0.001$).

Discussion

Over 90% of patients reported a reasonable understanding of the post-HoLEP recovery process with the majority expecting potential common postoperative symptoms and signs (ex. dysuria, hematuria, UI). However, our quality assessment of patient's perceptions also highlights that understanding common postop symptoms durations is important to the patients surveyed and we plan to incorporate these finding into future quality improvement for preoperative counselling in our practices. The identification of patient perceptions and information that they deem important in the post-HoLEP recovery period is crucial to educate effectively at the time of consultation, particularly with referrals from across the United States. With patient travel distance in mind and given the unique transient QOL impairing recovery period that may not be familiar to local urologists, ensuring successful physician-patient communication may also help improve patient satisfaction, while reducing office phone calls and postoperative patient stress.

A noticeable unanticipated finding from our study was that most patients do not believe that a website or online resource supported by the endourology team would be beneficial for further information. This may represent a technology averse cohort of patients. In fact, those patients that supported more online resources were significantly younger than the average study age. One study examining BPH information seeking behaviours (ISB) of 479 men before and after a variety of BPH surgeries found that overall patients felt it was easy to find information on BPH and its treatment options online(9). Although the inclusion for their study was men ≥ 50 years old they did not report the average or range of age of respondents, and this may represent a younger cohort. Interestingly, close to 75% of men in their study reported that communicating with other patients experiencing the same BPH symptoms or postoperative concerns was not important and BPH support groups are rarely utilized, which may point towards the sensitive nature of urinary symptoms. This highlights a further reliance on the physician-patient communication of accurate and patient deemed important factors of the recovery period.

Further supporting the importance of communicating patient defined goals and expectations, 170 patients were examined across validated surveys before and after HoLEP at 1, 3, 6 and 12 months(13). Prior to HoLEP, patient determined key self-assessed goals of the treatment and were subsequently asked to provide self-assessed goal achievement (SAGA) and

overall satisfaction scores. The authors found that SAGA responses improved with time from surgery, correlated to overall treatment satisfaction and varied significantly between patients. This highlights that simply examining single traditional objective measures (ex. IPSS) uniformly across all patients may provide an inaccurate evaluation of satisfaction.

Our findings reinforce the literature regarding patient defined importance of ejaculatory changes post-BPH surgery and further support that irrespective of baseline or postoperative SHIM or EjD scores, a specific cohort of patients may be identifiable for having significant concern regarding retrograde ejaculation through adequate preoperative communication(5, 6). At time of preoperative counseling patients are counseled by the fellow and then the staff surgeon regarding the development of retrograde ejaculation after HoLEP. They then visit with a nurse who provides them written literature on retrograde ejaculation. However, despite this extensive preoperative counseling 10% of patients still were not aware that they would develop retrograde ejaculation after HoLEP. Such a communication gap indicates some patients require a different style of counseling to ensure proper education.

We also identified significant variation in patient understanding and expectations of postoperative UI, particularly with respect to duration. We believe this is important as patients who reported that they did not have a reasonable understanding of the recovery period expected significantly shorter postop UI duration compared to patients who had a reasonable understanding. Despite multiple studies showing improvement in UI rates up to 12 months from primary or secondary HoLEP, a definitive tool to predict and counsel our patients on their anticipated UI timeline has not yet been developed(3, 14). One study looking at overall patient reported satisfaction after 331 HoLEPS found 91.8% were satisfied(15). Importantly, of the patients that were dissatisfied, one of the most common reason was transient postoperative urinary incontinence. Of note, dissatisfied patients in that study had higher postoperative IPSS scores at 6months (11.7 vs. 6.8, $p<0.001$)(15). Although distinct from overall satisfaction, our study found no difference in preop or postoperative AUASS in patients reporting a reasonable understanding versus those that did not.

At consultation for consideration of HoLEP at our center, patients are explained risks, benefits, side effects and typical perioperative course by the endourology fellow and primary surgeon. Subsequently, the surgery consent process and further questions are reviewed with the patient by the primary surgeon. After these two interactions, the patient interacts with our surgical nurse who reviews the standardized perioperative course and provides patients a uniform handout containing HoLEP recovery information. Despite three levels of counseling, the highest patient reported way, in our study, to improve physician-patient communication of post-HoLEP recovery was to provide a patient handout to take home. Other studies aiming to improve physician-patient knowledge transfer have shown improved patient understanding and information retention when the handout was physically provided to patients by the surgeon and this represents an area for future evaluation(16).

Beyond seeking to improve physician-patient communication itself, there are additional potential benefits of improving patient understanding. Often, patients undergoing elective HoLEP are searching for QOL improvement and a recovery period with new or worsened LUTS can lead to stress, frustration and regret between their initial goals and perceived early surgical outcomes. Although not changing the occurrence of the transient recovery symptoms, aiming to reduce avoidable patient stress with increased understanding throughout the healing process is a priority to our urology team. Secondly, patient understanding of the recovery is important in early identification of patients that may be veering off the standard pathway. Although there are planned regular postoperative visits with their surgical team, there remains periods of time where patients are managing the recovery symptoms independently. Empowering patients throughout this period so that they can reach out to their care team and receive reassurance or further evaluation is crucial. This early notification could avoid worse complications or need for additional treatments. Finally, there may be a reduction in patient-initiated postoperative office phone calls for regular symptoms of the HoLEP recovery, potentially improving the time utilization of ancillary urology team members. Further studies are required to objectively determine these benefits of improved physician-patient communication for HoLEP recovery.

A strength of our study is correlation of responses to validated pre- and post-operative questionnaires (AUASS, SHIM, MISI, GAD-7). One limitation is excluding patients who were physically or cognitively unable to complete the survey. This cohort of excluded patients and health care power of attorney represent an area that requires further investigation. Additionally, we do not have specific data on all comorbidities that may impair ejaculatory or sexual function, such as degree of diabetic control or testosterone deficiency syndrome. Also, patient reported retrograde ejaculation and erectile function, or dysfunction is a subjective reported measure. Beyond utilization of the questionnaire and additional validated QOL surveys, we did not perform objective verification of these patient reported outcomes (ex. post ejaculation urinalysis). It is important to acknowledge that we used a non-validated patient questionnaire. However, the objective of our study was to explore the under reported patient's perceptions and own expectations of the recovery process itself and not to explore previously well studied objective HoLEP outcomes or validated surveys. Finally, our study was a non-comparative design with a relatively short term follow up.

Building upon our initial evaluation of patient perceptions of the HoLEP recovery, we look forward to developing quality improvement interventions to bridge the gap in physician-patient communication to ensure patients understand the expected and potential timeline of the post-HoLEP recovery period.

Conclusions

Although surgical technique and technologies continue to improve objective outcomes of HoLEP, ensuring adequate physician-patient communication of the potential recovery period to

optimize patient expectations is crucial. We report patient understanding of HoLEP recovery and highlight areas for future improvement.

DRAFT

References

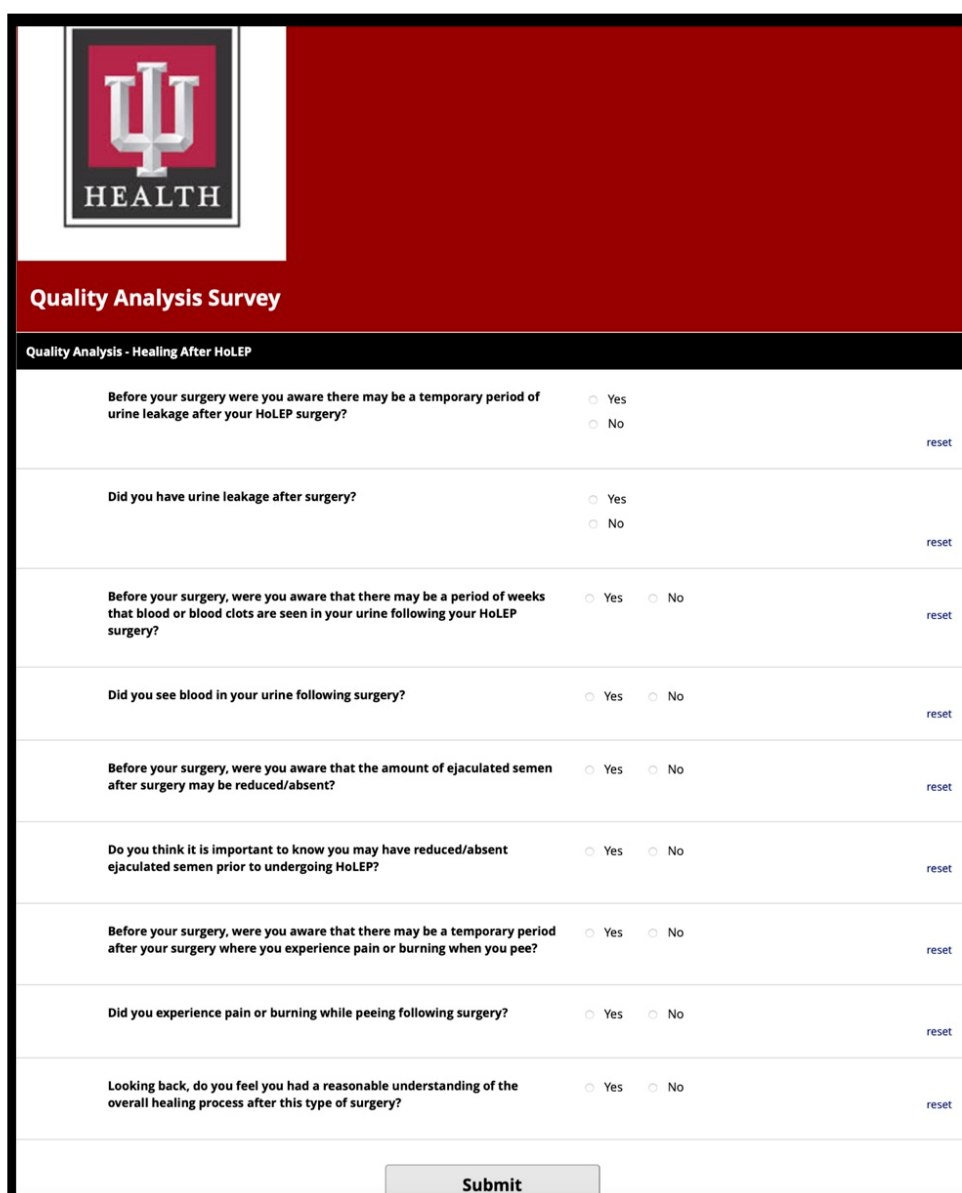
1. Fitzpatrick JM. The natural history of benign prostatic hyperplasia. *BJU International*. 2006;97:3-6.
2. Elmansy HM, Kotb A, Elhilali MM. Holmium laser enucleation of the prostate: long-term durability of clinical outcomes and complication rates during 10 years of followup. *J Urol*. 2011;186(5):1972-6.
3. Large T, Krambeck AE. Evidence-based outcomes of holmium laser enucleation of the prostate. *Curr Opin Urol*. 2018;28(3):301-8.
4. Klett DE, Tyson MD, 2nd, Mmeje CO, Nunez-Nateras R, Chang YH, Humphreys MR. Patient-reported sexual outcomes after holmium laser enucleation of the prostate: a 3-year follow-up study. *Urology*. 2014;84(2):421-6.
5. Kim JK, Cho MC, Son H, Ku JH, Oh SJ, Paick JS. Patient Perception of Ejaculatory Volume Reduction After Holmium Laser Enucleation of the Prostate (HoLEP). *Urology*. 2017;99:142-7.
6. Gild P, Dahlem R, Pompe RS, Soave A, Vetterlein MW, Ludwig TA, et al. Retrograde ejaculation after holmium laser enucleation of the prostate (HoLEP)-Impact on sexual function and evaluation of patient bother using validated questionnaires. *Andrology*. 2020;8(6):1779-86.
7. Placer J, Salvador C, Planas J, Trilla E, Lorente D, Celma A, et al. Effects of holmium laser enucleation of the prostate on sexual function. *J Endourol*. 2015;29(3):332-9.
8. Sturch PW, H.H.; McNicholas, T.; Muir, G. Ejaculatory dysfunction after treatment for lower urinary tract symptoms: retrograde ejaculation or retrograde thinking? *BJU International*. 2014:186-7.
9. Abdul-Muhsin H, Tyson M, Raghu S, Humphreys M. The Informed Patient: An Analysis of Information Seeking Behavior and Surgical Outcomes Among Men With Benign Prostatic Hyperplasia. *Am J Mens Health*. 2017;11(1):147-53.
10. Twistle. [Mobile Application Software]: 011 Silver Ave SE Albuquerque, New Mexico 87108; 2020© Accessed from: <https://www.twistle.com>
11. Corporation I. IBM SPSS Statistics for Windows. In: Armonk NIC, editor. 27.0 edReleased 2020.
12. Ogrinc GD, L.; Goodman, D.; et al. . SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence): Revised publication guidelines from a detailed consensus process. *BMJ Qual Safety*. 2015;41:474-9.
13. Cho MC, Kim JK, Ha SB, Ku JH, Paick JS. Self-assessed goal achievement (SAGA) after Holmium laser enucleation of the prostate (HoLEP): Association with patients' postoperative satisfaction. *PLoS One*. 2018;13(9):e0203825.
14. Jaeger CD, Krambeck AE. Holmium laser enucleation of the prostate for persistent lower urinary tract symptoms after prior benign prostatic hyperplasia surgery. *Urology*. 2013;81(5):1025-9.
15. Lee YJ, Oh SA, Kim SH, Oh SJ. Patient satisfaction after holmium laser enucleation of the prostate (HoLEP): A prospective cohort study. *PLoS One*. 2017;12(8):e0182230.

16. Assmus MA, McLarty R, Senthilselvan A, De S. Improving Knowledge Transfer by Using a Summative Patient Handout for Cystoscopy. *Urology Practice*. 2020;7(5):356-61.

DRAFT

Figures and Tables

Fig. 1. General template of our 10-part patient questionnaire regarding their expectation and understanding of the post-HoLEP recovery period. Branch logic questions based on respondent answers were populated to tailor survey to individual patient experience and expectations.



Quality Analysis Survey

Quality Analysis - Healing After HoLEP

Before your surgery were you aware there may be a temporary period of urine leakage after your HoLEP surgery? ☐ Yes ☐ No [reset](#)

Did you have urine leakage after surgery? ☐ Yes ☐ No [reset](#)

Before your surgery, were you aware that there may be a period of weeks that blood or blood clots are seen in your urine following your HoLEP surgery? ☐ Yes ☐ No [reset](#)

Did you see blood in your urine following surgery? ☐ Yes ☐ No [reset](#)

Before your surgery, were you aware that the amount of ejaculated semen after surgery may be reduced/absent? ☐ Yes ☐ No [reset](#)

Do you think it is important to know you may have reduced/absent ejaculated semen prior to undergoing HoLEP? ☐ Yes ☐ No [reset](#)

Before your surgery, were you aware that there may be a temporary period after your surgery where you experience pain or burning when you pee? ☐ Yes ☐ No [reset](#)

Did you experience pain or burning while peeing following surgery? ☐ Yes ☐ No [reset](#)

Looking back, do you feel you had a reasonable understanding of the overall healing process after this type of surgery? ☐ Yes ☐ No [reset](#)

Submit

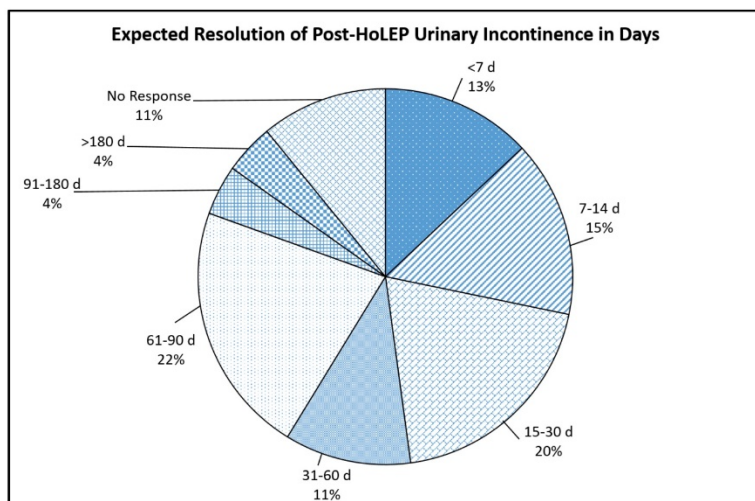
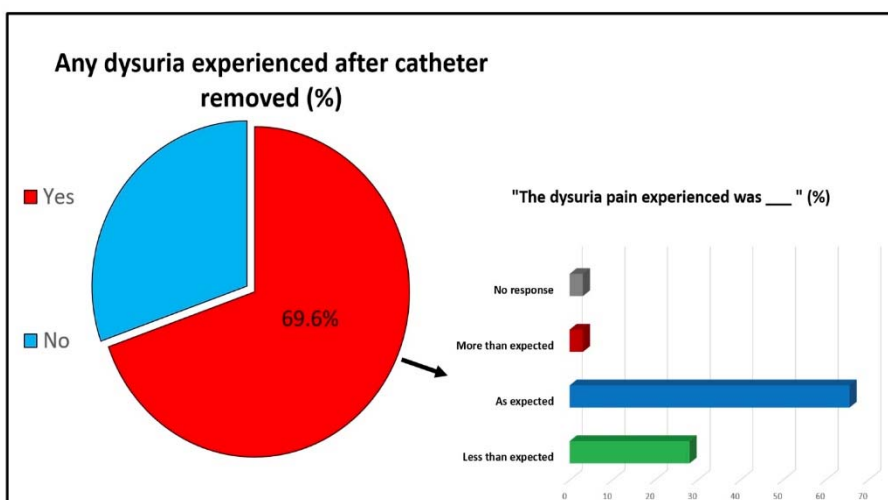
Fig. 2. Patient-reported expectation of urinary continence duration (days) after HoLEP surgery.**Fig. 3.** Patient-reported postoperative dysuria and perception of post-HoLEP dysuria severity.

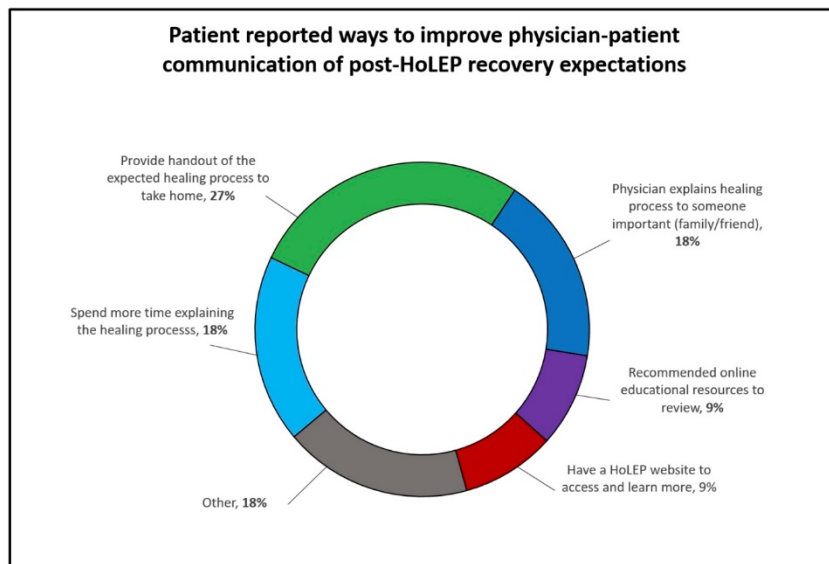
Fig. 4. Patient-reported way to improve physician-patient communication of the post-HoLEP recovery period.

Table 1. Patient and perioperative demographics		
Variable	Mean	Range
Age (years)	69.4	55–88
BMI	29.5	22.2–43.4
ASA score	2.5	2–4
Enucleation time (min)	45.2	14–102
Morcellation time (min)	7.8	1–20
Total procedure time including ancillary procedures (min)	87.5	41–164
Energy used (kJ)	112.9	39.7–251.6
Intraoperative pathology specimen weight (g)	68.0	7–164
	n	%
Preoperative urinary incontinence	13	28.3%
Rarely, uses no protection	9	19.6%
Often, wears liners or incontinence product	4	8.7%
Moses 2.0 mode used	39	84.8%
Perineal urethrostomy used	0	0%
Bladder neck incised	7	15.2%

Concurrent urolithiasis surgery	6	13.0%
Unilateral ureteroscopy	0	0%
Bilateral ureteroscopy	1	2.2%
Cystolitholapaxy	5	10.8%
Urinary retention at time of HoLEP	11	23.9%
Indwelling urethral catheter	6	13.0%
Clean intermittent catheterization	5	10.9%
History of urinary retention	19	41.3%
Therapeutic antiplatelet/anticoagulation use	6	13.0%
Antiplatelet (Clopidogrel)	3	6.5%
Anticoagulant (Warfarin)	3	6.5%
Prostate cancer detected on pathology	3	6.5%
Gleason grade group I	2	4.3%
Gleason grade group II	1	2.2%

ASA: American Society of Anesthesiology; BMI: body mass index; HoLEP: holmium laser enucleation of the prostate.

Table 2. Comparison of preoperative serum PSA, validated symptom scores (AUASS, QOL, BPH Index, SHIM, MISI, GAD-7, EjD), postvoid residuals, and urinary flow to 3-month followup			
Variable	Baseline preoperative mean (range)	3-month postoperative Mean (range)	p
Serum PSA, ng/mL	5.05 (0.096–16.5)	0.55 (0.00–2.10)	<0.001
Serum hemoglobin, g/dL	14.30 (10.4–17.7)	14.03 (11.3–16.4)	0.60
Serum creatinine, mg/dL	1.06 (0.67–2.39)	1.09 (0.72–2.10)	0.73
AUASS	24.5 (13–35)	5.7 (0–19)	<0.001
QOL score	4.5 (2–6)	2.0 (0–7)	<0.001
BPH index	7.7 (0–13)	2.1 (0–8)	<0.001
MISI	9.1 (0–24)	5.3 (0–18)	0.037
SHIM	11.5 (0–25)	14.1 (1–25)	0.33
GAD-7	3.7 (0–21)	2.8 (0–14)	0.54
EjD	7.4 (0–20)	6.9 (0–16)	0.72
Postvoid residual (mL)	166.7 (38–750)	22.2 (0–74)	0.0013
Qmax (mL/s)	6.1 (2.6–14)	15.5 (8.3–26.6)	0.020
Qavg (mL/s)	3.3 (1.1–10.1)	8.1 (3.4–16.8)	0.016

AUASS: American Urological Association symptom score; BPH: benign prostatic hyperplasia; EjD: Male Sexual Health Questionnaire Ejaculatory Dysfunction Short Form; GAD-7: Generalized Anxiety Disorder-7; MISI: Michigan Severity Incontinence score; PSA: prostate-specific antigen; Qmax: peak urinary flow; Qavg: average urinary flow; SHIM: Sexual Health Inventory for Men.