



## Patient, treatment and discharge factors associated with hospital readmission within 30 days after surgery for vulvar cancer



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### HIGHLIGHTS

- Discharge to a post acute care facility was associated with risk of readmission.
- Readmission after vulvar surgery leads to long hospitalization stay and reoperation.
- Readmission is a multifactorial event with some factors outside physician control.

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### ABSTRACT

**Objectives.** The majority of hospital readmissions are unexpected and considered adverse events. The goal of this study was to examine the factors associated with unplanned readmission after surgery for vulvar cancer.

**Methods.** Patient demographic, treatment, and discharge factors were collected on 363 patients with squamous cell carcinoma in situ or invasive cancer who underwent vulvectomy at our institution between January 2001 and June 2014. Clinical variables were correlated using  $\chi^2$  test and Student's *t*-test as appropriate for univariate analysis. Multivariate analysis was then performed.

**Results.** Of 363 eligible patients, 35.6% had in situ disease and 64.5% had invasive disease. Radical vulvectomy was performed in 39.1% and 23.4% underwent lymph node assessment. Seventeen patients (4.7%) were readmitted within 30 days, with length of stay ranging 2 to 37 days and 35% of these patients required a re-operation. On univariate analyses comorbidities, radical vulvectomy, nodal assessment, initial length of stay, and discharge to a post acute care facility (PACF) were associated with hospital readmission. On multivariate analysis, only discharge to a PACF was significantly associated with readmission (OR 6.30, CI 1.12–35.53,  $P = 0.04$ ). Of those who were readmitted within 30 days, 29.4% had been at a PACF whereas only 6.6% of the no readmission group had been discharged to PACF ( $P = 0.003$ ).

**Conclusions.** Readmission affected 4.7% of our population, and was associated with lengthy hospitalization and reoperation. After controlling for patient comorbidities and surgical radicality, multivariate analysis suggested that discharge to a PACF was significantly associated with risk of readmission.

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### 1. Introduction

In 2009 the Affordable Care Act reported on healthcare spending and identified 30 day readmission rates as an area that needed improvement. Jenks et al. [1] examined over 11 million Medicare beneficiaries and discovered that 19.6% of all discharged patients in 2004 were rehospitalized within 30 days with an estimated cost of \$17.4 billion. A

subgroup analysis focusing on discharge after surgical procedures showed a readmission rate of 15.6% in the first 30 days after discharge [1]. Although some of these readmissions may be planned or expected as part of the patient's treatment plan, most of them are unexpected and may result from inadequate discharge planning, poor care coordination between hospital and community clinicians, and lack of an effective longitudinal community-based care infrastructure. The current readmission rates in the United States lend support to the increasing concern that patients are more infirm after initial discharge, and subsequently require more diagnostic and therapeutic interventions, developing poorer quality of life and higher healthcare costs.

As readmissions are increasingly viewed as a metric for quality care, there is growing interest in elucidating the drivers for this occurrence

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[2–4]. The data specific to readmissions in gynecologic oncology patients are limited and have focused primarily on readmission after debulking for ovarian malignancy, with rates ranging from 11.5–16% [5–7]. Data on readmission after surgery for vulvar malignancy are scarce. Similar to patients with ovarian cancer, patients with vulvar malignancy often have multiple other comorbidities and undergo radical tumor resection. The goal of this study was to examine the patient demographic, treatment, and discharge factors associated with unplanned readmission after surgery for vulvar cancer.

**2. Methods**

After obtaining approval from the Massachusetts General Hospital/Partners Healthcare Institutional Review Board, we identified 479 patients that underwent vulvar surgery at our institution between January 2001 and June 2014. Inclusion into the study required the following: histology showing squamous cell carcinoma in situ or invasive cancer (including squamous cell, melanoma, basal cell, or more rare subtypes) and complete medical records with operative and postoperative care at our institution. Exclusion criteria included vulvectomy for benign indications and incomplete medical records. There were 363 patients who met criteria and were included in the study.

All operative reports and pathology reports were reviewed to abstract specific data regarding surgical procedures, demographics, treatment, and outcome parameters. Abstracted data included the following: age at time of surgery, number of major comorbidities, histology, previous radiation therapy, prior vulvar surgery and adjuvant therapy. In regards to treatment, surgical radicality, concomitant nodal dissection and extent of nodal assessment (unilateral vs bilateral vs sentinel node dissection), and length of index stay were collected. To evaluate peri-operative and post-operative complications we used the American Board of Obstetrics and Gynecology reportable events including: estimated blood loss (EBL) > 2 L, transfusion > 4 units, unplanned intensive care unit admission, readmission within 30 days, re-operation within 30 days, presence of vascular injury, and postoperative infection. The authors did not collect data on surgical site infections that did not require admission to the hospital but rather focused on the significant wound complications that required inpatient admission. Finally, we examined discharge planning factors including discharge to post acute care facilities (PACF: rehabilitation facility or skilled nursing facility), as well as discharge with visiting nurse (VNA). In addition, we examined whether a patient was discharged home with antibiotics or surgical drains. Readmissions were defined as unplanned admission to the hospital within 30 days of discharge from the index hospitalization.

Clinical variables were correlated using  $\chi^2$  test and Student's *t*-test as appropriate for univariate analysis against each specific variable and readmission. Standard univariate analyses were performed, as were logistic regression models to describe predictors of readmission within 30 days from surgery. Variables that were significant in the univariate analyses were included in the multivariate analysis. Statistical analyses were conducted using R package (version 2.2.3) and SPSS statistical software (version 23.0, SPSS, Inc., Chicago, IL).

**3. Results**

A total of 363 patient encounters were included in the analysis. Due to the recurrent nature of this disease process, there were 54 patients who underwent more than one resection. Median age at time of surgery was 59 years old (range = 48–74), and patients had a median BMI of 27.9 (23.9–32.7). While the median number of comorbidities was 2, it is important to note that 28.4% of patients had 3 or more major comorbidities requiring chronic care by a primary care physician, as documented by patient's pre-operative history and physical. Most patients had Stage 1 (50.7%) or in situ (35.6%) disease and the most represented histology (81.2%) was squamous cell carcinoma (SCC), though melanoma (11.0%), basal cell carcinoma (1.9%), and other malignancies (5.8%)

were also represented. Radical vulvectomy was performed in 39.1% of patients. Of the 141 procedures listed as a radical vulvectomy, 43.7% were total radical vulvectomy procedures whereas the remaining underwent a radical hemi-vulvectomy, radical wide local excision, radical anterior vulvectomy, or radical posterior vulvectomy. In our cohort 23.4% of patients required a lymph node assessment. Of those patients who underwent a lymph node assessment, 25.8% had unilateral dissection, 42.4% had bilateral dissections, and 31.8% underwent a sentinel lymph node procedure. In our cohort, 28 patients (7.7%) had undergone previous radiation therapy and only 3.6% of patients required adjuvant therapy after resection. The median length of stay on index admission was 0 days (0–2) for all patients. (Table 1)

Thirty two patients (8.8%) had perioperative complications. Wound infections requiring antibiotics, reoperation, or drainage were the most frequent (*n* = 13) representing 3.6% of patients. Other complications were rare. Cardiopulmonary events such as pulmonary embolism, pleural effusion or MI occurred in 3 patients (0.8%). Estimated blood loss > 2 L (0.3%), transfusion > 4 units of packed red blood cells (0.3%), and unplanned ICU admission (0.3%) were also rarely seen (Table 1).

Of our entire cohort, 17 women (4.7%) were readmitted to the hospital within 30 days of discharge. Of these patients, 88.2% were readmitted because of complications with their wound. While wound

**Table 1**  
Patient demographic characteristics.

Total patient encounters ( <i>n</i> = 363)	
Age, median (range) (years)	59 (47–76)
Length of stay (mean, days)	1.69
Stage, <i>n</i> (%)	
Stage I	184 (50.7%)
Stage II	14 (3.9%)
Stage III	31 (8.5%)
Stage IV	5 (1.4%)
In situ	129 (35.6%)
Histology, <i>n</i> (%)	
Squamous cell	295 (81.2%)
Melanoma	40 (11.0%)
Basal cell carcinoma	7 (1.9%)
Other	21 (5.8%)
Comorbidities, <i>n</i> (%)	
0	88 (24.2%)
1	94 (25.9%)
2	78 (21.5%)
3 or more	103 (28.4%)
Radicality, <i>n</i> (%)	
Simple vulvectomy	221 (60.9%)
Radical vulvectomy	142 (39.1%)
Nodal Assessment, <i>n</i> (%)	
None	278 (76.6%)
Unilateral	22 (6.1%)
Bilateral	36 (9.9%)
Sentinel	27 (7.4%)
Other, <i>n</i> (%)	
Prior XRT	28 (7.7%)
Adjuvant therapy	13 (3.6%)
Perioperative complications, <i>n</i> (%)	
EBL > 2 L	1 (0.3%)
Transfusion > 4 units	1 (0.3%)
Unplanned ICU admission	1 (0.3%)
Re-operation	2 (0.6%)
Cardiovascular event	3 (0.8%)
Collection/infection	13 (3.6%)
Readmission within 30 days	17 (4.7%)
Discharge planning, <i>n</i> (%)	
Home with visiting nurse	73 (20.1%)
Post acute care facility	28 (7.7%)
Discharge with antibiotics	63 (17.4%)
Discharge with drains	68 (18.7%)

complications are often multifaceted, of those readmitted for wound complications 53.3% listed infection as the primary diagnosis, 26.7% developed wound breakdown and 20.0% had bleeding. Patients readmitted with wound complications were significant enough that providers felt that they required inpatient care rather than outpatient care. Of those patients who were readmitted, five underwent a surgical procedure for wound debridement for infection or abscess, one underwent debridement for a flap failure, and three underwent operation for evacuation of hematoma (two of whom were on therapeutic anticoagulation). The remaining patients readmitted with wound complications were managed medically. One patient (5.6%) was admitted for failure to thrive and another (5.6%) for a cardiopulmonary event. None of the patients were readmitted more than once. The median length of stay on readmission was 15 days (range = 2–37 days) (Table 2).

Univariate analyses are reported in Table 3. There was no statistically significant difference in age, stage, histology, adjuvant therapy, or prior radiation therapy between the patients who were readmitted and those that were not. Those patients who were readmitted were more likely to have 3 or more comorbidities (OR = 5.06, 95% Confidence Interval (CI) = 1.82–14.08,  $P = 0.002$ ), to have undergone radical vulvectomy (OR = 3.98, 95% CI = 1.37–11.58,  $P = 0.014$ ), to have had lymph node assessment (OR 3.99, 95% CI = 1.49–10.71,  $P = 0.006$ ), and had a longer length of initial stay ( $P = 0.011$ ).

In total, 20.1% of patients undergoing simple or radical vulvectomy were discharged home with visiting nurses and 7.7% were discharged to a PACF. Currently, at our institution all post vulvectomy patients whose insurance will reimburse for home health are discharged with VNA. Of readmitted patients, 41.2% had been discharged with VNA, whereas only 19.1% of non-readmitted patients were discharged with VNA, a difference that trended towards significance even when controlling for comorbidity and radicality ( $P = 0.06$ ). Patients discharged to a post acute care facility had a significantly increased risk of readmission (OR 5.85, 95% CI = 1.89–18.03,  $P = 0.003$ ). In fact, of all patients who were readmitted to the hospital within 30 days, 29.4% had been at a PACF whereas only 6.6% of the no readmission group had been discharged to a PACF ( $P = 0.003$ ). Furthermore, patients who were discharged to PACF had a longer index hospital stay (3.23 days). Those who were not readmitted had a mean index stay of 1.61 days ( $P = 0.01$ ). Discharge home with antibiotics, drains, or nursing services did not have a statistically significant effect on readmission. All patients who were readmitted from a PACF were admitted due to wound breakdown ( $n = 8$ , Table 2).

Multivariate analysis was then performed with the results reported in Table 4. Only discharge to a PACF was associated with readmission (OR of 6.3, 95% CI = 1.12–35.53,  $P = 0.04$ ). Surgical radicality, patient comorbidities, and VNA were not statistically significantly associated with readmission on multivariate analysis.

#### 4. Discussion

Hospital readmissions are common, costly and increasingly deemed to be a proxy for the quality of care delivered. As such, understanding

**Table 2**  
Characteristics of readmitted patients.

Total number = 17 (4.68%)	
Age, median (range) (years)	64 (53–76)
Length of stay on index admission (days)	3 (2–5)
Average LOS during readmission	15 (2–37)
Reason for readmission	
Wound Complications	15 (88.2%)
Infection	8 (53.3%)
Wound breakdown	4 (26.7%)
Bleeding	3 (20.0%)
Failure to thrive	1 (5.6%)
Infection & cardiopulmonary	1 (5.6%)

**Table 3**  
Risk factors for readmission (univariate analysis).

P value	
Comorbidities	0.002
Discharge to Post Acute Care Facility	0.003
Nodal assessment	0.005
Increased LOS	0.011
Radicality	0.014
Discharge with drain	0.035
Home with visiting nursing services	0.056
Stage	0.159
Histology	0.207
Adjuvant therapy	0.233
Age	0.315
Discharge with antibiotics	0.718
Prior radiation therapy	0.861
Plastic surgery involvement	1

LOS, length of stay.

drivers for readmission in various patient populations will become critical in enhancing care quality, patient safety, and controlling costs.

In our study of patients undergoing vulvectomy for CIS or malignancy we found an unplanned readmission rate of 4.7%. While this rate is lower than the rates published for other patients with gynecologic malignancies, it is important to note that the average length of stay at readmission is over 2 weeks. Furthermore, 35% of those patients readmitted required a re-operation within 30 days. This indicates that although readmissions after vulvar surgery are relatively rare, when they occur they are an incredibly costly event.

On univariate analyses, pre-existing patient comorbidities, surgical radicality, and discharge to a post acute care facility all predicted readmission. Medical comorbidities and extent of surgery are risk factors that are difficult to modify at the time of diagnosis. Radical resection remains the standard of care for locally advanced disease and physicians/hospitals cannot control at which stage the patient will present for care. This suggests that while readmission is a multifactorial event, there are certainly factors that remain outside an individual physician's immediate control.

One aspect of care that could potentially be malleable is our use of post acute care facilities; i.e. skilled nursing facilities or rehabilitation centers for patients who are deemed to need assistance with wound care or recovery. Because of the complex nature of vulvar resections, a difficult to visualize surgical location, and the often obese or sick patient cohort, many patients who undergo vulvectomy will require services for wound care. As such, they are often discharged to home with visiting nurses or to a skilled nursing facility or rehabilitation center with the goal of improving wound care and postoperative recovery.

In general, the majority of our postoperative patients requiring admission after surgery were evaluated by the inpatient case manager to determine if the patient met criteria for discharge to a PACF. Patients who met these criteria were usually older with more medical comorbidities who did not have assistance at home for perineal wound care. In addition the patient had to agree to be discharged to such a facility and if so, a patient's medical insurance would dictate which particular facility they could be discharged to. In Massachusetts there was an enactment of the Mass Health program on April 12, 2006 which allowed for an expansion of health care to approximately 8% of the state's

**Table 4**  
Risk factors for readmission (multivariate analysis).

	OR	P value	95% CI
Discharge to post acute care facility	6.30	0.04	1.12–35.53
Home with visiting nurse	3.43	0.10	0.78–15.21
Comorbidities	1.24	0.14	0.93–1.66
Radicality	1.68	0.46	0.43–6.55
Increasing LOS	0.997	0.97	0.84–1.18

population who were previously uninsured. Based on review of the readmission rates from before and after 2006, it would appear that readmission rates were 7.2% prior to and 3.6% after Massachusetts instated universal coverage. This may be secondary to more patients being covered for VNA or PACF or may be due to changes in surgical technique.

Discharge to PACF theoretically provides a more intensive level of postoperative care than VNA services. Patients who may require more active management of wound care are often discharged to these institutions, and nearly 1 in 12 of our patients met such criteria (7.7%). Our research suggests this is a target population for improvement. Of those who were readmitted to the hospital within 30 days of discharge, 29.4% ( $P = 0.003$ ) were readmitted from a rehabilitation facility. Conversely, only 6.6% of patients who were not readmitted had been discharged to rehab, a fact that retains significance even when controlling for radicality and comorbidities ( $P = 0.04$ ). Furthermore, patients who were discharged to a PACF had a significantly longer length of initial stay than those who were discharged to home. This suggests that as index length of stay increases beyond the mean, this may be a marker for a patient who is at high risk for readmission irrespective of discharge to a PACF. Also of interest is that all patient readmissions from a PACF were due to wound breakdown. While reasons for vulvar wound breakdown are likely complex and multifactorial, it is possible that the wound care required after vulvectomy is not within the purview of the majority of PACF [8,9]. Perineal wound care is invasive, specialized, and cumbersome to perform. Our data suggests that while a PACF often provide a plethora of excellent services, they may be unaccustomed to the highly specialized needs of post vulvectomy patients. The association between PACF and readmission may also be related to confounding factors that were not evaluated in this analysis such as baseline patient mobility and need for assistive devices. It is also possible that patients who were discharged home were more ambulatory than those discharged to PACF, and that the activity required to perform one's own activities of daily living is protective against vulvar breakdown.

One area for improvement that our study identified is follow up visits after discharge. Of patients who were readmitted, none had complications during their initial hospital stay. This indicates that for vulvar surgery, complications tend to occur later in the postoperative course. One potential area for intervention would be to schedule early evaluations in the week following discharge and perhaps more frequent postoperative visits for patients deemed to be at increased risk, including patients who were discharged to a PACF.

The limitation of our study is that it is a single institution retrospective study. We also did not have access to a data about readmissions at

other hospitals other than our institution and its affiliated sites. The authors also did not have information regarding the length of stay at the PACF prior to discharge home. In addition, our study includes patients spanning 14 years of care. Practice patterns, ancillary services, surgical technique, and the standard of care during this time evolved, which could influence our data.

In conclusion, the data from our study suggest that preexisting comorbidities, surgical radicality, and discharge to a PACF are associated with increased risk of readmission with only discharge to a PACF retaining significance after multivariate analysis. While many of these readmissions were likely unavoidable, patients who appear to be in need of postacute care services represent an easy identifiable, high risk cohort of patients to target for care redesign and potential intervention.

### Conflicts of interest

All authors declare that they have no financial relationships or conflicts of interest.

### References

- [1] S.F. Jencks, M.V. Williams, E.A. Coleman, Rehospitalizations among patients in the Medicare fee-for-service program, *N. Engl. J. Med.* 360 (2009) 1418–1428.
- [2] P. Halfon, Y. Egglie, I. Pretre-Rohrbach, D. Meylan, A. Marazzi, B. Burnand, Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care, *Med. Care* 44 (2006) 972–981.
- [3] R.F. Averill, E.C. McCullough, J.S. Hughes, et al., Redesigning the Medicare inpatient PPS to reduce payments to hospitals with high readmission rates, *Health Care Financ. Rev.* 30 (4) (2009).
- [4] A.M. Epstein, Revisiting readmissions—changing the incentives for shared accountability, *N. Engl. J. Med.* 360 (2009) 1457–1459.
- [5] R.M. Clark, W.B. Growdon, A. Wiechert, D. Boruta, M. del Carmen, A.K. Goodman, et al., Patient, treatment and discharge factors associated with hospital readmission within 30 days after surgical cytoreduction for epithelial ovarian carcinoma, *Gynecol. Oncol.* 130 (2013) 407–410.
- [6] K.M. Doll, A.C. Snavely, A. Kalinowski, D.E. Irwin, et al., Preoperative quality of life and surgical outcomes in gynecologic oncology patients: a new predictor of operative risk? *Gynecol. Oncol.* 133 (2014) 546–551.
- [7] M.S. Henretta, J. Scalici, C. Englehard, L. Duska, The revolving door: hospital readmissions of gynecologic oncology patients, *Gynecol. Oncol.* 122 (2011) 479–483.
- [8] E.M. Aviki, K.M. Esselen, S.M. Barcia, Nucci, et al., Does plastic surgery consultation improve the outcome of patients undergoing radical vulvectomy for squamous cell carcinoma of the vulva? *Gynecol. Oncol.* 137 (2015) 60–65.
- [9] A. Wills, A. Obermair, A review of complications associated with the surgical treatment of vulvar cancer, *Gynecol. Oncol.* 131 (2) (2013) 467–469.