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**Review Article** 

# Feasibility and safety of same-day discharge after minimally invasive hysterectomy in gynecologic oncology: A systematic review of the literature

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# HIGHLIGHTS

• Compare same-day discharge (SDD) vs. traditional admission to the hospital following minimally invasive hysterectomy (MIS)

• Six studies met eligibility criteria.

- Results suggest that SDD post hysterectomy for gynecologic malignancies with or without staging is safe & feasible.
- · Low complication & readmissions rates, few/low rates of unscheduled visits within follow up period of 2-6 weeks after surgery

## ARTICLE INFO

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# ABSTRACT

*Objective.* To compare same-day discharge (SDD) versus traditional admission to the hospital following minimally invasive hysterectomy (conventional laparoscopy and robotic assisted laparoscopy) for the treatment of gynecologic malignancies.

*Methods.* A systematic review was conducted in which MEDLINE and Cochrane Center Register of Controlled Trials were searched using terms related to same-day discharge, outpatient, and hysterectomy. We reviewed published English language trials and studies that compared safety, feasibility, readmission rate, emergency department (ED) visits, complication rate, and associated risk factors for admission. Studies of any design that included at least 20 patients who underwent minimally invasive hysterectomy (conventional laparoscopy and robotic laparoscopy) for gynecologic oncology indications were included.

*Results.* The literature review yielded 421 citations, of which 27 full-text articles were reviewed. Six comparative studies met eligibility criteria. Study data were abstracted and inputted into structural electronic forms.

*Conclusion.* Our results suggest that in comparison to admission post minimally invasive hysterectomy with or without full staging, SDD in gynecologic oncology procedures is safe, and feasible. It is associated with low complication and readmissions rates, few visits, and low rates of unscheduled visits within the follow up period of two to six weeks after surgery.

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# 1. Introduction

Over the last 20 years, minimally invasive surgery (MIS) has gained popularity replacing open surgery in many surgical specialties, as a result of improved postoperative outcomes including less pain, decreased blood loss, faster recovery, and shorter hospital stays [1–4].

Fifteen years ago, laparoscopic appendectomies and cholecystectomies were routinely admitted for observation; however, current standard practice in many centers is to perform these surgical procedures as a same day discharge [8–10]. Similarly, the safety and feasibility of SDD discharge has been practiced among gynecologic surgeons.

Hysterectomy is the most common gynecologic procedure in the United States, with over 600,000 hysterectomies performed annually [5]. The use of MIS in general gynecology has grown exponentially, and has been rapidly adopted in the treatment and staging for patients with gynecologic malignancies. For example, Walker et al. [6,7] completed a prospective randomized trial—the GOG-LAP 2 trial—comparing the clinical outcome of MIS to laparotomy. The results of this study suggested that laparoscopy is a safe and feasible approach for uterine cancer management, resulting in fewer complications, shorter hospital stay, and a better quality of life for patients.

Since 1985, results from many retrospective studies from different parts of the world comparing SDD to overnight admission post vaginal, laparoscopic, and robotic hysterectomy for benign gynecologic indications, have reported that SDD is safe, feasible, cost effective, and carries a low complication, and readmission rates. [11–19]. Alperin et al. [20] reported similar results when they evaluated SDD after MIS hysterectomy for large uteri > 500 g (ranging from 500 g to 4500 g); SDD was successful in 92.8% of all cases among the 446 patients included in their study, with low complication and readmission rates.

Schiavone et al. [21] studied a large, US prospective cohort of 128,634 women who underwent laparoscopic hysterectomies from 2000 to 2010. SDD was achieved in 26.5% of patients, with the trend increasing from 11.3% of patients in 2000 to 46% of patients in 2010. Of the SDD cases, 2.2% were performed for malignant indications. Schiavone et al. showed that SDD is safe and associated with a decrease in cost compared to admission.

A smaller body of evidence is available to support the safety and feasibility for SDD post hysterectomy, with or without full staging in gynecologic oncology. We conducted a systemic literature review of studies that compared SDD to hospital admission after hysterectomy, with or without staging, for gynecologic malignancies indication. The primary objective of this review was to compare the safety, feasibility, cost, perioperative outcome, adverse events, readmission rate, ED visits and unscheduled visits associated with SDD.

# 2. Materials and methods

A systemic review of literature was conducted to identify studies with SDD in gynecologic oncology. MED-LINE and Cochrane Central Register of Controlled Trials were searched for published English language trials and studies, using the search terms "outpatient," "sameday discharge," "laparoscopic," "robotic," "hysterectomy," "gynecologic oncology," "gynecologic malignancy," "surgery," as well as "surgical procedures".

Abstracts were screened for the following eligibility criteria: studies about women who underwent minimally invasive hysterectomy (conventional laparoscopy and robotic laparoscopy) with or without staging procedures for gynecologic oncology indications, and were discharged home the same day. Studies with at least 20 procedures were included to insure adequate power. Relevant full text articles were retrieved and analyzed for outcomes consistent with our primary objectives—to assess safety, feasibility, cost, rate of complications, adverse outcomes, readmission rate, and unscheduled ED and clinic visits or contact.

# 3. Results

The systemic literature review yielded 421 citations, of which 27 full-text articles were identified and reviewed. Of the 27 articles, the six comparative studies that met eligibility criteria were included in this review.

Clinical and associated outcomes from comparative studies were categorized according to inclusion criteria and outcome from SDD including: preoperative diagnosis, procedure, SDD rate, predictors of successful SDD, risk factors associated with admission, complication rates, readmission rates, rate of ED visits, and rates of unscheduled visits or contact.

Six nonrandomized retrospective studies were identified that compared SDD with admission post MIS hysterectomy, with or without staging for gynecologic malignancy indications [22–27]. Two studies included only conventional laparoscopic surgeries [22,23], two included only robotic surgeries [24,25], and two studies were mixed laparoscopic and robotic surgeries [26,27].

The six studies included a total of 1212 minimally invasive procedures for gynecologic malignancy indications; 956 cases included staging with e pelvic lymphadenectomy; and/or omentectomy, and/or para aortic lymphadenectomy. [Table 1]

Gien et al. [22] were the first to evaluate the safety and feasibility of SDD after laparoscopic surgery in gynecologic oncology. They studied 303 patients who underwent laparoscopic surgery for malignant indication, including 21 patients (6.9%) who were converted to laparotomy. Gien found the success rate for SDD to be 48.5% in procedures that included at least a hysterectomy or trachelectomy with omentectomy and/or pelvic  $\pm$  para aortic lymphadenectomy. Out of the 303 study patients, 268 had a cancer diagnosis, including 150 endometrial cancers, 78 cervical cancers, and 40 ovarian cancers.

Another study of 28 patients with stage 1 endometrial cancer treated with laparoscopic hysterectomy and pelvic lymphadenectomy by Rettenmaier, et al. had a 75% SDD [23]. Lee et al. [24] studied 200 robotic assisted hysterectomies; 47% had a cancer diagnosis, and 45% had complex surgery with at least pelvic lymphadenectomy. The authors reported an overall SDD success rate of 78%.

Penner et al. [25] reviewed records of 141 fully staged (pelvic and para aortic lymphadenectomy) patients with endometrial cancer and cervical cancer. They excluded 12 (7.8%) patients who were converted to laparotomy. Penner's study showed the highest SDD rate of 83.7%. Rivard et al. [26] included 140 patients post robotic surgeries; however, only 87 patients had a cancer diagnosis, and only 66 of these patients underwent staging; overall SDD success rate was 64.3%.

A large study published by Melamed et al. [27] of 696 laparoscopic and robotic hysterectomies were evaluated, with 593 endometrial cancer cases and excluding all converted cases. Approximately 37% of these cases had at least pelvic lymphadenectomy performed. They found a SDD rate of 42.4% with a time dependent trend from the first year of this study showed a SDD rate of 3.9% compared to 69.6% in the third year of study.

The six studies discussed above were inconsistent with regard to pre-operative planning for SDD. Two studies included all MIS cases in

#### Table 1

Eligibility criteria and success rate for SDD.

Source Sample Cases with Cases with staging SDE size (n) cancer diagnosis procedure (at least rate (n) pelvic lymphadenectomy or omentectomy) (n)	D 2 %
Gien et al. [22] 303 268 286 48.4	5
Rettenmaier et al. [23] 28 28 28 75	
Lee et al. [24] 200 95 91 78	
Penner et al. [25] 141 141 141 83."	7
Rivard et al. [26] 140 87 66 64.2	3
Melamed et al. [27] 696 593 344 42.4	4

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gynecologic oncology with no clear plans for SDD. These two studies evaluated the rate of SDD and the variable factors that affected the risk for admission [22,27]. In contrast, the remaining four studies included MIS for gynecologic malignancies with planned SDD, and compared risk factors between women who had a successful SDD to those who needed admission [23-26]. Most studies evaluated a list of clinical variables, and used univariate or multivariate analysis to evaluate the factors associated with postoperative admission. [Table 2].

Common risk factors for postoperative admission were shown to be statistically significant in at least two of the six studies. Five studies were consistent in showing that one of the strongest common predictors of admission was surgery start time. Surgeries with a start time later in the day were more likely to result in admission. The exact late start time that was more likely to result in an admission varied among the six studies between 1 p.m. and 6 p.m. [22,24-27].

Older age of patients was another significant factor for admission in three of the six studies [22,26,27]. The last common significant factor for admission among the six studies was longer operative time, which was a significant factor in two studies [22,24].

Other significant factors specific to individual studies included surgeon's choice, conversion to laparotomy and radical hysterectomy [22]; estimated blood loss [24]; severe pain, delayed oral intake, and laparoscopic versus robotic [25]; increased BMI, and performance of pelvic lymphadenectomy [27].

All six studies evaluated rate of hospital readmission, and were consistent in the low readmission rate with SDD. [Table 3] When comparing readmission rate in SDD to admission, most studies showed a trend of higher readmission rate in patients who required admission compared to SDD; however, no study differences reached statistical significance except for the study by Lee et al. [24] showing a 2.5% readmission rate in the SDD group compared to 7% in the group of patients who required admission. No study showed higher readmission rates in the SDD group.

Four of the six studies evaluated ED visits of patients who had SDD compared with patients who required admission [Table 3]. Three studies demonstrated a trend toward increased ER visits in the women who required admission [22,24,27]. In two of the three studies, the rate reached statistical significance [24,27]. Penner et al. [25] were the only investigators to report increased ER visit rate in the SDD group, but the effect did not reach statistical significance. The same study was the only one to evaluate and compare the rate of unscheduled postoperative visits and medical team contact. Penner et al. found that the rate was higher in the admission group for unscheduled visits in the first two weeks post-surgery; 17.4% in the admission group compared to 9.3% in the SDD group. The rate for any verbal contact with the medical staff in the first two weeks post-surgery was 24.6% in the SDD group compared to 34.8% in the admission group. None of the results reached statistical significance.

Most studies did not include complications as an independent outcome. [Table 4]. Penner et al. [25] evaluated 141 patients with endometrial and cervical cancer who underwent full staging, and compared complications in one week and two weeks post-surgery between the SDD group and the admission group. The complication rate was lower in the SDD group (5.9% versus 8.7%, P = NS); however, in the second week, the complication rate was higher in the SDD (12.9% versus 8.7%,

a	b	le	3

Readmission rate, ER visits, and unscheduled visits in SDD compared to admission.

Source	Readmission rate		ER visit		Unscheduled visit	
	SDD %	Admission %	SDD %	Admission %	SDD %	Admission %
Gien et al. [22]	4.8	5.8	12.9	13.5	NA	NA
Rettenmaier et al. [23]	0	0	NA	NA	NA	NA
Lee et al. [24]	2.5	7*	5.1	11.6*	NA	NA
Penner et al. [25]	11	17	9.3	4.4	9.3	17.4
Rivard et al. [26]	1.4	1.4	NA	NA	NA	NA
Melamed et al. [27]	3.1	5.7	1	4.7*	NA	NA

\* Statistically significant P < 0.05.

P = 0.74); they concluded that there was no difference in overall frequency or type of complication [Table 5].

Melanmed et al. [27] studied 696 patients, where >37% underwent staging for endometrial cancer. They evaluated complication rates within 30 days post-surgery, and found the rate of complication to be significantly higher in the group who required admission 10.2% compared to 5.8% in the SDD group; however, when Melanmed analyzed the results using multivariate analysis, adjusting for multiple variable, the difference was not significant.

#### 4. Discussion

Our literature review suggests that SDD is a safe and feasible approach in patients undergoing a hysterectomy (with or without staging) for gynecologic malignancies. SDD carries low morbidity, low readmission rates, low ER visits, and low unscheduled visits.

In a separate study not included in this review, Liang et al. [28] evaluated the pattern and risk factors for readmission within 90 days postsurgery. In the 395 patients with endometrial cancer who underwent robotic surgery, readmission rate was 7.6%. Liang reported that one of the significant risk factors for readmission was length of stay greater than one day compared to one day or less (40% versus 23.0%, P =0.04). Thus, we could assume that SDD may carry a further reduction in the readmission rate compared to overnight admission.

The results of our review are encouraging, but given the nature of the studies and the multiple biases that could have affected the results-assumptions that patients requiring admission were sicker, had complications, had more complex procedures, or advanced disease-it would be the best if a future randomized trial to control all variables that might interfere with results was conducted.

Given the retrospective nature of the six studies, potential biases in patient selection, non-randomization, and failure to control for many variables, it is difficult to draw a final conclusion about the significant risk factors for admission to be able to avoid those factors when planning for SDD.

For example, all six compared outcomes from the SDD group to the outcomes of patients who required admission. Arguments can be made that it is not a fair comparison, since an admitted patient may

<b>Table 2</b> significant risk factors for a	dmission (P < 0.05).			Complication. Source	Admission %	
Source	Time procedure ended after 1–6 pm	Age (older patients)	Longer operative time	Gien et al. [22] Rettenmaier et al. [23] Lee et al. [24]	NA O NA	NA 0 NA
Gien et al. [22]	+	+	+	Penner et al. [25]		
Rettenmaier et al. [23]	NA	NA	NA	1 week	12.7	8.7
Lee et al. [24]	+	_	+	2 weeks	5.9	8.7
Penner et al. [25]	+	_	_	Rivard et al. [26]	NA	NA
Rivard et al. [26]	+	+	-	Melamed et al. [27]	5.8	10.2*
Melamed et al. [27]	+	+	-	* Statistically significant $B < 0.05$		

Table 4

Statistically significant P < 0.05

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#### 4

# Table 5

## Study details.

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Source	Study site	Study design Year of study Sample size	Inclusion criteria	Exclusion criteria
Gien et al. [22]	Sunnybrook health science center, Toronto, Canada	Retrospective 2006–2009 303	All patients that underwent laparoscopic hysterectomy and or staging by the two gynecologic oncologist in the center, including patients that were converted	Patients undergoing minor laparoscopic cases like oopherectomy, cystectomy, or patients that had upfront laparotomy
Rettenmaier et al. [23]	Newport Beach, CA, USA	Retrospective 2011 28	Patients with stage 1 endometrial cancer that underwent total laparoscopic hysterectomy, bilateral salpingo-oopherectomy and pelvic lymphadenectomy	Patients with higher stage, complex medical problem, had open surgery, or where converted to laparotomy
Lee et al. [24]	Memorial Sloan-Kettering Cancer Center, New York, USA	Retrospective 2010–2012 200	All patients that underwent Robotic hysterectomy, with or without staging and had planned SDD	NA
Penner et al. [25]	University of California Irvine, Orange Kaiser Permanente Los Angeles. University of Texas MD Anderson Cancer Center USA	Retrospective 2008–2011 141	Patients undergoing minimally invasive surgical staging for endometrial cancer and cervical cancer with planned SDD	Patients with metastatic disease, planned overnight say, or were converted to laparotomy
Rivard et al. [26]	University of Minnesota, Minneapolis, USA	Retrospective 2013 140	All robotic hysterectomies performed by one of the gynecologic oncologist in the center	Planned overnight stay, radical hysterectomy, converted to laparotomy, or in conjunction with surgery by another service
Melamed et al. [27]	Harvard medical school, Boston, USA	Retrospective 2012–2013 696	All robotic or laparoscopic hysterectomies performed by one of the gynecologic oncologist in the center for endometrial intraepithelial neoplasia or cancer	Patients requiring conversion to laparotomy

have been older with higher comorbidities, had longer or more complex surgeries, or more complications.

It is reasonable to assume that factors that were found to be significant in more than one study are candidates for consideration when selecting patients for SDD. All factors should be considered in the design of future well-designed prospective randomized trial evaluating SDD in the gynecologic oncology population. Cost-effectiveness should also be highly considered in Further research for SDD given the no increased significant complications or readmission rates.

For the current practice, it is fair to say that the results from this literature review are reassuring. With careful planning and careful patient selection, it is safe and feasible to adopt SDD in gynecologic oncology.

## **Conflict of interest**

SN is a consultant for Medtronic Ltd. All other authors have no conflict of interest to declare.

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