The Frequency and Indications for Hospital Readmissions after Abdominal Hysterectomies in a Regional Hospital in Hong Kong

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Objectives: To determine the frequency of emergency readmission within 28 days of abdominal hysterectomy, and to identify the indications and risk factors for such readmissions and explore feasible interventions to avoid them.
Methods: The study took place in the Department of Obstetrics and Gynaecology, Queen Elizabeth Hospital, Hong Kong. Hospital records of patients having emergency readmission within 28 days after abdominal hysterectomy performed in our unit between January 2004 and December 2009 were retrieved and analysed.
Results: Over the study period, 1823 patients underwent abdominal hysterectomy in our unit, of whom 67 had unscheduled readmissions within 28 days of discharge. The overall readmission rate was 3.7%. The readmitted group had a mean age of 52 years, though the majority were aged 40 to 49 years. Age of 70 years or more was a risk factor for readmission. Per-vaginal bleeding / vault haematoma was the most common reason for readmission, accounting for 26.9%. No statistically significant differences were found between those readmitted and a group of randomly selected controls with respect to mean age, intra-operative blood transfusions, intra-operative blood loss, nature of the operation (elective / emergency), type of operation (general / oncological), duration of the operation, training level of the surgeon, postoperative length of stay, co-morbidity scores, and previous abdominal surgery.
Conclusion: The emergency readmission rate after abdominal hysterectomies in our unit was 3.7% and the most common cause was per-vaginal bleeding / vault haematoma. Age of 70 years or older was a significant risk factor.
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Introduction

Hysterectomy is one of the most common major gynaecological procedures and like other operations, it is associated with a significant risk of morbidity. The abdominal approach is still the most commonly used[1], despite various randomised studies showing that the vaginal approach has more favourable morbidity outcomes[2]. Short-term complications are more easily documented as most become apparent during hospitalisation[3], but intermediate-to-late complications arising after discharge may be unrecognised unless specifically looked for. Clinical indicators such as emergency readmissions to hospital within 28 days of discharge are increasingly used to assess the quality of hospital care and evaluate complications[4]. With the development of the individual electronic medical record system in the Hospital Authority (HA) hospitals, it is possible to identify complications after discharge from hospital. In the 6-year period from 2004 to 2009, 1823 abdominal hysterectomies have been performed in the Department of Obstetrics and Gynaecology (O&G) of Queen Elizabeth Hospital (QEH), Hong Kong, where this study was carried out. The aims of this study were: (1) to determine the frequency of emergency readmission to any HA hospital within 28 days of discharge following abdominal hysterectomy, (2) to identify indications and risk factors associated with readmission, and (3) to explore possible interventions to reduce potentially avoidable hospital readmissions among these patients.

Methods

This study was carried out in the Department of O&G of QEH, which is one of the 12 public hospitals providing gynaecological services in Hong Kong and the only regional acute general hospital with an O&G service within the Kowloon Central Cluster. This was a retrospective case comparison study of hospital records. The hospital records of patients having emergency readmission to any HA hospitals within 28 days of discharge from the hospitalisation episode for abdominal hysterectomy performed in our hospital between January 2004 and December 2009 were retrieved and analysed. Those who had scheduled readmission were not included. A control group consisted of a random sample (generated

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using an internet program) of the same number of patients retrieved from all other women who underwent abdominal hysterectomy in the same hospital within the same period. A total of 40 general and 27 oncology cases were retrieved in the control group, and matched the number in the study group. Other parameters such as age and duration of the operation were not matched. The research protocol was approved by the Ethics Committee of the study hospital. The patients were not required to undergo additional tests or visits, and therefore consent from the patients involved was not needed.

All gynaecological patients who had operations performed in QEH from July 1998 onwards had electronic operation records, with a unique identifier using their Hong Kong Identity Card number, which was linked to all their medical attendance in HA hospitals, Accident and Emergency Department and outpatient clinics. Episodes of emergency readmission to any HA hospitals within 28 days after any hospital discharge were automatically captured in the HA Clinical Management System and could be retrieved via the Clinical Data Analysis and Reporting System (CDARS), through an *ad hoc* reporting enquiry.

Information of all patients having abdominal hysterectomies performed from January 2004 to December 2009 and having an emergency readmission within 28 days of discharge from the index admission was retrieved, using the CDARS *ad hoc* reporting enquiry, and supplemented by hard copies when necessary. The index admission was defined as the hospital admission for the hysterectomy procedure and readmission as an admission to any HA hospital within 28 days of the index admission. The 28-day timeframe was used because this is the timeframe used in most studies in the United Kingdom. Length of stay in hospital during the index admission was defined as the interval between the day of hysterectomy and the day of discharge plus one (to ensure that the length of stay in days was greater than zero).

Indications for hysterectomy were retrieved from the operative records. They were classified as leiomyoma, endometriosis +/- leiomyoma +/- adenomyosis, benign ovarian tumour (excluding endometriosis), ovarian or peritoneal malignancies, uterine pre-malignant and malignant lesions, cervical pre-malignant and malignant lesions, post-menopausal bleeding and obstetrical indications. The principal diagnosis quoted on the operative record was used as the principal indication for hysterectomy. Operative procedures were also classified into Standard Procedure (total or subtotal abdominal hysterectomy +/- salpingo-oophorectomy) and Complex Procedure (total or subtotal hysterectomy +/- salpingo-oophorectomy with debulking or lymph node dissection or surgeries involving the gastrointestinal or urinary tract).

Other operative information including qualifications of the chief surgeon, operating time, intra-operative blood loss, intra-operative blood transfusion, operation nature (elective or emergency), previous abdominal surgeries, operation disease group (benign or malignant) and length of hospital stay after the operation was also retrieved. The surgeons were classified into specialists (if they had Fellowship of the Hong Kong Academy of Medicine in Obstetrics and Gynaecology, or equivalent) and trainees (undergoing specialist training).

Co-morbid conditions were selected from 21 different categories described by Charlson et al[5]. An unweighted co-morbidity score was assigned to each woman as the cumulative number of different co-morbid conditions identified from all hospital admissions up to 1 year before and including the index admission (an Appendix is available on the journal website: www.hkjgom.org).

For those with readmission episodes, the discharge summaries of the episode were retrieved electronically, and if necessary, supplemented by recourse to hospital records to assess for the reasons for that readmission. The records were analysed independently by the authors, comprising one trainee and two consultants. The reason for readmission was determined to be directly, indirectly, or not related to the abdominal hysterectomy. Complications were considered directly related if they were related to the surgical procedure, such as the wound complications, per-vaginal bleeding, vault haematoma and injuries to surrounding organs. Complications considered indirectly related were those as a consequence of procedures, such as catheterization of bladder causing urinary tract infection, anaesthesia, and immobilisation. Complications were considered to be unrelated if the symptoms could not be identified as related to the surgical procedure itself. If there was a difference in opinion, a consensus was reached after discussion.

Statistical analyses were performed using the Statistical Package for the Social Sciences (version 13.0). Baseline characteristics of the study and control groups were compared using different statistical tests. The independent *t*-test was used for the analysis of continuous data, such as age and length of stay. Categorical data such as indications for hysterectomy and operative procedures were analysed using chi-square tests. All statistical tests

were two tailed, and p values of <0.05 were considered statistically significant.

Results

During the 6-year period, a total of 1841 abdominal total or subtotal hysterectomies were performed in QEH, of which 18 were performed by general surgeons as part of their management for surgical conditions. These were excluded from this study, leaving 1823 patients who had abdominal hysterectomies suitable for analysis. Among these, 1221 underwent hysterectomy for benign conditions such as leiomyoma, endometriosis, benign ovarian cysts, of whom 40 (3.3%) were readmitted within 28 days of discharge. On the other hand, 602 patients had hysterectomy for malignant or pre-malignant lesions and 27 (4.5%) of them were readmitted within 28 days. Thus, the overall readmission rate was 3.7%.

Just over half of the hysterectomies were performed in the 40-49 years' age-group (Table 1). The mean age in the study group was 52 years, for those in the control group it was 55 years. Notably, of the 160 patients who underwent hysterectomies were aged ≥70 years, 15 of whom were readmitted, which gives a readmission rate of 9.4% in this group (p=0.006) and differs significantly from the overall data.

The emergency readmission rates throughout the 6-year study period were generally stable (Table 2). The reasons for hospital readmissions are shown in Table 3; 45 (67.2%), 6 (9.0%), and 15 (22.4%) were readmitted for direct, indirect, and unrelated causes, respectively. Per-vaginal bleeding / vault haematoma was the commonest reason for readmission (26.9%).

The indications of hysterectomy in the study and the control groups are shown in Table 4. There was no statistically significant difference between benign and malignant indication for hysterectomy readmitted in the study and control groups. Hysterectomy for leiomyoma and / or endometriosis accounted for almost half of the

Table 1. Age distribution of patients who underwent abdominal hysterectomies (AH) and the percentage of readmissions within the age-group

Age-group (years)	No. (%) of patients with AH	No. (%) of readmissions
20-29	14 (0.8)	0
30-39	155 (8.5)	3 (1.9)
40-49	920 (50.5)	37 (4.0)
50-59	424 (23.3)	7 (1.7)
60-69	151 (8.3)	5 (3.3)
70-79	118 (6.5)	11 (9.3)
80-89	39 (2.1)	3 (7.7)
90-99	3 (0.2)	1 (33.3)
Total	**1823**	**67 (3.7)**

Table 2. Year distribution of abdominal hysterectomy (AH) and number of readmissions within 28 days of discharge after AH

Year	No. of AH	No. (%) of readmissions
2004	404	17 (4.2)
2005	316	10 (3.2)
2006	271	9 (3.3)
2007	259	15 (5.8)
2008	276	6 (2.2)
2009	297	10 (3.4)
Total	**1823**	**67 (3.7)**

Table 3. Reasons for hospital readmission after abdominal hysterectomy

Reason	No. (%) of readmissions
Direct causes	
Abdominal wound pain / discharge / gaping	8 (11.9)
Per-vaginal bleeding / vault haematoma	18 (26.9)
Vault / pelvic infection	4 (6.0)
Intestinal obstruction	8 (11.9)
Urinary tract infection	5 (7.5)
Abdominal pain	2 (3.0)
Indirect causes	
Chest infection	2 (3.0)
Warfarin overdose	2 (3.0)
Shoulder pain	1 (1.5)
Deep vein thrombosis	1 (1.5)
Unrelated causes	
Constipation	1 (1.5)
Cholecystitis	1 (1.5)
Gastroenteritis	4 (6.0)
Chest pain / heart disease	2 (3.0)
Vulval abscess	1 (1.5)
Upper respiratory tract infection	1 (1.5)
Syncope / dizziness	1 (1.5)
Confusion	1 (1.5)
Musculoskeletal pain	1 (1.5)
Right upper quadrant pain	1 (1.5)
Unknown	1 (1.5)
Total	**67 (100)**

Table 4. Indications for index abdominal hysterectomy

Indications for abdominal hysterectomy	No. (%) in readmitted group	No. (%) in control group	p Value
Benign			
Fibroid	17 (25.4)	22 (32.8)	
Endometriosis ± fibroid ± adenomyosis	16 (23.9)	10 (14.9)	
Benign ovarian tumour	5 (7.5)	4 (6.0)	
Postmenopausal bleeding	1 (1.5)	0	
Obstetrics indications	0	1 (1.5)	
Malignant			
Ovarian / peritoneal malignancies	13 (19.4)	8 (11.9)	
Uterine pre-malignant and malignant lesions	11 (16.4)	12 (17.9)	
Cervical pre-malignant and malignant lesions	4 (6.0)	10 (14.9)	
Total	**67 (100)**	**67 (100)**	**0.338**
Operative procedures			
Standard procedure: total / subtotal hysterectomy +/- BSO	50 (74.6)	55 (82.1)	
Complex procedure: total / subtotal hysterectomy +/- BSO with debulking or lymph node dissection or bowel injury requiring resection / anastomosis or urinary tract injury	17 (25.4)	12 (17.9)	
Total	**67 (100)**	**67 (100)**	**0.575**

* Abbreviation: BSO = bilateral salpingo-oophorectomy

readmitted cases (49%), although the difference compared to the controls was not statistically significant. Operative procedures performed in the study and control groups are also shown in Table 4, and show that there was no statistically significant difference between them with regard to the complexity of the procedures performed.

No statistically significant differences were found between the groups with regard to mean age, intraoperative blood transfusion, intra-operative blood loss, operation nature (elective / emergency), type of operation (general / oncology), duration of operation, level of training of surgeon, postoperative length of stay, co-morbidity scores and any previous abdominal surgery (Table 5).

Discussion

Hospital readmission rate is commonly used as a hospital procedural outcome indicator. Most complications are manifested in the first readmission episode, which is usually within 28 to 30 days after discharge. In a prospective Finnish study performed in 1999, the hospital readmission rate was 1.6% for abdominal hysterectomies[6], but was 3.7% in our study. This may be attributed to the difference in methodology and elements of bias if clinicians were not double-blinded to the study. Differences in the medical system and culture of medical consultations may also lead to a difference in readmission rate in different countries, particularly if patients have their own family physicians who are able to manage situations that might have otherwise been managed in hospital (as in Hong Kong).

The majority of those readmitted were aged 40 to 49 years and underwent hysterectomy for benign conditions. This was consistent with most patients undergoing hysterectomies being in this age-group, though such an assumption requires further study.

The readmission rate was significantly higher in patients aged 70 years or over, and could be attributed to old age, decreased general condition, co-morbidities, use of medications, poor nutritional support, and poor social support. The general condition of these patients (bed-bound or independent in daily activities) was not assessed in this study, but could have a bearing on recovery and rehabilitation. In this study, 21 co-morbidities were taken into account. However, the severity and control of these conditions, as well as any concurrent medications (e.g. corticosteroids, immunosuppressants and anti-coagulants) were not weighted in the analysis. The stress of a major operation could have triggered an exacerbation in patients with poorly controlled pre-morbid conditions. In Hong Kong, many elderly do not live with their children, and may be cared for by an elderly spouse or old-age home staff. Therefore, there may be a lack of knowledge (e.g. the need for adequate nutrition and exercises) and the ability to manage the patient after a major operation. Since

Table 5. Comparison between readmitted and control groups

	No. (%) in readmitted group	No. (%) in control group	p Value
Mean age (years)	55.0	51.4	0.098
Intra-operative blood transfusion	1 (1.5)	6 (9)	0.115
Mean operative blood loss (ml)	457.8	581.6	0.241
Intra-operative blood loss (ml)			
1-500	51 (76.1)	49 (73.1)	
501-1000	9 (13.4)	11 (16.4)	
1001-1500	5 (7.5)	1 (1.5)	
1501-4500	2 (3)	6 (9)	
Operation nature			
Elective	66 (98.5)	64 (95.5)	0.619
Emergency	1 (1.5)	3 (4.5)	
Operation type			
General	39 (58.2)	39 (58.2)	1.000
Oncology	28 (41.8)	28 (41.8)	
Mean operation elapse time (mins)	120.4	119.3	0.906
Surgeon			
Fellow	42 (62.7)	41 (61.2)	0.859
Trainee	25 (37.3)	26 (38.8)	
Mean postop length of stay (days)	7.0	8.3	0.309
Mean co-morbidity score	0.79	0.54	0.320
Co-morbidity score			
0	43 (64.2)	52 (77.6)	
1	15 (22.4)	6 (9.0)	
2	4 (6.0)	4 (6.0)	
3	0	2 (3.0)	
4	1 (1.5)	1 (1.5)	
5	0	0	
6	3 (4.5)	2 (3.0)	
7	0	0	
8	1 (1.5)	0	
Previous abdominal surgery	20 (29.9)	26 (38.8)	0.275

old age is now identified as a risk factor for readmission after abdominal hysterectomy, special attention should be given to this patient group by way of education, and arrangements for physical and social support. In this group, anaesthetic and other consultations may be indicated prior to the operation to optimise their medical conditions. Social workers and other forms of assistance should also be arranged for postoperative support, and physiotherapists consulted for postoperative chest and limb exercises. Information leaflets on postoperative management after discharge may also be helpful.

Notably, more patients underwent hysterectomy for endometriosis in the readmitted group than in the controls, though the difference was not statistically significant. This observation was nevertheless in keeping with the findings in another local study in 2007[1], where it was also shown that endometriosis did not affect the complication. It was assumed that endometriosis might pose more difficulties during operations because of adhesions, but a larger sample size would seem needed to validate this assumption.

Most hospital readmissions were directly related to the abdominal hysterectomy, the major reason being vault haematoma or per-vaginal bleeding. Most of these patients presented with a small amount of bleeding and the vault haematomas resolved with time and after antibiotic treatment. Only one patient underwent re-operation for

heavy bleeding from the vaginal vault, but none received a blood transfusion. These patients possibly have been managed as outpatients, whilst being regularly monitored by physical examinations, ultrasound evaluations and receiving oral antibiotics as necessary. Education before discharge, in the form of verbal counselling supplemented by written leaflets, better telephone support, and easier access to ambulatory care may reassure these patients and might decrease readmission rates.

A major reason for readmission was wound infection or wound dehiscence. Data on the use of antibiotics were not included in this study, yet could have had an impact on this problem. Most patients with this complication might also be managed in an outpatient setting with antibiotics and wound dressing, as most only had mild infections. Any re-suturing required could also be undertaken in such a setting using local anaesthetics.

Indirect reasons for readmission include chest infection, warfarin overdose, shoulder pain (possibly related to posture during and after the operation), and deep vein thrombosis (possibly related to the pelvic surgery coupled with immobilisation). Unrelated reasons were mostly non-specific, and included dizziness, musculoskeletal pain, constipation, diarrhoea, and abdominal pain. Two patients were readmitted for cardiovascular complications, namely congestive heart failure with atrial fibrillation, which was very likely related to the underlying co-morbidities with the operation as the stressor. Most of these acute and subacute complications could be documented, though late complications such as incisional hernia could not be detected in this study due to the 28-day timeframe. The severity of each complication was not analysed, though the necessity for an admission probably precluded mild cases.

No statistically significant differences were found between those requiring hospital readmission and the control group with regard to the factors being investigated, including procedures done during hysterectomy, intra-operative blood transfusion, operative blood loss, duration of operation, elective or emergency operation, general or oncology operation, surgeons' level of experiences, postoperative length of stay in hospital, co-morbidities and previous abdominal surgeries. The major reason was that the sample size was not large enough to provide sufficient statistical power, and with a small control group chosen, the comparison between the study and control group could not be representative enough. Although a longer time span would allow more case recruitment, change of clinical practice (such as early hospital discharge is more prevalent nowadays, use of prophylactic antibiotic etc.) may affect the outcome.

Other limitations in this study were that it was retrospective, and the investigators retrieving and analysing the data were not blinded to its purpose. Potential confounders, such as previous abdominal surgery before records were computerised, uterine sizes, use of prophylactic antibiotics and thromboprophylaxis, and the severity of intra-abdominal adhesions were not controlled for. Moreover, the scoring system was difficult to accurately quantify with respect to co-morbidities, because patients could also be receiving care in the private sector. Finally, the severity and control of co-morbidities was not included in the co-morbidity score, and therefore might not have reflected the general status of the patients accurately.

Conclusion

The emergency readmission rate after abdominal hysterectomies in our unit was 3.7%, the commonest reason being per-vaginal bleeding / vault haematoma. Persons aged 70 years or older had a higher chance of readmission. Education and arrangement of physical and social support might reduce hospital readmissions. Further studies with larger samples, control of more confounding factors, and assessment of late complications appear necessary.

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Appendix

Assigned weights for diseases	Conditions
1	Myocardial infarct
	Congestive heart failure
	Peripheral vascular disease
	Cerebrovascular disease
	Dementia
	Chronic pulmonary disease
	Connective tissue disease
	Ulcer disease
	Mild liver disease
	Diabetes
2	Hemiplegia
	Moderate or severe renal disease
	Diabetes with end organ damage
	Any tumour
	Leukaemia
	Lymphoma
3	Moderate or severe liver disease
6	Metastatic solid tumour
	AIDS