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ORIGINAL RESEARCH ARTICLE

Ureteric injuries during hysterectomy—A Norwegian retrospective study of occurrence and claims for compensation over an 11-year period

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Abstract

Introduction: Ureteric injury is a rare but serious, iatrogenic complication of hysterectomy. The risk depends on indication for surgery, predisposing risk factors, and peroperative conditions. Our aims were to evaluate and learn from compensation claims to The Norwegian System of Patient Injury Compensation (NPE) for ureteric injury occurring during hysterectomies to predict risk factors, time of identification, symptoms, and consequences, and to relate these cases to injuries registered in The Norwegian Patient Registry.

Material and methods: A retrospective study of ureteric injuries occurring during hysterectomies, reported to NPE and the Norwegian Patient Registry from 2009 through 2019.

Results: During the study period, 53 096 hysterectomies were registered in The Norwegian Patient Registry, of which ureteric injury was documented in 643 (1.2%). More ureteric injuries were registered in large hospital trusts than in small trusts (1.3% vs. 0.7%, $p < 0.05$). NPE received 69 claims due to ureteric injury occurring during hysterectomy, comprising 11% of all injuries in the study period. Compensation was approved for 15%. Women who claimed compensation were younger (48.1 ± 8.9 years vs. 55.1 ± 13.6 years, $p < 0.01$), more likely to have had a benign diagnosis (89.9% vs. 52.1%, $p < 0.01$), and more likely to have had the ureteric injury recognized after discharge (58.0% vs. 33.0%, $p < 0.001$) compared with non-complainants. Identification of the ureters during the hysterectomy was documented in 30% of the NPE patient files. Additional information for the NPE cases included the following. The most common symptoms of unidentified injury were pain (77%), fever (12%), urinary leakage (13%), and anuria (8%). Re-operation was necessary in 77% of the cases, and 10% of the women lost one kidney. Long-term consequences after repair, such as loss of a kidney or persistent pain, were seen in 17%. No women died because of the injury.

Abbreviations: ICD-10, International Classification of Diseases and Related Health Problems 10th revision; NCSP, Nordic Medico-Statistical Committee Classification of Surgical Procedures; NPE, Norwegian System of Patient Injury Compensation (*Norsk pasientskadeerstatning*).

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Conclusions: The incidence of ureteric injury occurring during hysterectomy in Norway was 1.2%; 11% involved a claim for compensation, and 15% of these had their case approved. Most ureteric injuries were not recognized during the hysterectomy. Documentation of peroperative identification of the ureters during hysterectomy was often missing. Vigilance to pain as a postoperative symptom of peroperative unrecognized ureteric injury may result in earlier diagnosis and treatment.

KEYWORDS
claims for compensation, hysterectomy, ureteric injury

1 | INTRODUCTION

Hysterectomy is carried out for benign and malignant indications, and the surgical approach can be laparotomy, laparoscopy, or vaginal. All gynecology departments in Norway perform hysterectomies, but for certain indications, for instance cancer or advanced endometriosis, the procedure can be centralized to specialized units.

The most common complications of hysterectomy are peroperative bleeding, injury of the urinary tract, intestine, or nerves, and postoperative infection or thromboembolism.[1] The risk of ureteric injuries varies by indication for hysterectomy, predisposing risk factors, and peroperative conditions.[2–4] The pelvic anatomy is complex, with close proximity between vessels, nerves, the intestine and urinary tract organs, and the female internal genital organs. The average distance from the ureters to the cervical margin has been measured as 2.3 cm.[5,6] Large uterus, previous pelvic surgery, severe endometriosis, adhesions, massive peroperative blood loss, and long operating time are all conditions that may increase the risk of ureteric injury during hysterectomy.[7,8] Early diagnosis of injury, preferably peroperatively, is the most important prognostic factor in avoiding permanent damage.[9,10]

In Norway, all surgical procedures, including the repair of surgical complications, are reported to the Norwegian Patient Registry, and all claims for compensation after alleged medical failures are evaluated by the Norwegian System of Patient Injury Compensation (NPE). Both the Norwegian Patient Registry and NPE contain valuable information about ureteric injuries occurring during hysterectomy. To improve patient safety, we need to identify and learn from complications of surgery and medical failures.

Our aims were to evaluate ureteric injuries occurring during hysterectomies registered in NPE to predict risk factors, establish time of identification, symptoms, and consequences, and to relate these cases to the same type of injuries registered in the Norwegian Patient Registry.

Key message

The incidence of ureteric injuries occurring during hysterectomy in Norway was 1.2%. The injuries were often not recognized peroperatively. Pain was the commonest symptom of unrecognized ureteric injury.

2 | MATERIAL AND METHODS

This retrospective study of ureteric injuries occurring during hysterectomy is based on registrations reported to the Norwegian Patient Registry, and on claims for compensation to NPE for these injuries. All registrations and claims are from an 11-year period, from 2009 through 2019.

The Norwegian Patient Registry has existed since 2008. To identify hysterectomies during the study period, we used the Nordic Medico-Statistical Committee Classification of Surgical Procedures (NCSP; version 10, Supporting Information Appendix S1). We categorized the hysterectomies by approach (laparotomy, laparoscopy, or vaginal), the occurrence of a ureteric injury (using International Classification of Diseases and Related Health Problems 10th revision (ICD-10) and NCSP, Appendix S1), and when the injury was recognized (peroperatively, after the operation but before discharge, or after discharge). For all women registered with ureteric injuries subsequent to hysterectomies, we registered age and whether the hysterectomy was the result of a malignant or a benign indication. Detailed information about the injuries, symptoms of undiagnosed injuries, and consequences of injuries was not available from the Norwegian Patient Registry. Obstetrical hysterectomies were not included. We consequently used the first registered hysterectomy for the women who were registered with more than one hysterectomy in different time-periods—considered to be reporting failures. We registered the hysterectomy as a laparotomy assumed to be converted from vaginal or laparoscopic surgery, if more than one hysterectomy was registered on the same day. We chose to define a hospital trust as large if more than 1000 hysterectomies were reported at that trust during the 11-year study period.

From NPE, we collected information about all the claims for compensation that had been registered as the result of ureteric injuries occurring during hysterectomy during the study period.

NPE is a nation-based government agency that deals with all patient claims for compensation in Norway. To qualify for compensation certain requirements must be met: the injury must most likely have been caused by a medical failure, the patient must have

sustained a financial loss, and the claim for compensation must be submitted within 3 years after awareness of the harm. There are two exceptions from these basic rules, where compensation can be granted without failure: injury after hospital-acquired infections, or unexpected and severe injuries. Compensation is given in accordance with the "blame-free" principle, where a medical failure can be established without looking for someone who should be blamed. "Medical failure" is defined here as a failure that has been recognized by the medical expert in NPE, and for which the claims have been approved.

The ICD-10 diagnosis codes were used to identify relevant NPE files (Appendix S1). Both approved and denied cases were included because we wanted to study ureteric injuries independent of the compensation outcome. We did not use the complete NPE files, as this would require informed consent from the patient. Our sources of information were the description of the surgical procedure in the medical journal, the medical expert statement, and the summary from the NPE lawyer. Identification and anonymization of files were performed by the NPE staff. The documents were available as electronic or paper files. The information and conclusions in these documents were accepted without evaluation by the authors. A structured review of all cases was performed by the first author and registered in an electronic case report form designed by the authors for this study purpose.

General information was registered for all NPE cases including age of the applicant, year of injury, the medical experts' specialty, and the reason for denial or approval of the claim. We also registered: if the hysterectomy was for a benign or a malignant diagnosis; the approach used for the hysterectomy; whether the hysterectomy was an elective or emergency procedure; and whether the medical experts considered the indication for surgery appropriate. Available information about the ureteric injury was identified, such as left-sided and/or right-sided injury, and whether there was documentation in the patient's file that the ureters had been identified peroperatively by either visualization or palpation. As it is not possible to identify the ureters during vaginal hysterectomy, these procedures were excluded in this specific parameter ($n = 6$). Time of recognition of the ureteric injury was registered as either peroperatively, after operation but before discharge, or after discharge. Type of treatment of the injury and any previous surgery before the hysterectomy were registered when this information was available. Symptoms and signs of undiagnosed ureteric injury were categorized as pain, fever, urinary leakage, anuria, abnormal biochemical tests, and "other" (hematuria, nausea, vaginal bleeding, hypertension). More than one symptom could be registered. Urinary leakage in this setting was the clinical symptom of uretero-vaginal fistula. Serum creatinine and serum C-reactive protein were the biochemical tests most often registered, and abnormal test results were usually not quantified, but just referred to as "a high level". Immediate and long-term consequences of the injury were categorized as reoperation (to treat the injury), loss of a kidney, renal failure, chronic urinary infection, fistula, chronic pain, urinary incontinence, loss of ovary, urostomy, residual urine, or death. Permanent damage was defined as persisting conditions after treatment of the injury. Psychological stress, prolonged hospitalization, and sick leave were not included because documentation was not available in our data.

The cases from NPE were not necessarily the same as the cases from the Norwegian Patient Registry, because some ureteric injuries in the NPE data could have occurred before 2009.

For most cases, we did not have information about patient body mass index, comorbidity, surgical history, surgeons' experience, adhesions, mechanism behind the ureteric injury (cutting, electrocoagulation, or suturing), if the hysterectomy was total or subtotal, or details about the treatment of the injury. Information about the hospital trust in which the injury had occurred was available for the Norwegian Patient Registry data only.

2.1 | Data recording and statistical analyses

Data were recorded and analyzed using IBM SPSS Statistics for Mac, Version 25. (IBM Corp.). Data from the Norwegian Patient Registry was available as encrypted and anonymized SPSS files. Data collection from NPE was performed using an electronic case report form, designed by the authors and technically developed and administered by the Unit of Applied Clinical Research, Institute of Cancer Research and Molecular Medicine, Norwegian University of Science and Technology, Trondheim, Norway. To test group differences in continuous variables we used Student's t test. For dichotomous variables we used chi-squared test. A probability value of $p < 0.05$ was considered statistically significant.

2.2 | Ethical approval

The Regional Committee for Medical and Health Research Ethics (REK) determined the study as not needing an approval (December 10, 2020, 2020/78966/REK midt). The study was approved both by the Norwegian Social Science Data Services (February 14, 2019, 40522/3/KS), and NPE's own in-house ethical committee. A Data Protection Impact Assessment was approved by the Norwegian University of Science and Technology (2018/38113).

3 | RESULTS

From January 2009 through December 2019, 53 096 hysterectomies and 643 (1.2%) ureteric injuries occurring during hysterectomy were registered in the Norwegian Patient Registry.

Out of 60 hospital trusts, 17 reported more than 1000 hysterectomies during the study period and were consequently categorized as "large". There were more ureteric injuries in large compared with smaller hospital trusts (1.3% vs. 0.7%, $p < 0.05$). There were fewer injuries in the vaginal hysterectomy group compared with laparoscopy and laparotomy (0.4% vs. 1.0% and 1.9%, $p < 0.0001$) (Table 1).

During the same period, 69 women claimed for compensation to NPE because of ureteric injury that had occurred during hysterectomy; this corresponds to 11% of all injuries during the study period.

Hysterectomy approach and number of injuries from both the Norwegian Patient Registry and NPE cases are shown in Tables 1 and 2, respectively.

The women who claimed compensation were younger (48.1 ± 8.9 years vs. 55.1 ± 13.6 years, $p < 0.01$) and more likely to have a benign diagnosis (89.9% vs. 52.1%, $p < 0.01$) than women who did not claim compensation.

Ureteric injuries recognized after discharge were more often found in women who claimed for compensation than for women who did not claim for compensation (Table 3).

TABLE 1 Hysterectomies (*N* = 53 096[a]), hysterectomy approach, ureteric injuries after hysterectomy (*N* = 643), and time of recognition of ureteric injury registered in The Norwegian Patient Registry (2009–2019)

	Hysterectomies, *n* (%)	Ureteric injuries, *n* (%)	Risk of ureteric injury, %	Peroperative recognition, *n* (%)	Recognition before discharge,[b] *n* (%)	Recognition after discharge, *n* (%)
Total *N* (%)	53 096 (100)	643 (100)	1.2	62 (9.6)	369 (57.4)	212 (33.0)
Laparotomy *n* (%)	20 784 (39.2)	386 (60.0)	1.9	49 (12.7)	230 (59.6)	107 (27.7)
Laparoscopy *n* (%)	21 506 (40.5)	215 (33.4)	1.0	11 (5.1)	115 (53.5)	89 (41.4)
Vaginal *n* (%)	10 953 (20.6)	42 (6.5)	0.4	2 (4.8)	24 (57.1)	16 (38.1)

[a]147 (0.3%) hysterectomies were registered with more than one hysterectomy code, probably as the result of combined operations and/or operations converted to laparotomy. These hysterectomies were included as only one procedure.

[b]Recognition *after* operation but *before* discharge.

TABLE 2 Age of women, indication for hysterectomy, year of injury, type of medical expert, and hysterectomy approach in hysterectomies with ureteric injury reported to NPE[a] (2009–2019) (*N* = 69)

	Total *N* (%) 69	Approved compensation *n* (%) 10 (14.5)	Denied compensation *n* (%) 59 (85.5)
Year of injury		NA	NA
Before 2010	24 (34.8)		
2010–2014	25 (36.2)		
2015–2019	20 (29.0)		
Age (years), mean ± SD	48.1 ± 8.9		
<30	1 (1.5)	0 (0.0)	1 (1.5)
31–40	11 (15.9)	2 (2.9)	9 (13.0)
41–50	38 (55.1)	6 (8.7)	32 (46.4)
51–60	12 (17.4)	1 (1.5)	11 (15.9)
>61	7 (10.2)	1 (1.5)	6 (8.7)
Preoperative diagnosis			
Benign	62 (89.9)	9 (13.0)	53 (76.8)
Malignant	7 (10.2)	1 (1.5)	6 (8.7)
Medical experts evaluating the case[b]			
Gynecologist	63 (91.3)	7 (10.2)	56 (81.2)
Urologist	9 (13.0)	3 (4.4)	6 (8.7)
General surgeon	1 (1.5)	0 (0.0)	1 (1.5)
Other	4 (5.8)	0 (0.0)	4 (5.8)
Hysterectomy approach			
Laparotomy	34 (49.3)	7 (10.1)	27 (39.1)
Laparoscopy	29 (42.0)	3 (4.3)	26 (37.7)
Vaginal	6 (8.7)	0 (0.0)	6 (8.7)

[a]NPE, the Norwegian System of Patient Injury Compensation.

[b]In some cases more than one specialist evaluated the case.

Further results regarding treatment and treatment failures were dependent on information available from the claim cases from NPE. Compensation was approved for 15%, out of which 13% were considered as "treatment failures", and 2% as "unexpected and severe injury". The reason for all denials, according to the medical experts, was that "no treatment failure had occurred". Gynecologists were the medical experts in 91% of the cases, and urologists were also involved in 13% of the cases (Table 2). All claims were due to elective procedures. The medical experts concluded that all hysterectomies had appropriate indication for surgery and adequate surgical technique. Peroperative identification of the ureters was not documented in the medical files in 60% of the cases (Table 4). Reoperations with re-anastomosis or reimplantation of the ureter were performed in 77%, and 6% were treated with a stent. In 3%, the injury was not considered treatable. Previous abdominal operations were registered for 44%, of which 9% had more than one previous operation. For women with unrecognized injuries, increased postoperative pain was documented in 77%. Other symptoms and signs were fever (12%), urinary leakage (13%), anuria (8%), and abnormal biochemical test results (5%) (Table 5). The two most common and serious consequences of injuries were reoperation (77%) and loss of a kidney (10%). Information about the cases resulting in loss of a kidney is reproduced in Table 6. Permanent damage after repair of the ureteric injury was seen in 17%. No women died as a result of the ureteric injury (Table 5).

TABLE 3 Time of recognition of ureteric injuries occurring during hysterectomy in the Norwegian Patient Registry compared with NPE[a] cases

	Ureteric injuries, *N*	Recognized peroperatively, *n* (%)	Recognized after operation but before discharge, *n* (%)	Recognized after discharge, *n* (%)
NPR	643	62 (9.6%)	369 (57.4%)	212 (33.0%)
NPE	69	8 (11.8%)	20 (29.3%)	40 (58.8%)
		No difference ($p = 0.06$)	More injuries recognized for the NPR cases ($p < 0.01$)	More injuries recognized for the NPE cases ($p < 0.01$)

[a]NPE, The Norwegian System of Patient Injury Compensation.

TABLE 4 Information about the ureteric injury after hysterectomy reported to NPE[a] (2009–2019) (*N* = 69)

	Total *N* (%) 69	Approved compensation *n* (%) 10 (14.5)	Denied compensation *n* (%) 59 (85.5%)
Side of injury			
Left side	31 (46.3)	4 (6.0)	27 (40.3)
Right side	30 (44.8)	4 (6.0)	26 (38.8)
Both sides	6 (9.0)	2 (3.0)	4 (6.0)
No information	2 (2.9)	0 (0.0)	2 (2.9)
Ureter identified peroperatively[b] (*N* = 63[c])			
Ureter not identified	38 (60.3)	8 (12.7)	30 (47.6)
Ureter identified	19 (30.2)	2 (3.2)	17 (27.0)
Identified due the injury[d]	4 (6.3)	0 (0.0)	4 (6.3)
No information	2 (3.2)	0 (0.0)	2 (3.2)
Time of recognition of the ureteric injury			
Peroperatively	8 (11.8)	0 (0.0)	8 (11.8)
After operation but before discharge	20 (29.3)	4 (5.9)	16 (23.6)
After discharge	40 (58.8)	6 (8.8)	34 (50.0)
No information[e]	1 (1.5)	0 (0.0)	1 (1.5)

[a]NPE, The Norwegian System of Patient Injury Compensation.

[b]Registered if documented in the description of the surgical procedure in the patient file.

[c]Vaginal hysterectomy ($n = 6$) excluded because identification of ureter is not possible.

[d]Identified as the result of hematuria at the end of the surgery.

[e]The operation file was missing.

TABLE 5 Symptoms, signs, and consequences of ureteric injury after hysterectomy reported to NPE[a] (2009–2019) (*N* = 69)

	Total	Approved compensation	Denied compensation
	N (%)	*n* (%)	*n* (%)
Symptoms and signs of unrecognized ureteric injury[b,c] (*N* = 60)			
Pain	46 (76.7)	9 (15.0)	37 (61.7)
Fever	7 (11.7)	3 (5.0)	4 (6.7)
Urinary leakage	8 (13.3)	1 (1.7)	7 (11.7)
Anuria	5 (8.3)	2 (3.3)	3 (5.0)
Abnormal biochemistry tests	3 (5.0)	2 (3.3)	1 (1.7)
Other[d]	10 (16.7)	1 (1.7)	9 (15.0)
No symptoms[e]	3 (3.3)	1 (1.7)	2 (3.3)
Consequences of ureteric injury[c]			
Reoperation	53 (76.8)	9 (13.0)	44 (63.8)
Loss of a kidney	7 (10.1)	3 (4.3)	4 (5.8)
Renal failure	1 (1.4)	0 (0.0)	1 (1.4)
Chronic urinary infections	2 (2.9)	1 (1.4)	1 (1.4)
Fistula	4 (5.8)	1 (1.4)	3 (4.3)
Chronic pain	3 (4.3)	1(1.4)	2 (2.9)
Urinary incontinence	1 (1.4)	1 (1.4)	0 (0.0)
Death	0 (0.0)	0 (0.0)	0 (0.0)
Other[f]	5 (7.2)	4 (5.8)	1 (1.4)
Permanent damage after repair of injury[g]			
No	55 (79.7)	6 (8.7)	49 (71.0)
Yes	12 (17.4)	4 (5.8)	8 (11.6)
No information	2 (2.9)	0 (0.0)	2 (2.9)

[a]NPE, The Norwegian System of Patient Injury Compensation.

[b]Cases were not included if the ureteric injury was recognized peroperatively.

[c]More than one possible.

[d]Hematuria, nausea, vaginal bleeding, hypertension.

[e]The injury discovered years later by coincident.

[f]Loss of ovary during reoperation, urostomy, residual urine.

[g]Loss of a kidney, pain, pyelostomy, loss of one ovary.

4 | DISCUSSION

The most important findings were that ureteric injuries occurring during hysterectomy were reported in 1.2% of all hysterectomies, 11% of these involved a claim for compensation to NPE, most injuries were not recognized during the hysterectomy, and peroperative identification of the ureters was often not documented. Pain was the dominant symptom of undiagnosed ureteric injuries.

A strength of the study was that data from the Norwegian Patient Registry are retrieved from a national registry. To our knowledge, no previous study has assessed the coverage rate of reporting hysterectomy and ureteric injuries in the Norwegian Patient Registry, but we assume that the reporting coverage is high because of the activity-based financing system of hospitals in Norway.[11] However, the purpose of the Norwegian Patient Registry is financial reimbursement to treatment facilities; it is not designed to register data about treatment and complications to be used for quality assessment. The data registered in NPE are also not intended for use in assessing and improving health care.

Another limitation of the study is the uncertainty of the external validity of the NPE data. We have little information about women who did not claim compensation after ureteric injury. Also, we did not have access to the complete NPE files and might have lost some information. However, we learned from previous studies that the loss of relevant information was negligible when only anonymized parts of files are used.[12]

Our findings are in line with previous studies that report ureteric injury rate after hysterectomy to be 0.3%–1.8%.[2–4,13]

Significantly fewer ureteric injuries occurred during vaginal hysterectomy. This is in line with previous publications.[2,14] One possible explanation might be that vaginal hysterectomy is chosen in less complicated cases. Comparing surgical approaches and ureteric injuries in a retrospective study like ours must be performed with care, as the indication for surgery and the complexity of the procedure are unknown.

TABLE 6 Patient cases where ureteric injury during hysterectomy caused loss of a kidney (*N* = 7)

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7
Approved claim	Yes	Yes	Yes	No	No	No	No
Year of hysterectomy	2007	2011	2009	2009	2009	2014	2018
Year of complaint	2009	2013	2015	2012	2016	2017	2019
Injury discovered after	3 months	1 year	5 years	3 years	7 years	2 years	5 months
Age (years)	43	67	45	52	39	65	53
Indication for hysterectomy	Benign	Malignant	Benign	Benign	Benign	Benign	Benign
Hysterectomy approach	Laparotomy	Laparotomy	Laparotomy	Laparotomy	Laparotomy	Laparoscopy	Laparotomy
Main symptoms	Pain	Pain and infection	None	None	None	Pain	Pain, infection hypertension
Peroperative identification of the ureters	No	Yes	No	No	No	No	Yes

The low number of complaints might be because most injuries were repaired without permanent damage. We can, however, not exclude the possibility that the low complaint rate may be due to patients' lack of knowledge about patient rights, or their hesitancy to complain. There were fewer complaints from women with a cancer diagnosis, possibly because there is more acceptance of complications when going through cancer surgery. Women with gynecological cancer are generally older than women who have a hysterectomy for benign conditions. This might contribute to an explanation of why women who claim for compensation are younger than women who do not claim for compensation.

In the NPE cases, peroperative identification of the ureters was often not documented in the description of the surgery. This information was not available for the data from the Norwegian Patient Registry. The fact that most injuries were not recognized peroperatively in either the NPE cases or the Norwegian Patient Registry indicates that the ureters were not routinely identified. Late recognition of ureteric injuries is also reported by others.[2,9] The use of diathermy may cause postoperative shrinkage of the tissue surrounding the ureter and result in late onset of occlusion. This might explain some of the cases of late diagnosis.

The debate concerning possible measures to avoid ureteric injuries is ongoing. Routine dissection of the ureters is not recommended because of the increased risk of bleeding, ureter avascularization, and ureteric injuries.[15] Insertion of ureteric stents before hysterectomy or routine cystoscopy during surgery is not cost-effective.[10,16–18] A uterus manipulator is used in laparoscopic surgery by many, but the effect of such devices to reduce ureteric injuries is debated.[19] It is reasonable to recommend peroperative identification of the ureters during all hysterectomies, because the procedure is easy, quickly performed, and free of cost. However, the effect of identification of the ureters to reduce ureteric injury during hysterectomy is yet to be documented.

Increased morbidity and mortality are found in hysterectomies performed by surgeons who perform very few procedures, and fewer complications occur during hysterectomies performed by surgeons with many procedures and in high-volume centers.[20–22] In our study, we found more ureteric injuries in the large hospital trusts. This was not surprising, as the more advanced procedures are performed in large hospital trusts. However, we do not know if the injuries actually occurred because of the advanced surgery. The reason might also be the small differences between large and small trusts. Other factors, such as number of doctors in a training setting, might have an impact. Ureteric injuries are surgical complications no matter if they are a medical failure or not. Surgical education is a continuous process throughout a career, and we can probably assume that "practice makes perfect". This assumption might encourage surgeons to perfect one hysterectomy approach, when possible, instead of aiming to master for example both the vaginal and laparoscopic approaches. Also, validated, standardized training programs are becoming more common, on-line surgical videos and simulation can improve surgical skills.[23–27] Supplementary education of young doctors, in addition to hand-to-hand teaching

from experienced doctors, might be valuable especially in small hospitals with few hysterectomies.

Early diagnosis of ureteric injury is considered the single most important prognostic factor for full recovery. This underlines the importance of knowledge about symptoms and signs of ureteric injury.[10,15,28] Pain as the dominant symptom of undiagnosed ureteric injury is also reported by others.[10,15,28] It is difficult to distinguish normal postoperative pain from pain due to complications. Persistent or increasing pain, and pain combined with other signs and symptoms, such as fever, anuria or urinary leakage, should cause further investigations. The medical experts considered it as a breach in standard of care if the ureteric injury was not diagnosed in the presence of the postoperative symptoms mentioned above.

In our study, the medical experts considered iatrogenic ureteric injury to be an "accepted risk of surgery". This is a contributing reason for the low number of approved claims. The discussion of which surgical complications are approved or not, is complex. Sometimes injuries are expected because of advanced surgery. Other studies have also concluded that ureteric injury may not be negligence.[15,29] This again underlines the importance of providing patients with proper preoperative information. In the case of ureteric injuries in non-gynecological surgery, urologists are the medical experts in most claims for compensation. According to NPE, 50% of these cases are approved, compared with 10% approval in our study where the medical experts were mostly gynecologists. It appears that experts reach different conclusions depending on their medical background.

Loss of a kidney was seen in 10%. Only one of these had her claim for compensation accepted because of an "unexpected and severe injury". The reason for acceptance in this particular case is not clear. The fact that medical experts disagree if ureteric injuries are medical failures and the NPE lawyers disagree when the exception rules are to be used, calls for further discussion.

5 | CONCLUSION

Ureteric injury occurring during hysterectomy is a rare but serious, iatrogenic injury, often not recognized during surgery. We recommend identifying the ureters during hysterectomy and to be vigilant of ureteric injury when pain is the dominant postoperative symptom. Information about the risk of surgery should be given to all women before hysterectomy.

AUTHOR CONTRIBUTIONS

MR was the main contributor of all parts of the work of this manuscript. MHM, IRKB, ML, EV participated in supervising the first author and writing the manuscript.

CONFLICT OF INTEREST

IRKB is a medical adviser in NPE. ML is a medical expert in NPE. MHM has previously been a medical expert in the Norwegian System of Patient Injury Compensation.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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