The British Society of Interventional Radiology

UK Uterine Artery Embolisation for Fibroids Registry

2003 - 2008.

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Preface

Occasionally we have new interventions that create excitement in, and outside, the world of IR and that change the way that a condition is managed. One such therapy is uterine artery embolisation. That therapy needed effectiveness demonstrated through randomised controlled trials and that has now been achieved. However, randomised controlled trials have limitations. They are by their nature an average of outcomes in a limited number of units over a defined period of time. What about the results in the UK? What about the results in a single unit in the UK? How do the outcomes change over time? How do the outcomes change for a particular population? Can we define either high risk or high success groups? For these reasons we need a national registry and the organisers of the BSIR UK Uterine Artery Embolisation for Fibroids Registry have to be hugely congratulated in producing this report.

The effect of fibroids on a patient's life and the difficult decisions to be made regarding open surgery are very eloquently described by Ginette Camps-Walsh. Her brave decision to be part of the early evolution of this innovative therapy is vindicated by this report. The outcomes are good with little in the way of serious morbidity. Like all good registries more questions will be asked and hopefully more research generated.

I am concerned that a fifth of patient had had no follow-up returned. Undoubtedly this relates to the poor clinical and support structure available for many Interventional Radiologists. We are all aware that many hospitals do not recognise the therapies available, and the good work performed, by Interventional Radiologists. We also know that some gynaecologists are reluctant to refer patients for treatment outside their own domain. This registry will go some way to help address those problems.

Professor PA Gaines.
President of the BSIR 2007-9

Foreword

Following Lord Darzi's Next Stage Review we have entered the era of QIPP (quality, innovation, productivity and prevention). At the time of writing there is no telling how long we will be in this halcyon environment and we may soon enter the age of QIFF (Quality If Found Funding). Wherever we find ourselves in the coming years Uterine Artery Embolisation for symptomatic fibroids ticks all of these boxes. This registry adds to the ever more compelling pool of evidence demonstrating this. UAE treats patients successfully and minimally invasively at lower cost than the most commonly used alternative with similar quality of life outcomes. It is a sobering fact that in the 3 years it took to recruit this UK wide registry of 1,515 patients, NHS statistics suggest that in England alone approximately 24,000 women underwent hysterectomy for fibroids. There is clearly much to do if the QIPP agenda is to be realized.

Tony Nicholson- Warden, Royal College of Radiologists

A Patient's Point of view

Fibroids are exceedingly common and women may be more likely to have them than not. Some women have no symptoms, but many of us are not so lucky and our fibroids adversely affect our whole lives and need to be treated. If drug treatments fail, until recently, women only had one option – hysterectomy. We had to choose which was worse, the symptoms or the treatment. Many of us found hysterectomy unacceptable for many reasons. In the main the thought of such an invasive operation that takes away our fertility, and some feel femininity as well, causes early menopause with long recovery times and many more serious side effects made us look at alternatives for fibroid treatment. It is a particularly difficult choice for women wishing to become pregnant, because the only treatment available apart from hysterectomy was myomectomy, only offered in a few hospitals. Our research revealed an alternative – uterine artery/fibroid embolisation. This is much less invasive, maintained our fertility and we could be back at work and resuming normal life in a couple of weeks. It is a relatively new treatment (started in the 1990s in France) and we took the risk that the long-term effects were not really known. Also being so new we were almost pioneers with little knowledge from our GPs and therefore no backup from them or gynaecologists; the backup was provided by the interventional radiologists who treated us. Most of us also had to battle with GPs and gynaecologists to get embolisation and not hysterectomy, but we were very determined. We were so delighted with the results of our treatment that we set up FEmISA (Fibroid Embolisation: Information, Support & Advice), a patient group of volunteers, to help other women have access to this much less invasive treatment.

We support the Fibroid Registry and the excellent work being carried out. Women need to know more about embolisation, so they can make informed choices. Their GPs and gynaecologists also need to be better informed, so they can properly support women in the treatment that best suits them. In particular the effect on fertility for those wishing to have a family needs further research and also the effects on the age of menopause and in the long-term. The analyses from the registry will help us to answer some of these questions, which are so important to so many women.

From Ginette Camps- Walsh, Founder Member of the patient support group, FEmISA.

EXECUTIVE SUMMARY

The main reasons for running this registry, with the support of National Institute for Health and Clinical Excellence (NICE), were to establish the safety and efficacy of the relatively new procedure of UAE as routinely practiced in the UK The highlights of this report are outlined here.

Safety

- 2% of patients suffered a pre discharge adverse event but in only 1% of patients did this result in delayed discharge.
- 94% of patients were discharged within 48 hours.
- There were no deaths within 30 days.
- 14% of patients reported a post discharge adverse event, the majority occurring within the first 12 months.
- One death was recorded 17 months post UAE from a uterine sarcoma. The small risk of sarcoma is well recognised, and all uterine conserving treatments are at risk of this.
- Only 2.7% of patients were known to have a subsequent hysterectomy.
- 70% of patients received prophylactic antibiotics; there were significantly more infective complications post discharge for patients who did not receive antibiotic prophylaxis.

Effectiveness

- 84% of patients reported improvement in their symptoms at 6 months post UAE, with this improvement being maintained at 83% at 12 months.
- UAE was equally effective in terms of reported symptom outcomes when performed for bleeding or for pressure symptoms.
- Increased patient age, and smaller uterine volumes were associated with better symptom outcomes.
- Large fibroid size (> 10 cm maximum diameter) was not associated with worse outcomes.

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Other information

- All UK centres (NHS, and Private) performing Uterine Artery Embolisation were invited to submit patients.
- 59 Centres recorded 1387 procedures between 2003 and 2006.
- The number of cases by centre ranged from 1 to 148, with a mean number per centre of 24.
- The technical success rate was 91%.
- Most cases were performed with a standard catheter system (4 or 5 Fr) with a microcatheter being used in only 16%.
- Some follow up was available for 78% of patients, but only 48% of patients were followed up to 12 months.
- Future registries will require better local support, with development of interventional radiology clinics, if follow up rates are to improve.

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SECTION 1 - Background

Introduction

Embolisation of the uterine arteries to treat uterine fibroids was first described in 1995.[1] After the original description the procedure was widely taken up, particularly in France, UK and USA. However, there was initially a paucity of information about the outcomes.

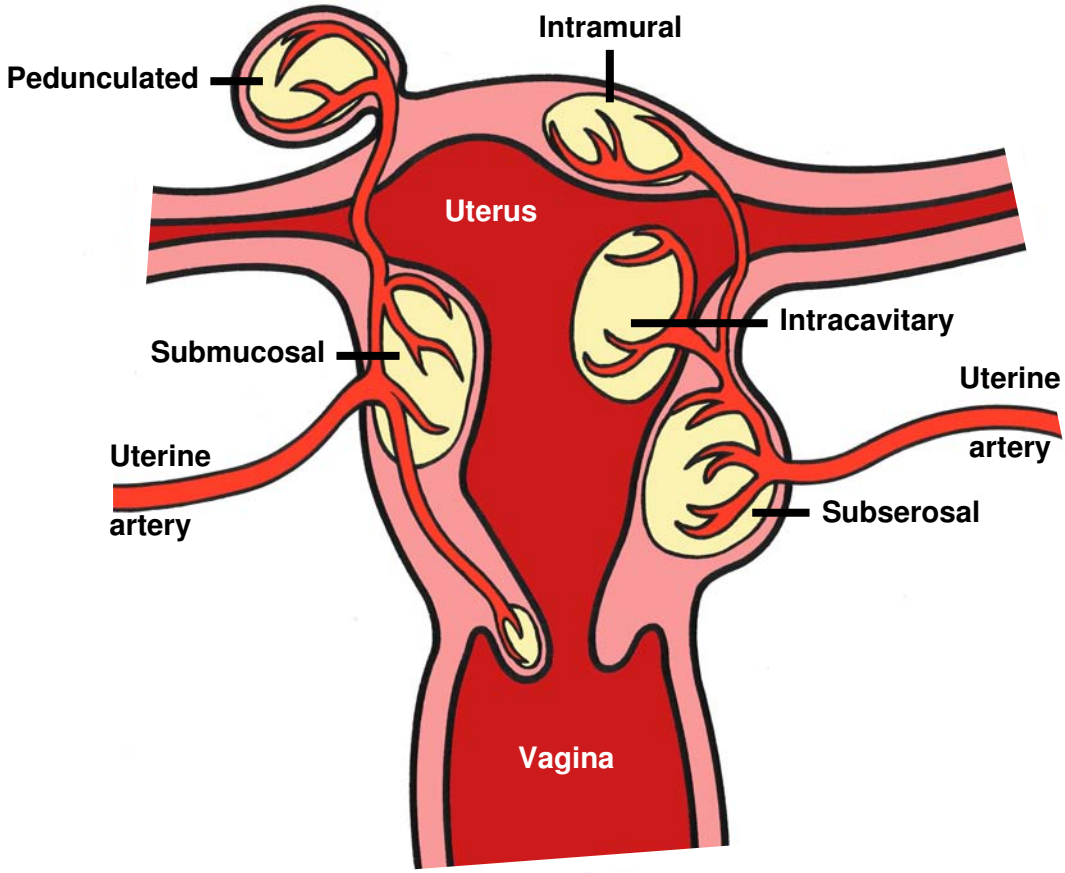
In 2003, the British Society of Interventional Radiology (BSIR) launched a registry to collect data on the then new procedure of Uterine Artery Embolisation (UAE), also known as Uterine Fibroid Embolisation (UFE), in the UK. The initial paper based version was supported by industry; subsequently this was converted into an electronic format supported by the National Institute for Health and Clinical Excellence (NICE).

The aim was to collect data on the efficacy and safety of UAE as undertaken in the UK. This registry was one of the first supported by NICE as a responsible way of monitoring innovation, gathering knowledge and ultimately informing the review of NICE guidance. The NICE Interventional Procedures Guidance on the use of UAE issued in 2004[2] recommended that all procedures should be audited, and entered on to the registry.

By December 2006 over 1500 patient procedures had been registered. The registry was closed to new entries, to allow analysis of the follow up data on the patients already registered. Although much more information about outcomes after UAE is now available, including the results from registries run in Europe and the USA,[3,4] and of several randomised trials[5-8] the information collected by this registry does provide information about the current practice, and outcomes of UAE in the UK.

Uterine Fibroids

Figure 1 Schematic diagram showing position of uterine fibroids



Uterine fibroids are the most common benign tumour of the uterus, present in around 25% of women by the age of 30 years. Fibroids can be single or multiple, and can grow to over 20cm in size. They can be situated anywhere within the muscle wall of the uterus from just under the serosa, the outermost layer (subserosal), to adjacent to the endometrium lining the cavity of the uterus (submucosal). Fibroids can be superficial, or can spread through the full thickness of the wall (transmural). They can also rarely be found in the cervix and broad ligament.

For many years surgical treatment, most commonly by hysterectomy, was the main treatment for fibroids. Whilst hysterectomy remains the definitive treatment for fibroids, it is an operation with significant morbidity and mortality. Over the last 5 – 15 years a number of less invasive treatments have been developed. These include UAE, focussed ultrasound ablation, direct laser treatment and most recently transvaginal clipping of the uterine arteries. Uterine artery embolisation is at the forefront of these new technologies and has been assessed by both registries, randomised trials and a Cochrane review.[3-8] Further trials are either on-going or in the developmental stages.

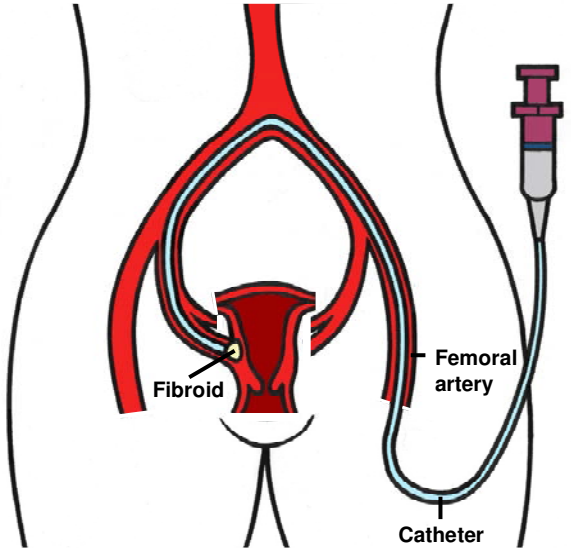
Uterine Artery Embolisation procedure

UAE is performed by introducing a fine catheter via the femoral artery at the groin through a small nick in the skin. X-ray fluoroscopy is used to manipulate the catheter into each uterine artery in turn. Then small particulate material is injected to occlude both uterine arteries. This has the effect of closing off the blood supply to the fibroids producing necrosis (cell death). The procedure itself is not painful and is performed

under conscious sedation and local anaesthesia. Once complete however some pain is inevitable and usually patients are kept in hospital for one overnight stay to allow adequate pain management.

Compared to some of the other treatments which have been developed, UAE treats the whole uterus, and can be used to treat almost all types of fibroids.

Figure 2 Schematic representation of uterine artery embolisation



Uterine artery embolisation is performed by Interventional Radiologists, doctors specially trained to perform image guided, minimally invasive treatments. Because this is only one of several possible treatments for fibroids, Interventional Radiologists work as part of a multidisciplinary team with Gynaecologists, to ensure patients receive all relevant advice and information regarding the various treatment options and hence the most appropriate treatment for their symptoms. All patients undergoing UAE should be assessed by both a gynaecologist, and an interventional radiologist.

Contributing Centres

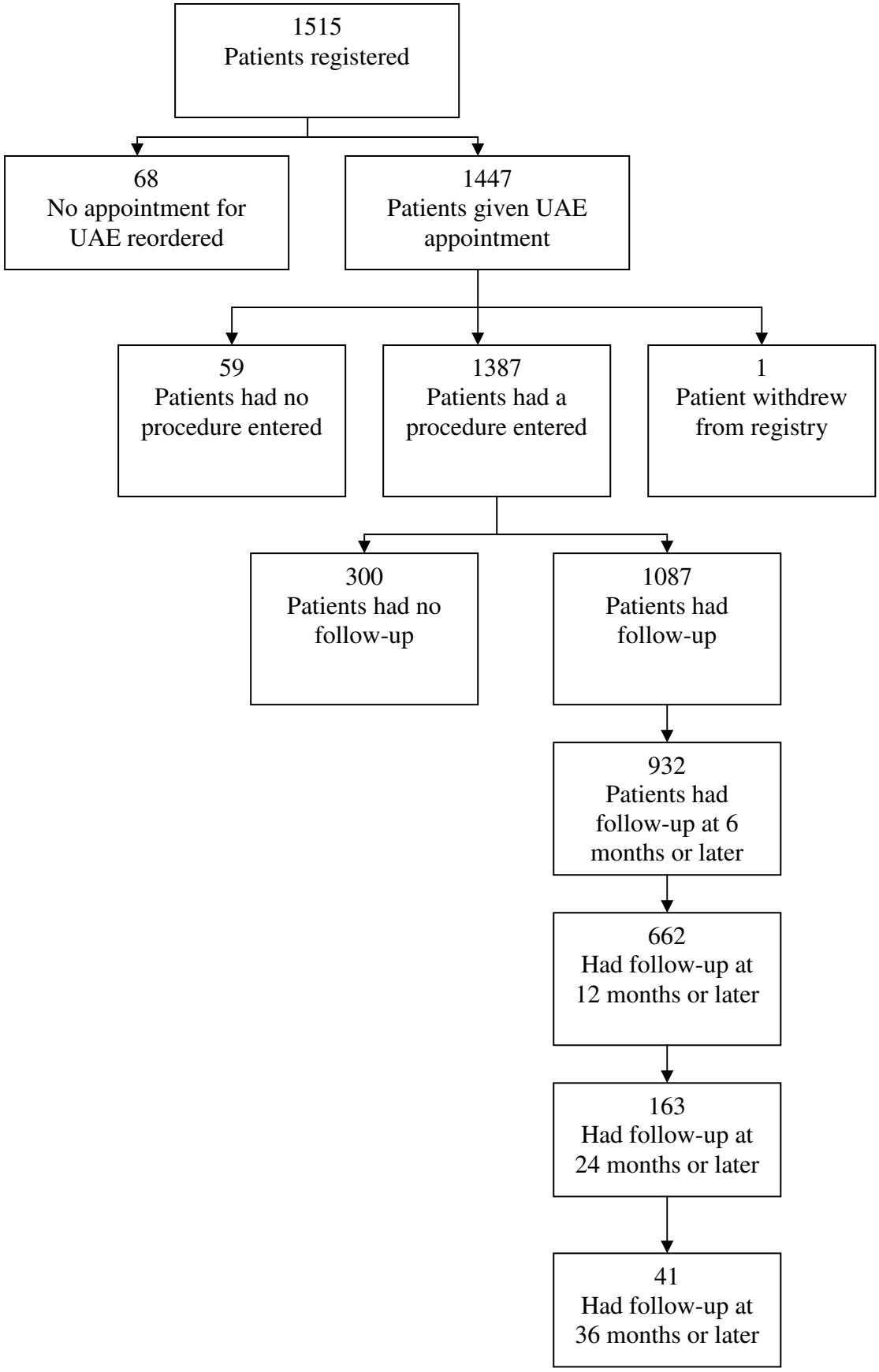
All centres performing UAE in the UK were invited to contribute data.
65 centres registered an interest in the registry. Cases were submitted by 67 Radiologists, working in 59 centres. The numbers of cases per centre ranged from 1-148, with the mean number entered per centre being 24.

Table 1 Contributing centres

Centre	Intervention radiologists	Patients			
		registered	embolised	followed-up	% followed up
Aberdeen Royal Infirmary	Thorpe, AP	42	36	29	80.6
Alexandra Hospital, Cheadle	Tuck, JS	1	1	1	100
Arrowe Park Hospital, Wirral	Klenka, R	1	1	1	100
Ayr Hospital	Ablett, MJ	4	4	2	50.0
Birmingham Heartlands Hospital	Crowe, PM	140	117	100	85.5
BMI London Independent Hospital	Matson, M	1	0	0	N/A
BMI Priory Hospital, Birmingham	Crowe, PM	53	52	29	55.8
BMI Ross Hall Hospital, Glasgow	Moss, JG	6	6	6	100
Bristol Royal Infirmary	Bishop, NL	21	20	13	65.0
BUPA Hospital, Portsmouth	Hacking, CN	1	1	1	100
Calderdale Royal Hospital, Halifax	Montgomery, HD	52	51	51	100
Eastbourne Distrtict General Hospital	Anderson, HJ	12	12	0	0
Edinburgh Royal Infirmary	Gillespie, I	17	16	9	56.3
	Ingram, SM				
Falkirk Royal Infirmary	Beveridge, E	12	10	10	100
Frimley Park Hospital, Portsmouth	Massouh, H	2	2	1	50.0
Gartnavel General Hospital	Edwards, RD	60	57	57	100
	Moss, JG				
	Robertson, I				
Hairmyres Hospital, Glasgow	Lau, F	1	1	0	0
Hammersmith Hospital	Graham, A	57	57	20	35.1
	Tait, NP				
Hull Royal Infirmary	Scott, PM	3	3	1	33.3
Ipswich Hospital	Whitear, WP	11	11	11	100
James Cook University Hospital	Leen, G	7	6	6	100
John Radcliffe Hospital, Oxford	Phillips-Hughes, J	3	3	3	100
Luton and Dunstable Hospital	Warren, MJ	14	14	10	71.4
Manchester Royal Infirmary	Chalmers, N	61	61	55	90.2
	Farquhars, F				
	Murphy, GJ				
New Cross Hospital	Dyer, JD	8	7	4	57.1
Ninewells Hospital, Dundee	Houston, JG	11	11	7	63.6
Norfolk and Norwich University Hospital	Cockburn, JF	29	24	23	95.8
	Girling, SD				
North Tees and Hartlepool Hospital	Latimer, J	3	3	0	0
Pinderfields Hospital, Wakefield	Turner, P	2	2	2	100
Queen Alexandra Hospital. Portsmouth	Atchley, J	2	2	2	100
Queen Elizabeth Hospital, Birmingham	McCafferty, IJ	13	8	2	25.0
Queen's Medical Centre, Nottingham	Whitaker, SC	16	15	8	53.3
Royal Bolton Hospital	Lay, JP	10	9	9	100
	Tuck, JS				

Centre	Intervention radiologists	Patients			
		registered	embolised	followed-up	% followed up
Royal Bournemouth Hospital	Shepherd, D	3	2	0	0
Royal Cornwall Hospital, Truro	Hancock, JH	24	23	23	100
	Travis, SJ				
Royal Devon and Exeter Hospital	Kinsella, DL	33	27	25	92.6
	Watkinson, A				
Royal Free Hospital, Hampstead	Davies, N	34	33	0	0
Royal Hampshire County Hospital, Winchester	Page, AC	32	32	21	65.6
Royal Liverpool University Hospital	McWilliam, RG	1	0	0	N/A
Royal London Hospital	Matson, M	2	2	0	0
Royal Preston Hospital	Lay, JP	2	2	0	0
Royal Surrey County Hospital, Guildford	Walker, W	6	6	0	0
Royal Victoria Hospital, Belfast	Ellis, PK	12	12	11	91.7
Royal Victoria Infirmary, Newcastle	Richardson, DL	27	24	22	91.7
Sheffield Vascular Institute	Cleveland, TJ	18	18	8	44.4
	Thomas, SM				
Southampton University Hospital	Atchley, J	148	135	125	92.6
	Hacking, CN				
Southern General Hospital, Glasgow	Urquhart, GD	21	19	19	100
St Anthony's Hospital, Cheam	Belli, A-M	2	2	2	100
St George's Hospital, Tooting	Belli, A-M	102	101	74	73.3
St Helier University Hospital, Carsholton	North, EA	57	56	37	66.1
St James's Hospital, Leeds	Nicholson, AA	130	103	97	94.2
	Shaw, DS				
St Richard's Hospital, Chichester	Burns, BJ	5	5	5	100
University Hospital of Wales, Cardiff	Wood, AM	47	41	38	92.7
	Young, CM				
University Hospital Aintree	O'Grady, EA	40	40	40	100
Victoria Infirmary, Glasgow	Downie, AC	1	1	1	100
Wexham Park Hospital, Slough	Charig, MJ	3	3	0	0
William Harvey Hospital, Ashford	Lashkari, K	7	6	1	16.7
Wythenshawe Hospital, Manchester	Tuck, JS	52	45	40	88.9
York Hospital	Bowker, AMB	30	26	25	96.2
	Total	**1,515**	**1,387**	**1,087**	**78.4**

Figure 3 Flow chart of patient enrolment and follow up



Of the 1515 patients entered onto the registry, after being assessed as suitable for UAE 1,447 were subsequently recorded as having been given an appointment for the procedure.

Of the 1,447 patients given an appointment, 1 patient declined to take any further part in the registry, and 59 other had no details of the procedure or any follow up recorded. This leaves a total of 1,387 patients who had an embolisation procedure recorded. All analyses of the registry data have therefore been performed on the data from these 1,387 patients only. Two centres initially registered patients but did not record any embolisation procedures.

There are a number of possible reasons for patients being registered but not having subsequent data entered:

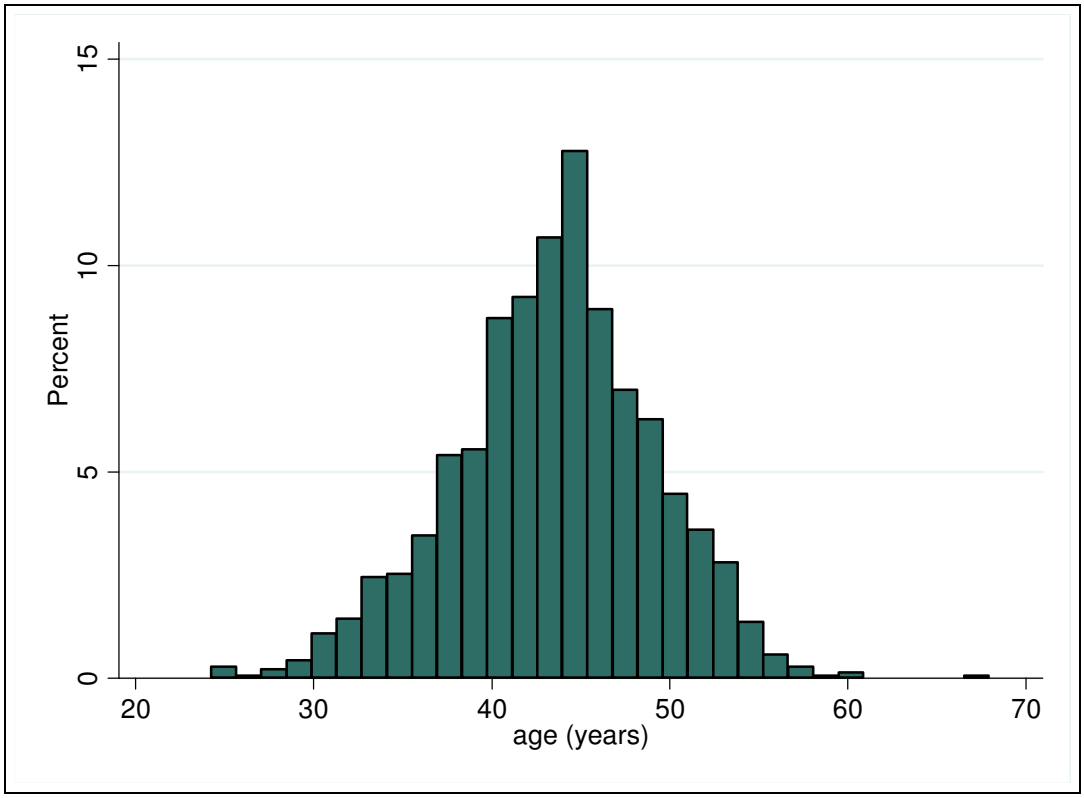
- The registry was designed so that radiologists were encouraged to register suitable patients at their initial assessment in clinic.
- Not all patients who might be considered suitable would proceed to UAE and may, after a period of reflection, select an alternative treatment.
- It is also possible that data was not entered on patients who were embolised.

SECTION 2- Patient Demographics

Age

Patient age was recorded for 1386 of patients.

Graph 1 Age of patient at time of initial UAE



The mean patient age was 43.5 years (range 37-49). There were 342 patients aged <40 years and only 14 aged <30 years

Ethnicity

Ethnicity was recorded for 1209 (87%) of patients.

Table 2 Ethnicity of patients

Group	Frequency	Percent
White	786	65.01
Black - Caribbean	251	20.76
Black - African	75	6.2
Black - other	16	1.32
Indian	37	3.06
Pakistani	10	0.83
Bangladeshi	1	0.08
Chinese	14	1.16
Other	19	1.57
Total	1,209	100
Not recorded	178	

The majority of patients were White (65%), with Black Caribbean and African patients comprising around 28%.

Desire for future pregnancy

The registry was not designed to measure fertility outcomes and many questions remain unanswered regarding the effect of UAE on both ovarian and uterine function. However a simple question was asked about any desire for a future pregnancy. 1288 (92%) answered this question (table 3) with 19.6% wishing to maintain their fertility.

At the time of launching the registry, patients who desired future fertility were generally advised not to undergo UAE and were excluded; so information about subsequent pregnancies was not considered relevant. However, as UAE became more established pregnancy data has emerged in the literature.[9] Therefore in December 2006 the follow up forms were modified to include questions about subsequent pregnancy.

Table 3 Desire for future pregnancy

Desire for future pregnancy	Frequency	Percent
Yes	252	19.6
No	787	61.1
Unsure	249	19.3
Total patients	1,288	100
Not recorded	99	

Symptoms

UAE is indicated for the treatment of symptomatic fibroids. Symptoms fall broadly into 2 main groups: bleeding problems (e.g. menorrhagia, dysmenorrhoea) and pressure/pain symptoms (e.g. urinary frequency, pelvic or back pain). Many patients have a combination of both. At the time of the launch of the registry, and indeed currently, UAE is not recommended as the first line treatment for patients with fibroid related infertility.

Table 4 Patient Symptoms pre UAE

Symptom type	Frequency*	Percent
bleeding	1,084	82.2
pelvic pain	626	47.5
back pain/pressure	706	53.5
including urinary system	*122*	9.2
fertility	19	1.4
other	89	6.7
Total patients	1,319	100
Patients with unknown symptom profile	68	
Total symptoms recorded	2,524	

* individual frequencies – these may add to more than total patients

The commonest symptom group was menorrhagia (82%). Pelvic pain was reported in 48% of patients; pressure symptoms, including urinary symptoms, in 54%.
The majority of patients reported symptoms in more than one category, with only 35% of patients reporting a single symptom group.
68 patients had no symptom profile recorded and only 1.4% were treated for fertility related issues.

Previous gynaecological intervention

UAE may be recommended for women who have undergone previous gynaecologic interventions which might increase their risk from a further surgical intervention. However, the registry shows that very few patients had had a previous significant gynaecological procedure. The most frequent was myomectomy 122 (8.8%). Eleven (0.8%) had undergone a previous UAE procedure. Many of the other interventions were either diagnostic (e.g. hysteroscopy) or related to pregnancy (caesarean section). Current evidence suggests that many of the less invasive procedures e.g. endometrial ablation and Mirena IUCD commonly used for abnormal bleeding in the non-fibroid uterus are much less successful when large fibroids are present.[10]

Table 5 Previous Gynaecological interventions

Intervention type	Frequency*	Percent
myomectomy	122	8.8
laparoscopy	89	6.4
caesarean section	74	5.3
ovary/fallopian tube proc	58	4.2
endometrial ablation	37	2.7
hysteroscopy	32	2.3
dilation and curettage	28	2.0
embolisation	11	0.8
pregnancy termination	15	1.1
laparotomy	8	0.6
mirena coil(s) insertion	8	0.6
invitro fertilisation	6	0.4
sterilisation	6	0.4
other	23	1.7
Total patients	1,385	100
Not recorded	2	

* individual frequencies – these may add to more than number of patients

Imaging and evaluation of fibroids pre- UAE

Imaging prior to UAE was recorded in 1385 of the patients entered on the registry.

Table 6 Imaging & Investigation prior to UAE

Imaging type	Frequency*	Percent
magnetic resonance imaging	974	70.3
abdominal ultrasound	529	38.2
trans-vaginal ultrasound	296	21.4
hysteroscopy	35	2.5
other	5	0.4
none	47	3.4
Total number of patients	1,385	100
Patients with no recorded type	2	

* individual frequencies – these may add to more than number of patients

Confirmation of the diagnosis of fibroids requires some form of imaging prior to UAE for accurate diagnosis and the exclusion of other pathologies. In addition some fibroids are thought less suitable for UAE, e.g. subserosal and submucosal lesions on a narrow pedicle are best managed surgically. MRI was the commonest imaging modality used (70%). MRI offers the best anatomical information, and is also capable of assessing fibroid vascularity and detecting other pathologies such as adenomyosis. There is evidence in the literature that MRI can alter the management in up to 20% of patients.[11] The major disadvantages of MRI are cost and limited availability (although this has been largely resolved with the introduction of national waiting time targets).
It is also well recognised that none of these imaging modalities reliably pick up the presence of malignancy within a presumed fibroid (leiomyosarcoma).

Number of fibroids

The number of fibroids present on initial imaging was recorded for 1272 (92%) of the patients.

Table 7 Numbers of fibroids on baseline imaging

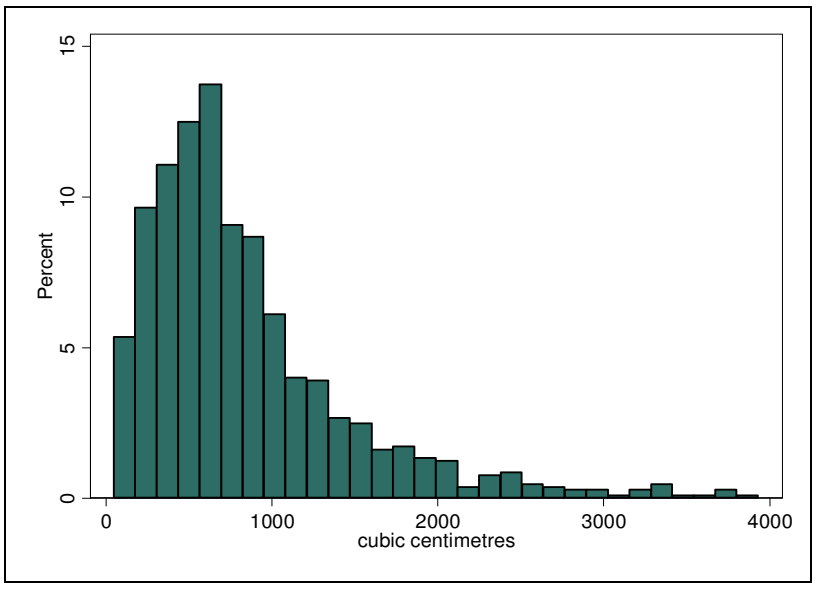
No. of fibroids	Frequency	Percent
1	363	28.5
2	117	9.2
3	87	6.8
4+	705	55.4
Total	1,272	100
Not recorded	115	

Only 28.5% of patients had a single fibroid and over 50% had 4 or more fibroids. The number of fibroids is irrelevant to UAE as the whole uterus is treated irrespective to the site, size and number of fibroids but large numbers of fibroids may make other uterine conserving treatments (such as myomectomy) more difficult.

Uterine volume

This was calculated using the ellipsoid formula (a x b x c / 0.50) where a, b and c represent the three lengths of the ellipsoid shaped uterus. Although not perfect for every uterus it is accepted as the most useful measurement of total fibroid burden and together with dominant fibroid length is now the accepted convention worldwide.

Graph 2 Uterine volume on baseline imaging



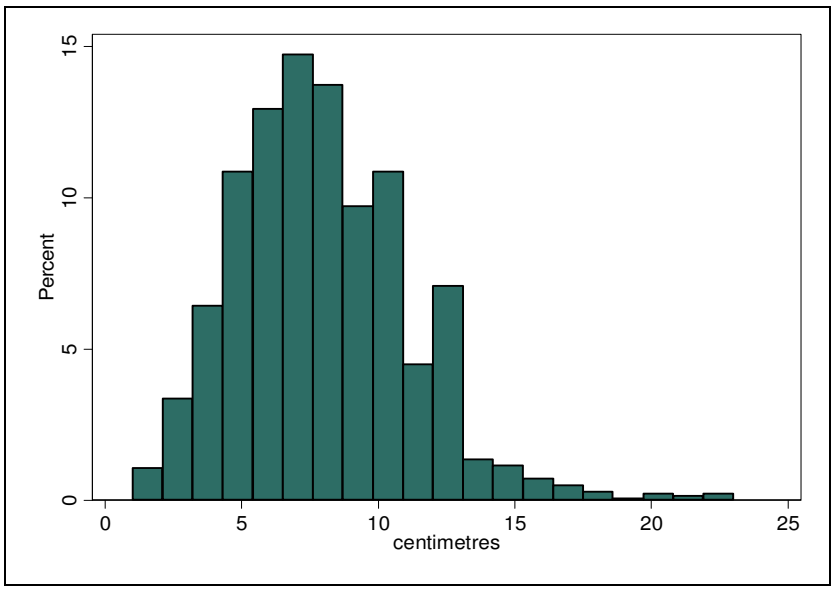
This shows the range of uterine volumes for the 996 patients in whom it was available.

Fibroid Length

Only the maximum length of the dominant fibroid is reported here.
1305 patients had at least one fibroid dimension recorded. The mean length was 7.9cm (range 1 – 23cm).

Whilst there is some controversy about the effectiveness of UAE in women with very large fibroids (>10cm) 12.9% of patients in this registry did have one or more fibroids greater than 10cm in length.

Graph 3 Longest baseline fibroid dimension



A small number of patients (n=6) had a fibroid measuring >20 cm in length.

SECTION 3– Procedural Details
Of the initial 1515 patients only 1387 patients had a procedure form submitted.

Antibiotic prophylaxis

There is considerable variation in practice relating to prophylactic antibiotic use with no consensus. However just over 70% of patients did receive at least one antibiotic and 31% received two agents in the per-procedural period. The percentages receiving 1 or 2 agents were roughly similar. The commonest antibiotics used were the cephalosporins, with or without metronidazole.

Table 8 Number of Antibiotic prophylaxis agents used

Number of agents	Frequency	Percent
1	375	28.4
2	405	30.8
3	198	15.0
none	340	25.8
Total patients	1,318	100
Not recorded	69	
Total patients embolised	1,387	

Arteries embolised

The main blood supply to the uterus, and the fibroids, is from the right and left uterine arteries and both need to be embolised. This is usually done at the same procedure but can be performed as two separate procedures either electively to avoid hospital admission, to reduce radiation in patients with large BMI or because of adverse anatomy preventing successful catheterisation at the first sitting. However the ovarian arteries can be a significant source of blood supply to the fibroid uterus. Whilst these can be embolised it is not routine practice due to concerns regarding damage to ovarian reserve and function. It may be undertaken when there has been clinical failure, after previous embolisation of both uterine arteries

For the purposes of this report any procedures undertaken within 3 months of the initial procedure have been considered to be part of the initial treatment. Technical success is defined as both uterine arteries embolised within 3 months of initial procedure.

Procedure forms gave details about the arteries embolised for 1365 patients. Both uterine arteries were embolised in 1252 patients at first attendance. 12 patients had a further embolisation procedure within 3 months. In addition 4 patients had one ovarian artery embolised, and in 1 patient both ovarian arteries were embolised.

22 procedure forms were returned with no record of any artery being embolised. The procedure forms had been designed without a space to allow operators to state when no artery had been embolised, nor to explain the reasons for failure to embolise. The 22 procedure forms with a blank entry for the artery(ies) embolised have been assumed to be technical failures, with no embolisation being performed.

A total of 1264 patients are recorded as having both uterine arteries embolised within 3 months. This gives a technical success rate of 91%.

Femoral access

UAE is almost always performed via the common femoral artery. Both uterine arteries are then selected using pre-shaped catheters and fluoroscopic guidance. When one femoral artery is accessed it is usually the right femoral artery that is used. Some operators choose to access both femoral arteries. This can make selection of the uterine arteries easier but does require a second arterial puncture. If two operators are present then bilateral femoral access can reduce the overall time of the embolisation and therefore the radiation dose to the patient (particularly to the ovaries), as both uterine arteries can be embolised simultaneously.[12]

Two thirds of patients had the procedure performed via a single femoral artery puncture.

Table 9 Femoral access

Laterality	Frequency	Percent
unilateral	923	67.3
bilateral	449	32.7
Total recorded	1,372	100
Not recorded	15	
Total patients embolised	1,387	

Catheter size

The most frequent catheter used was a 4F diameter (50%) followed by 5F (34%). In 16% of cases, a microcatheter was used. Microcatheters being smaller (2F-3F) cause less spasm in the uterine artery and may permit a more effective “free flow” embolisation. However, they do add to the cost and complexity of the procedure.

Embolic agent used

Table 10 Embolic agent used

Agent combinations	Frequency	Percent
particles only	1,185	85.4
gelfoam only	130	9.4
particles & gelfoam	43	3.1
particles & coils	13	0.9
other only	10	0.7
coils only	2	0.1
gelfoam & coils	1	0.1
particles & other	1	0.1
All	1	0.1
Total patients embolised	1,387	100
Not recorded	13	
Total combinations recorded	1,374	

There are a number of different embolic agents available. Most embolisations were undertaken using particulate agents (PVA, spheres, or Gelfoam). Three patients had coils placed.

In most cases (96%) only 1 embolic agent was used

Radiation dose

The technique of uterine fibroid embolisation involves positioning of the catheter for embolisation using x-ray guidance. Much of the technique is performed solely using fluoroscopy, though limited formal angiograms are taken, particularly if the anatomy is difficult.

The area of the pelvis irradiated is kept as small as possible, but the ovaries will receive direct irradiation during the procedure. The condition being treated is a benign condition in pre-menopausal patients and the radiation dose for each procedure should be kept as low as possible. A number of factors can influence the dose given: the age and type of equipment; the pulse rate of fluoroscopy; the patient body habitus; the field of view; and the screening time used. Some factors cannot be altered, but minimising the length of screening and the number of angiographic runs along with reducing the field of view are important steps in minimising radiation dose to the patient. However, the time taken to achieve a satisfactory end point to embolisation is highly variable .

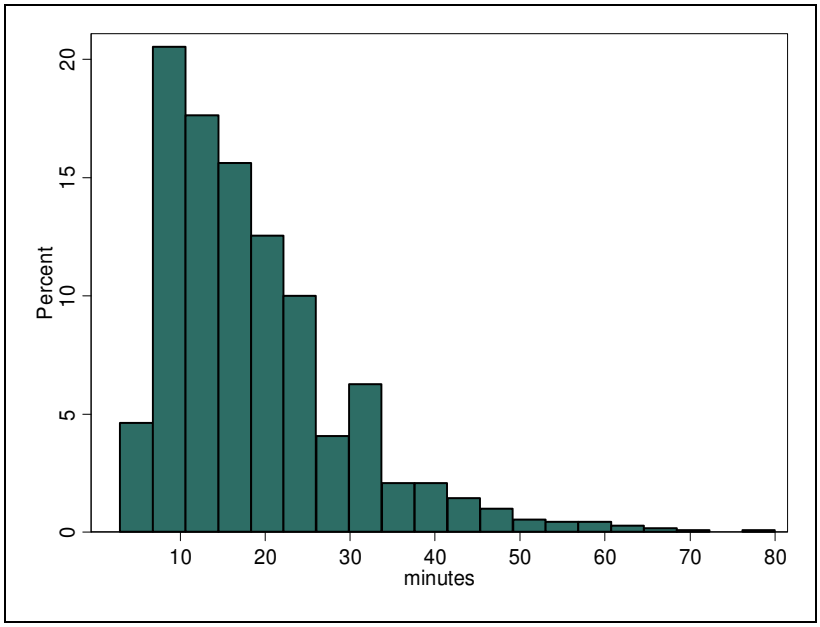
The registry data show that the majority of procedures have screening times below 30 minutes, with a median time of 16 minutes. Screening times of over 60 minutes were unusual.

Table 11 Fluoroscopy time characteristics

Time	N	Mean		Median	Min	Max
minutes	1,101	18.8		16	2.9	80

The length of fluoroscopy (screening time) was entered onto the registry for 1101 procedures.

Graph 4 Distribution of fluoroscopy times (minutes)



The registry also requested that the radiation dose received by the patient be entered. Recording of this dose is a legal requirement. The forms allowed data to be entered in two possible forms (Centigrays by centimetre squared, or milliSieverts), as these were the two main methods of recording dose. However, they are not comparable. In addition the doses are known to vary with the age of the equipment, with new machines delivering smaller doses. Attempts to analyse the recorded dose showed that there was confusion about the units of measurement used in many cases, and as the dose will also depend on equipment factors outside the radiologists' control, no meaningful data could be extracted.

Pain control

Table 12 Methods of Pain control

Type of pain control	Frequency*	Percent
patient-controlled analgesia narcotics	1,215	87.6
non-steroidal anti-inflammatory drugs	1,132	81.6
non- patient-controlled analgesia narcotics	644	46.4
sedation	522	37.6
epidural injection	3	0.2
spinal injection	2	0.1
None recorded	25	1.8
Total patients	1,387	100

* individual frequencies – these may add to more than number of patients

The UAE procedure itself is not painful, and is usually performed under conscious sedation. However, on completion of the embolisation moderate to severe pain is to be expected and requires careful management. The pain is due to ischaemia. It is part of post embolisation syndrome; it is a recognised consequence of embolisation and devascularisation of any organ which gradually abates over the following week. Most units have a locally agreed pain protocol which is essential.

Possible strategies involve pre-medication and/or post medication with non steroidal anti-inflammatory agents (NSAIs) plus/minus paracetamol to reduce the effect of the embolisation, narcotic pain killers for acute pain either as intravenous boluses titrated against patient's response, or via patient controlled analgesia pumps (PCAs), and oral painkillers such as codeine.

We found the most commonly used strategies were PCAs (88%) and NSAIs (82%), with most patients using more than one method of pain control.

SECTION 4- Post Procedure

Length of stay

The length of the in-patient stay post procedure was recorded for 93% of patients. Almost all patients require at least one overnight stay for pain control.

Table 13 Length of hospital stay

Length of Stay (nights)	Frequency	Percent
0	50	3.9
1	848	65.4
2	322	24.8
3 - 7	67	5.2
8+	9	0.7
Total recorded	1,296	100
Not recorded	91	

The majority (65%) of patients had one overnight stay with only 5.9% needing more than 2 nights stay. 4% had UAE performed as an out patient procedure.

The recovery period after UAE is significantly less than following surgery. Reduction in length of stay from the 5-7 days expected post hysterectomy to 1-2 days post UAE has the potential to bring significant cost savings to the NHS, as well as being preferable to the majority of patients.

Adverse Events prior to discharge.

1214 (87%) of the 1387 patients embolised had no adverse events prior to discharge. In a further 143 patients (10%) the adverse events field was not completed.

41 (3%) patients, had an adverse event recorded but in 11 of these no adverse event form had been completed. This is either because an adverse event did occur, but was not recorded, or because the wrong box was marked when the patients' procedure data was entered on to the registry.

Data on adverse events prior to discharge is therefore available for 30 of the 1387 patients embolised (2%).

Table 14 Adverse events prior to discharge

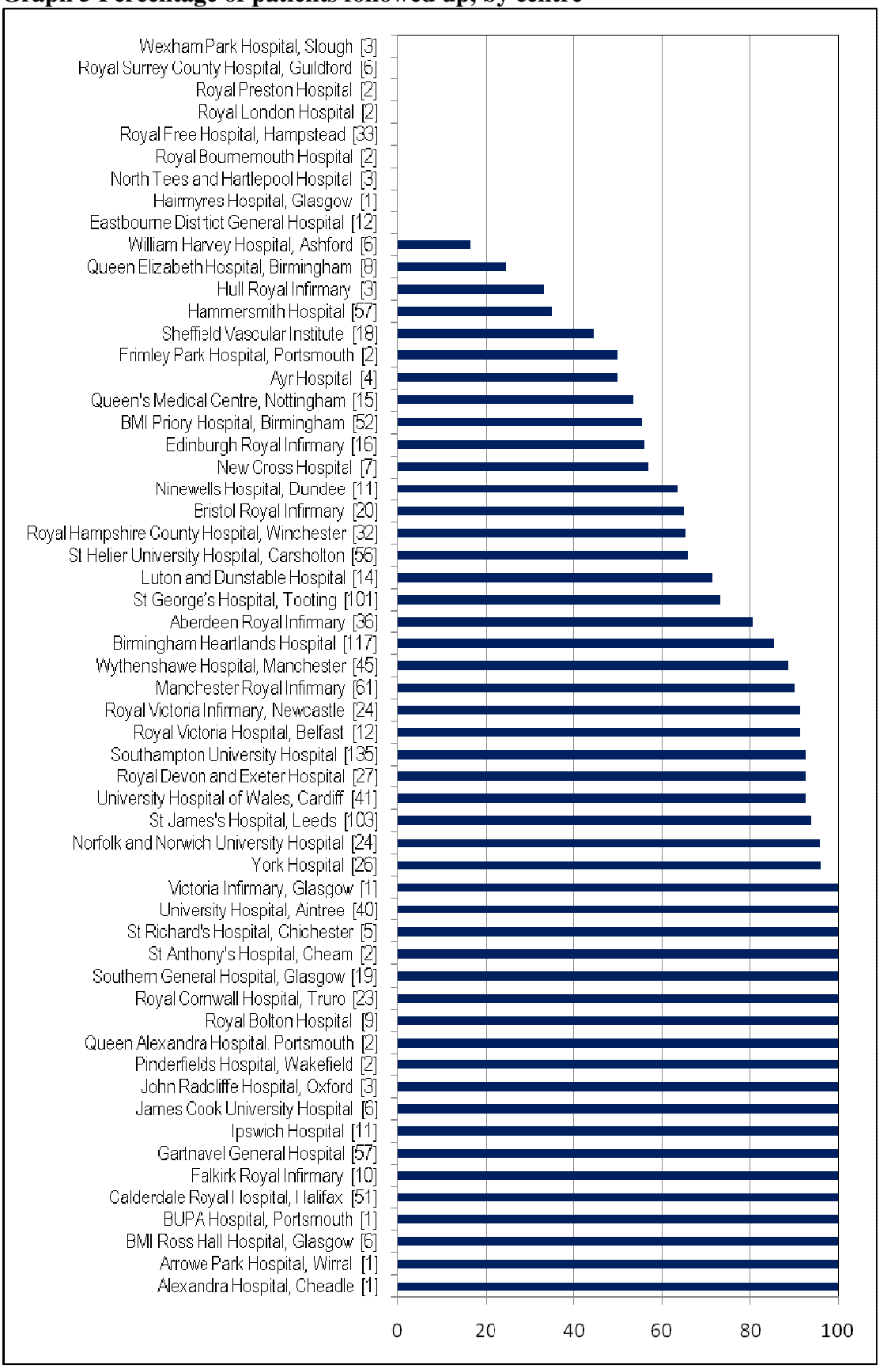
Procedural problems		**11**
Embolisation not performed	2	
Embolisation incomplete	1	
Femoral Artery occlusion	1	
Artery dissection/perforation	2	
Groin bleeding/pseudo aneurysm	2	
Contrast reaction	2	
Catheter kinked – snared to release	1	
Urinary tract problems		**3**
Retention	2	
Urinary tract infection	1	
Pain		**7**
Pain control	5	
Persistent pain in leg/ femoral nerve irritation	2	
Other		**10**
Post procedure hypertension	2	
Post embolisation syndrome	2	
Post procedure rash	2	
Prolonged vaginal discharge	3	
Respiratory arrest	1	

There were a total of 31 adverse events prior to discharge, 1 patient experiencing 2 adverse events. One patient suffered a temporary respiratory arrest, related to the use of a fentanyl patient controlled analgesia pump (PCA).

In 15 (50%) patients, the adverse event resulted in a delay in hospital discharge. The increased length of stay was up to 5 days.

Follow up

Graph 5 Percentage of patients followed up, by centre



Some form of follow up is mandatory following UAE. Local practice varies with the radiologist or gynaecologist taking on this responsibility. The follow up schedule advocated by the registry was: 1, 6 and 12 months, and annually thereafter to 3 years.

When the decision to close the registry to new patients at the end of December 2006 was taken, 1387 procedures had been registered but 50% of patients had no follow up. The registry remained open for 12 month follow-up for a further 20 months. By the time the registry was closed in 2008, 1087(78%) of 1387 patients had some follow up recorded. Graph 6 shows the attrition rate for follow up data and this fell from 67% at 6 months to only 3.8% at 3 years.

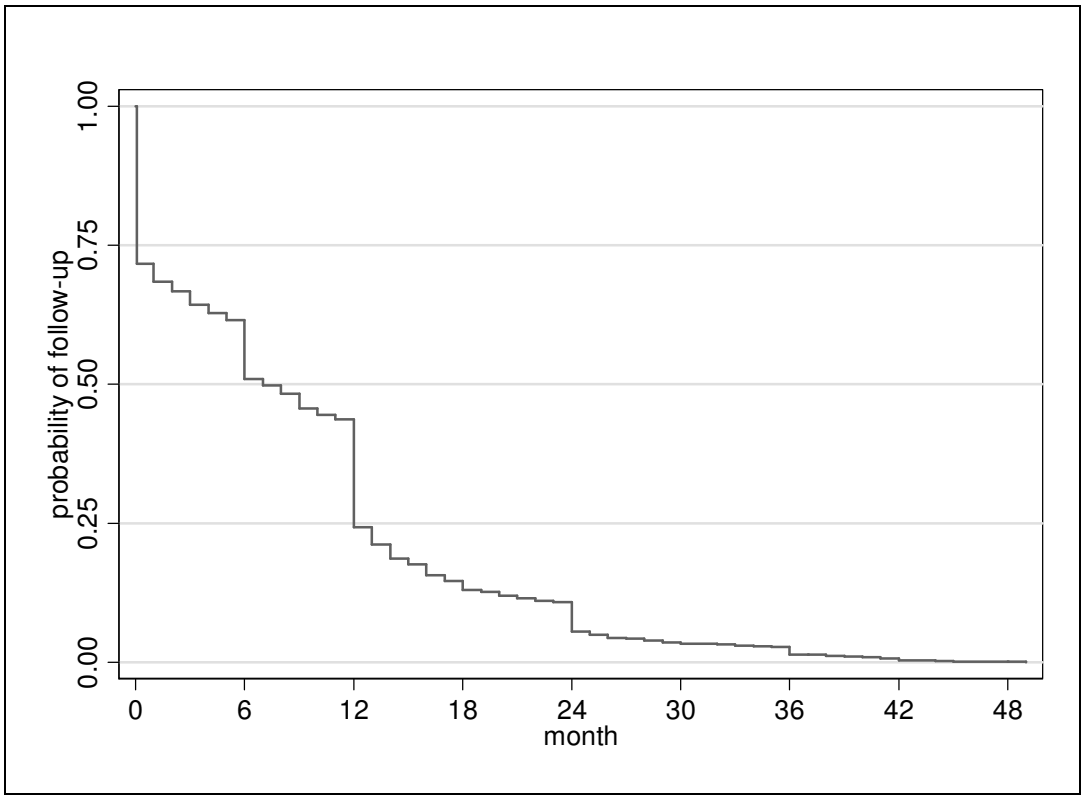
19 centres achieved follow up on all patients entered.

9 centres had no follow up registered. In one centre, patients were followed up, but the data was not returned – only Quality of Life (QoL) forms were returned.

Table 15 Percentage of patients followed up, by time after UAE

Time point (months)	Frequency	Percent
1	1,087	78.4
6	932	67.2
12	662	47.7
18	221	15.9
24	163	11.8
30	54	3.9
36	41	3.0
No Follow Up recorded	300	
Total patients embolised	1,387	

Graph 6 Kaplan Meier plot to show maximum length of follow up



SECTION 5- Outcomes

Symptom Score

At each follow up visit the clinicians were asked to summarise the patients reported change in their symptoms compared either to pre-embolisation, or to the last follow up. A simple 5 point linear score was used as below.

The five points available were: Much Worse, Worse, Unchanged, Better, Much Better

An overall alteration in reported symptoms has therefore been calculated to give a value that compares symptoms at follow up, to that pre-embolisation.

84% of patients reported an improvement in symptoms at 6 months which was maintained at 12 months (83%) and 24 months (83%) although the numbers available for analysis fell dramatically with time. 3.8% of patients reported worsening of symptoms post procedure.

At 12 months 82.3% of patients with bleeding symptoms, 82.1% of patients with pelvic pain, and 83.2% of patients with pressure symptoms were improved. There was therefore no significant difference in the outcomes from embolisation whether it was performed for pressure or bleeding symptoms.

Analysis was undertaken of symptom outcomes, by size of largest fibroid (for a largest fibroid greater or less than 10cm in length) and by ethnicity of the patient (White, African/Afro-Caribbean, or other including Asian). There was no statistically significant change in symptom score by fibroid size or ethnicity.

This analysis was carried out on symptom scores at 6 months, as follow up was available on a larger number of patients at 6 months, and because there was no obvious decline in overall symptom scores between 6 and 12 months.

A further regression analysis was carried out to determine whether the age of the patient, the number of fibroids, the volume of the uterus or the maximum fibroid diameter at baseline were associated with changes in the patients symptom score, at last follow up.

This analysis indicated that age of the patient was the only predictor of outcome after UAE with increasing age ($p < 0.01$) of the patient significantly associated with improved outcomes after UAE.

Imaging outcomes

All but 2 patients had baseline imaging carried out and 919(66 %) had at least one post-embolisation imaging procedure. Of these 58% had MRI, 26% Ultrasound, and 8 (<1%) had other imaging, mainly repeat angiography.

Only changes in uterine volume and length of dominant fibroid are reported here.

a. Overall uterine volume

Table 16 Alteration in Uterine Volume

Decrease in volume	N	Mean	SD	Median	Min	Max
Total	666	40.1	48.3	47.2	-788.9	96.3

The mean reduction in uterine volume was 40.1% (sd48.3), median 47.2. Volume reduction was not dependent on either the size or number of fibroids**.**

b. Length of dominant fibroid

Table 17 Alteration in Fibroid Diameter

Decrease in diameter	N	Mean	SD	Median	Min	Max
Total	847	24.4	52.9	25.2	-23.9	27.9

Mean fibroid length was reduced by 2.2 cm (median 2 cm (range -21.5-11.8cm). This reduction in diameter was greater for fibroids with a baseline length of >10cm (33%) than those <10cm (23%) p<0.001.

Complications after hospital discharge

191 (14%) of patients suffered a total of 198 adverse events (AEs) after being discharged from hospital.

Of these 147 (74%) occurred within the first 12 months of the UAE procedure.

Table 18 Adverse events post hospital discharge: Relationship to UAE procedure

Symptom type	Related to UAE procedure[1]				Total[1]	Percent[2]
	yes	no	unsure	not recorded		
fibroid expulsion	31	0	0	8	39	2.8
persistent vaginal discharge	17	1	3	6	27	1.9
amenorrhoea	2	0	3	2	7	0.5
deep vein thrombosis	1	0	0	0	1	0.1
pulmonary embolus					0	0
death			1		1	0.1
other AEs including	28	7	20	55	110	7.9
bleed	*9*	*0*	*3*	*3*	*15*	1.1
urinary retention	*1*	*1*	*2*	*1*	*5*	0.4
post embolisation syndrome	*2*	*0*	*0*	*1*	*3*	0.2
pressure	*0*	*1*	*0*	*0*	*1*	0.1
infections[3]	27	1	9	2	40	2.9
uterine	*21*	*1*	*6*	*0*	*28*	2.0
non-uterine	*5*	*1*	*4*	*2*	*12*	0.9
Not recorded				17	17	
Total number of AE reports	69	7	29	87	198	14.3

[1] column frequencies may add up to more than total number of reported events (198) as some events can be allocated to multiple categories

[2] of total embolised patients (1,387)

[3] these include follow-up diagnoses of 36 AEs events counted in other rows of this table

The mean length of follow up was 12.7 months. Although not calculated directly in the above table, this means that the percentages given equate roughly to a rate of adverse events per 100 person years.

The overall incidence of post discharge adverse events was 14.3%. Most of these were thought to be related to the UAE procedure, although others, such as urinary retention, did appear to the reporting clinician to be coincidental**.**

The incidence of fibroid expulsion was 2.8% which is lower than that quoted in the literature (up to 8%). Fibroid expulsion may be alarming for the patient, but is usually not clinically significant. On occasions, a necrotic fibroid will require hysteroscopic resection to assist passage. Other patients may slough a fibroid in small pieces. This is often not apparent to the patient. Such patients are only detected at post procedure imaging, and are not included here.

Uterine infections were rare (2%) and usually settled with antibiotic treatment.

For those infections reported after discharge secondary to the procedure or of uncertain cause, the rate was significantly higher for those patients who had not had prophylactic antibiotic treatment (relative risk: 2.38, $p < 0.01$).

There were no reported cases of pulmonary embolic disease and only one DVT.

Serious adverse events

Two patients had serious adverse events. One patient, a 35 year old with a 10cm intramural fundal fibroid required a laparotomy 3.5 months post UAE. At the time of

surgery the fibroid was adherent to bowel. There was diffuse thickening of the mesentery, with part of the fibroid being bile stained suggestive of a walled off bowel perforation. This required resection of a small section of bowel. Subsequently the patient made a good recovery.

The second patient developed a uterine sarcoma 17 months after UAE. The hysterectomy specimen confirmed infarction of the anterior wall fibroids, and a de-novo uterine sarcoma arising from the posterior wall. The patient had node clearance at the time of hysterectomy and subsequent chemotherapy but died 11 months later, 28 months after UAE, aged 33 years.

Secondary procedures

Table 19 Secondary interventions, by type

Intervention	Frequency	Percent*
Repeat/second embolisation	68	5.4
myomectomy	10	0.7
hysterectomy	38	2.7
endometrial ablation	4	0.3
other intervention, including	93	6.7
- *mirena coil insertion*	*6*	*0.4*
Total intervention events	200	14.4
Total patients with intervention	150	10.8

* of total patients embolised (1,387)

Secondary interventions may be necessary following UAE for either technical failures, complications and continuing or persistent symptoms. Normally a decision to re-intervene would not be made until at least 6 months post UAE as it can take this long for the fibroids to involute, and symptoms to settle down. The reasons for continuing or recurrent symptoms are not fully understood but one explanation is incomplete fibroid infarction.

The most frequent re-interventions were hysterectomy, myomectomy or repeat UAE. Clearly repeat UAE is only an option if there is incomplete infarction.

During the follow up period 150 (10.8%) patients underwent a total of 213 procedures after UAE:
68 (5%) had a repeat UAE, 10 (0.7%) a myomectomy and 38 (2.7%) a hysterectomy, 97 (7%) other interventions (including 4 endometrial ablations, and 6 Mirena coil insertions).

The hysterectomy rate of 2.7% is much lower than reported in other studies where a figure of 10-15% is expected at 1 year. It is possible that this is due to the relatively poor follow up rate (48% of patients at 12 months) and patients undergoing hysterectomy without the radiologist being made aware. It has not been possible, in this registry, to separate out emergency and elective hysterectomies.

Pregnancy outcomes

As stated previously, the questions relating to pregnancy were only included in the follow up data sets after December 2006. The registry had initially been intended for patients undergoing UAE who did not wish further pregnancy. For both these reasons the numbers of pregnancies recorded are small. What is not known from this registry is the number of patients who have attempted to become pregnant following their UAE procedure but have failed.

7 pregnancies were recorded in the registry.

Three women have delivered live births and a further 2 had an on-going pregnancy at last follow up. Two women have miscarried. The average age of the patients who subsequently became pregnant was 36 years at the time of registration.

Patient quality of life

One of the most important outcome measures when assessing any treatment for uterine fibroids is quality of life. This registry (like the U.S. FIBROID registry) used the UFS-QOL questionnaire. The UFS-QOL is a disease specific quality of life (QoL) questionnaire developed specifically for fibroids and was published and validated in 2002.[13] It consists of two parts which measure separately a symptom score (8 questions) and a health related quality-of-life score (39 questions). The scores on the two scales range from 0 to 100; higher scores on the health related quality-of-life indicate a better score, while a lower score is better on the symptom scale, indicating fewer symptoms.

Of the 1387 patients who underwent UAE, 948 completed at least one follow up UFS-QOL score for symptoms and 856 a UFS-QOL score for health related QoL.

The following table breaks down the patient totals by centre and completion status. The difference in completion rates between the two scores probably reflected the number of questions involved (symptom score 8, health related QoL score 39).

Table 20 Symptom Score Follow up by Centre

IR Unit	Symptoms QoL score					Non-symptoms-related QoL score				
	complete	incomplete	missing	total*	%	complete	incomplete	missing	total*	%
Aberdeen Royal Infirmary	29	2	5	36	80.6	29	2	5	36	80.6
Alexandra Hospital, Cheadle	1	0	0	1	100	1	0	0	1	100
Arrowe Park Hospital, Wirral	0	0	1	1	0	0	0	1	1	0
Ayr Hospital	4	0	0	4	100	3	0	1	4	75.0
Birmingham Heartlands Hospital	70	2	45	117	59.8	61	2	54	117	52.1
BMI Priory Hospital, Birmingham	37	1	14	52	71.2	33	2	17	52	63.5
BMI Ross Hall Hospital, Glasgow	5	0	1	6	83.3	5	0	1	6	83.3
Bristol Royal Infirmary	16	0	4	20	80.0	16	0	4	20	80.0
BUPA Hospital, Portsmouth	0	0	1	1	0	0	0	1	1	0
Calderdale Royal Hospital, Halifax	49	1	1	51	96.1	44	2	5	51	86.3
Eastbourne Distrtict General Hospital	11	0	1	12	91.7	9	0	3	12	75.0
Edinburgh Royal Infirmary	15	0	1	16	93.8	14	0	2	16	87.5
Falkirk Royal Infirmary	9	0	1	10	90.0	9	0	1	10	90.0
Frimley Park Hospital, Portsmouth	1	0	1	2	50.0	1	0	1	2	50.0
Gartnavel General Hospital	57	0	0	57	100	53	2	2	57	93.0
Hairmyres Hospital, Glasgow	1	0	0	1	100	1	0	0	1	100
Hammersmith Hospital	30	0	27	57	52.6	32	0	25	57	56.1
Hull Royal Infirmary	2	0	1	3	66.7	2	0	1	3	66.7
Ipswich Hospital	11	0	0	11	100	11	0	0	11	100
James Cook University Hospital	6	0	0	6	100	5	0	1	6	83.3
John Radcliffe Hospital, Oxford	1	0	2	3	33.3	0	0	3	3	0.0
Luton and Dunstable Hospital	14	0	0	14	100	13	1	0	14	92.9
Manchester Royal Infirmary	46	1	14	61	75.4	43	5	13	61	70.5
New Cross Hospital	6	0	1	7	85.7	5	1	1	7	71.4
Ninewells Hospital, Dundee	11	0	0	11	100	9	1	1	11	81.8
Norfolk and Norwich University Hospital	23	1	0	24	95.8	24	0	0	24	100
North Tees and Hartlepool Hospital	3	0	0	3	100	1	0	2	3	33.3
Pinderfields Hospital, Wakefield	2	0	0	2	100	1	0	1	2	50.0
Queen Alexandra Hospital. Portsmouth	2	0	0	2	100	2	0	0	2	100
Queen Elizabeth Hospital, Birmingham	8	0	0	8	100	8	0	0	8	100
Queen's Medical Centre, Nottingham	9	0	6	15	60.0	8	0	7	15	53.3
Royal Bolton Hospital	7	0	2	9	77.8	7	0	2	9	77.8
Royal Bournemouth Hospital	2	0	0	2	100	2	0	0	2	100
Royal Cornwall Hospital, Truro	23	0	0	23	100	23	0	0	23	100
Royal Devon and Exeter Hospital	25	0	2	27	92.6	22	2	3	27	81.5
Royal Free Hospital, Hampstead	30	3	0	33	90.9	29	4	0	33	87.9
Royal Hampshire County Hospital, Winchester	29	0	3	32	90.6	10	5	17	32	31.3
Royal London Hospital	2	0	0	2	100	2	0	0	2	100
Royal Preston Hospital	0	0	2	2	0	0	0	2	2	0
Royal Surrey County Hospital, Guildford	0	0	6	6	0	0	0	6	6	0
Royal Victoria Hospital, Belfast	12	0	0	12	100	12	0	0	12	100
Royal Victoria Infirmary, Newcastle	18	0	6	24	75.0	16	0	8	24	66.7
Sheffield Vascular Institute	0	0	18	18	0	0	0	18	18	0
Southampton University Hospital	103	3	29	135	76.3	91	7	37	135	67.4
Southern General Hospital, Glasgow	16	0	3	19	84.2	16	1	2	19	84.2
St Anthony's Hospital, Cheam	2	0	0	2	100	2	0	0	2	100
St George's Hospital, Tooting	54	3	44	101	53.5	49	5	47	101	48.5
St Helier University Hospital, Carsholton	49	0	7	56	87.5	40	5	11	56	71.4
St James's Hospital, Leeds	0	0	103	103	0	0	0	103	103	0
St Richard's Hospital, Chichester	5	0	0	5	100	5	0	0	5	100
University Hospital of Wales, Cardiff	8	0	33	41	19.5	8	0	33	41	19.5
University Hospital, Aintree	21	0	19	40	52.5	20	1	19	40	50.0
Victoria Infirmary, Glasgow	1	0	0	1	100	1	0	0	1	100
Wexham Park Hospital, Slough	2	0	1	3	66.7	2	0	1	3	66.7
William Harvey Hospital, Ashford	0	0	6	6	0	0	0	6	6	0
Wythenshawe Hospital, Manchester	45	0	0	45	100	42	2	1	45	93.3
York Hospital	15	0	11	26	57.7	14	0	12	26	53.8
Total	948	17	422	1,387	68.3	856	50	481	1,387	61.7

* total patients embolised

a. QoL component scores at baseline and final follow-up visit

Table 21 Symptom score

Time-point	n	mean	SD	median	quartile	
					lower	upper
Baseline	953	58.0	20.6	59.4	43.8	71.9
Baseline score of pts included in comparison	449	56,3	19.9	56.3	43.8	68.8
Final score of pts included in comparison	449	23.6	19.5	18.8	9.4	34.4

The mean symptom score improved 32.7 points (56.3 to 23.6) ($p<0.001$) over the 2 year follow up period. The comparison being made between pairs of observations for patients who had a baseline score plus a latest score after 6 months.
For comparison in the much larger US registry the symptom score improved by 40.4 points (58.6 to 18.2) over the same time period.

Table 22 Health related QoL score

Time-point	n	mean	SD	median	quartile	
					lower	upper
Baseline	862	42.7	22.3	41.4	25.9	58.6
Baseline score of pts included in comparison	378	44.1	20.9	43.1	31.0	57.8
Final score of pts included in comparison	378	79.5	23.0	88.8	64.6	98.3

The mean health related QoL score improved 35.4 points (44.1 – 79.5) ($p<0.001$) in comparison to baseline. Again, the comparison was made between pairs of observations for patients who had a baseline observation and the latest after 6 months.

For comparison in the much larger US registry the QoL score improved by 40.4 points (47 to 87.4) over the same follow up period.

There was no evidence in this registry of variation in QoL outcome scores between individual centres and results may therefore be generalisable across U.K. interventional units.

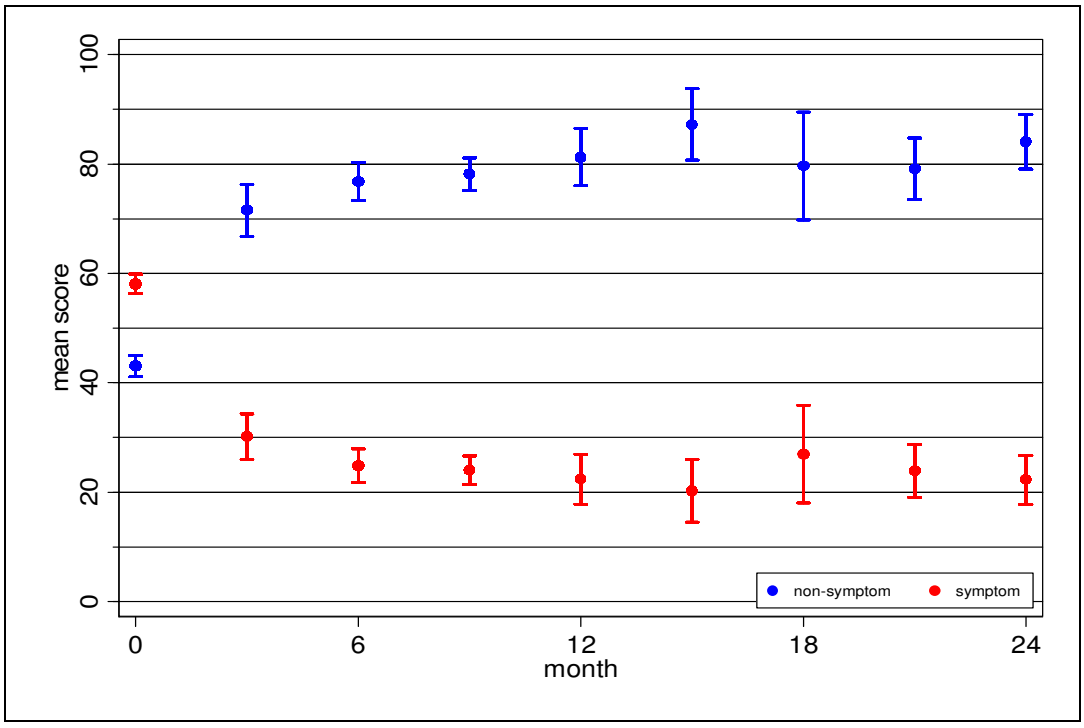
Table 23 UFS-QOL forms available for analysis during follow up

Time point (month)	Symptom scores		Non-symptom scores	
	frequency	percent	frequency	percent
baseline	950	100	856	100
6	467	49.3	428	45.1
12	371	39.1	341	36.0
18	154	16.2	140	14.8
24	114	12.0	102	10.8

Of those patients in whom UFS-QOL data was collected, 49% completed a UFS-QOL symptom score and 45% a UFS-QOL non-symptom score at 6 months follow up. However, this fell to 12% and 10.8% respectively at 24 month follow up.

This probably reflects a lack of infrastructure for patient follow up beyond the normal clinical window (usually 6 months).

Figure 4 Plots showing changes from baseline in the two components of the UFS-QOL over the 24 month follow up period



Means with 95% CI
Red – symptom outcome p <0.001
Blue – QoL outcome P< 0.001

In order to associate baseline characteristics with change in symptoms over time, a multiple linear regression was conducted using the final UFS-QOL symptom score as the dependent variable. Baseline variables included (simultaneously) in the model were age, number of fibroids, volume of uterus, and maximum fibroid diameter. To account for variable final visit times, month of final visit was also included. Baseline UFS-QOL symptom score was also included to account for baseline differences:

This analysis indicated that increasing age ($p<0.001$), and increasing number of fibroids ($p<0.05$) were significant predictors of improvement in UFS-QOL symptom score after UAE.

Discussion

When the BSIR set up this registry in 2003 UAE was classified as a new procedure and in 2004 NICE issued guidance that all cases in the U.K. be entered into this registry. NICE has been awaiting this registry report before issuing an update.

Since then the U.S. registry of over 2000 patients has published 12, and 36 month outcomes.[3,4] In addition four randomised controlled trials comparing UAE with predominantly hysterectomy have also been published.[5-8] The Royal Colleges of Obstetrics and Gynaecology and Radiology have also published an updated document on UAE in 2008.[14] Whilst the procedure is now established as safe and efficacious, this registry remains an important summary of practice in the UK.

The registry was open to all UK centres performing any number of UAE procedures, from tertiary referral teaching hospitals to smaller district general hospitals units. This is in contrast to the U.S. registry which mandated a certain level of activity from participating centres. An observational registry such as this offers a picture of overall practice in the UK, with outcome and complication data that may give patients a more realistic expectation than that from a controlled clinical trial.

The results of this registry confirm that UAE is associated with a length of stay of 24 hours or less for two thirds of patients. This compares very favourably with the length of stay required after myomectomy or hysterectomy, with anticipated cost savings to the NHS and also to the patient who can return to work or normal activities earlier. The fact that general anaesthesia is not required contributes to this and also results in a reduction in associated morbidity, and mortality, as well as freeing up anaesthetic colleagues for other work.

Adverse events prior to discharge were recorded in 2% of patients, with half of these patients requiring a prolonged length of stay as a result. A further 14% of patients had adverse events recorded by the time of last follow up. It is recognised that the complication "window" of UAE is different from more conventional surgical procedures where almost all of the complications occur within the 30 day post-operative period. In contrast most of the complications following UAE occur after the first 30 days.[5]

The rate of subsequent hysterectomy, and myomectomy recorded was significantly less than that reported by the FIBROID registry (2.7%, and 0.7%, compared to 9.8%, and 2.8%). The recorded hysterectomy rate in the EMMY trial was 20% at 12 months. These differences most probably reflect the lack of long term follow-up in this registry.

The reported rate of repeat embolisation in this registry was however higher than that from the FIBROID registry (5.4%, compared to 1.3% at 3 years.)

Patient outcomes were assessed both by alteration in symptom scores reported at clinical review, and by Quality of Life scores in a smaller percentages of patients. Reported symptoms improved overall for 84% of patients at 6 months post UAE, and for 83% at 12 months. There was no significant difference in reported outcomes when analysed by ethnicity of the patient, or size of the largest fibroid (greater than

10cm or not). This is in contradistinction to the FIBROID registry where increasing size of the largest fibroid was a predictor of poorer outcome after UAE.

Improvements were also seen in the reported QoL scores from the QoL questionnaire, with a significant improvement in mean scores at follow up of 36 points (range 43.4 – 79.4), similar to those seen in the much larger US registry where the QoL score improved by 40.4 points (range 47 to 87.4) over the same follow up period.

The percentage reduction of uterine volume recorded overall was 40%. There was no significant difference between patients with single or multiple fibroids but there was a greater percentage reduction for patients with a largest fibroid diameter greater than 10cm pre-UAE.

The technique of UAE practised by most interventional radiologists in the UK shows some variety but there is a strong preference for the use of 4 and 5French catheters and a range of particulate emboli, with few operators using microcatheters on a routine basis. This is at variance with the techniques propounded by some operators outside of the UK, where microcatheters are advocated routinely. The results of this registry with regard to symptomatic response would suggest no advantage to the routine use of microcatheters, at least in the short term results.

There are several limitations to the data from this registry. Not all centres performing UAE contributed cases to the registry despite NICE guidance. Some centres initially submitted a few of their cases but stopped. There are several possible reasons including a wish to collect their own data and publish separately or insufficient manpower to submit registry data which is inevitably time consuming and done in personal time. Unfortunately because of changes in coding contained in Hospital Episode Statistics (HES) data, it is not possible to use historical HES data to ascertain the number of cases of UAE performed across the UK during the time that data was submitted to the UAE registry, and so it is not possible to know the proportion of cases undertaken that have been submitted to the registry.

It was initially assumed that gynaecologists would contribute to the registry to supply follow-up data if they were reviewing the patients in clinic, as traditionally few radiologists would see the patients at follow-up. A follow-up protocol was suggested by the registry. Follow up was left to each centre to organise, but there was no funding available to support data collection. In many centres the radiologist entered the procedural information but the responsibility for entering patient follow up information was not clear. Centres where the same clinician entered the patient onto the registry, and followed up the patient could be expected to have better overall patient follow up. One of the benefits of running this registry was that it taught many radiologists to take the initiative to commence their own clinics for assessment and follow-up. Those who did so, found it to be an extremely useful extension to their working practice. Unfortunately as few had their own clinics when this registry commenced, patients were lost to follow up at every stage, with less than 50% being followed to 12 months. Similarly there were difficulties obtaining QoL scores with those patients in whom UFS-QOL data was collected, 49% completing a UFS-QOL symptom score and 45% a UFS-QOL non-symptom score at 6 months follow up. However, this fell to 12% and 10.8% respectively at 24 month follow up. This probably reflects a lack of infrastructure for patient follow up beyond the normal clinical window (usually 6 months). This type of problem is seen with most registry

data seeking follow up.[15] In contrast the US registry achieved 60% follow up at 3 years but was fully funded with a dedicated central office and team constantly monitoring individual centre activity with electronic reminders for missing data. Despite these problems the number of cases submitted and followed up represents the largest number of cases recorded in the UK.

When this registry was launched the role of UAE in the treatment of pre-menopausal women considering future pregnancy was highly controversial. For this reason this registry was initially designed to exclude such patients, and data about subsequent pregnancies was not sought until several years of data collection had passed. Hence, only a small numbers of pregnancies are included in this report. If this registry was being set up now, more information about previous parity, and future pregnancies would be sought. In particular the number of women desiring, and trying for pregnancy after embolisation would be of great interest as currently the data about the numbers actively seeking pregnancy and the number of live births achieved is very limited. As women delay childbirth and seek minimally invasive treatment options, information regarding the effect of UAE on fertility is required and is an important area for future research.

Although the follow up data is disappointing, the results from this Registry do confirm that as practiced in the UK, UAE is a safe procedure with no procedure related deaths, and a low pre-discharge adverse event rate of only 2%. We found that the rate of subsequent hysterectomy was lower than that reported by the FIBROID registry, although this may be a reflection of the limitations of the follow up obtained.

Overall, for women in the UK with symptomatic fibroids seeking an alternative to hysterectomy this registry shows UAE to be a safe treatment, with reduced morbidity and mortality compared to surgery. Further research is needed to address the effects of UAE in younger women, particularly the long term durability of UAE, and the effect on fertility. A randomised controlled trial to compare subsequent fertility after UAE and myomectomy is needed. These questions have not been addressed by this registry.

Acknowledgements

1.Use of the UFE QoL questionnaire
The UFs-QOL questionnaire was kindly supplied by the Society of Interventional Radiology (SIR). The UFS – QOL was developed in part through funding by the SIR Foundation. The UFS-QOL questionnaire is copyrighted by the SIR Foundation and may only be used with permission.
Contact: SIR Foundation, 3975 Fair Ridge Dr., Suite 400 North, Fairfax, VA 22033, USA.

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Appendices

Registry forms

Pre Procedure

Fibroid Embolisation Registry Form 01/10/03 Version 1

Pre-procedure

Hospital Nº [ ] Patient's Date of Birth: [ ][ ] [ ][ ] [ ][ ]

Symptoms

Symptoms (tick all that apply):

Bleeding [ ] Pelvic pain [ ] Back pain/pressure [ ] Other [ ] → *please specify*

Ethnic group

White [ ] Black Caribbean [ ] Black African [ ] Black Other [ ]

Indian [ ] Pakistani [ ] Bangladeshi [ ] Chinese [ ] Other [ ]

Fibroids

Largest fibroid dimensions: [ ] (cm) [ ] (cm) [ ] (cm)

Largest uterine dimensions: [ ] (cm) [ ] (cm) [ ] (cm)

Number of fibroids: 1 2 3 >3

Imaging TVUS [ ] TAUS [ ] Hysteroscopy [ ] MRI [ ]

Other [ ]

Previous Gynaecological Surgery (please tick all that apply)

Myomectomy [ ] Laparoscopy [ ] Ovary/Fallopian tube procedure [ ] Endometrial ablation [ ] Caesarean section [ ]

Other [ ]

Parity Pregnancies lasting: (please enter number of all such pregnances)

At least 24 weeks [ ] Less than 24 weeks [ ]

Desire for pregnancy? [ ] **Yes** [ ] **No** [ ] **Undecided**

Please return to: BSIR administrator, 4 Verne Drive, Ampthill, Bedford, MK45 2PS. Further copies: www.bsir.org

01/10/03 Version 1

Fibroid Embolisation Registry Form
Procedure & Discharge 1

Hospital N° ☐☐☐☐☐☐☐☐ Patient's Date of Birth: ☐☐ ☐☐ ☐☐

Date of procedure: ☐☐ ☐☐ ☐☐ Date of discharge: ☐☐ ☐☐ ☐☐

Procedure undertaken by:

Consultant ☐ Other grade ☐ Speciality: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Procedure details

Femoral Access

Unilateral ☐ Bilateral ☐

Catheter system

5F ☐ 4F ☐ Coaxial micro catheter ☐

Embolic agent

Particles ☐ Gelfoam ☐ Coils ☐ Other ☐

↓

Type ☐☐☐☐☐☐☐☐ Size ☐☐☐ Microns Dose ☐☐☐ Bottles / Vials (delete as appropriate)

Arteries

Which uterine arteries were embolised? Left ☐ Right ☐

IF ovarian arteries were embolised, which? Left ☐ Right ☐

Antibiotics

Prophylaxis given? Yes ☐ No ☐

Agent ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Dose ☐☐☐☐☐☐☐☐☐☐

Pain

How was pain managed? Please tick all that apply

Sedation ☐ Non-PCA narcotics ☐ PCA narcotics ☐ Epidural ☐

Spinal ☐ NSAIDs ☐

Date form completed: ☐☐ ☐☐ ☐☐

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Fibroid Embolisation Registry Form
Procedure & Discharge 2

Hospital N° ☐☐☐☐☐☐☐☐☐☐ Patient's Date of Birth: ☐☐ ☐☐ ☐☐

Radiation dose ☐☐☐☐

CentiGrays per centimetre squared
OR
MilliSieverts per centimetre squared
(Please tick which measurement used)

Fluoroscopy time ☐☐☐ mins

Adverse events

Did this patient have any adverse events prior to discharge? Yes ☐ No ☐

If *Yes*, please complete Adverse Events form and return with this form.
(Copies kept in department or available from BSIR website)

Did this event delay patient's discharge?

Yes ☐ No ☐ If Yes, by how many days? ☐☐

Follow-up

Please indicate who will be responsible for following this patient up.
This information is needed in order for the registry to effectively monitor the outcome of this procedure. Outcome evaluation forms are available from the BSIR website. Thank you.

Name: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ ☐☐
LAST NAME INITIALS

Specialty & Title: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Address: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Post code ☐☐☐☐☐☐☐☐☐

Date form completed: ☐☐ ☐☐ ☐☐

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Outcome

Fibroid Embolisation Registry Form 01/10/03 Version 1

Outcome Form page 1

Hospital No: _____ Patient's Date of Birth: __ __ __ __ __ __

ALL PATIENTS TO COMPLETE UFS-QOL IF THIS IS THEIR SECOND OR SUBSEQUENT FOLLOW-UP.

Follow-up (please see note *)
Time since embolisation procedure: 1 month ☐ 6 months ☐ 12 months ☐ 24 months ☐ Other ☐ → _____

Did the patient attend for follow-up? Yes ☐ No ☐

If *No*, please give reason if known: _____

Is this patient discharged? Yes ☐ No ☐

If *No*, next follow-up due in: ☐ months from today

Adverse Events

Has this patient had any adverse events since discharge (or last follow up)? Yes ☐ No ☐

If Yes, please complete Adverse Event form(s) and return with this form
(Copies kept in department or available from BSIR website)

Has this patient required secondary intervention(s) since discharge (or last follow up)?

If 'Yes', please tick all that apply: Yes ☐ No ☐

- Repeat Embolisation ☐
- Second uterine artery embolised ☐
- Myomectomy ☐
- Hysterectomy ☐
- Endometrial ablation ☐
- Other ☐ → _____

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Fibroid Embolisation Registry Form 01/10/03 Version 1

Outcome Form page 2

Hospital Nº ______ Patient's Date of Birth: ☐☐ ☐☐ ☐☐

Symptoms

To what extent does the patient report that symptoms have altered since the procedure (or last follow-up)?

Much worse ☐ Worse ☐ No Change ☐ Better ☐ ☐ Much Better

Amenorrhoea No ☐ Yes ☐ → FSH level? ☐ U/l

i.e. more than 6 months without periods

Fibroids

Largest fibroid dimensions: ☐ (cm) ☐ (cm) ☐ (cm)

Largest uterine dimensions: ☐ (cm) ☐ (cm) ☐ (cm)

Number of fibroids: 1 2 3 >3

Imaging

TVUS ☐ MRI ☐

TAUS ☐ Hysteroscopy ☐

Other ______

***Please note-** The suggested time frame for follow-ups is: one month post-procedure; six months post-procedure; twelve months post-procedure and then annually thereafter

Date form completed: ☐☐ ☐☐ ☐☐

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Fibroid Embolisation Registry Form 01/10/03 Version 1

Adverse Events page 1

Hospital Nº ☐☐☐☐☐☐☐☐☐☐ Patient's Date of Birth: ☐☐ ☐☐ ☐☐

Please complete separate form for each episode.

Is this patient still an in-patient following procedure? Yes ☐ No ☐

Date event first reported: ☐☐ ☐☐ ☐☐

Required Ward or clinic visit only: Yes ☐ No ☐ Date: ☐☐ ☐☐ ☐☐

Required further hospital admission: Yes ☐ No ☐ Date: ☐☐ ☐☐ ☐☐

Date admitted: ☐☐ ☐☐ ☐☐ Date discharged: ☐☐ ☐☐ ☐☐

Details (please tick and specify details as appropriate)

Fibroid expulsion	☐	
Persistent vaginal discharge i.e. more than 6 weeks continuous discharge	☐	
Amenorrhoea i.e. more than 6 months without periods	☐	

If amenorrhoea present, please give the FSH level -

☐☐☐ U/l

Pulmonary embolus	☐	
Deep vein thrombosis	☐	
Other	☐	
Death	☐	

Related to UAE? Yes ☐ No ☐ Not sure ☐

Date form completed: ☐☐ ☐☐ ☐☐

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Fibroid Embolisation Registry Form

Adverse Events page 2

Hospital N° ☐ Patient's Date of Birth: ☐☐ ☐☐ ☐☐

Any Embolisation Specific Problems?

Groin haematoma/bleeding ☐

Pseudoaneurysm ☐

Access artery occlusion ☐

Non-target embolisation ☐

Adverse contrast reaction ☐

Other ☐

Date identified/diagnosed: ☐☐ ☐☐ ☐☐

Any Infection(s)?
If "yes", please tick

Uterine ☐ Other ☐

Date identified/diagnosed: ☐☐ ☐☐ ☐☐

Related to UAE? Yes ☐ No ☐ Not sure ☐

Additional details

Has this patient required:
If "yes", please tick

Antibiotics ☐ Drainage ☐ Hysterectomy ☐ Other ☐

Any further comments

☐

Date form completed: ☐☐ ☐☐ ☐☐

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Quality of Life forms

1/10/03 Version1

Hospital No: _____ **Patient's Date of birth:** _____

Date: _____

UTERINE FIBROID SYMPTOM AND HEALTH-RELATED QUALITY OF LIFE QUESTIONNAIRE
(UK English version of the UFS-QOL)

Listed below are symptoms experienced by women who have uterine fibroids. Please consider each symptom as it relates to your uterine fibroids or menstrual cycle. Each question asks how much distress you have experienced from each symptom during the last 3 months.

There are no right or wrong answers. Please be sure to answer every question by ticking (✓) the most appropriate box for you. If a question does not apply to you, please mark "not at all" as a response.

During the last 3 months, how distressed were you by…	Not at all	A little bit	Some-what	A great deal	A very great deal
1. Heavy bleeding during your menstrual period?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
2. Passing blood clots during your menstrual period?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
3. Variations in the length of your menstrual periods?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
4. Variations in the number of days between each menstrual period?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
5. Feeling tightness or pressure in your pelvic area (lower part of the belly)?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
6. Frequent urination during the daytime?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
7. Frequent night-time urination?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
8. Feeling tired?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

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The following questions ask about your feelings and experiences regarding the impact of uterine fibroid symptoms on your life. Please consider each question as it relates to your experiences with uterine fibroids during the last 3 months.

There are no right or wrong answers. Please be sure to answer every question by ticking (✓) the most appropriate box for you. If the question does not apply to you, please tick "none of the time" as your option.

During the last 3 months, how often have your symptoms related to uterine fibroids...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
9. Made you worry because you did not know when your period would start or how long it would last?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
10. Made you anxious about travelling?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
11. Interfered with your physical activities?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
12. Caused you to feel tired or worn out?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
13. Made you spend less time on exercise or other physical activities?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
14. Made you feel as if you are not in control of your life?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
15. Made you concerned about soiling your underwear?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
16. Made you feel less productive?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
17. Caused you to feel drowsy or sleepy during the day?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
18. Made you feel self-conscious of weight gain?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
19. Made you feel that it was difficult to carry out your usual activities?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
20. Interfered with your social activities (e.g., going out to the cinema, restaurants, parties, etc)?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
21. Made you feel conscious about the size and appearance of your stomach?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
22. Made you concerned about soiling bed linen?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

During the last 3 months, how often have your symptoms related to uterine fibroids...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
23. Made you feel sad, discouraged, or hopeless?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
24. Made you feel down-hearted and blue?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
25. Made you feel exhausted ?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
26. Caused you to be concerned or worried about your health?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
27. Caused you to plan activities more carefully?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
28. Made you feel inconvenienced by always having to carry extra pads, tampons, and clothing in case of accidents?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
29. Caused you embarrassment?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
30. Made you feel uncertain about your future?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
31. Made you feel irritable?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
32. Made you concerned about soiling your outer clothes?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
33. Affected the size of clothing you wear during your periods?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
34. Made you feel that you are not in control of your health?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
35. Made you feel weak as if energy was drained from your body?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
36. Decreased your sex drive?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
37. Caused you to avoid sexual relations?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5