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Factors affecting the length of stay after total hip replacement: A retrospective analysis

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Abstract

Background: Total hip replacement is one of the most commonly performed surgical procedures. Healthcare budgets are finite. Much of the cost of total hip arthroplasty comprises the length of stay in hospital. Advancing care in joint replacement requires identification and correction of the factors affecting LOS.

Materials & Methods: A retrospective case series of 299 patients of elective primary total hip replacement, performed between 04/2015 to 03/2016 in a District General Hospital to determine patient and implant related factors.

Results: We looked at 299 patients. There was a clear correlation between ASA PS score and length of stay. With ASA PS Score one, LOS is three days, to ASA PS 3 = LOS five days. Effect of BMI on LOS is only significant in people with Grade III Obesity with average LOS is more than five days. Effect of age is only significant in patients above 80 years old. Patient with age range of 32 to 79 had an average LOS Four days but patient in the age group of above 80 years had an average LOS of Six days. Gender has an association with LOS in males four days and females have average LOS five days. Type of Implant shows an effect on LOS with shortest LOS four days in Uncemented Implants.

Conclusions: Our study showed that LOS after THR is multi factorial. Health system resources are limited, understanding of these variables is important for more effective use of resource, safe practice and high patient satisfaction in delivery of Orthopaedic care.

Keywords: Length of stay, total hip replacement

Introduction

Total hip replacement is one of the most commonly performed surgical procedures. In 2010 the global market for hip prostheses was estimated at \$4.7b [1]. As per 12th Annual NJR report Total 83125 hip replacements were performed and 299 procedures were carried in our local trust. In England and Wales only, 123 different brands of acetabular cups and 146 brands of femoral stems were used [2]. Cementless prostheses have become the most common type of prosthesis used for total hip replacement in England, Wales, Italy, Australia, Canada, and the United States, with hybrid prostheses growing in popularity [2-5].

Healthcare budgets are finite; high quality total hip arthroplasty therefore must be provided in cost-effective manner. Much of the cost of total hip arthroplasty comprises the length of stay in hospital which healthcare organizations naturally seek to reduce. The length of stay (LOS) after THA has declined over the past decade from a mean of three weeks in 80's [6] to mean of four days recently [7, 8]. Lot of research has been done and is ongoing in this area to look for factors affecting the LOS and areas for improvement without compromising the outcome.

Enhanced recovery protocols have been implemented in many hospitals as they have been successful in achieving shorter LOS. A recently published study has concluded that reducing the LOS is achieved through such protocols but is also associated with increase in readmission rate and therefore needs careful implementation of such protocols to maintain good quality of care [9].

Number of procedures performed in any institution also affects length of stay. A study done in 2013 based on finish Arthroplasty register looked into 54,505 THRs for primary osteoarthritis performed between 1998 and 2010.

They classified Hospitals into four groups according to the number of primary and revision arthroplasties performed on an annual basis over the whole study period and analyzed the association between hospital procedure volumes and LOS, length of uninterrupted institutional care (LUIC), re-admissions and reoperations. They concluded that the larger the volume group, the shorter were LOS and LUIC ($p < 0.01$). According to the adjusted data, risk for re-admission in 42 days was greater in small hospitals. There was no difference in the risk for reoperation. Therefore LOS and LUIC need to be shortened in lower volume hospitals [10].

Another study publishes in 2015 tried to identify which specific patient characteristics influence length of stay after successful implementation of a 'fast-track' rehabilitation protocol in 477 patients. Mean length of hospital stay for primary total hip Arthroplasty was decreased from 4.6 to 2.9 nights for unselected patients. However, despite this reduction there was still a wide range across the patients' hospital duration. According to this paper Age ($p < 0.001$), living situation (alone vs. living together with cohabitants, $p = 0.002$) and approach (anterior approach vs. lateral, $p < 0.001$) (posterolateral approach vs. lateral, $p < 0.001$) were main factors significantly associated with increased length of stay [11]. Advancing care in joint replacement requires identification and correction of the factors affecting length of stay while ensuring safe practice and high patient satisfaction. We performed a retrospective study evaluating these factors in our institution after total hip replacement.

Our aim is to look for patient and implant related factors that have a significant effect on average length of hospital stay after total hip replacement.

Materials and Methods

A retrospective case series of 299 patients of elective primary total hip replacement, performed between 04/2015 to 03/2016 in a District General Hospital to determine patient and implant related factors that can have a significant effect on average length of hospital stay after total hip replacement. There were no alterations in existing treatment protocols and all patients received enhanced recovery protocol. Data was collected from one hospital with surgery performed by multiple surgeons of differing experience and from Electronic patient records and Physiotherapy department data register. Our primary outcome measure was average Length of Stay (LOS) in hospital post operatively. Factors considered to be influencing our primary outcome were divided into; Patient related factors such as American Society of Anaesthesiologists classification of physical status (ASA PS) [12], Body Mass Index (BMI) [13], Age, Gender and Implant related factors such as cemented, un-cemented or hybrid prosthesis.

Social reasons for delayed discharge and patient who needed Post op ICU admissions were excluded from our study. The study approval was obtained from the hospital's Research and Audit department.

Results

We looked at a total number of 299 total hip replacements performed between 01/04/2015 to 31/03/2016, all elective primary total hip replacements at Loakes Theatre Wycombe General Hospital. The American Society of Anesthesiologists classification of physical status (ASA PS) is a widely used system for categorizing the preoperative status of patients [12]. As per this system we had ASA PS One (N=53 17%), ASA PS Two (N=172 58%), ASA PS Three (N=41 14%) and no

ASA PS grade recorded in operative records (N=33 (11%).

Table 1: (Number of patients with ASA PS Grading)

ASA	No. of patients	%
1	53	17
2	172	58
3	41	14
Unknown	33	11

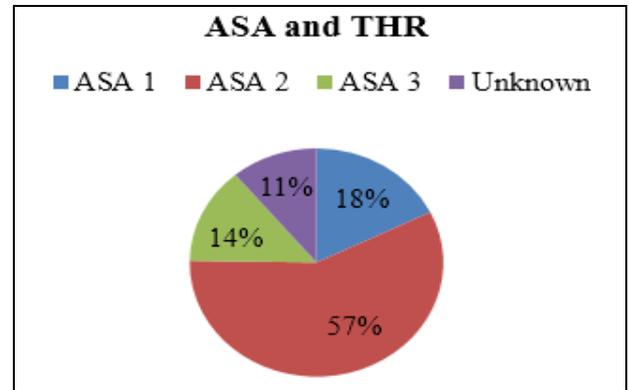


Fig 1: (Percentage of patients with ASA PS Grading)

There was a clear correlation between ASA PS score and length of stay. With ASA PS Score One = LOS Three days, ASA PS Two = LOS 4 days, ASA PS Three = LOS Five days

Table 2: (ASA and LOS)

ASA	Average length of Stay(Days)
1	3
2	4
3	5

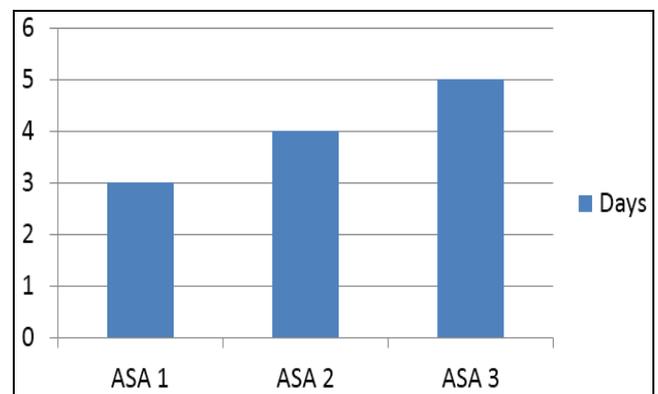


Fig 2: (ASA and LOS)

The body mass index (BMI) is a value derived from the mass (weight) and height of an individual[13]. In our cohort we had Normal weight patients with BMI up to 25 (N=61, 21%), overweight with BMI up to 30 (N=93, 32%), grade I obesity with BMI up to 35 (N=79, 28%), grade II obesity with BMI up to 40 (N=35, 12%) and grade III obesity with BMI more than 40 (N=13, 4%)

Table 3: (Number of patients as per BMI)

BMI	No	%
Normal	61	20
Overweight	99	33
Obese Grade II	85	29
Obese Grade III	41	14
Severe Obesity	13	4

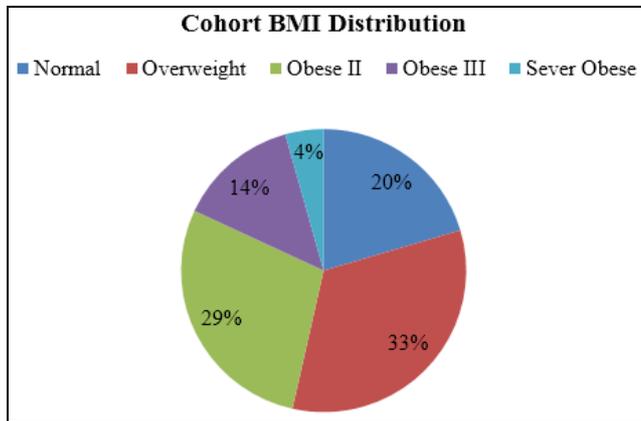


Fig 3: (Percentage of patients as per BMI)

Effect of BMI on LOS is only significant in people with Grade III Obesity with average LOS is more than Five days

Table 4: (BMI and Average LOS)

	BMI	Average Length of Stay
Normal	19.3-24.9	4
Overweight	25-29.9	4
Obese Grade II	30-34.9	4
Obese Grade III	35-39.9	4
Severe Obesity	>40	5

Our patient age range was 32 to 95 years old with mean age 69 years.

Table 5: (Age and Number of Patients)

Age	Number	% of total
<60	50	17
60-69	85	28
70-79	104	35
>80	60	20

Effect of age is only significant in patients above 80 years old. Patient with age range of 32 to 79 (N=239, 80%) had an average LOS Four days but patient in the age group of above 80 years (N=60, 20%) had an average LOS of Six days

Table 6: (Effect of Age on LOS)

Age	Average LOS
<60	4
60-69	4
70-79	4
>80	6

Gender has an association with LOS in males (N=123, 41%) Four days and in females (N=176, 59%) has an average LOS Five days.

Table 7: (Gender Effect on LOS)

Gender	Average Length of Stay in all types of Primary THR
Male	4
Female	5

Our ratio of male to female patients is matching the UK national data for primary Total hip Replacement (Female=60, Male=40%).

Table 8: (Gender ratio)

	Female %	Male %
UK National No	60	40
Our Institution	59	41

We also looked at the effect of type of Implant on LOS. Compared to UK national Data Our Trust has higher percentage of Uncemented and Hybrid Total hip replacements and lower percentage of Cemented Hips.

Table 9: (Type of Implant as per UK National Standards)

	UK %	Our Institution %
Uncemented THR	41	45
Hybrid THR	26	31
Cemented THR	32	23

Type of Implant shows an effect on LOS in our patient with shortest LOS in Uncemented Implants (N=136, 45% Average LOS Four days). Hybrid implants (N=93, 31%) has averages LOS 5days while in cemented THR (N=70, 23%) LOS was Six days.

Table 10: (Type of Implant and Average LOS)

Total Primary THR	299	Percentage	Average Length of stay
Uncemented-THR	136	45	4
Hybrid-THR	93	31	5
Cemented-THR	70	23	6

Discussion

Length of stay (LOS) in hospital has significant impact on medical costs. Several variables are associated with prolonged LOS such as advanced age, gender and obesity [7-14-15]. There is considerable variation in LOS after THR. There are reports in the literature that THRs have actually been performed as day-case surgery [16], even though very early discharge has been associated with complications [17]. Reducing LOS reduces the cost of care and benefits of increase in bed occupancy rates [18]. In past literature shows, longer LOSs after THR has been associated with low output [19, 20]

The findings of our study are consistent with other literature. One study in India showed that among different age groups, older patients above the age of 80 years had the longest stay. All other age groups do not have significant difference. The reason for increased LOS along with age could be the presence of chronic disease in older ages, which required a longer hospital stay [21]. This study also shows that gender has effect on LOS which is consistent with the findings of our study. Male patients stay one day less than female. Our ratio of male to female patients is matching the UK national data for primary Total hip Replacement. The results of one study showed that the mean LOS was higher among patients with medical treatment compared with those with surgical intervention only [22].

Among other patient related factors Higher ASA PS grades have strong association for longer LOS. Severe obesity (BMI >40) has effect on length of stay. All other grades of Obesity do not appear to affect the LOS; these results are consistent with other published literature [7-14].

When it comes to the implant choice, we have found that Uncemented THR has shorter length of stay as compared to Cemented total hip replacement. However our cemented cohort of patients is an average age of Ten years older than the uncemented cohort. These results are same as this study

which mentions that Cemented femoral components provide immediate postoperative advantages, but opinion over long-term results is divided. Use of non-cemented prostheses in younger patients (age <65 years) and cemented prosthesis in older and less active patients (with a shorter projected life span); the adjusted means length of stay were 10.1 and 7.9 days ($p=0.10$), respectively^[23].

Our study has limitations such as low numbers so there is a risk of a type-1 error in some factors; however, this study was started to look at our local practice and we are up to national standards in United Kingdom. The study could have been further enhanced by the collection of patient-reported outcome data. We did not change local protocols, such as the type of implant used and the anaesthetic and pain control protocol due to retrospective nature of data collection, which is a limitation of this study. We expect that further reductions in LOS may be achieved by careful attention to the factors established in this study.

Conclusions

Our study showed that Patient LOS after THR is multi factorial. Because health system resources are limited, understanding of these variables is important for more effective use of existing NHS resource and at the same time ensuring a safe practice and high patient.

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