



## Post-Operative Nausea and Vomiting (PONV) Rates Following the Introduction of an Enhanced Protocol in Patients Undergoing an Elective Primary Lower Limb Arthroplasty

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### Abstract

According to the NJR, approximately 160,000 lower limb joint replacements are performed annually, with local data demonstrating a 4-fold rise in cases over 10 years [1].

The AAGBI advocates multidisciplinary, protocol-driven integrated pathways to effectively manage such patients.

Enhanced Recovery theory has highlighted this notion [3], and this audit has focused on one aspect of minimising and addressing PONV, which is still prevalent and impactful to patient's overall experience and recovery.

**Keywords:** Post-Operative Nausea and Vomiting (PONV); Lower Limb; Arthroplasty

### Introduction

Total Knee and hip replacement surgery is fast becoming a widely performed procedure at many hospitals around the world. According to the NJR, approximately 160,000 are performed a year, with a near equal split between hip and knee replacements. These procedures are offered and performed at nearly 400 hospitals in the UK, with 2/3 of these being within a NHS hospital [1].

Data from Warwick Hospital, SWFT demonstrates that for 2016, 416 hip replacements, and 487 knee replacements were performed, which equates to just over 75 lower limb joint replacements per month. This is in stark contrast when looking at figures from 10 years ago, where in 2016, only 133 hip replacements and 130 knee replacements were performed a year giving an average of 21 per month - showing nearly a 4 fold rise in the number of these cases performed over a 10 year period [2].

Despite the growing prevalence of these procedures, the risk to patients are significant, especially in view of increasing age and comorbidity of the cohort of patients [3].

Of note, these procedures are also costly; therefore peri-operative complications can have a detrimental effect on NHS funds, spending and budgets. A study looking at 34 UK hospitals, calculated a primary TKR and 5 years of subsequent care would cost £7458 per patient [4], which is significant compared to other procedures such as a cataract operation, which would only cost £748 [5].

The AAGBI therefore advocates multidisciplinary, protocol driven integrated pathways to effectively manage such patients [6].

Fast tracked, protocolised approaches - akin to enhanced recovery, are being seen more frequently across the country. Enhanced recovery was first described by Kehlet in 1990s, where a multimodal approach was considered to be paramount in improving the patient pathway for elective surgery [7].

There has been an overarching feeling towards a "Fast track approach to elective surgery in order to improve surgical outcome", whereby it is recognised that the anaesthetist in particular has an important role in enabling post-operative recovery through the advent of "minimally-invasive anaesthesia" [8,9].

Through the work of Enhanced Recovery, improved knowledge of changes to the patient subgroup and a more thorough understanding of the operation, this audit has focused on looking at one facet of the procedure; looking at the risk of postoperative nausea and vomiting encountered by patients undergoing such procedure.

Conventionally, these operations were all performed under a GA, however, there is an increasing prevalence of neuraxial blockade and regional approaches due to their myriad benefits and postulated reduction in risk [10].

A number of papers and research exist that document the improved patient outcome undergoing a hip or knee replacement under spinal anaesthesia [11].

However, despite the advances in patient care, particularly in the perioperative period, unwanted side effects, particularly PONV are still prevalent and impactful to patient's overall experience and recovery. PONV is consistently reported as one of the most important factors patients would like to avoid when surveyed preoperatively [12].

Nausea and Vomiting can be significant enough to affect physiological electrolyte balance, appetite, rate of recovery and general satisfaction [13].

Therefore the focus of this audit is to see how we can manage this particular aspect of care better than we already do.

### Sources of Materials

- PONV rates should be kept to a minimum.
- All patients should have regular anti-emetics prescribed for the postoperative period.
- All patients should have a different class of antiemetic prescribed on the "As required" section of the prescription chart [14].

### Method and Interventions

An initial audit was carried out across 3 months between 2013 and 2014. Patients were reviewed post operatively following an elective primary lower limb joint replacement, regardless of the method of anaesthesia. Drug charts were scrutinised to see if anti-emetics had been prescribed intraoperative and post operatively.

Vomiting and nausea rates were identified along with whether rescue "PRN" medication was needed.

Poor management and identification of nausea and vomiting rates existed between patients undergoing elective knee or hip arthroplasties. An enhanced protocol was introduced to provide clarity in the approach to such patients following agreement with the orthopaedic and anaesthetic team. A recommendation was made that patients should receive chemoprophylaxis as part of the perioperative pathway.

Looking at one aspect of PONV, the individual anaesthetist provided their own personal choice of intraoperative antiemetics, whilst the post-operative plan was standardised for all, ensuring a regular 5HT3 antagonist and an "as required" H1 receptor antagonist was prescribed. This ensured that all patients received chemoprophylaxis.

The next audit was carried out retrospectively looking at all patients who underwent either an elective primary total hip, knee or oxford knee replacement on a NHS basis at Warwick Hospital for the entirety of March 2017. This audit focused on whether post-operative antiemetics were prescribed, the incidence of PONV, and how this varied depending on the intraoperative provision of antiemetics.

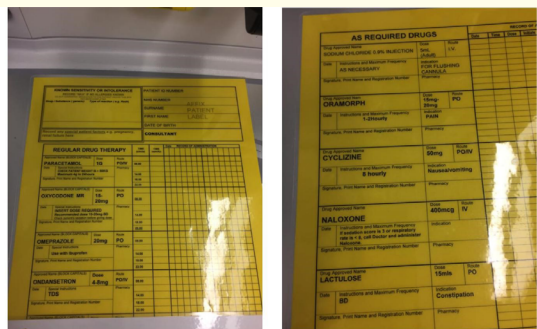


Figure 1: Regular antiemetic prophylaxis.

Figure 2: "As required" antiemetic.

## Results

### Pre Intervention

Initially, data was collected from 47 patients, with a mix of 26 females, and 21 males. Regardless of gender, 25 patients underwent a hip replacement, and 23 patients underwent a knee replacement (either a total or unilateral). The age range of patients given was between 40 and 88 years old, with a median age of 70.

16 of 47 patients (34%) underwent a General Anaesthetic, whereas 31 (66%) received a spinal anaesthetic to facilitate surgery.

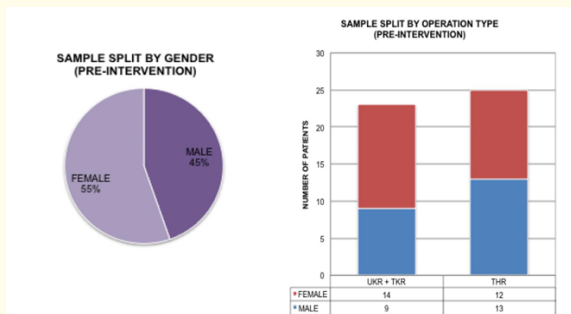


Figure 3

### Intraoperative

In terms of chemoprophylaxis, 30 of the 47 patients (64%) did not receive any intraoperative antiemetics.

### Postoperative

No patients were prescribed any regular antiemetics. Some patients had "as required" antiemetics prescribed but this was unclear as to exactly who was the prescriber.

18 patients (38%) required rescue "as required" antiemetic, with 5 of these 18 (11% of the total patient group) requiring more than 2 different types of rescue antiemetics.

82% (14) of the patients who experienced PONV did not receive any prophylactic antiemetics whatsoever.

### Post Intervention

Data was retrospectively collected from all patients who underwent a primary lower limb joint replacement in March 2017. A total of 96 patient records were investigated with a split between gender of 39 male patients and 57 female patients. Of these patients, 61 underwent a primary knee arthroplasty, and 35 underwent a primary hip replacement. The age range of patients was between 49 year to 91 years, giving an average age of 67 for male patients, and 70 for female patients.

75 patients (78%) had the procedure performed under a spinal anaesthetic, 17 patients (18%) received a general anaesthetic, and 4 patients (4%) received a combination of them both.

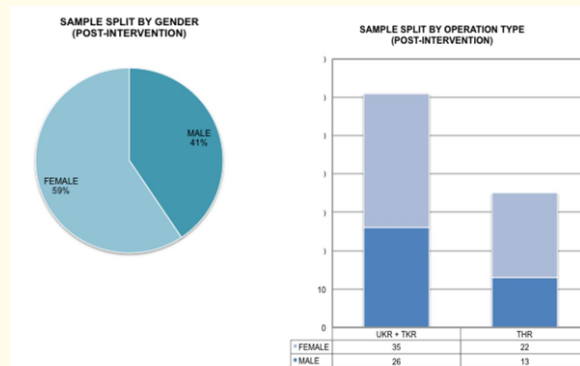


Figure 4

### Intraoperative

62 of the 96 patients (65%) received chemoprophylaxis intraoperatively, and of these 62 patients, 42% received 2 different agents, whereas the majority (58%) only received 1 agent. However, 35% of patients did not receive any intraoperative chemoprophylaxis.

### Postoperative

There was a significant rise in prophylactic antiemetics prescribed, with 96% patients (92/96) receiving regular ondansetron and 85% (82/96) receiving "as required" Cyclizine.

Despite the intervention, PONV still continues to be an issue 42% (41/96) patients required rescue “As required” Cyclizine, analogous to experiencing PONV. The maximum number of times Cyclizine was given was recorded as 3.

Number of Times Vomited	Count
0	55
1	26
2	13
3	2

16% of patients (15/96) who experienced PONV, did not receive any antiemetics intraoperatively.

Results	Male	Female	Total	Yes	No
Number of patients	39	57	96	N/A	N/A
Average age of patient	67	70	N/A	N/A	N/A
UKR'+TKR	26	35	61	N/A	N/A
THR	13	22	35	N/A	N/A
Spinal	33	42	75	N/A	N/A
GA	6	11	17	N/A	N/A
Both 'spinal' and 'GA	0	4	4	N/A	N/A
INTRA7OP Prophylaxis	21	41	62	62	34
1 Antiemetic Only	12	24	36	N/A	N/A
2 Antiemetics	9	17	26	N/A	N/A
Regular Ondansetron	38	54	92	92	4
Average Days prescribed	3	3	3	N/A	N/A
Cyclizine prescribed	34	48	82	82	14
PONV but no cyclizine prescribed	1	1	2	N/A	N/A
MAX cyclizine required by a single patient	3	3	3	N/A	N/A
PONV but no intra OP prophylaxis	5	10	15	N/A	N/A

## Discussion

From the first audit the need to manage PONV rates was obvious. Patients were undergoing an elective procedure for a joint replacement and given the wide variation in practice, a significant number (38%) suffered with nausea and vomiting. What was more shocking is that 82% of these did not receive any chemoprophylaxis. It was important to address this and offer a standard protocolled approach to managing this cohort of patients. Since the introduction of the protocol, we have seen increased patient and nursing satisfaction alongside reduced length of hospital stays.

Over the 3 years since the re-audit took place, more patients are receiving intraoperative antiemetics; only 36% in 2014 compared to 64% in 2017. In terms of intraoperative antiemetics, risk prediction scoring models are important; however it is left to the anaesthetist’s discretion. The rise could be secondary to an increased knowledge of the impact of PONV and the drive to prevent its occurrence.

However, despite the change in approach and mind set, the actual proportion of patients experiencing PONV has remained largely unchanged. The most obvious reason could be in the provision of regular Oxycodone to all patients postoperatively. This opioid could be directly responsible for the unchanged prevalence of PONV rates given its direct side effect of inducing nausea and emesis. However, despite this, there has been minimal change in the number of patients demonstrating PONV, most likely due to the antiemetic administration.

Another possible reason could be attributed to the approach that data was collected. We interpreted “as required” Cyclizine use to imply patients were experiencing PONV, rather than objectively seeing if patients had indeed vomited. The use of medication may have been encouraged from nursing, medical staff and visiting family and friends, which would’ve skewed the results. Furthermore, far more patients are being operated upon, so our relative risk has increased as a result.

Many argue that the differences lie between the types of anaesthesia offered to the patient, as there seems to be a growing trend toward a neuraxial block combined with sedation compared to the conventional approach of a GA with systemic or regional opioids. There exists a multitude of papers, which show the benefits of a performing a spinal anaesthetic for joint replacement patients, which include but aren’t limited to; reduced overall costs, complications, infections and pain control [10].

A large meta-analysis which looked at 21 Randomised Control trials, showed that regional anaesthetic reduced both operative times and significantly reduced the rates of PONV [11].

This was believed to be as a result of improved, targeted, and longer acting postoperative analgesia, thus reducing the requirement of postoperative opioids [15].

The avoidance of a general anaesthetic itself reduces this risk, as an approach which utilises inhalational agents and opioids without prophylactic anti-emetics, sees 30% patients suffer with PONV [16].

However despite the evidence that regional anaesthesia provides a reduction in PONV rates, it must also be stressed that there is still an inherent risk and prevalence of PONV from a spinal technique. These patients still go on to experience nausea and vomiting, and intrathecal diamorphine is well studied and confirmed to be one of these causative factors compared to a delivery of an opioid free spinal [17].

These rates of PONV still exist for different types of opioid preparation such as Fentanyl and Diamorphine that are the main 2 opioid choices used by anaesthetists for joint replacement patients [18].

Overall, the approach to formalise a protocol has been successful in the elective orthopaedic population in reducing the rates of PONV. Patients still go on to experience these symptoms, however the incidence has fallen. The recommendation is still to risk

stratify these patients for intraoperative prophylaxis, but to also be mindful that both the general and regional approaches to the anaesthetic still carry a risk for developing PONV.

## Conclusions

Having recognised the prevalence of PONV in patients undergoing primary lower limb arthroplasties, we were able to implement a fast track, protocolised pathway adhering to enhanced recovery principles. Although we did not clearly show a reduction in the rate of PONV, we were able to highlight the multifaceted approach through which PONV develops and how a well-rounded approach is required in order to improve the patient pathway. We would suggest that this work be repeated with a focus towards PONV risk assessment and intraoperative provision of antiemetic prophylaxis and see how this affects our incidence of PONV.

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