Optimal patient pathways for hip and knee arthroplasties – current use of Enhanced Recovery After Surgery principles in Scotland

A Report from the Musculoskeletal (MSk) Audit

Interpretive text in blue from Nick Scott (Consultant Anaesthetist, Golden Jubilee National Hospital) and Steffen Breusch (Consultant Orthopaedic Surgeon, Royal Infirmary Edinburgh) on behalf of the 18-Weeks Orthopaedics Task and Finish Steering Group for Enhanced Recovery

Here we report on a 12-week Enhanced Recovery After Surgery (ERAS) ‘snapshot’ audit commissioned by the Scottish Government that collected data on hip arthroplasties from all Scottish operating hospitals from 10th May to 20th June 2010 and data on knee arthroplasties from 21st June to 1st August 2010. In the first period we included all patients listed for an elective Total Hip Replacement. Revision surgery, hemiarthroplasties and resurfacing surgery were excluded. During the second period we included all patients listed for an elective Total Knee Replacement, excluding revisions, resurfacings and unicompartmental knee arthroplasties. MSk Local Audit Co-ordinators collected data from patient case notes, patient information systems, results reporting and referral management systems.

The main intention of this report is to show to what extent ERAS methods are being used for arthroplasty patients within Scotland’s orthopaedic units. In doing so, we will provide each Board with current ‘baseline’ ERAS data that will allow them to assess their own potential for adopting ERAS principles. They will then be able to determine what progress has been made when the MSk Audit Team repeat the audit cycle in approximately six months time.

Acknowledgements - David McDonald (National ERAS Clinical Implementer) made valuable comments throughout this report. John McDonald and Heather Hosie fed back constructive comments on the draft report. Sadia Majid collated, validated and analysed the data gathered by the team of MSk Local Audit Co-ordinators based in each hospital (see list on http://www.msk.scot.nhs.uk/Coord.html)

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Introduction and Key Learning Points

Enhanced Recovery After Surgery (ERAS) is a recent development in care that aims to hasten post-operative recovery by minimising the physical and physiological trauma of the surgery, by removing post-operative traditions that are not evidence-based and by encouraging early mobilisation and feeding. ERAS programmes should not be exclusive to the young, fit and healthy and, if conducted properly, every patient should benefit. The key to success in each hospital is the formation of a multidisciplinary team that focuses on all aspects of peri-operative care and meets regularly to audit and redesign pathways for its own patients.

- Data from 97% of arthroplasty patients (677 hips, 668 knees) from all 22 mainland Scottish orthopaedic units are reported
- At present only 8 units have developed an ERAS programme and only one has developed this for every patient (Fig. 4)
- Pre-operative assessment and work-up are encouraging - most patients are seen at pre-operative screening clinics, given information by nurses, OTs and physiotherapists, and reviewed by an anaesthetist
- Blood transfusion rates (Fig. 20) are high and require further attention
- In many hospitals food and drink are stopped much earlier than current guidelines (Figs. 14, 15)
- Only 46% of patients received pre-operative medication (Fig. 11)
- Most patients are now receiving regional (mainly spinal) anaesthesia with/without regional or nerve blocks (Fig. 16)
- Only 18% of patients had fluids discontinued within 12 hours of surgery, a major deterrent to early mobilisation (Fig. 22)
- The high urinary catheterisation rate in some centres may be excessive (Fig. 19)
- Only 29% of patients were admitted to hospital on the day of surgery (Fig. 31)
- Hospitals that had higher transfusion rates, longer use of IV fluids and patient-controlled analgesia had lower early mobilisation rates and longer lengths of post-operative length of stay

Each hospital should develop its own programme that takes the local infrastructure into account. The short-term focus should be on admission on the day of surgery, spinal anaesthesia, restrictive IV fluid therapy, opioid-sparing multimodal analgesia and techniques that avoid blood-transfusion.

Please send comments and queries on this report to either:

Jane Campbell
MSk Clinical Co-ordinator
01463 705850
jane.campbell7@nhs.net

or

Rik Smith
MSk Senior Analyst
0131 275 7040
rsmith11@nhs.net

If you need more information or advice on how to take ERAS forward in your hospital please contact David McDonald, National ERAS Clinical Implementer, 0141 951 5000 ext 5629, david.mcdonald@nhs.net
Number of patients

As far as we are aware, very few arthroplasty patients were missed during the audit period (Table 1). Numbers in the above table are close to the numbers expected from ISD’s SMR01 database for the corresponding period in 2009.

Table 1: Number of patients reported on

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Number of primary arthroplasty patients included in this report *</th>
<th>Number (%) excluded **</th>
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<tr>
<td></td>
<td>Hips</td>
<td>Knees</td>
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<tr>
<td>GRI / Stobhill</td>
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<td>Gartnaval / WIG</td>
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</tr>
<tr>
<td>Crosshouse</td>
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<td>28</td>
</tr>
<tr>
<td>Total</td>
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* The audit included elective hip arthroplasty patients operated on between 10th May and 20th June 2010, and elective knee arthroplasty patients operated on between 21st June and 1st August 2010. The collection period was extended for several hospitals to ensure a sample size of at least ten hips and knees (hips - extended sample at Wishaw and Monklands; knees - extended sample at Elgin, Monklands and Inverclyde)

** These exclusions because notes were unavailable. We further excluded all revisions, hemiarthroplasties, resurfacings and unicompartmental knee arthroplasties

*** Tayside patients are reported by surgical hospital as requested locally

Notes on Methodology

Although hip and knee arthroplasties are obviously very different operations, some aspects of the management of these patients are often very similar. In the interests of brevity of this report we have combined figures for hip and knee operations if there was little meaningful difference between these types of operations nationally. Otherwise the data has been split. This may disguise local variations, but interested parties can request more detail if required.
A) Demographics

With regard to the pre-operative assessment and work-up the results are reassuring (Figs. 1-10). A ‘typical’ Scottish patient is over 60 (80%) with an ASA score of 1 or 2 (65%). Although there is considerable variation in the presence of co-morbidities between units, one patient in three has either diabetes or cardiovascular disease. Implicit in an ERAS programme is extensive pre-operative preparation and counselling, so it is encouraging that most patients were seen at a pre-operative screening clinic and given both written and verbal information by the nurses, occupational therapists and physiotherapists (Figs. 6-10). Subsequently they were reviewed by an anaesthetist pre-operatively, thereby ensuring a high quality of screening and work-up.

80% of hip/knee arthroplasty patients were 60 years of age or over (Fig. 1) and at least 24% had an ASA score of 3 or more (Fig. 2).

Fig. 1: Age (combined hips and knees)

![Age Distribution](image1)

Fig. 2: ASA

![ASA Distribution](image2)

It is of concern that in some sites recording of an ASA score for elective arthroplasty patients is not carried out on a routine basis.
During this audit we recorded whether patients had formal documentation of any of a set of co-morbidities (IDDM, ischaemic heart disease, CVA/TIA, pulmonary embolism, LVF/CCF or COPD) in their medical clerking, pre-assessment or anaesthetic assessment sheets irrespective of time since diagnosis. 30% of patients had one or more of these medical co-morbidities (Fig. 3).

**Fig. 3: Medical history - number of previous selected co-morbidities**

![Bar chart showing the percentage of patients with different numbers of co-morbidities across various sites.](chart)

Only eight of the 22 mainland Scottish orthopaedic units had included patients as part of an Enhanced Recovery After Surgery programme during the snapshot audit (Fig. 4). Although 21% of patients overall were treated as ERAS patients, much of this was due to one centre who have developed ERAS for every patient. Some units use the terms ‘fast-tracked’ or ‘rapid recovery’ - both relate to the ERAS concept.

**Fig. 4: Was the patient treated as an Enhanced Recovery patient?**

![Bar chart showing the percentage of patients treated as ERAS patients across various sites.](chart)
B) Pre-operative phase

In all but one hospital, where a majority of data was available most patients were known to have been seen by the orthopaedic consultant in charge of their care following admission and prior to surgery (Fig. 5). However, in many cases (48%) this data was not available. In these cases the orthopaedic consultant may well have visited, but there is no documented evidence to allow this to be recorded.

**Fig. 5: Visit by orthopaedic consultant**

The large majority of patients were seen by the anaesthetic service prior to surgery (Fig. 6).

**Fig. 6: Visit by anaesthetic service**
Most patients were given information detailing their planned pathway at pre-admission/assessment (94% verbal, 80% written). If the patient attended a hip/knee ‘school’ this was recorded as pre-admission/assessment. The increase in the use of hip/knee schools is encouraging and is proving popular with arthroplasty patients (http://www.heraldscotland.com/life-style/real-lives/on-a-learning-curve-1.1062087).

Approximately 2% of patients did not receive any verbal information and 16% of patients did not receive any written information.

Fig. 7: Planned pathway: Verbal information given

Fig. 8: Planned pathway: Written information given
85% of patients were given pre-op therapy information from a physiotherapist at pre-admission/assessment (Fig. 9). However, there was variation across units, and in some units pre-op therapy information was not given by a physiotherapist to any patients. Hospitals that provided pre-op therapy information from a physiotherapist also mobilised patients more quickly and had shorter post-operative lengths of stay.

Fig. 9: Pre-op therapy information from physiotherapist

Over 70% of hip arthroplasty patients were given pre-op therapy information from the OT service at pre-admission/assessment (Fig. 10a). However, there was variation across units, with 80% of patients at one site being given information at OPA and most patients at another site being given information at pre-op. A smaller proportion of knee patients were given pre-op therapy information from the OT service (Fig. 10b).

Fig. 10: Pre-op therapy information from OT service

In Forth Valley and RAH/VOL the OT input for knee patients was not given as part of a formal assessment, but general OT information was provided to patients in the written documentation supplied in the pre-admission clinic to describe their proposed postoperative pathway.
**Documented evidence that patients were fit for surgery**

The audit asked whether there was documented evidence that patients had been assessed as ‘Fit for surgery’. Anaesthetic assessment sheets, ASA score, or medical clerking notes with details of past medical history were all accepted as evidence. This evidence was available for all patients included in the audit.

**Pre-medication**

Only 46% of patients received pre-operative medication (Fig. 11), partly because patients are often now admitted on the day of surgery (Fig. 31). Amongst those who did get a ‘pre-med’, there was marked variation as to what was prescribed (Fig. 11). Multimodal analgesic regimes should ideally be commenced pre-operatively, not as ‘pre-emptive analgesia’ but to ensure good analgesia immediately following cessation of anaesthesia and most patients can receive these plus their relevant daily medicines for co-morbid conditions prior to anaesthesia and surgery. See White & Kehlet 2010 for more information ([Improving postoperative pain management: what are the unresolved issues?](https://doi.org/10.1097/01.anes.0000346822.45204.1e) *Anesthesiology* 112: 220-225).

Patients who were admitted on the day of surgery were less likely to be given pre-medication (40%) than those who were admitted on the day before surgery (88%). There was variation across units, but no difference nationally between hips and knees. Some hospitals gave pre-medication to most or all of their patients, while others did not give pre-medication to any patients.

**Fig. 11: Type of pre-medication given**

*Pre-medication for patients at Crosshouse and Ayr are being re-investigated following a query from the local clinicians*
The majority of patients had normal biochemistry and haematology pre-operatively (Figs. 12, 13). A small number had either a high creatinine or low haemoglobin. The data do not tell us whether low haemoglobin levels are corrected pre-operatively but recent published evidence supports the prescription of a course of iron for patients who have an iron deficiency in reducing the need for post-operative transfusion. Transfusion requirements are probably excessive (14%; see Fig. 20) and this topic requires further attention.

Serum creatinine and haemoglobin were measured against each site’s normal laboratory values. 86% of patients’ pre-operative serum creatinine levels were within the normal range of laboratory values (Fig. 12). For pre-operative haemoglobin levels, 86% of patients were within normal range (Fig. 13). 27% of patients whose haemoglobin levels were outwith normal range were transfused, compared to 12% of those with normal levels.

Fig. 12: Pre-operative serum creatinine

Fig. 13: Pre-operative haemoglobin
**Fasting and fluids**

Both published evidence and Royal College of Anaesthetists guidelines suggest that patients should not be starved for more than 6 hours pre-operatively and may drink clear fluids up to 2 hours pre-operatively. Despite this, only one hospital allowed patients to eat and drink up to 2 hours before surgery (Figs. 14, 15). 99% of patients in Scotland do not currently receive hypocaloric drinks. These have been shown to reduce thirst, hunger and anxiety pre-operatively and to reduce insulin resistance in the post-operative period by promoting a positive nitrogen balance. Insulin resistance is associated with impaired healing and infection (Nygren 1998 *Preoperative oral carbohydrate administration reduces postoperative insulin resistance. Clin Nutr* 17: 65-71; Soop 2001 *Preoperative oral carbohydrate treatment attenuates immediate postoperative insulin resistance. Am J Physiol Endocrinol Metab* 280: 576-83).

49% of patients were fasting (solid and/or non-clear fluids) for more than 10 hours prior to induction of anaesthetic (Fig. 14).

**Fig. 14: Period of fasting**

There was wide variation in the time when clear oral fluids were stopped. In some hospitals the majority of patients were not allowed clear oral fluids (Fig. 15).

**Fig. 15: When were clear oral fluids stopped prior to surgery?**

**Carbohydrate drinks**

99% of patients were not given carbohydrate drinks in the pre-operative period.
C) Intra-operative phase

Anaesthesia

The choice of anaesthetic varies widely but the majority of patients (90%) received regional anaesthesia, notably spinal anaesthesia plus either wound infiltration or peripheral nerve block.

This is encouraging because although modern anaesthesia and perioperative care have significantly reduced the incidences of thromboembolism and blood loss, spinal anaesthesia is known to prevent the risks of both (Wu and Liu 2009 Neural blockade: impact on outcome In Cousins and Bridenbaugh’s Neural Blockade in Clinical Anesthesia and Pain Management. Fourth Edition. Lippincott, Williams and Wilkins, Philadelphia). The recent National Audit by the Royal College of Anaesthetists confirmed that spinal anaesthesia, performed and managed properly, is associated with minimal morbidity in the overwhelming majority of cases (Cook et al 2009 Major complications of central neuraxial block: report on the Third National Audit Project of the Royal College of Anaesthetists. British Journal of Anaesthesia 102: 179-90).

All trainees involved in anaesthesia for arthroplasty should be proficient at the technique before anaesthetising alone and the aim is to provide a block that is sufficient for the duration of surgery but which will wear off in time to mobilize the patient on the same day.

Interestingly, a recent paper based on a large epidemiological database of arthroplasty patients in Taiwan has shown that spinal or epidural techniques are associated with significantly lower rates of surgical site infection compared with patients receiving general anaesthesia (Chang et al 2010, Anesthesiology 113: 279-284), probably as a result of attenuation of the stress response to surgery (Carli and Schricker 2009 Modification of metabolic responses to surgery by neural blockade Also in Cousins and Bridenbaugh’s Neural Blockade in Clinical Anesthesia and Pain Management). Taken together, although it would take a study of many thousands of patients to validate these findings, spinal anaesthesia (with or without sedation) should now be considered as the technique of choice for any ERAS programme in lower limb arthroplasty.

Inevitably, the choice of anaesthetic will vary from centre to centre but whatever anaesthetic is used the anaesthetic should be designed to allow early mobilisation.

Nationally knee replacements were more likely to receive regional/nerve blocks or Local Infiltration Analgesia (LIA) with spinal anaesthetic, rather than just spinal anaesthetic alone (Fig. 16). Just over half of the patients in the ‘other’ anaesthetic category received both general and spinal anaesthetic. Of these, 58% were failed spinals that proceeded to GA.

Fig. 16: Type of anaesthesia given

![Graph showing the percentage of patients receiving different types of anaesthesia at various sites](image-url)
Fig. 16: Type of anaesthesia given (continued)

b) Knees

Where documentation was available, almost all patients were given intra-operative warming (Fig. 17).

Fig. 17: Intra-Operative Warming used?
**IV Fluids**

Goal-directed fluid therapy (GDT), aimed at individualising the total amount of fluids given to patients peri-operatively and thereby reducing post-operative complications and length of stay, is part of ERAS programmes in other surgical specialties. GDT may be relevant for total hip arthroplasty where blood loss can be unpredictable, but is probably unnecessary for total knee replacement when a tourniquet is used and blood loss is minimal. However, unnecessary infusions of large volumes of fluid should be avoided and a restrictive approach to fluid management is probably more appropriate than GDT in these patients. Each unit should therefore give careful consideration to their overall management of fluid replacement therapy and aim to avoid both overload and dehydration.

Some combination of crystalloid and colloid is used intra-operatively in all units (Fig. 18b). Data regarding the total volumes prescribed was not collected. The majority of the total volume should ideally be given in the intra-operative period, since the aim is to get the patient up and mobile. Thus IV fluids should be discontinued as early as possible in the post-operative period. A further major deterrent to walking for an elderly patient with arthritis is being attached to a drip stand, so every effort must be made to avoid this. Only 22% of patients had fluids discontinued within the first 12 hours after surgery (Fig. 22). The majority of patients had their IV infusions discontinued on the day after surgery, but 16% still had IV lines on the second post-op day.

Almost all patients were given crystalloids intra-operatively, and 43% were also given colloids (Fig. 18b). Two per cent of patients also received IV fluids pre-op, and 84% post-op.

**Fig. 18: IV Fluids administered pre-op**

[a] Pre-op

[b] Intra-op

[c] Post-op

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Colloids  | Crystalloids  | Both  | None  | NR
Urinary catheterisation

Both an excess of and a restriction of IV fluids may result in a patient receiving an avoidable urinary catheter. In an ERAS programme the need for catheterisation should be in the region of 5% but the overall catheterisation rate in Scotland is 35% (Fig. 19). Nine centres had an incidence higher than 40%. Even higher rates (80 to 95%) of pre- and intra-operative catheterisation in four units is of concern. The presence of a urinary catheter is uncomfortable and upsetting for many patients and catheterisation is associated with potentially significant morbidity. Efforts should therefore be made to reduce the overall incidence of catheterisation significantly.

Fig. 19: Patient Catheterised
**Blood transfusion**

The well-documented risks and side-effects of blood transfusion require its use to be restricted. In modern elective surgery the need for blood transfusion continues to decline. This need has been further diminished by lowering the level of Hb that triggers a transfusion and, in orthopaedics, by the use of tranexamic acid. It is disappointing that the overall transfusion rate in all Scottish orthopaedic centres is 14% and seven centres exceeded 20%, despite similar pre-op Hb levels. These findings may reflect variation in local guidelines or protocols or blood loss. Further efforts should be made to reduce this expensive and largely avoidable therapy. Tranexamic acid has been shown in many prospective randomised controlled trials to reduce blood loss after major surgery in adult and paediatric patients. It is cheap and without significant side-effects even in high dose and its use is to be encouraged.

Nationally, 19% of hip arthroplasty patients received a blood transfusion compared to 9% of knee arthroplasty patients (Fig. 20).

**Fig. 20: Patient Transfused**

a) Hips

![Graph showing blood transfusions for hips by different hospitals.]

b) Knees

![Graph showing blood transfusions for knees by different hospitals.]

Legend:
- Pre-op
- Post-op
- Intra-op
- Both intra and post-op
- Both pre and post-op
- None
D) Post-operative phase

**Analgesia**

There is considerable variation in the types and combinations of analgesia being prescribed and administered across hospital sites (Fig. 21) which reflects staff attitudes, patients’ expectations, the availability of patient-controlled analgesia (PCA) machines and the presence of an Acute Pain Service. All these make the topic very difficult to audit. Thus, although difficult to achieve, perhaps an attempt to standardise protocols nationwide should be made.

Throughout Scotland, 58% of patients received opioid analgesia as the focus for post-operative pain relief. Wound infiltration plus multimodal analgesia is gaining increasing popularity as a post-operative regimen. Whichever regimen is used, opioids (by whatever route) should be either used sparingly or avoided in order to reduce the incidence of post-operative nausea and vomiting (PONV), ileus and urinary retention (e.g. Maheshwari 2009, Clin Orthop Relat Res 467: 1418-1423). All of these opioid-related side-effects inhibit a patient’s ability to mobilise. Of these side-effects, PONV is regarded as the most unpleasant and undesirable, with an incidence as high as 40% in some studies. Persistent PONV is another avoidable reason for prolonged post-operative infusions.

Within a multimodal analgesia regime, paracetamol, NSAIDs and gabapentin (short-term) are all associated with low morbidity and a reduced rate of PONV. However, more data are required on these combinations and the contribution of each component to the overall pain experience.

LIA and nerve blocks were prescribed more often for knees than hips.

**Fig. 21: Post-operative analgesia prescribed**

*Excludes patients who also had either LIA or nerve blocks

**Other = IV/IM/SC opioids, Oral opioids or Non-Oral opioids, or IV/IM/SC opioid with Oral Opioids*
Only 22% of patients had their IV fluids discontinued on the day of the operation (Fig. 22). Most were stopped next day, and 16% thereafter. Hospitals that discontinued IV fluid in more patients on the day of operation mobilised patients earlier and had shorter post-operative lengths of stay (Figs. 27, 32).

Fig. 22: IV Fluids discontinued

46% of patients were not given patient-controlled analgesia (PCA), but if PCA was used it was most often discontinued on the day after operation (Fig. 23). However, hospitals that used PCA less often or for a shorter period were also those that mobilised patients earlier and had shorter post-operative lengths of stay (Figs. 27, 32). Elderly frail patients will be more reluctant to mobilise if they are connected to PCA devices attached to a drip stand. Prolonged attachment will inhibit early mobilisation and early return to normal function.

There was little difference in use of PCA between hips and knees.

Fig. 23: PCA discontinued
The majority of patients (96%) had started to take solid/semi-solid foods before the second day post-op, with 60% recommencing diet on the day of operation. For national data, there was no overall difference in the timing of diet recommencement between hip and knee arthroplasty patients.

**Fig. 24: Diet recommenced**

![Diet recommenced chart]

**Post-operative energy/fortified drinks**

Only 1% of patients were provided with fortified supplements post-op.
There was some variation across units in timing of anti-emetic prescribing (Fig. 25), and most were then administered during and after surgery (Fig. 26). Hip arthroplasty patients were slightly more likely to be prescribed anti-emetics pre-op than knee arthroplasty patients. 6% of patients were prescribed anti-emetics more than once, usually either before and during surgery, or during and after.

Fig. 25: Time first anti-emetics prescribed

![Graph showing the percentage of patients receiving anti-emetics first by site and procedure.](image)

Dexamethasone is a well established means of preventing post-operative nausea and vomiting. Historically its use has been discouraged because of surgical concerns that wound healing may be compromised and that wound infection might increase. However, subsequent review articles have shown that there is no evidence to support these concerns (Sauerland et al 2000 Risks and benefits of preoperative high dose methylprednisolone in surgical patients: a systematic review. Drug Saf 23: 449–461; Holte 2002 Perioperative single-dose glucocorticoid administration: pathophysiologic effects and clinical implications. J Am Coll Surg 195: 694-712). Furthermore, dexamethasone is an effective (mild to moderate) analgesic and significantly reduces the consumption of opioid. It is cheap and without major side-effects. The need for anti-emetics and the associated costs are reduced accordingly.
There is also variation in the frequency and timing of subsequent administration of anti-emetics between operating units, though little overall difference between hips and knees.

23% of patients were given anti-emetics more than once, usually during and after surgery.

**Fig. 26: Time first anti-emetics administered**
Although most (84%) patients had been mobilised (up to stand/sit) by the first post-operative day, only 11% were mobilised on the day of operation (Fig. 27). A small proportion of patients will remain in bed for a variety of reasons, but the vast majority of patients can and should be mobilised as early as possible in the post-operative period. Early mobilisation has been shown to reduce both post-operative thromboembolic events (e.g. Pearse et al 2007, J Bone Joint Surg Br 89: 316-322) and length of stay (Husted et al 2008, Acta Orthopaedica 79: 168-173). Several units have a high percentage of patients that were not mobilised until day 2, and this may have contributed to their prolonged length of stay.

Many units continue to adhere to the tradition that patients must be mobilised by a physiotherapist when they first get out of bed. In an ERAS programme it is acknowledged that any appropriately trained member of the MDT team may do so in order to expedite mobilisation. This is even more important when physiotherapy staffing may be an issue.

Nationally there was no difference in the timing of mobilisation of hip and knee arthroplasty patients, although there does seem to be variation within units (Fig. 27).

Fig. 27: Post-op mobilisation
It is disappointing that the patients’ experiences were not measured at all in 15 out of the 22 units (Fig. 28).

At least 11% of hip patients and 42% of knee patients were asked to attend for ongoing physiotherapy after discharge from the orthopaedic department (Fig. 29) and there is considerable variation in practice between units. Mockford et al (2008, J Arthroplasty 23: 1110-1114) suggested that standard post-op physiotherapy had minimal benefit in patient outcome at one year. There is a need to look at current discharge criteria and the role of physiotherapy post-discharge, particularly following knee replacement.

Fig. 28: Patient experience measured?

Fig. 29: Post-discharge Physio planned?
E) Outcomes

The median length of stay in hospital (including any pre-operative stay) was six days for both hips and knees. Across Scotland 49% of patients were discharged by day 5, but only seven units achieved this for more than 50% of their patients (Fig. 30).

Further feedback on local pathways and policies is required but the majority (71%) of patients in Scotland are still admitted on the day prior to surgery. Only three units had near 100% admission on the day of surgery. As those units that have adopted this approach have not encountered major problems, it is recommended that all other units should aim to adopt a similar same-day admission policy. Both local factors and the hospital infrastructure will determine to what extent this can be achieved, but it could be that simple measures such as later scheduling of patients with longer travelling distances can help a fuller implementation towards this HEAT target.

Fig. 30: Length of stay (date of admission to date of discharge)

29% of patients were admitted to hospital on the day of surgery (Fig. 31; similar rates for hips and knees). One per cent of patients were admitted more than a day before surgery.

Fig. 31: Patient admitted on day of surgery
The median length of post-operative stay in hospital was five days for both hips and knees. Two units discharged almost half of their patients within three days of operation, but three others had over 35% of patients staying more than one week (Fig. 32). While medical, surgical and social factors may all contribute to a prolonged duration of stay, local traditions and protocols may also prevent patients from earlier discharge. During this audit, slow mobilisation and an increased post-operative length of stay were both associated with prolonged use of IV fluids, PCA and higher blood transfusion rates (see Figs. 20, 22, 23).

62% of patients were discharged by day 5, 84% by day 7.

**Fig. 32: Length of post-operative stay (date of operation to date of discharge)**

ICU and HDU stays

4 (0.3%) of 1345 patients spent one or more days in an intensive therapy unit.

Excluding one hospital where it is standard practice that all hip and knee arthroplasty patients spend their first post-operative night in HDU, 19 (1.5%) of patients spent one day in HDU and a further 10 (0.8%) were there for up to 5 days.
96% of patients were discharged home (Fig. 33). A further 2% were discharged to a rehabilitation unit and 2% required transfer to an acute ward or another hospital for ongoing care or medical management of a postoperative complication.

**Fig. 33: Discharge destination**

We defined ‘delayed discharge’ as documented evidence of clinical, social or administrative reasons clearly postponing the patient’s discharge. By this definition, 13% of patients had a delayed discharge (Fig. 34). Just over 10% were delayed for clinical reasons, 1% for social reasons and 1% for administrative reasons. Although many patients are given an Estimated Day of Discharge (EDD) at point of admission, they were not classed as delayed discharges if they exceeded their estimated length of stay purely for reasons such as ‘slow to mobilise’.

**Fig. 34: Reason for delayed discharge**

Post-discharge measures available from the Scottish Arthroplasty Project, such as re-admission and complication rates, will be monitored in 2010 and 2011 to make sure there are no adverse effects associated with the implementation of ERAS. These will be presented in future follow-up reports.
F) Referral to Treatment measures

Nationally, approximately half of hip and knee arthroplasty patients were operated on within 18 weeks of their original referral (Fig. 35).

Fig. 35 includes 526 (39%) patients who indicated that they were unavailable at some stage between referral and surgery. This varied between 0% and 87% across units (Fig. 37). If unavailable at some stage, documented unavailability averaged 54 days (median=40 days). Altogether 239 (18%) patients were known to be unavailable for more than six weeks.

30% of patients who had indicated that they were unavailable at some stage between referral and surgery were treated within 18 weeks, compared to 64% of patients who were available throughout. Fig. 36 shows the percentage of patients who met the 18-week Referral to Treatment target after excluding times when patients were unavailable.

Long delays may occur because patients have to wait for diagnostics, non-surgical management or treatments prior to review appointments, are referred elsewhere, fail to attend, or postpone to consider their options.

Fig. 35: Length of time from referral to surgery - all patients

Fig. 36: Length of time from referral to surgery - excluding periods when patients were unavailable
As with previous reports, Fig. 37 shows that a substantial number of patients elect to be ‘unavailable’ at some point in the patient pathway and that unavailability rates continue to vary widely across the country. ‘Unavailability’ may also arise when patients opt to wait for treatment at a particular site or by a specific consultant.

**Fig. 37: Percentage of patients with some documented unavailability**

70% of patients were operated on within 12 weeks of being added to the theatre waiting list (Fig. 38). However, 20% were in the period from 9-12 weeks, a substantial chunk of the future 18-week RTT target period.

**Fig. 38: Length of time to surgery after being added to the theatre waiting list – all patients**

*Fig. 38 includes all patients irrespective of any reason for delay, including patient unavailability*
On average 11% of patients did not go to surgery until after their original booked date (Fig. 39). Three per cent of operations were delayed due to patient cancellation prior to admission. A further 5% were delayed because the hospital cancelled before admission. Surgery was also cancelled after admission due to lack of theatre time (3 patients), bed shortage (3 patients), staff shortage (1 patient), lack of equipment/equipment failure (1 patient), or because the patient was medically unfit (7 patients).

**Fig. 39: Reason for delay from first booked theatre date to actual date of operation**

*Note upper limit of scale is 30%, not 100%; only 11% of patients are not operated on at their first booked date*