

Institution: Bournemouth University		
Unit of Assessment: 3		
Title of case study: Reducing costs and improving patient outcomes through Enhanced Recovery After Surgery approaches in orthopaedics		
Period when the underpinning research was undertaken: 2010 – 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Professor Robert Middleton	Head of the Orthopaedic Research Institute	2015 - current (visiting Professor 2009 - 2015)
Associate Professor Tom Wainwright	Deputy Head of the Orthopaedic Research Institute	2015 - current (visiting Fellow 2009 - 2015)
Louise Burgess	Research Associate	2017 - current
Tikki Immins	Research Development Manager	2014 - current
Period when the claimed impact occurred: 2015 – 31 December 2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words)		
<p>Enhanced Recovery After Surgery (ERAS) is an evidence-based approach to help people recover more quickly after major surgery. Since 2010, Bournemouth University (BU) research has been instrumental in the application of ERAS within orthopaedics across the UK and internationally. Many hospitals now have ERAS programmes in place as a standard practice after major orthopaedic surgery. BU researchers have worked with clinicians and government officials around the world to decrease costs for hospitals by reducing the average length of hospital stay (LOS) through ERAS programmes, whilst improving patient outcomes.</p>		
2. Underpinning research (indicative maximum 500 words)		
Applying ERAS to orthopaedics		
<p>First described in 2000 by Henrik Kehlet, enhanced recovery was initially used to treat patients following colonic surgery. There are approximately 6 times more elective hip and knee replacements performed per year in the United Kingdom than colorectal procedures, leading to considerable interest in the introduction of ERAS approaches in orthopaedic surgery.</p> <p>In 2010, whilst employed as Visiting Fellows at BU, Middleton and Wainwright published the results of the first UK study to implement ERAS within orthopaedics [R1]. The study followed 2,391 consecutive hip and knee joint replacement patients at the Royal Bournemouth and Christchurch Hospital where Middleton and Wainwright worked as an NHS Consultant Orthopaedic Surgeon and an NHS Physiotherapist respectively. They found high levels of staff and patient satisfaction, along with good clinical outcomes, following the implementation of ERAS. The average length of stay (LOS) decreased from 7.8 days to 4.1 days and there was no increase in the rate of complications or readmissions.</p>		

The outcomes achieved were a major step forward for care, especially for older and vulnerable patients. Wainwright and Middleton presented the first data to assess ERAS in much older people [R2] and found patients aged 85 years and over went home 4 days quicker after hip replacement compared to case matched patients elsewhere in the UK. The readmission rate for these patients was over 45% lower when compared with national averages (5.2% vs. 9.4%) and mortality rate was 0% compared with a national average of 0.8%. Applying the reduction in LOS observed alone for patients aged over 85 to the national dataset would have saved 30,202 bed days or GBP7,550,500 (at an estimated bed day cost of GBP250) over the study period.

The researchers therefore recommended the implementation of ERAS within orthopaedics at other hospitals, stating that major economic and capacity savings could be realised at the same time as improving key aspects of patient care (such as readmission rates and mortality).

Patient satisfaction and education

While traditionally the outcomes of ERAS pathways are measured using LOS alongside readmission and complication rates, Middleton and Wainwright have considered outcomes more broadly. They conducted the first systematic review examining patient experience of ERAS in hip and knee replacements [R3]. The research confirmed that patient satisfaction was high and not adversely affected by ERAS.

Furthermore, they have sought to optimise elements of the pathway known to directly affect patient experience. Pre-operative education is one such component. BU research has been the first to demonstrate that for patients this is most important, and showed that patients undergoing knee replacement, who were considered at high risk of an extended LOS, and who attended an education class prior to surgery, stayed, on average, 2.58 days less in hospital [R4].

Expanding the use of ERAS

In 2015, BU established the Orthopaedic Research Institute to advance research in orthopaedic surgery. Research has since expanded to include advocating ERAS for fractured neck of femur, ankle replacement surgery, shoulder replacement surgery and the first ever paper on ERAS for major spine surgery [R5]. BU researchers proposed a paradigm shift in how peri-operative care is delivered. They endorsed the use of ERAS techniques to accelerate the often long, painful, expensive and a highly variable recovery following major spine surgery.

Wainwright and Middleton have recently published a set of international ERAS hip and knee replacement guidelines [R6]. Wainwright, as lead author, coordinated an international group of experts across 17 topic areas to conduct an updated and expanded consensus review of the literature, creating practice guidance for peri-operative care for hip and knee replacement based on current evidence.

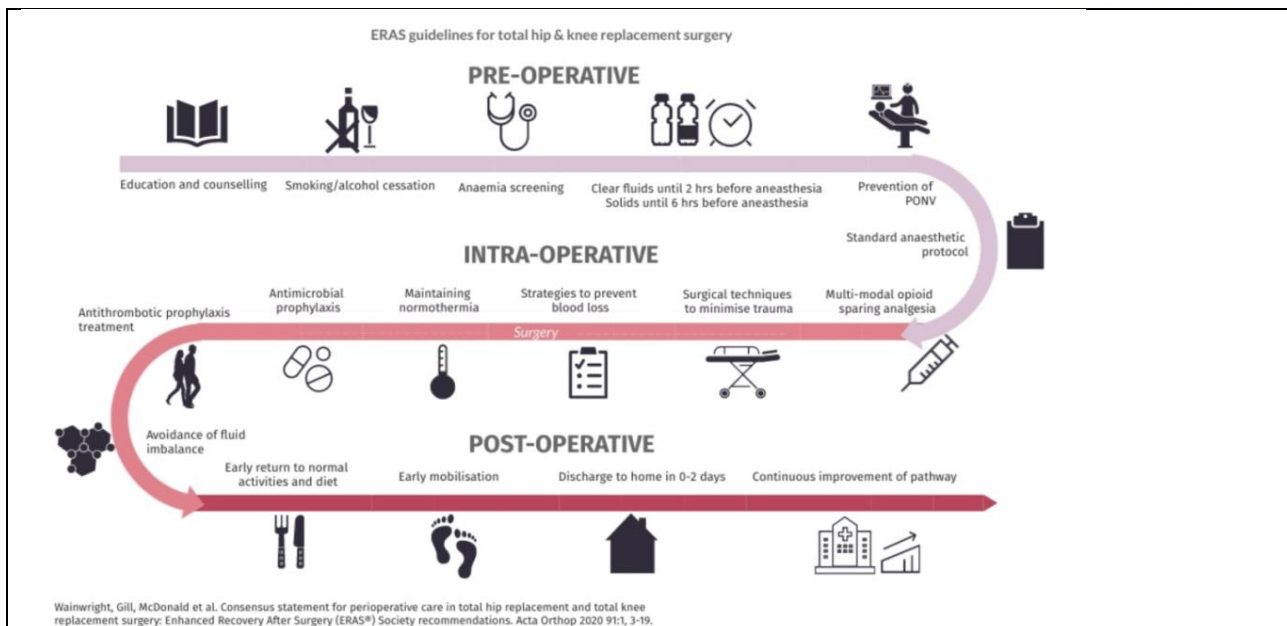


Figure 1 ERAS pathway Hip and Knee Surgery

3. References to the research (indicative maximum of six references)

R1-R6 have been rigorously peer-reviewed and published in internationally-recognised journals.

R1: Wainwright, T. and Middleton, R., 2010. An orthopaedic enhanced recovery pathway. *Current Anaesthesia and Critical Care*, **21** (3), 114-120.
[doi:10.1016/j.cacc.2010.01.003](https://doi.org/10.1016/j.cacc.2010.01.003)

R2: Starks, W., Wainwright, T.W., Lewis, J., Lloyd, J., Middleton, R., 2014. Older patients have the most to gain from orthopaedic enhanced recovery programmes. *Age and Ageing*, **43** (5), 642–648 <https://doi.org/10.1093/ageing/afu014>

R3: EL Jones, TW Wainwright, JD Foster, JRA Smith, RG Middleton, and NK Francis., 2014. A systematic review of patient reported outcomes and patient experience in enhanced recovery after orthopaedic surgery. *The Annals of The Royal College of Surgeons of England*, **96** (2), 89-94 <https://doi.org/10.1308/003588414X13824511649571>

R4: Sisak, K., Darch, R., Burgess, L., Middleton R. and Wainwright, T., 2019. A preoperative education class reduces length of stay for total knee replacement patients identified at risk of an extended length of stay. *Journal of Rehabilitation Medicine*, **51** (10), 788-796
DOI: [10.2340/16501977-2602](https://doi.org/10.2340/16501977-2602)

R5: Wainwright, T.W., Immins, T. and Middleton, R.G., 2016. Enhanced recovery after surgery (ERAS) and its applicability for major spine surgery. *Best Practice and Research: Clinical Anaesthesiology*, **30** (1), 91-102 <https://doi.org/10.1016/j.bpa.2015.11.001>

R6: Wainwright, T.W., Gill, M., McDonald, D.A., Middleton, R.G., Reed, M., Sahota, O., Yates, P. and Ljungqvist, O., (2020). Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. *Acta Orthopaedica*, **91**(1) 3-19. [10.1080/17453674.2019.1683790](https://doi.org/10.1080/17453674.2019.1683790)

4. Details of the impact (indicative maximum 750 words)

Cost saving by reducing Length of Stay (LOS)

In 2012, Wainwright and Middleton delivered a series of 8 Enhanced Recovery Masterclass education sessions across 8 cities in Australia and New Zealand, developed from their research findings on the orthopaedic Enhanced Recovery Pathway [R1]. The sessions were attended by over 200 practitioners, including a Consultant Orthopaedic Surgeon at Middlemore Hospital, Auckland. In November 2013, the surgeon joined the Expert Advisory Group for the National Orthopaedic ERAS Quality Improvement Collaborative, funded by New Zealand's Ministry of Health. The surgeon states: "I pushed for national implementation, following your presentation. A Ministry of Health funded process was established." [E1]

Between November 2013 and March 2015, ERAS principles were implemented in 18 participating district health boards for 11,378 people having elective hip and knee replacements and acute patients with fractured neck of femur [E2]. The average LOS fell from 4.63 to 4.05 days for hip replacement surgery and from 5.00 days to 4.29 days for knee replacement surgery, providing a nominal saving of NZD1,804,725 in costs [E2]. The number of blood transfusions fell from 13.9% to 9.2% for patients having hip replacements, from 17.8% to 5.5% for patients having knee replacements and from 31.9% to 27.5% for patients with fractured neck of femur, providing a nominal saving of NZD515,607.[E2].

Another Masterclass attendee, a Clinical Leader in Outpatient Physiotherapy, used learning from the Masterclass to implement cost savings at Taranaki District Health Board. In 2012, a working group was established to apply ERAS principles to patients undergoing primary total hip and knee replacements. Changes were made to patient pathways in August 2013, which resulted in a reduction in the average LOS from 6.72 days to 4.30 reducing the average cost per patient by 12% [E3]. This Clinical Lead also formed part of the Expert Advisory Group working to implement ERAS at a national level, as described above.

Influenced by the research findings of R4, A Consultant Neurosurgeon has recently implemented ERAS following spinal surgery at the Clinique Des Cedres, Toulouse. It employs 6 other neurosurgeons and represents the first centre in France to transition to the ERAS protocols [E4]. An initial study into the effectiveness of ERAS for 271 patients with anterior cervical discectomy and fusion has demonstrated a significant decrease in LOS, without causing an increase in post-operative complications and has maintained patients' satisfaction [E5].

Improved patient outcomes and satisfaction

Following publication of R1 in 2010, Wainwright worked with the National Improvement Advisor for the Modernising Patient Pathways Programme in the Scottish Government, to implement a national programme to improve standards of care for orthopaedic joint arthroplasty patients across all 22 units in Scotland. Data collected from the Musculoskeletal Audit on behalf of the Scottish Government between September – December 2013 showed an increase from 21% (2010) to 92% (2013) of hip and knee arthroplasty patients benefitting from ERAS and a decrease in LOS from 5.6 days (2010) to 4.8 days (2013) [E6].

The National Improvement Advisor states that Wainwright's "ground-breaking work in improving standards of care" provided "further impetus to our clinical team to learn from his published work and further enhance our patient care."

Wainwright aided "the development of this programme and the significant improvement noted across NHS Scotland in the subsequent 4 years. Throughout this period there was continued uptake in ERAS pathways across the units, with significant reductions in hospital stay, blood transfusion, urinary catheterisation and early mobilisation of patients. Its role in changing clinical pathways and resultant patient outcomes should not be underestimated." [E7]

The effectiveness of the national programme is highlighted in an example within the National Clinical Strategy for Scotland (2016), stating that ERAS approaches have produced "better outcomes ... The impact has been that the average length of stay has reduced from ten days to less than three days: patients mobilise more quickly, with less side effects and with better longer-term outcomes." [E8]

When surveyed in 2020, attendees from the Masterclass series in New Zealand noted a range of benefits for patients resulting from the implementation of ERAS. Middlemore Hospital, Auckland recorded outcomes including “Shorter day stay, more process standardisation, less complications.” In Auckland City Hospital “patients [are] able to be mobilised earlier due to better anaesthesia and analgesic options. Staff and patients [are] both more proactive re discharge plan.” An attendee from Wairarapa District Health Board states: “we have reduced our length of stay without any corresponding increase in readmission. Our patients enjoy the information session and say it is very helpful. Our patients say the inpatient experience is good.” Additionally, “less time in hospital has decreased the overall cost of treatment.” [E1] Taranaki District Health Board reports lower readmission and complication rates, improved day surgery admission rates and high degrees of patient satisfaction [E3].

Impact on professional practice

The Association of periOperative Registered Nurses (AORN) in USA has an accredited training module called Enhanced Recovery After Surgery for Patients Undergoing Total Hip or Total Knee Arthroplasty based on the ERAS® Society guidelines and Wainwright’s consensus statement [R6] [E9].

5. Sources to corroborate the impact (indicative maximum of 10 references)

E1: Wainwright, T. (2020) *Follow-Up Survey of Participants Of 2012 Masterclass Tour*.

E2: Ministry of Health, New Zealand Government (2017) *A Review Of The National Orthopaedic Enhanced Recovery After Surgery (ERAS) Quality Improvement Collaborative: November 2013–March 2015*. Executive Summary, p.viii.

E3: Enhanced Recovery Blog (2013) Orthopaedic Enhanced Recovery After Surgery (ERAS) – Taranaki District Health Board. Available at: <http://www.enhancedrecoveryblog.com/index.php/orthopaedic-enhanced-recovery-after-surgery-eras-taranaki-district-health-board/> [Accessed 3 November 2020].

E4: Société Française de Neurochirurgie (2020) *Testimonial letter*.

E5: Debono, B., Sabatier, P., Boniface, G. *et al.* (2020) Implementation of enhanced recovery after surgery (ERAS) protocol for anterior cervical discectomy and fusion: a propensity score-matched analysis. *Eur Spine J.* **29**(5) <https://doi.org/10.1007/s00586-020-06445-0>

E6: Musculoskeletal Audit on behalf of the Scottish Government (2013) *Optimal Patient Pathways For Hip And Knee Arthroplasties: Use Of Enhanced Recovery After Surgery Principles – 2013*, p.3. NHS National Services Scotland.

E7: National Improvement Advisor, Scotland (2020) *Testimonial letter*.

E8: Scottish Government (2016) *A National Clinical Strategy For Scotland*, p.63.

E9: Spruce, L. (2020) Enhanced Recovery After Surgery for Patients Undergoing Total Hip or Total Knee Arthroplasty. *AORN Journal*, **111**(5), pp.550-557.