

Day case shoulder arthroplasty: needed now more than ever

Abstract

The demand for total shoulder arthroplasty has grown over the years and is set to continue in a similar trend because of the ageing population. Following a global reduction in elective orthopaedic treatment and an exponential rise in surgical waiting times, innovative strategies are desperately needed to mitigate against the harmful effects of delaying vital operations on both patients and the wider society. Day case shoulder arthroplasty is a safe alternative to a traditional inpatient approach, with evidence supporting substantial cost savings, improved outcomes and fewer complications. Rigorous patient selection and a multidisciplinary team approach are paramount when adopting a day case service to deliver joint replacement surgery. This review outlines the principles of day case total shoulder arthroplasty and highlights key considerations when transitioning to this approach.

Key words: Cost-effectiveness; Day case surgery; Inpatient surgery; Total shoulder arthroplasty

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Introduction

The annual growth rate of shoulder arthroplasty surgeries has been estimated to be greater than that of hip and knee replacement surgery (Day et al, 2010). Owing to the ageing population, it has been projected that between 2011 and 2030 this demand will increase by 755% in those over the age of 55 years (Padegimas et al, 2015). As healthcare policy has evolved, a greater emphasis has been placed on providing safe, high-quality care in both an efficient and cost-effective manner. Total shoulder arthroplasty has conventionally been delivered as an inpatient service despite some patients not having complex medical comorbidities and wishing to be discharged quickly. Ancillary costs arising from this can be considerable and are predominantly a result of additional laboratory studies, overnight bed occupancy and staffing (nursing, physiotherapy and occupational therapy). These variables contribute to the length of stay following surgery, which ranges from 2 to 6 days (Brolin and Throckmorton, 2018; Borakati et al, 2020).

The COVID-19 pandemic has led to a substantial reduction in the provision of elective orthopaedic care with an estimated 28 404 603 operations being cancelled worldwide during a peak 12-week window (COVIDSurg Collaborative, 2020). In November 2020 the orthopaedic elective waiting list in England was estimated to be as high as 1.4 million (Oussedik et al, 2021). Even with a 20% increase in normal surgical volume it would take up to 46 months to clear the backlog resulting from the disruption (Oussedik et al, 2021). Many patients experience severe pain and disability and so it vital that the healthcare system develops methods to deal with this unprecedented caseload that has the potential to overwhelm clinical services in the months to come.

Given the progressive nature of arthritis and its ability to distort normal anatomy, the complexity of surgical cases may increase with time, and so strategies are desperately needed to optimise theatre efficiency and increase output. It is no surprise that the desire to pursue day case shoulder arthroplasty has grown, with 16 articles on the subject published in 2020 in PubMed, compared to three in 2019. Not only does day case shoulder arthroplasty result in substantial cost savings, it is associated with high levels of patient satisfaction and favourable complication and readmission rates when compared to inpatient procedures (Basques et al, 2017; Brolin et al, 2017; Charles et al, 2019; Borakati et al, 2020).

This article outlines the principles of day case total shoulder arthroplasty and highlights key considerations when transitioning to this approach.

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Safety of a day case shoulder arthroplasty service

Compared to hip and knee surgery, shoulder arthroplasty is associated with a lower mortality rate, fewer complications, shorter hospitalisation and fewer readmissions (Fehringer et al, 2010). Given the successful transition of lower limb arthroplasty to a day case service, it is plausible that a similar approach may be suitable for a subset of patients traditionally offered hospital admission for their shoulder replacement (Brolin et al, 2017). Critics cite inadequate pain control, excessive blood loss and the possibility of complications as reasons for not changing to a day case service (Brolin and Throckmorton, 2018). However, the complication rate following total shoulder arthroplasty ranges from 2.8% to 9.4%, with inpatient surgery being associated with a significantly increased risk of 30-day and 90-day hospital readmission, acute kidney injury, thromboembolic events, surgical site infections and the need for a blood transfusion (Basques et al, 2017; Brolin et al, 2017).

Several large centres in North America have described their experience with day case shoulder arthroplasty, providing a degree of optimism for those in the UK wishing to adopt a similar policy. In a database study of 123 347 shoulder replacements over a 7-year period, 3493 (2.8%) were treated as a day case (Basques et al, 2017). A significant proportion of those undergoing inpatient surgery had a greater incidence of medical comorbidities such as diabetes, ischaemic heart disease and chronic kidney disease. Accordingly, readmission rates were significantly higher for the inpatient group at both 30 and 90 days, as were complications such as thromboembolic events and surgical site infections. While this may appear to be a result of selection bias, the results were no different after controlling for age and medical comorbidities (Erickson et al, 2020). To further evaluate the safety profile of day case surgery, Brolin et al (2017) compared the outcomes between 30 day case total shoulder arthroplasties and an inpatient group of 30 patients matched for age and comorbidities. No significant differences were found between cohorts regarding age, American Society of Anesthesiologists (ASA) score, operative indications or body mass index. They found no significant differences between rates of complications and hospital readmissions. Additionally, in a retrospective case-control study of 241 day case total shoulder arthroplasties and 373 inpatient procedures, no difference in clinical outcomes were found between groups despite significantly fewer complications occurring in the day case cohort (7% vs 13%, $P=0.023$) (Erickson et al, 2020).

Falls are one of the most commonly reported safety incidents in hospitals and lead to physical injury in up to 30% of cases, prolonged inpatient stays and increased healthcare costs (Sridharan et al, 2020). An analysis of all inpatient falls that occurred over nearly a decade in a tertiary referral hospital found that 0.9% of patients admitted for elective orthopaedic procedures experience a fall during their stay, of which 5.5% underwent an upper limb procedure (Mandl et al, 2013). In the only study to specifically review this complication following both inpatient and day case shoulder arthroplasty, the total prevalence of postoperative falls was 11.1%, noted to be significantly higher in those undergoing day case surgery (Sridharan et al, 2020). Independent risk factors associated with this included female sex and a history of a movement disorder. Interestingly, age was not a contributing factor.

Cost-effectiveness of day case shoulder arthroplasty

During the COVID-19 pandemic, the NHS has been stretched more than ever before. With a strong desire to return to pre-pandemic activity levels, methods of decreasing costs without jeopardising patient safety and clinical outcomes should be explored. In the private sector, the transition to day case hip arthroplasty has been associated with an overall saving of approximately £5000 per patient (Aynardi et al, 2014). Using a day case approach in the USA, up to \$3500 (~ £2500) can be saved per patient undergoing shoulder arthroplasty. In the UK the figure has been suggested to be £529, although this is likely to be a gross underestimation since limited cost analyses were undertaken to derive this (Cancienne et al, 2017; Borakati et al, 2020). According to the National Joint Registry (2020), 7655 primary shoulder replacements were carried out in the UK during 2019, and so with a day case service there is scope to make substantial savings that can be redistributed to other areas across the NHS.

Patient selection

The main concerns with day case arthroplasty are potential complications leading to increased morbidity and hospital readmission. In a large population-based study of approximately 34 000 patients, the postoperative complication rates for total shoulder arthroplasty, total hip arthroplasty and total knee arthroplasty were 7.6%, 6.8% and 2.8% respectively. The 30-day mortality rates followed a similar trend, at 1.2%, 1.1% and 0.4% for total hip arthroplasties, total knee arthroplasties and total shoulder arthroplasties respectively (Fehringer et al, 2010).

The favourable adverse event profile of total shoulder arthroplasty highlights its suitability as a day case procedure but a comprehensive understanding of which patients are most vulnerable to complications is essential to selecting those that will undergo a benign postoperative course. Risk factors for complications within the first 30 days following surgery include chronic steroid use, a preoperative haematocrit of less than 38%, ASA class 4, and an operative time longer than 2 hours (Anthony et al, 2015). Intraoperative bleeding requiring transfusion occurs in 4% of cases and has been identified as the most common complication following total shoulder arthroplasty (Anthony et al, 2015). Fortunately, cardiac sequelae following blood loss during total shoulder arthroplasty occur infrequently, but predictors of a postoperative transfusion (preoperative haematocrit less than 40% and post-traumatic arthritis) should be considered when selecting patients for day case surgery (Abildgaard et al, 2016).

Patients with an increasing number of medical comorbidities should intuitively be at a greater risk of complications and hospital readmission following surgery, but reliance on such ‘medical dogma’ may disadvantage patients with stable chronic conditions that seldom pose a risk to inpatient total shoulder arthroplasty. An algorithm exclusively based on patient age, body mass index, cardiopulmonary comorbidities and preoperative haematocrit has been proposed. While this resulted in a low rate of perioperative complications and no readmissions, it did not consider other medical problems or encompass a comparative scale for risk stratification (Fournier et al, 2019).

A more discriminative tool that may assist with patient stratification is the Day case Arthroplasty Risk Assessment score (Meneghini et al, 2017). This was initially developed to help determine a patient’s likelihood of safely undergoing lower limb arthroplasty and subsequently being discharged within 24 hours of surgery. The Day case Arthroplasty Risk Assessment score assesses nine categories of comorbidity (general medical, haematological, cardiac, endocrine, gastrointestinal, neurological, renal, pulmonary and infectious) based on their presence, severity and extent to which they are controlled. A total of 54 binary questions (yes or no) are answered to calculate the score with a result less than 59 having a positive predictive value of 82% for early discharge and a 90-day readmission rate of 2.9% (Meneghini et al, 2017). The only study examining the Day case Arthroplasty Risk Assessment score for total shoulder arthroplasty found a much higher threshold score of 110 accurately identified patients suitable for same day discharge. Additionally, patients with a score of ≤ 110 were 2.5 times less likely to visit the emergency department for an acute medical or surgical complaint related to their surgery (Polisetty et al, 2020). It is unsurprising that the cut-off score was lower for surgery involving the shoulder compared to the lower limb given the lower complication rate associated with total shoulder arthroplasty (Fehringer et al, 2010). The Day case Arthroplasty Risk Assessment scoring tool is a promising development in the quest to provide day case shoulder arthroplasty, but the mandatory subscription fee and its failure to consider non-medical factors influencing a patient’s ability to stay overnight (eg lack of home support and distance from the hospital) presents some distinct challenges.

Key steps in the transition to day case shoulder arthroplasty

The care of patients undergoing total shoulder arthroplasty has evolved over the years as a result of improvements in surgical technique, implant design, pain management and perioperative care. Cumulatively, these have led to an overall reduction in length of stay and form the foundation of a potential day case approach. While several factors need to be considered when delivering a day case-based service, the most important ones include partnership and coordination with the anaesthetic department, patient education, pain management, limiting intraoperative blood loss and medical risk stratification (Figure 1).

The decision to include a patient into a day case pathway should be taken by both the surgeon and anaesthetist. Irrespective of whether a formal scoring system or a more generalised algorithm is used, certain factors must be considered and include severity of any cardiopulmonary disease, presence of obstructive sleep apnoea, ASA score, opiate dependence, mobility, degree of social support at home and motivation for the day case process. With the exception of revision surgery, post-traumatic and oncology cases, the majority of patients may be suitable (Bean et al, 2018).

Before surgery, a comprehensive anaesthetic evaluation should be carried out and the operation scheduled as either the first or second case to allow sufficient recovery time. Regional anaesthetic block is conventionally given but concerns have been raised regarding severe rebound pain. To mitigate against this, novel local anaesthetic agents have been advocated as a useful adjunct to standard postoperative analgesic regimens. Liposomal bupivacaine consists of bupivacaine stored in multivesicular liposomes that allow its slow release and thus prolongs its action (Chahar and Cummings, 2012). Additional pharmacological treatments may include perioperative tranexamic acid (1 g intravenous) since this decreased the need for blood transfusion following total shoulder arthroplasty in patients with a haematocrit under 38% (Clay et al, 2020).

Multimodal pain relief uses a combination of analgesic medications that act on different sites of the pain pathway. It may include a combination of opiate and non-opiate analgesia and is a fundamental part of day case arthroplasty surgery because adequate pain control is essential for any postoperative discharge plan, and in preventing unplanned hospital readmission. For discharge on the day of surgery, plans should be made to phone the patient on the following day in order to ensure satisfactory clinical progress. If an unexpected problem is identified, such as an exacerbation of pain or bleeding through the dressing, a clear policy needs to be in place to facilitate an immediate surgical assessment without the need to attend the emergency department. Essential criteria that need to be fulfilled to safely discharge a patient on the day of surgery include review of formal postoperative X-rays taken in the radiology department, dry surgical dressings, adequate pain relief, passage of urine and the ability to independently mobilise (Figure 2).

Important considerations during implementation

Successful introduction of day case shoulder arthroplasty is predicated upon a robust protocol that should be developed in collaboration with the anaesthetic department, day surgery unit and theatre team. This is vital since defined lines of communication and staff engagement are arguably two of the most important factors influencing the outcome. Patient education and motivation are critical, and these should be provided and evaluated respectively preoperatively. If for any reason the patient does not consent for same-day discharge, then the procedure should be performed as an inpatient.

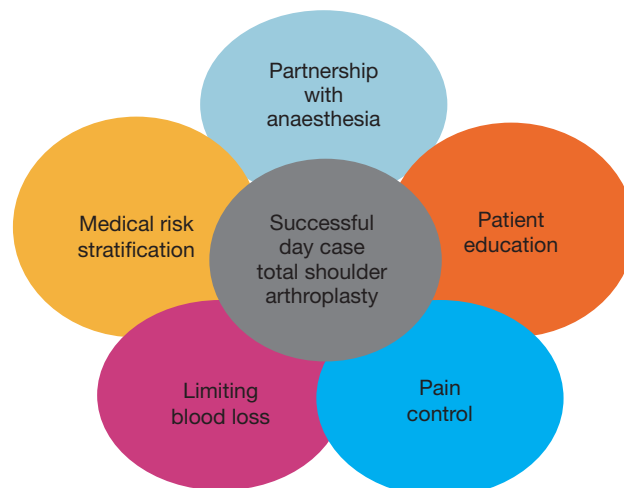


Figure 1. Principles of successful day case total shoulder arthroplasty.

Potential barriers to implementation

Before performing total shoulder arthroplasty as a day case procedure, it is essential that the surgeon possesses a degree of technical proficiency because prolonged operating time increases complication rates (Anthony et al, 2015). Similarly, surgical volume influences the decision to pursue day case arthroplasty, with those that engage with the approach performing higher numbers; a factor that likely reflects their comfort with the procedure (Brolin et al, 2018).

Transitioning to day case shoulder arthroplasty may be seen as a relatively novel change in policy, and so it is important to identify not only potential barriers to its implementation, but also the views of clinicians who have experience with it. In a survey of members

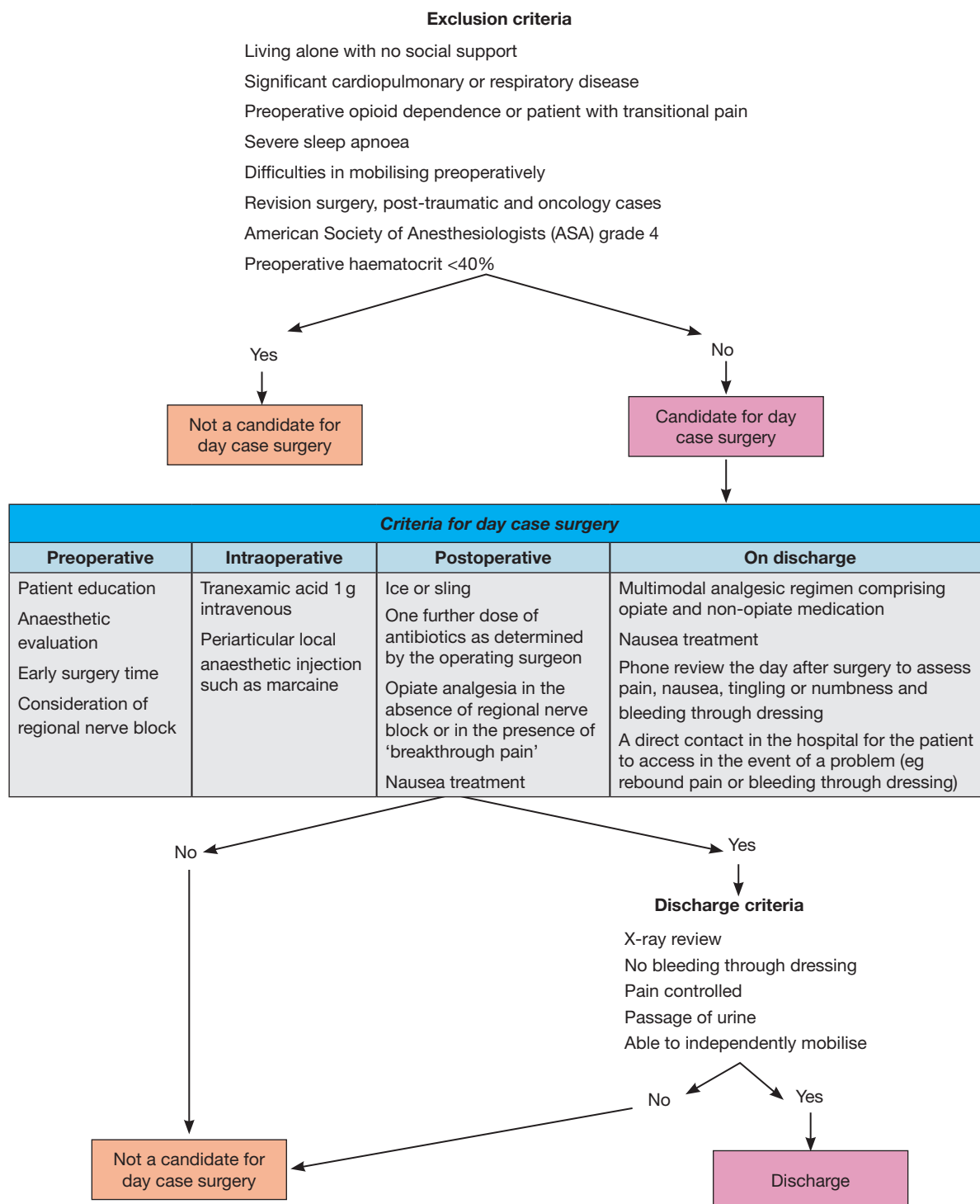


Figure 2. Algorithm guiding patient selection for day case shoulder arthroplasty.

Key points

- Compared to a day case approach, inpatient shoulder arthroplasty is associated with higher rates of hospital readmissions and complications such as thromboembolic events and surgical site infections.
- Using a day case approach for shoulder arthroplasty in the USA, up to \$3500 (~£2500) can be saved per patient, giving scope for substantial savings to the NHS.
- Risk factors for complications within the first 30 days following shoulder arthroplasty include chronic steroid use, a preoperative haematocrit of less than 38%, American Society of Anesthesiologists class 4 and an operative time longer than 2 hours.
- Key factors that need to be considered when delivering a day case service include partnership and coordination with the anaesthetic department, patient education, pain management, limiting intraoperative blood loss and medical risk stratification.

belonging to the American Shoulder and Elbow Surgeons society, reasons for surgeons not performing day case arthroplasty included patient comorbidities, patient social support, complications occurring in an unmonitored home environment, readmission risk and patient age (Brolin et al, 2018). Unforeseen overnight stays or unplanned hospital admissions increase episode-of-care-costs, decrease patient satisfaction and may compromise patient safety. Nonetheless, surgeons performing day case total shoulder arthroplasty reported high levels of satisfaction with nearly 80% reporting an excellent experience (Brolin et al, 2018).

Conclusions

Providing high-quality musculoskeletal healthcare in an overstretched NHS has always been challenging because of the numerous financial and logistical challenges that need to be overcome. The COVID-19 pandemic has placed an increased strain on all medical services with soaring waiting lists and limited capacity. Strategies will be needed to cope with the increased demand for elective orthopaedic care as a result of an ageing population and the cessation of non-emergency surgery. Evidence supports the use of day case shoulder arthroplasty with results demonstrating excellent clinical outcomes, high patient satisfaction and few complications. Careful patient selection and partnership with the anaesthetic department are crucial components of a potential day case pathway. This is an exciting opportunity for the health service to keep up with demand, while limiting bed occupancy rates and making substantial savings that can be redirected into other vital services.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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