

Utility of Post Anesthesia Care Unit vs. Postoperative Day 1 Radiographs Following Shoulder Arthroplasty

Taylor Den Hartog, Garrett Christensen¹, Maria Fernanda Bozoghlian², James V Nepola³, Brendan Patterson²
¹University of Iowa Hospitals and Clinics, ²University of Iowa, ³UHIC

INTRODUCTION:

Postoperative radiographs may be performed at different timelines after shoulder arthroplasty. Many surgeons perform radiographs in the post anesthesia care unit (PACU), while other surgeons obtain them in the radiology suite. Images from the PACU offer immediate feedback regarding operative complications and implant placement. They can aid in that patient's care and immediately inform the surgeon on their operative technique, which has the potential to improve future surgical decision making. These PACU radiographs, though, are often underpenetrated and can be very difficult to interpret due to an inadequate position of the patient.¹ Namdari et al. evaluated the quality of PACU radiographs in shoulder arthroplasty and concluded that these radiographs are both costly and of poor quality. In addition, they found in their series that no treatment changes were made based on PACU radiographs.² Conversely, radiographs taken in the radiology suite offer different advantages. In this scenario, alert patients and radiology technicians can optimize positioning, increase resolution of the study, and obtain higher quality radiographs to serve as postoperative evaluation and baseline films for future comparison. The purpose of this study was to determine if PACU radiographs differed in quality from radiographs performed in the radiology suite at postoperative Day 1 (POD1) following shoulder arthroplasty.

METHODS: We retrospectively reviewed 392 consecutive shoulder arthroplasties performed between January 2020 and July 2021. There are two shoulder surgeons performing shoulder arthroplasty at our institution. One of our surgeons prefers to obtain postoperative radiographs (AP, Grashey, Scapular Y) in the post anesthesia care unit (PACU) and at two weeks (AP, Grashey, Axillary Lateral) postoperatively, while the other surgeon prefers to obtain postoperative radiographs (AP, Grashey, Axillary Lateral) in the radiology suite on postoperative day (POD) 1 that are meant to serve as baseline. Our series included 50 consecutive anatomic total shoulder arthroplasties (TSA) and 50 consecutive reverse total shoulder arthroplasties (RSA) for which postoperative radiographs were obtained in the PACU. We also included 50 consecutive TSA and 50 consecutive RSA for which postoperative radiographs were obtained in the radiology suite on POD 1 prior to discharge. Single view, true AP, or "Grashey" TSA radiographs, both PACU and POD1, were blinded and reviewed by 3 authors and graded on their quality. Quality was based on prior description by Alolabi et al. who defined the best fit circle technique.³ Criteria and quality examples were provided during the review process. Radiographs were reviewed independently. A second review was completed one month following the first review process. Reviewers were asked to score "yes" or "no" if the radiograph met quality criteria. RSA radiographs were reviewed for evidence of fracture or dislocation. Final radiology reads were also reviewed for fracture or dislocation. The weighted kappa was used to describe the intra-rater agreement and inter-rater agreement between two raters.

RESULTS: There was no statistical difference in age, sex, BMI, and number of comorbidities between all groups. Intra-observer reliability was moderate to substantial with weighted kappa values of 0.65 ± 0.07 (95% CI 0.51-0.80, $p<0.001$), 0.58 ± 0.09 (95% CI 0.41-0.75, $p<0.001$), and 0.67 ± 0.07 (95% CI 0.53-0.82), $p<0.001$). Inter-observer reliability was moderate to substantial with weighted kappa values of 0.605 ± 0.07 (95% CI 0.46-0.75, $p<0.001$), 0.66 ± 0.07 (95% CI 0.52-0.81, $p<0.001$), and 0.65 ± 0.08 (95% CI 0.50-0.80, $p<0.001$). When assessing quality of radiographs, 30% of radiographs obtained in the PACU deemed of high quality while 57% of radiographs obtained in the radiology suite were deemed of high quality, which was statistically significant ($p<0.001$). When reviewing final radiology reads, two patients final radiology read reported possible fracture. On review of these radiographs the possible fracture was determined to be the lesser tuberosity osteotomy site. There were no changes in patient's postoperative courses based on imaging findings. Cost and amount of radiation didn't differ between PACU and POD1 [radiographs](#).

DISCUSSION AND CONCLUSION:

Historically, many institutions have obtained immediate postoperative portable radiographs in the PACU following shoulder arthroplasty. We have questioned whether immediate postoperative radiographs have altered patient care and if the quality is similar to that of radiographs obtained in the radiology suite on POD 1. There is a paucity of literature regarding immediate postoperative imaging following shoulder arthroplasty. Namdari did report on shoulder arthroplasty patients who received a single view (88% internal rotation) in the PACU compared to a second group of patients who obtained a full series at a later date after discharge.³ They concluded that routine PACU radiographs may result in poor-quality images and elimination of these radiographs may reduce cost without changing clinical care. Our study shows that immediate postoperative radiographs are often of poorer quality than those obtained in the radiology suite on POD 1. This study also shows that there was no change in patient management based on when radiographs were obtained. Obtaining high quality baseline radiographs prior to discharge can also streamline postoperative clinic visit efficiency by negating the need to obtain baseline radiographs at the first postoperative visit, and if they are taken within the first few days of the procedure, they could become useful in scrutinizing surgical technique. It's important to mention that even though there

are multiple advantages to obtaining radiographs in the radiology suite POD 1, interestingly only 57% of these radiographs were deemed of high quality. It is crucial then, for the postoperative radiographs to be taken with the highest quality possible not only to assist the surgeon in detecting immediate postoperative complications, but also to serve as baseline radiographs and decrease the number of radiographs performed.