

# Guidelines for establishing quality outcomes in cataract surgery in an ambulatory surgery center

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## Abstract

**Purpose:** The purpose of this paper will suggest best practice guidelines that should be implemented in ambulatory surgery centers for review of cataract complications. The paper will also assess and compare a physician's rate of posterior capsule rupture (PCR) with published literature.

**Methods:** A retrospective chart review encompassing 2010-2015 which evaluated 4,028 consecutive patients who underwent a routine cataract procedure with one physician at three locations.

**Keywords:** Posterior Capsule Rupture, Vitrectomy, Cataract Surgery, Best Practice.

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**Results:** Over the five year period, 4,028 cases experienced no PCR, for an incidence rate of 0%. Surgeon volume showed no signs of correlation with the rate of PCR.

**Conclusions:** Posterior capsule rupture remains a huge concern for patients undergoing cataract procedures. The results of this study include a lower incidence of previously published literature. Suggested guidelines found in the article will only add to the growing body of literature to inform future policy.

## Introduction

Cataract procedures are one of the most commonly performed procedures in the United States. The goal in healthcare is to provide optimal patient care while performing continuous quality improvement. Complications in medicine and surgery will occur but the goal should be to minimize them. With the rise of the Accountable Care Organizations (ACOs), outcomes will increasingly come under scrutiny as we attempt to measure the provision of necessary and quality care. With the advances in medicine and technology, the complication rates during cataract surgery have decreased dramatically, but still remain an issue for patients who experience a complication.

As previously stated, cataract surgery is the most common outpatient surgical procedure in the developed world. It has the highest rate of success of any surgical procedure, and represents a large expenditure of health care dollars. Due to its reproducibility, it lends itself easily to a convenient examination of the metrics involved. To create a simple method of quality measurement for the institution, the ambulatory surgery center selected the rate of capsular rupture and/or subsequent vitrectomy as the core measurement of acceptable surgical performance.

It is well recognized that the rate of vitrectomy is often underreported. The posterior capsule may be ruptured and the surgeon does not always proceed to vitrectomy. The reasons are: 1) the rupture is small and vitrectomy is not indicated, 2) the indication for vitrectomy is borderline and the surgeon often, for reasons of time, elects to forgo the vitrectomy or 3) the surgeon will use a simple but ineffective weck cell vitreous division to avoid the reporting of and the cost of using automated vitrectomy. After a posterior capsule rupture, if the surgeon avoids the use of automated vitrectomy, when truly indicated, it can potentially harm the patient's result. The center recognizes that if surgeon's outcomes are being evaluated, the temptation to keep the reported vitrectomy rate low may lead to poor decisions.

The rate of posterior capsular rupture and vitreous loss (PCR/VL) has long been accepted as the core measurement of quality in cataract surgery. This parameter is easily measured and tracked. The surgery center has elected to use this measure as the "gold standard" to define quality and define quality surgery. To avoid ambiguity, the surgery center considers posterior capsular rupture (PCR) with or without vitreous loss (VL) or vitrectomy in any fashion to be the same parameter. For the purposes of this review, a PCR with or without a vitrectomy will be considered to be the same event.

## Background

The literature was reviewed regarding the rate of PCR/VL. Many of the studies, although informative and well conducted, pertain to residents in training or at least include residents and fellows performing surgery in large academic settings. These institutions vary greatly from the work done at the ambulatory surgery center; therefore the guidelines are conceived to inform the progress of attending surgeons in non-academic large volume community settings [1-3]. An example of how experience influences results is provided by the excellent study by Martin [4] of his first 3,000 cases of phacoemulsification where the first 300 cases had a vitreous loss rate of 4% and the last 300 cases had a loss rate of 0.7%, for an overall rate of 1.3%. The paper by Ionides et al of 1,533 cases shows a total rate of 4.1%, however the rate for residents in the study was 5.3% versus the consultants, or attending's at the rate of 1.2% [5]. Tan and co-workers reported a series of 2530 phacoemulsifications with a 3.6% vitrectomy rate; however the rate for consultant surgeons was 2% [6]. Mearza et al reported a rate of vitreous loss in 1614 eyes to be 2.66% with the rate for consultants being 2.3% [7]. A 2006 study of 2,727 cases by Ang and Whyte [8] gave a rate of 1.7%, however of 45 posterior capsule ruptures, 15 (33.3%) were during resident surgery. Muhtaseb et al reviewed 1,441 patients with a PCR/VL rate of 4.4%, however only 28.4% of the procedures were performed by attending surgeons. The same study quotes a posterior capsule rupture rate of

26% to 36% for phacoemulsification in eyes with posterior polar cataracts [9]. One thousand consecutive cases were analyzed by Zaidi et al in 2007 with a vitreous loss of 1.1% and a 0.4% rate of capsular tear without vitrectomy for a combined rate of 1.5%. Consultant surgeons directly performed 16.5% of the cases. The rest were performed by trainees with supervision by a consultant [10].

Hyams et al studied 137 eyes with pseudoexfoliation (PXF) and 1,364 eyes without and found an incidence of capsular break of 2.9% in both groups. Vitreous loss was 1.5% in the PXF group and 2% in the control eyes. It is important to note that in the hands of these experienced surgeons PXF did not confer an increased incidence of PCR/VL in the absence of phacodonesis or lens subluxation [11]. The landmark 2001 report by Gimbal et al reports 18,470 cases with a posterior capsule tear rate of 0.45% [12]. The most recent article by Chen et al in 2014 [13] showed a 0.68% rate of posterior capsule rupture and vitreous loss during phacoemulsification in 3,339 cases for four attending surgeons in a small non-academic cataract surgical center. Of particular note is that only cases deemed acceptable for topical anesthesia were included in the study and cases requiring additional anesthesia or those in a hospital setting were excluded.

Two articles stand out due to the number of patients included in the sample size. The 2003 report from Chan et al [14] includes 8,230 consecutive cataracts from a predominantly Asian population in a tertiary ophthalmic center with a posterior capsular rupture rate of 1.9%. This study however also included cases of extracapsular cataract extraction (not phacoemulsification). The Cataract National Dataset electronic multicenter audit by Narendran et al [15] included 55,567 operations with an overall PCR/VL rate of 1.92%. This study includes 406 surgeons of all training levels in the English National Health Service. The study is difficult to utilize in our model of non-academic, community based cataract surgery done solely by attending surgeons due to the many grades of surgeons and the complex nature of the case stratification in this large study. An excellent table summarizing published rates of vitreous loss is provided in the article by Chang [16].

## Methods

A retrospective chart review was done from 2010-2015 on 4,028 cases. Study approval was granted through the Medical Advisory Board of the Ambulatory Surgery Center in Bucks County, PA. Surgical procedures were performed by the Lead Author (AM) at three locations within the Bucks County, PA. The three institutions are 1) multispecialty ambulatory surgery center, 2) an ambulatory surgery center, and 3) a large suburban hospital. There were no patient exclusions. The cases included were peer reviewed by another attending MD.

## Results

Of the 4,028 cases reviewed, the PCR rate was found to be 0%. Of all the included cases, 896 were the highest risk type; these were performed in the hospital outpatient surgery setting. These risk factors included: oxygen dependent patients, mentally ill patients, patients with severe movement disorders, patients with severe physical deformities who were difficult to position and those who were considered to be greater than ASA class three.

## Implications

Identifying and investigating complication rates is paramount to provide best practice to patients. Publishing complication rates

and strategies for best practice will enhance accuracy in reporting and provide surgeons with a benchmark for comparison. Previous suggestions have been to prepare a national database in order to identify outliers on the negative side but this endeavour is costly and is only as accurate as the information provided [3].

Insurance companies, mainly Medicare, are the main reimbursement bodies for cataract surgery. Complications during the procedure leads to increased follow up, longer procedure times, and ultimately more money per procedure. A way to identify surgeons with best practice, and review cases with complications should be paramount for the future. It is a goal to provide a model for the effective evaluation of cataract surgical quality in a non-academic community based environment among experienced attending surgeons. Although copious articles have been written on rates of various cataract surgical complications and their predisposing factors, this is the first attempt to codify a framework to assess the fundamental quality outcome measurement in the most commonly performed surgical procedure.

As we move into an era of cost accountability it will be increasing necessary to identify the provision of quality care. Complications, in the end, are far more costly than a simple review of a cost per case analysis. A surgeon may have a slightly lower cost per case, but if the complication rate is excessive, this will lead to an overall higher cost in terms of reoperations and poor patient outcomes.

After careful review of the literature, the ambulatory surgery center intends to examine on a quarterly basis the PCR/VL rate of each surgeon. The case load of any surgeon with a rate that equals or exceeds 1.8% will be intensively reviewed. We acknowledge that certain variables are beyond the control of the surgeon to a great extent and therefore we exclude from the calculations:

1. The following type of cataract: Posterior polar cataract
2. The following circumstances:
  - a. eyes with known subluxated lenses from any cause including trauma or pre-existing collagen vascular disorders
  - b. patients with severe pseudoexfoliation noted in the second eye with the first eye having experienced PCR/VL
  - c. eyes known or discovered at the time of surgery to have loose zonules
  - d. eyes with greater than three intravitreal injections of any agent
  - e. eyes with dark brown or black cataracts

Two rates will be calculated. The "raw rate" will include all cases and results. This rate will be tabulated but not considered in the outcome analysis for the purpose of following surgeon quality. The "corrected rate" will exclude the above listed factors and give a more realistic assessment of surgical quality. It is acknowledged that the degree of surgical difficulty varies by region and patient population and some surgeons, by the nature of the practice, will be exposed to more advanced pathology which will affect outcomes.

As mentioned above, a corrected PCR/VL rate of 1.8% will trigger an intensive chart review. However during review the following conditions will be given special consideration due to their higher level of inherent risk:

1. Eyes with synechi (adhesions) which need to be broken at the time of surgery due to trauma or severe inflammatory disease
2. Eyes requiring pupil expansion
3. Eyes with prior extensive filtration surgery
4. Eyes with prior par plana vitrectomy

## Conclusions

The goal is to identify cataract surgeries that do not meet quality measures that are objective and easily identified. This allows us to review surgical performance in a timely manner to improve and maintain a high level of patient safety and satisfaction with a cost effective delivery of care for the most commonly performed surgical procedure. We intend to refine these parameters over time and predict that the acceptable corrected rate of 1.8% will drop over time. Participation by similar community based ambulatory centers would allow for large numbers to be analyzed in a short period of time leading to widespread acceptance of a uniform measurement of cataract surgical outcomes. The surgery center intends to publish under separate cover an analysis of the total complication rates, to include other experienced surgeons performing cataract surgeries.

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