Cataract extraction with lens insertion performance measurement study

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Abstract

Aim: To examine performance in ambulatory cataract surgery.

Methods: Participating organizations provided organizational, process, and follow-up patient data via surveys over a four month period.

Results: Median pre-procedure time (patient check in to incision) was 82 minutes. Median postprocedure time (dressing on to meeting discharge criteria) was 23 minutes. Forty-five cases (2.6%) were reported as having complications (28) or not routine (17). In 99% of cases, povidone iodine was used in the eye. Almost 2% of patients indicated they had unscheduled follow up and possible symptoms of infection.

Conclusion: Opportunities for improvement include decreasing: variation in procedure times; complicated/non-routine cases; and, possible post-operative infections.

Keywords: Cataract extraction, Ambulatory surgery center, Procedure time, Complications, Non-routine cases, Unscheduled follow up, Infection, Patient outcomes.

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Introduction

The purpose of the study was to provide opportunities to initiate clinical performance measurement on key processes and outcomes for cataract extraction with lens insertion in the ambulatory care setting. Cataract accounts for approximately one half of adult (over age 40) low vision cases. [1] In 2006, of the approximately 4.4 million cataract surgeries performed in the ambulatory setting, more than three fourths (approximately 3.25 million) of these were performed in freestanding facilities. [2]

Among the issues studied was "procedure times." Procedure times are indicative of not just efficiency but also safety and patient satisfaction. The pre-procedure or "wait" time can be associated with patient satisfaction. The post-procedure or "discharge time" (the patient meets discharge criteria – *not* when the patient's ride arrived) may signify over-medication during the procedure.

Complication rates were also studied. Complication rates for cataract surgery are not high (e.g., endophthalmitis: 0.74%; capsular rupture: 1.8%), but possibly preventable complications should be examined. The American Academy of Ophthalmology (AAO) recommends the use of a 5% solution of povidone iodine in the conjunctival cul de sac to prevent infection. When there is unscheduled follow-up associated with pain, inflammation, and/or redness at or near the operative site, it can be indicative of a post-operative infection or endophthalmitis.

Methods

Participant Recruitment

The AAAHC Institute for Quality Improvement solicited, via mail, participation from the Accreditation Association for Ambulatory Health Care (AAAHC) accredited organizations and those who had participated in previous AAAHC Institute cataract studies, as well as the wider population through the AAAHC Institute website (www.aaahciqi.org). Seventy-eight organizations voluntarily registered for the study. Seventy-one (representing more than 130,957 cataract procedures annually) submitted data. Annual cataract extraction procedure volume ranged from 70 to 8,000. Almost two thirds (65%) of the participating organizations were single specialty ambulatory surgery centers; the rest were multi-specialty specialty ambulatory surgery centers.

Case Data Collection

Data were collected using standardized survey instruments from August through November, 2007. All cases were collected during the same four-month period to avoid issues with "historical" factors such as changing prices and technology. Participating organizations completed a "General Information" survey, describing their organization and its practices, as well as "Procedure Specific" surveys, which included documentation of patient attributes (ASA classification [5] and indications for the procedure), specific processes of care and patient outcomes, via a telephone follow-up survey with patients 2 weeks post- surgery. Organizations were asked to complete surveys for 15 to 25 cases.

It should be noted that that 25 to 35 cases for the same procedure/diagnosis may be needed provide a statistically accurate picture of a physician's practice regarding that procedure/diagnosis. This assumes organizations' patients are statistically independent, which is unlikely [4], so even larger samples would be necessary for statistical accuracy. Instead, organizations participating in AAAHC Institute studies are asked to review their performance from year to year to develop a composite of their performance.

Cases matching the procedure code were assigned by a manager, so that the organization submitted a sample of procedures to form a composite profile of the practice. If organizations had more than one surgeon, they were encouraged to use data from two or more of their

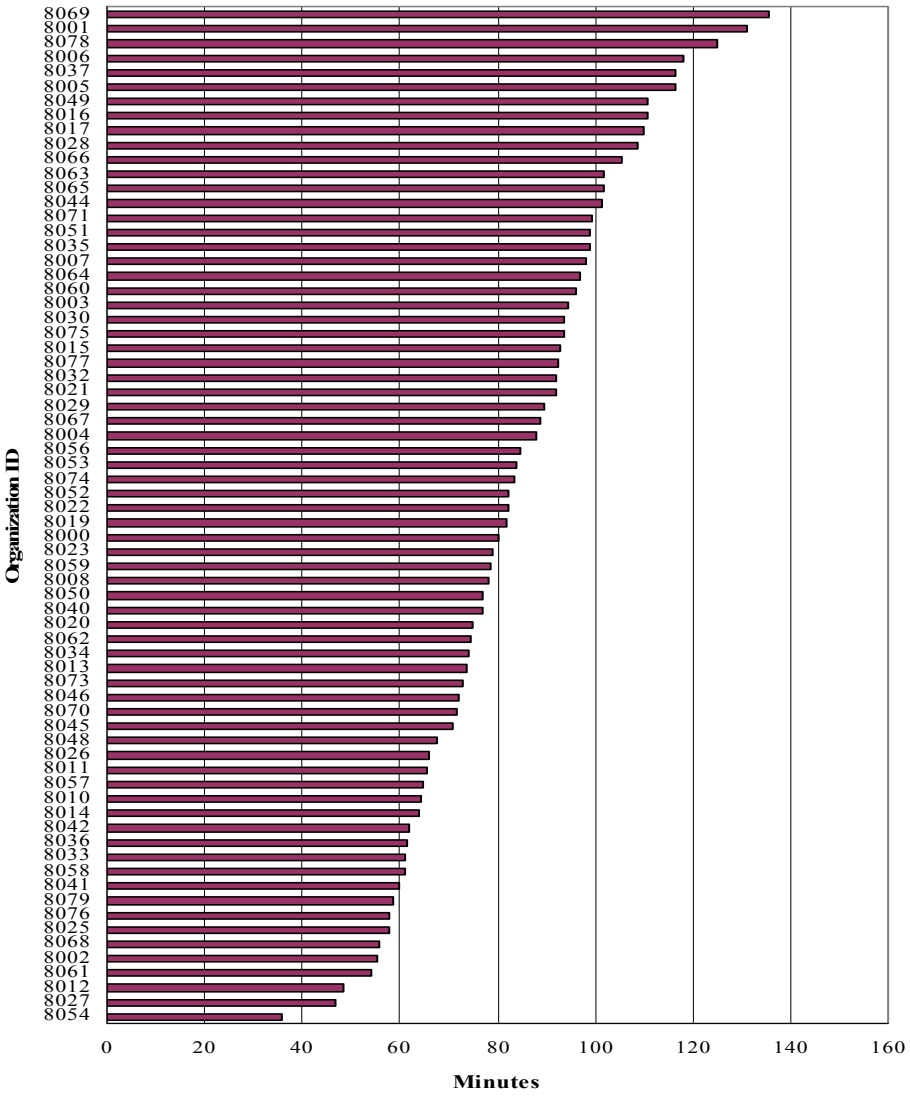

Figure 1 Average Pre-Procedure Time by Organization.

surgeons. To avoid retrospective chart reviews, and obtain the most complete and accurate data, all documentation of processes of care were completed concurrently (real time).

Data Review

A total of 1756 cataract extraction with lens insertion surveys were received and reviewed for accuracy and completeness. Each survey tool was reviewed in detail to ensure that the responses accurately represented a potential profile for the procedure identified. Surveys that appeared to include inconsistent data or outliers, or that had a small number of missing values, were checked with participating organizations to maximize completeness and consistency. The 45 complicated or non-routine cases that were submitted were not included in analyses because they might skew results; however, they are described in the Results section below. A total of 1711 surveys were used for aggregate (grouped) analyses. For the benchmark (comparison) of the procedure time analyses, (for which a minimum of 15 cases per organizations was required) 1701 cases from 70 organizations were analyzed.

Results

The results described here are part of a more extensive 2007 study report on cataract extraction with lens insertion. [5]

Patient Attributes

ASA classifications were assigned for 92% (1577/1711) of the cases; 94% of patients were classified ASA 2 or 3. [6] Indications for the procedure were documented for all cases—many had multiple indications. The most frequently listed indication for the procedure was "impaired visual function" (61%). For 99% (1001/1012) of those with visual acuity listed as an indication, acuity ranged from 20/20 to 20/800+, with a median of 20/60. Additionallly, "glare" was listed as an indication for the procedure in 47% of cases (808/1711).

Pre-Procedure Time

Pre-procedure time was defined as the time from the patient's checking in to the facility to the time the procedure began (the incision was made).

- The median pre-procedure time overall was 82 minutes; the times ranged from 36 to 135 minutes. See Figure 1.
- The time between when the patient has arrived at the operating room (OR) and when the procedure starts is included in the "pre-procedure" time because some organizations may be shifting the wait time from the patient waiting area to the procedure room itself. If the wait in the waiting area is short, but the wait in the OR is long, patient satisfaction may suffer and facility times (and associated cost to the organization) will remain higher.
- Pre-procedure time may be influenced by how early or late patients arrive. Patients who arrive very early may contribute to a longer average pre-procedure time, and those who arrive very close to the procedure time or who are "moved up" in the schedule because of a cancellation, may decrease the average pre-procedure time.
- In the 2003 AAAHC Institute study of cataract extraction with

lens insertion (the only year this correlation was studied), there was a correlation of 0.48 between how early patients arrived and pre-procedure time. This value indicates more than a chance relationship between average number of minutes early and average pre-procedure times. [7]

- Organization 8054 had the lowest pre-procedure time (See Figure 1.) They attributed it to:
  - Pre-operative screening before the day of surgery to anticipate any medical or ophthalmic problems, including:
    - reviewing charts and reporting special needs to the nursing director;
    - using a medical checklist, identifying special surgical equipment necessary, as well as the need for viscoelastics or solutions like Trypan blue, and making sur these are in or directly outside of the OR; and,
    - checking the powers and styles of intra-ocular lenses (IOLs) prior to surgery.
  - Adequate staffing for efficient patient flow for 2 ORs, consisting of:
    - a receptionist who obtains any consents that need to be signed, and administers dilating drops immediately upon arrival (if the patient hasn't been instructed to administer these at home);
    - 2 circulators (one in each OR);
    - 2 scrub personnel (one in each OR);
    - an instrument tech (goes between rooms);
    - 4 nurses (2 for pre-op prep and holding and 2 for post-op check out); and,
    - a floating nurse supervisor who fills in where needed and handles patient problems.
  - Scheduling patients, with more complicated cases at the end of the day.
  - Assigning patients specific arrival instead of surgery times
    - The nursing director sets the schedule 3–5 days prior to surgery;
    - The pre-op nurse calls the patient 2–3 days before the procedure;
    - This process allows for time to re-organize the schedule if cases are added.
  - Giving each patient printed post-operative instructions, including pictures of the postoperative drops used in a patient post-operative kit.
- Organization 8027 attributed pre-procedure performance to:
  - Scheduling longer cases at the end of the day;
  - Staffing up" (adding) pre- and post-op nursing staff;
  - Having the Circulator/Float set up phaco, so there is less physician wait time;
  - Using pre-printed paperwork; and,
  - Using topical and local anesthesia with intravenous sedation for 95% of procedures
- For Organization 8012, pre-procedure speed is explained by the following:
  - The ASC and Clinic are in the same building. This permits pre-operative patient interviews to understand patient needs and provide education, a tour of facility, and meeting the staff before the surgery.
  - Prior to patient arrival, the pre-operative area is set-up to anticipate any special needs (such as lifting or retrobulbar block) that each patient may require.
  - Eye drops are started upon arrival.
  - Patients remain in clean street clothing.
  - Patients' stretchers have attached limb leads for cardiac monitoring through the perioperative period.
  - IV saline locks with IV anesthesia permit patient anxiolysis prior to arrival in the OR.

Discharge Time

Discharge time is defined as the time from when the procedure finishes (and the dressing is on) to the time the patient meets discharge criteria.

- The overall median discharge time was 23 minutes, with a range of 3 to 41 minutes. (See Figure 2.)
- Please note that the definition of discharge time used for this study is from the time the procedure finishes to the time the patient is *ready for discharge* – not to the time the patient's ride has arrived.
- In addition to contributing to overall facility time (and the associated cost to the organization), longer discharge times may be indicative of inappropriate choice or levels of anesthesia for the patient, discharge criteria that are too strict, or staff not checking patients against discharge criteria frequently enough.
- Discharge times may also be longer if discharge instructions are being reviewed with patients/family for the first time or have not been provided in written form.
- Organization 8022, with the lowest discharge time of three minutes, attributed its performance to:
  - Using primarily topical anesthesia with a light IV sedation (thereby speeding up recovery);
  - Certified registered nurse anesthetists (CRNAs) in the OR keeping patients stabilized throughout the procedure and escorting them to recovery (rather than RNs) ;
  - Using mobile gurneys for quick transfers;
  - Prior to surgery, providing patients with packets to help them to understand what the discharge instructions will be;
  - Including patients' families in the discharge phase to assure that everything is understood (4 ears are better than 2!);
  - Employing a patient family assistant to narrate the surgery to the patient's family and ensure that the family is waiting in recovery for the patient and that all belongings are returned to the patient prior to discharge;
  - Offering patients only a small amount of water and juice before discharge; (not snacks that can take up time and make a mess); and,
  - Being aware that there is a fine line between being efficient and having patients feel like they are "cattle" being driven through the center.
- Organization 8027 described short average discharge time as being due to:
  - "Staffing up" (adding staff) at discharge;

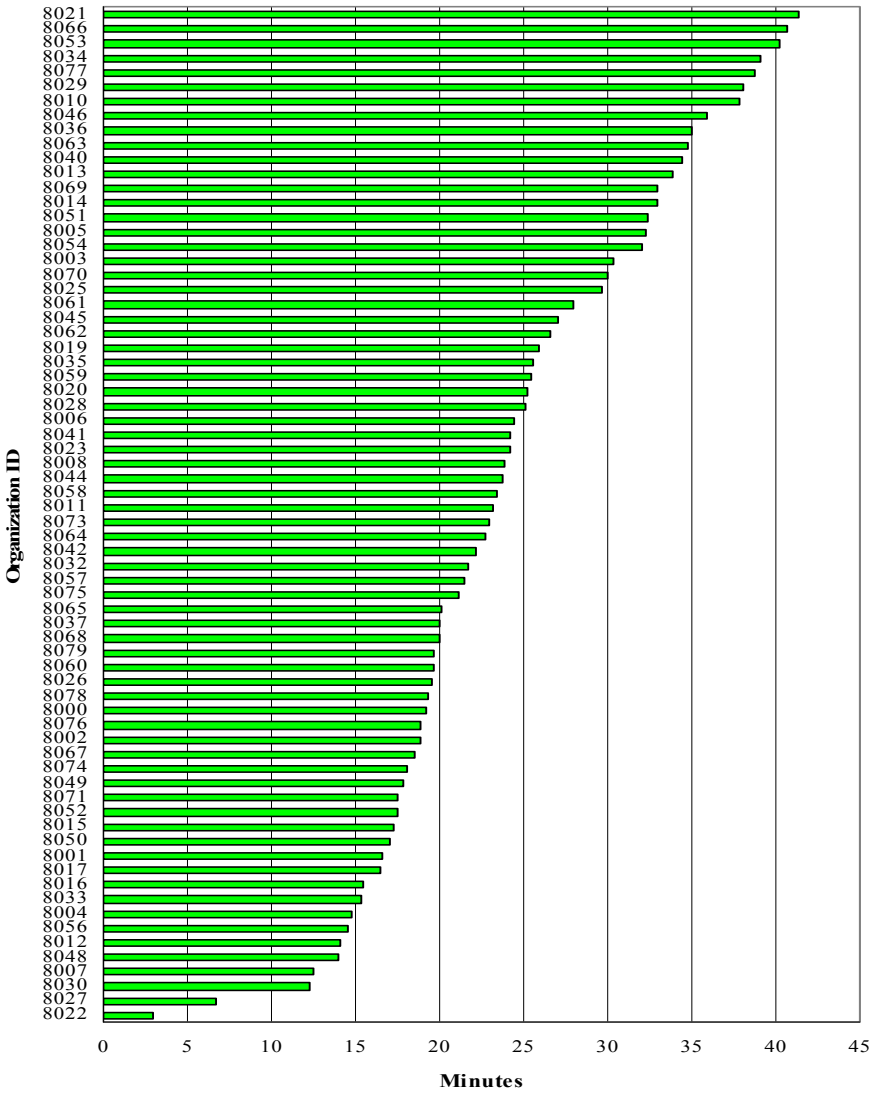

Figure 2 Average Discharge Time by Organization.

- using pre-printed paperwork;
- Using topical and mild sedation;
- Providing education during the pre-op phase; and,
- Having someone dedicated to escorting patients to the car.

- Organization 8030 has the third shortest average discharge time. Their efficiencies were noted as follows:
  - Use a system where nurses in pre-op and recovery do not remain in one designated position throughout the day; they assist in other areas as they are available.
  - Have an established routine:
    - the cataract surgery patients are discharged from the surgery bed, so there is one less transfer for the patient;
    - patients do not change into gowns prior to surgery; and,
    - recovery room orders from cataract surgeons are standardized.
  - Prepare the patient pre-procedure:
    - review the discharge instructions with the patient (and their family) during the pre-op time, so that only brief reminders are necessary during the recovery time; and,
    - involve family members in the patient's surgery process to the extent possible.

Intra-Operative Complications / Non-Routine Procedures: Capsular Tears and Intra-Operative Floppy Iris Syndrome (IFIS)

- Of the 28 procedures listed as complicated were:
  - Floppy iris (1);
  - Floppy iris with suture (1);
  - Aborted procedure with post capsular tear (1);
  - Posterior capsular tear (6); and,
  - Posterior capsular tear and vitreous prolapse/vitrectomy (4).
- Forty-five cases (2.6%) were reported as having complications (28) or not routine (17), and not included in the procedure time benchmark (comparison of participating organizations) or aggregate (grouping of all cases together) analyses.
- Among the 17 non-routine cases were:
  - "Detrol" (tolterodine tartrate – an alpha blocker – 1);
  - "Flomax" (tamsulosin – also an alpha blocker – 1);
  - "Floppy iris syndrome" (3); and,
  - "IFIS [intra-operative floppy iris syndrome]/suture" (1).

As noted above, the AAO cites a rate of 1.8% for capsular rupture in cataract surgery. [3] The rate in this study was 0.6% (11/1756). Almost 18% of the intra-operative complications or nonroutine cases reported were associated with IFIS.

For each case documented in this study, organizations were asked whether the patient was taking tamsulosin (Flomax), a medication associated with IFIS. [8] If this question was answered affirmatively, organizations were then asked whether they were taking any measures to prevent IFIS, and if so, what. In 4% (61/1711) of uncomplicated, routine cases, patients were reported to be taking Flomax. For 75% of them (46/61), organizations were taking measures to prevent IFIS. Multiple measures could be employed by one organization. The most popular preventive measures used were:

- Iris hooks, ring, or other device (14);
- Viscoelastic (11);
- Lidocaine/'Shugarcaine' (8);
- Epinephrine or adrenaline (6);
- Atropine (5); and,
- Patient discontinuation of the medication prior to surgery (5).

The American Society of Cataract and Refractive Surgery (ASCRS) addressed IFIS in a "White Paper." They find that pupil stretching is "ineffective" and "stopping the alpha(1)-antagonist preoperatively is of questionable value." [9]

Possible Post-Operative Infections and Preventive Measures Employed by Study Participants

Within two weeks following their procedures, approximately 90% (1545/1711) of patients were contacted by telephone to obtain information about their outcomes. Ninety-nine percent of respondents (1537/1545) answered the telephone survey question regarding whether they had unscheduled contact with a doctor or the facility for reasons other than routine follow-up or unrelated physical problems (i.e., brain aneurysm, bronchitis) since surgery. Of them, 6% (92/1537) responded affirmatively. Five cases did not list a reason for unscheduled contact. There were 1.9% (29/1537) of respondents listing reasons that were *possibly* associated with infection:

- Eye inflammation (12);
- Pain control or medication refill(16); and,
- Vision and pain (1).

The AAO lists cites an endophthalmitis rate of 0.74% (0 to 1.9) in cataract surgery. [3] MedPac has found a rate of 1.64 for Medicare fee-for-service patients in outpatient departments (OPDs) and 1.05 for ambulatory surgery centers (ASCs). [10]

For cataract surgery, the American Academy of Ophthalmologists recommends the use of povidone iodine in the eye to prevent infection. [3] A recent study reviewing povidone iodine protocols in more than 10,000 cases suggests that pre-operative skin disinfection with 10% povidone-iodine and conjunctival disinfection with 5% povidone-iodine, significantly reduced the relative risk of post-operative endophthalmitis. [11] In almost 100% (1709/1711) of cases, AAAHC Institute study participants reported whether povidone iodine was used in the eye. Where this question was answered, in 99% (1690/1709) of cases, povidone iodine was used in the eye. Patient allergy to iodine would be a contraindication to this recommendation. In cases where povidone iodine was not used (19), for 74% (14) it was indicated that the patient had an allergy to iodine.

Conclusions

As illustrated in Figures 1 and 2, there is great variation in average pre-procedure and discharge time by organization. Those organizations with the shortest times offer many suggestions for decreasing the times that include common themes of using pre-printed forms and instructions, and communicating with and preparing the patient/family prior to the day of surgery. Another important theme is studying patients' special needs, patient flow, surgeon speed, and staffing, then using this information to anticipate changes in scheduling and patient arrival instructions, as well as increasing or moving staff.

The rate of one of the most important intra-operative complications, capsular rupture, was relatively low in this study (0.6% versus 1.8% cited by the AAO). At the same time, almost 20% of the intra-operative complications or non-routine cases reported were associated with IFIS, and some of the most popular strategies employed by participating organizations to prevent such issues do not appear to be very effective. [9] As more of the population in the United States becomes older and more likely to use alpha blockers, IFIS promises to increase. Addressing the issue of IFIS during cataract surgery has become more important. Research on best strategies is emerging.

From information provided by patients about symptoms associated with unscheduled contact with the physician or facility, it appears that post-operative infections may occur in as many as 1.9% of the patients studied. This happens despite participating organizations' rigorous use of povidone iodine to prevent endophthalmitis. One promising area of research suggesting an approach to this issue is the identification of patient characteristics that may be associated with risk for negative outcomes from cataract surgery. [10] It may be necessary to examine risk factors for endophthalmitis and provide special follow up with patients at risk.

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