

## Patient Outcomes and Cataract Surgery Volume

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Cataract surgery is one of the safest, most beneficial, most cost-effective medical interventions in modern medicine.<sup>1</sup> Operating on either the first eye or the second eye has been shown to improve patient function and quality of life.<sup>2</sup> Cataract surgery can ameliorate the age-related decline in general functioning<sup>3</sup> and is likely one of the major factors in why regular eye care in seniors is associated with a lower likelihood of developing new limitations in instrumental activities of daily living.<sup>4</sup> With new technology that has simplified and standardized care, its visual results are also more successful and predictable today.

In this issue, Bell et al demonstrate the high degree of safety of modern cataract surgery, with an adverse event rate of 0.33% to 0.41%.<sup>5</sup> They also show for the first time, for cataract surgeries (performed in Ontario), that compared with those who perform between 50 and 250 cases per year, surgeons who perform >250 cataract procedures per year have lower odds of postoperative adverse events, with odds ratios of 0.52 for those performing 251 to 500 cases per year and as low as 0.14 for those who perform >1000 surgeries in a year. In absolute terms, though, this translates into average rates of 0.7% to 0.9% among those in low-volume groups and 0.1% among those in high-volume groups. These results may appear to contrast with those of the cataract Patient Outcomes Research Team (PORT) study in the United States from the 1990s, in which no significant difference was found in surgical outcomes, whereas complications (notably the need for yttrium–aluminum–garnet capsulotomy) favored the lower volume surgeons.<sup>6</sup> What are we to make of these differing findings?

First, the cataract PORT study obtained information directly from the medical charts of patients, whereas the current study uses administrative claims data, with its inherent limitations.<sup>7</sup> These limitations include variation in reporting and potential bias for reporting diagnoses and complications. However, in this situation any such biases would not be expected to favor high- or low-volume surgeons on a systematic basis, unless high-volume surgeons were more likely to operate in a privately owned surgery center and did not generate a bill to the patient/government for their additional services in the event of a complication. A second potential issue is that it is current practice in many U.S. surgery centers to reoperate the same day in the case of dropped nuclei or an intraocular lens power miscalculation, practices that would not be captured in the study methods (which use only separate claims from 1 to 14 days after surgery). On the other hand, administrative claims data on a person/patient level have the advantage of capturing all the care that a patient receives, even if from a provider other than the one who performed the surgery.

Second, the PORT study was conducted in the U.S., whereas the current study was conducted in Canada. Would there be a likelihood of a systematic bias that would differ between the two countries? For example, it is well known that there is a queue, or waiting list, for cataract surgery in Canada, such that many patients will receive care in the U.S. rather than wait in Canada. However, such patients—who one might suspect to differ from those who wait—would have been excluded from the study, because it included only patients who had cataract surgery performed and paid for in Ontario.

Third, could there have been a difference in the patient populations undergoing surgery between lower and higher volume surgeons in Canada? For example, patients with chronic glaucoma treatment (and small pupils) or pseudo-exfoliation are technically more difficult, and one would expect them to have higher complication rates. If these patients are found preferentially with lower volume surgeons—for example, in surgeries done by glaucoma specialists, who might be expected to have a lower volume of cataract surgeries than cataract specialty practices—then the differential rates might reflect the impact of case mix rather than a volume-related skills context. The study authors did not state if they excluded patients with other ocular conditions, which could have a significant impact on the study results for this reason.

In addition, the authors use billing for vitrectomy, vitreous aspiration, or injection of medications between 1 and 14 days after cataract surgery as the marker of an adverse event. If, for example, patients with uveitis were included in the study (case mix), then injection of medications may have been reasonable (such as the injection of steroids) and not an adverse event. In addition, patients with comorbid ocular conditions may be more likely to have bilateral disease, such that surgery on the other eye (and, thus, misclassified as an adverse event in the operated eye) is more likely. Whether the nature of the patients would vary by cataract surgery volume is unknown, but referral patterns for surgery may vary by volume. Linking the procedure codes to diagnosis codes could shed more light on the study results and implications. Although these comorbidities would be rare, the low absolute volume of complications means that even a few of these cases might influence the results of the analysis.

Similarly, could higher volume surgeons operate on different types of cataracts than lower volume surgeons? It is unclear from the literature whether this would make any difference,<sup>8,9</sup> but anecdotal advice suggests that earlier cataracts may be easier to remove. Because there are waiting lists in Canada, one might expect that there would not be

a significant difference. However, the current study is a comprehensive administrative data study but does not include clinical data, so this question cannot be answered at this time.

Fourth, Bell et al studied cataract surgery when the prevailing standard had become phacoemulsification, whereas the cataract PORT study was conducted during a period of transition from extracapsular surgery with corneal-scleral incisions to phacoemulsification. One might expect that the change in technology has made surgery safer overall while also being more demanding, such that complication rates are more likely to vary by provider skills with phacoemulsification and, potentially less so, with extracapsular cataract extraction. However, Schein et al found no difference in complication rates in the PORT study by surgical technique during the time of their study,<sup>6</sup> whereas more recent reports<sup>10</sup> (further along the learning curve for phacoemulsification) suggest that phacoemulsification may have fewer complications (although not necessarily the ones studied by Bell et al).

Fifth, the studies' definitions of low and high volume differ. In the current study by Bell, volume thresholds are noted to be at 250, 500, and 1000 cases per year, whereas Schein et al used thresholds of 50, 200, and 400 cases per year, potentially accounting for some of the difference in findings, because the PORT study did not have a separate group with the highest volume as in Bell et al's article.

What are the implications of this study? It is a significant one, demonstrating a relationship between volume and post-operative complications in a representative population. It thus creates the need for additional study to assess the impact of such differences on patient-centered outcomes such as vision and visual functioning. Endophthalmitis clearly can compromise visual outcomes, as can the development of retinal detachment. Although it is likely that the study indicators will be borne out by more detailed analyses, having an understanding of the magnitude of differences in outcomes would be important in assessing if reimbursement or care patterns should change.

Changing cataract surgery delivery patterns to favor higher volume surgeons and settings is a decision that cannot be supported yet by this article's results. First, as noted above, important unanswered questions about case mix still exist, as noted by the authors. Second, decisions

about cataract surgery engender consideration of a set of many concerns, such as patients' access to care facilities and their established relationships to providers, and not just complication rates, particularly when the actual rates of adverse events measured are <1%, on average, even among the low-volume group. At these rates, patients may value other factors in addition to the technical rates of complications. However, providing patients this information, once the above concerns are addressed, would be a very important and powerful start to enhancing patient-centered care for cataract surgery. As pay for performance indicators are developed, careful attention to the issues raised by this important and timely article will become ever more critical.

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