MICROCOSTING OF CATARACT SURGERY COMPLICATIONS FROM A US PROVIDER PERSPECTIVE

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Background

- The costs associated with complications during and following cataract surgery are not well documented in the literature.
- This study aimed to determine the routine treatment of cataract surgery complications through discussions with an expert panel, and to determine the costs of the complications from a US provider perspective through a micro-costing approach.

Methods

- Three US cataract surgeons were interviewed about healthcare resource utilization (HRU) for the treatment of intraoperative and postoperative cataract surgery complications including:
  - Posterior capsule rupture (PCR)
  - Corneal burn
  - Cystoid macular edema (CME)
  - Corneal edema
  - Elevated intraocular pressure (IOP)
- HRU categories included:
  - Additional operating room (OR) time
  - Additional intraoperative procedures
  - Additional postoperative physician visits
  - Additional postoperative clinic procedures or imaging*
- Unit costs for OR overhead, OR labor, materials/supplies, postoperative physician visits, and physician time for postoperative clinic procedures or imaging* were obtained from published sources, where available (**Table 1**).
- Where necessary, costs were inflated to 2021 USD using the medical care component of the US Consumer Price Index.[7]

Table 1: HRU Unit Costs and Sources

HRU	Unit Cost(s)	Source(s)
OR overhead	$13.86 per minute	Taravella et al. 2014[1]
OR labor[a]	$0.32-$1.77 per minute	US Bureau of Labor Statistics[2]
Materials/supplies[b]	$33.44-$704.52 per unit	Alcon data-on-file,[3] Linnehan 2020,[4] and the Navlin database[5]
Physician visits[c]	$36.29 per visit	Medicare Physician Fee Schedule[6]
Physician time for postoperative clinic procedures or imaging[d]	$25.47-$501.41 per procedure	Medicare Physician Fee Schedule[6]

[a]Includes a cataract surgeon and a technician. [b]Includes bandage contact lens, miotic agent, suture pack, steroid, viscoelastic, a vitrectomy pack, and wound sealant. [c]Costed using Common Procedural Terminology (CPT) code 99212. [d]Includes macular optical coherence tomography (OCT) (CPT 92134; modifier -26), barrier laser retinopexy (CPT 67220), laser vitreolysis (CPT 67031), and paracentesis (CPT 65810).
Abbreviations: OR=Operating room; US=United States of America.
*Only physician time was costed; facilities were assumed to be reimbursed for postoperative clinic procedures or imaging, and therefore this HRU was not considered a cost to facilities.

Results

- Healthcare resource utilization estimates for each complication are summarized in **Table 2**. Where appropriate, the cataract surgeons provided specific estimates for the treatment of mild, moderate, and severe cases of the complications.
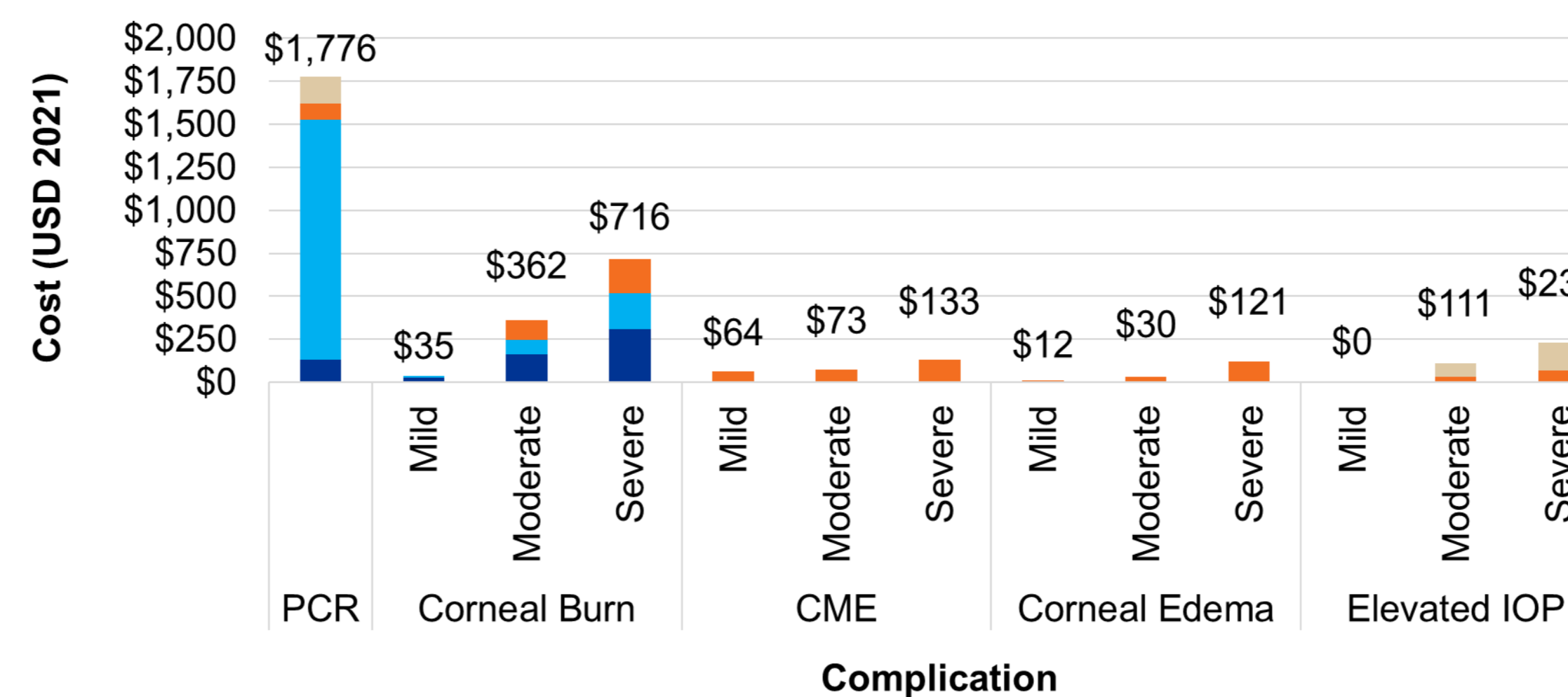
Table 2: HRU Estimates

Complication	Additional OR Time[a]	Intraoperative Procedures		Additional Postoperative Physician Visits	Postoperative Clinic Procedures or Imaging
	Duration (Min./Pt.)	Proportion of Patients	Duration (Min./Pt.)	Number of Visits/Pt.	Proportion of Patients
Posterior Capsule Rupture	8.33	72.0%[b]	42.50	2.63	5.3%-50%[c]
Corneal Burn	1.53-19.46[d]	3.3%-68.3%[e]	2.50-9.67[e]	0-5.5[d]	-
Cystoid Macular Edema	-	-	-	1.75-3.67[d]	-
Corneal Edema	-	-	-	0.33-3.33[d]	-
Elevated IOP	-	-	-	0-1.83[d]	0%-35.0%[f]

[a]The estimated additional OR time required for intraoperative procedures was subtracted from the estimated total additional OR time to avoid double-counting. [b]Anterior vitrectomy. Materials used included miotic agent, suture pack, steroid, viscoelastic, and a vitrectomy pack. [c]Includes macular OCT, barrier laser retinopexy, laser vitreolysis, and paracentesis. [d]Across severities. [e]Includes wound closure with sutures, and wound closure with sealants across severities. Materials used included bandage contact lens, and sutures or a wound sealant. [f]Includes paracentesis across severities.
Abbreviations: IOP=Intraocular pressure; Min.=minute(s); OCT=Optical coherence tomography; OR=Operating room; Pt.=Patient.

- Total treatment costs per patient are summarized in **Figure 1**. PCR was associated with the highest estimated costs to the US healthcare provider, followed by corneal burns, elevated IOP, CME, and corneal edema.

Figure 1: Total Treatment Cost per Patient with Cataract Surgery Complication (Provider Perspective)

Abbreviations: CME=Cystoid macular edema; IOP=Intraocular pressure; OR=Operating room; PCR=Posterior capsule rupture.

Results Continued

- The two **intraoperative** complications, PCR and corneal burn, were associated with the highest treatment costs to providers due to the additional OR time, intraoperative procedures, and materials required. The total treatment costs were **$1,776** for **PCR** and ranged from **$35** (mild) to **$716** (severe) for **corneal burns**.
- The costliest **postoperative** complication was **elevated IOP**, driven by paracentesis for some patients with moderate and severe cases. The total treatment costs ranged from **$0** (mild) to **$230** (severe).
- **CME** and **corneal edema** were the least costly complications, as these complications only required additional physician visits. The total treatment costs ranged from **$64** (mild) to **$133** (severe), and **$12** (mild) to **$121** (severe), respectively.

Discussion & Conclusions

- Intraoperative complications (PCR and corneal burn) were associated with the highest costs to providers due to the additional intraoperative procedures required and their related additional OR time, labor time, and materials.
- Providers also incur costs related to additional follow-up visits and procedures for both intraoperative and postoperative complications.
- Limitations of the micro-costing analysis included:
  - HRU estimates from the three cataract surgeons were subject to sampling bias and limited to their personal experiences within their practice settings. This limits the generalizability of results to other surgeons across the US.
  - Medicare reimbursement figures[6] were used as a proxy for physician costs given the lack of published data, and these amounts may differ from actual costs to healthcare providers.
- This study addresses a current gap in the literature in complications costs and can be used to inform future economic analyses for interventions designed to reduce cataract surgery complications.

References

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