



A Systematic Analysis of the Impact of an Ambulatory Ophthalmology Urgent Care Clinic

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Abstract

Importance A same-day ophthalmic urgent care clinic can provide efficient eye care, a rich educational environment, and can improve patient experience.

Objective The aim of this study was to systematically evaluate volume, financial impact, care metrics, and the breadth of pathology of urgent new patient encounters based on their site of initial presentation.

Design, Setting, and Participants A retrospective analysis was performed on consecutive urgent new patient evaluations in our same-day triage clinic at the Henkind Eye Institute at Montefiore Medical Center between February 2019 and January 2020. The cohort of patients who presented directly to this urgent care clinic were referred to as the “TRIAGE” group. Patients who initially presented to an emergency department (ED), and were subsequently referred to our triage clinic, are referred to as the “ED + TRIAGE” group.

Main Outcomes and Measures Visits were evaluated on a variety of metrics, including diagnosis, duration, charge, cost, and revenue. Furthermore, return to the ED or inpatient admission was documented.

Results Of 3,482 visits analyzed, 2,538 (72.9%) were in the “TRIAGE” group. Common presenting diagnoses were ocular surface disease ($n = 486$, 19.1%), trauma ($n = 342$, 13.5%; most commonly surface abrasion $n = 195$, 7.7%), and infectious conjunctivitis ($n = 304$, 12.0%). Patients in the “TRIAGE” group, on average, were seen 184.6% faster (158.2 vs. 450.2 minutes) than patients in the “ED + TRIAGE” group ($p < 0.001$). The “ED + TRIAGE” group were furthermore found to generate 442.1% higher charges (\$870.20 vs. 4717.70) and were associated with 175.1% higher cost (\$908.80 vs. 330.40) per patient. The hospital was found to save money when noncommercially insured patients with ophthalmic complaints presented to the triage clinic instead of the ED. Patients seen in the triage clinic had a low rate of readmission to the ED ($n = 42$, 1.2%).

Keywords

- ▶ ophthalmology
- ▶ residents
- ▶ subspecialty
- ▶ triage
- ▶ urgent care
- ▶ emergency department

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Conclusions and Relevance A same-day ophthalmology triage clinic provides efficient care, while providing a rich learning environment for residents. Less wait time with direct access to subspecialist care can help improve quality, outcome, and satisfaction metrics.

The management of acute ophthalmic conditions represents a major burden to the urgent care and emergency department (ED) infrastructure in the United States. It is estimated that nearly 2 million ED visits in 2010 were associated with a primary ophthalmic complaint, a quarter of which were considered nonurgent.¹ Another retrospective analysis of almost 12 million ED visits between 2006 and 2011 demonstrated that only 40% of the cases were truly emergent, with mean inflation-adjusted charges totaling \$2.0 billion annually.² Managing nonurgent cases in the ED diverts critical resources. It further impacts our healthcare system by increasing costs, patient wait times, rates of physician burnout, patient dissatisfaction and increases the potentially for suboptimal care.³⁻⁶ In response, some large academic centers have established ambulatory same-day specialty urgent care centers.⁷⁻⁹ These clinics not only are able to provide high level subspecialty care in a more efficient and appropriate setting, but furthermore can provide the foundation for graduated resident autonomy in a dynamic learning environment.^{9,10}

The Henkind Eye Institute at Montefiore Medical Center in the Bronx, NY, implemented a same-day urgent care clinic in 2014, which is run by all levels of ophthalmology residents (postgraduate year 2, 3, and 4) and supervised by an ophthalmology attending. Patients can access this clinic either by making an urgent appointment via a centralized patient contact center, or simply walking in for same-day evaluation. Alternatively, patients who present to a Montefiore ED can be referred to the clinic for same-day ophthalmic care, with or without a consult evaluation by an ophthalmology consult resident (postgraduate year 3 or 4) in the ED with remote supervision by the same supervising attending.

Our analysis primarily aims to quantify patient volumes based on presenting location and diagnosis and qualitatively assess the acuity of care. A time-efficiency and cost-effectiveness analysis comparing visit duration, charge, cost, and revenue by site of initial presentation and insurance coverage was additionally performed.

Methods

This retrospective chart review (Epic Systems, WI) was approved by the Institutional Review Board at the Albert Einstein College of Medicine and adhered to the principles outlined in the Declaration of Helsinki. Consecutive new patient visits to the triage eye clinic between February 2019 and January 2020 were systematically analyzed.

Patient Visit Data

Each of these patient encounters were separated into two groups based on the site of initial presentation. Patients with

urgent ophthalmic complaints either presented directly to the clinic ("TRIAGE") or were referred by the emergency room to the clinic ("ED + TRIAGE"). Along with demographic information, diagnosis, and visit duration (from check-in to check-out, including all the wait time), any diagnostic workup including bloodwork, radiographic imaging (e.g., computed tomography, magnetic resonance imaging), and/or ophthalmic imaging (e.g., optical coherence tomography, perimetry, angiography, ultrasound) were included in the analysis. Presenting diagnoses were grouped by level of acuity as defined by perceived clinical severity and/or potential for loss of vision (►Table 1).

The severity and frequency of the presenting ophthalmic diagnosis were compared for the two groups using Fisher's exact test. In addition, the overall visit duration, charges, and costs were analyzed by both the presenting diagnosis and the perceived level of acuity with Welch's *t*-test and 95% confidence interval of difference were obtained.

Financial Analysis

For the financial analysis, our institution's accounting system (Stratajazz, Strata Decision Technologies, Chicago, IL) was used to obtain detailed charge and cost data for each visit and ancillary clinical activity, utilizing time-driven costing analysis from both the physician and hospital perspectives.

Charge is defined by the value (\$) that a hospital determines for any given patient service, prior to negotiating discounts with individual payers. The associated *charges* were further subcategorized as "Hospital" (e.g., hospital stay, support staff, supplies, medications) vs "Professional" (e.g., medical services provided by physicians), based on hospital reimbursement. *Net Patient Service Revenue (NPSR)* is defined as the amount a hospital expects to receive for services after accounting for contractual allowances and uncompensated care ($NPSR = \text{gross patient revenue} - \text{contractual allowances} - \text{uncompensated care}$). *Contribution Margin (CM)* measures to what extent generated revenue from services can offset variable and fixed costs. The *Profit/Loss margin (PL)* shows how much profit or loss is generated with patient care volume ($PL = NPSR - \text{Total Costs}$).

The financial analysis was performed excluding any costs or charges related to an incident inpatient admission ($n = 30$). For the remaining ambulatory patients ($n = 3,452$), NPSR, CM, and PL were compared using Welch's *t*-test with further stratification by insurance payor.

Results

Of the 3,904 same-day visits reviewed, 422 visits were excluded because of an incomplete record (►Fig. 1); of these, 204 were recorded as "no-show," indicating that patients did not present to the same-day appointment that was scheduled

Table 1 Frequency of primary ocular diagnoses by site of presentation

Acuity/diagnosis	TRIAGE (<i>n</i> = 2,538), <i>n</i> (%)	ED + TRIAGE (<i>n</i> = 944), <i>n</i> (%)	<i>p</i> -Value
Overall^a			
Low acuity	1,009 (39.8)	225 (23.8)	b
High acuity	1,529 (60.2)	719 (76.2)	
Low acuity			
Ocular surface	418 (16.5)	68 (7.2)	b
Benign eyelid mass	204 (8.0)	57 (6.0)	
Corneal abnormalities	87 (3.4)	33 (3.5)	
Eyelid abnormality	87 (3.4)	21 (2.2)	
Cataract	67 (2.6)	12 (1.3)	b
Conjunctival abnormalities	52 (2.1)	15 (1.6)	
Allergic conjunctivitis	45 (1.8)	13 (1.4)	
Refractive error	41 (1.6)	5 (0.5)	b
Routine	8 (0.3)	1 (0.1)	
High acuity			
Trauma	169 (6.7)	253 (27.0)	b
Infectious conjunctivitis	214 (8.4)	90 (9.5)	
Uveitis/Iritis	125 (4.9)	44 (4.7)	
Glaucoma	124 (4.9)	32 (3.4)	
Postoperative management	136 (5.4)	14 (1.5)	b
Retinopathy	116 (4.6)	27 (2.9)	b
Subconjunctival hemorrhage	101 (4.0)	27 (2.9)	
Infectious keratitis	70 (2.8)	52 (5.5)	b
Vitreous detachment	67 (2.6)	22 (2.3)	
Neuroophthalmic Diagnosis	62 (2.4)	25 (2.7)	
Optic nerve abnormality	59 (2.3)	20 (2.1)	
Infectious cellulitis	48 (1.9)	25 (2.7)	
Vision change	54 (2.1)	18 (1.9)	
Headache/migraine	42 (1.7)	16 (1.7)	
Retinal tear/detachment	37 (1.5)	13 (1.4)	
Vitreous hemorrhage	22 (0.9)	13 (1.4)	
Eye pain	24 (1.0)	4 (0.4)	
CNS/orbital mass	22 (0.9)	4 (0.4)	
Vaso-occlusive disease	13 (0.5)	10 (1.1)	
Endophthalmitis	10 (0.4)	7 (0.7)	
Proptosis/inflammation	11 (0.4)	1 (0.1)	
Hyphema	3 (0.1)	2 (0.2)	

Abbreviation: CNS, central nervous system; ED, emergency department.

^aA significantly higher proportion of patients with a high acuity diagnosis are likely to present to the ED.

^b $p < 0.05$ (Fisher's exact test) means difference in sites of presentation for the diagnosis is statistically significant.

through the contact center. The remaining 3,482 initial presenting visits were included in the study, with a calculated total average of 15 unique urgent evaluations per day. Most patients presented directly to the triage clinic ("TRIAGE") ($n = 2,538$; 72.9%). The remaining patients ($n = 944$; 27.1%) were referred to the triage clinic by a Montefiore ED facility ("ED + TRIAGE").

Within this group, 22.9% ($n = 216$) were formally evaluated in the ED by the ophthalmology resident consult service, with subsequent transfer to the clinic for further diagnostics and evaluation. Irrespective of the site of initial presentation, only 42 patients (1.2%) were deemed to require an emergent workup in the ED.

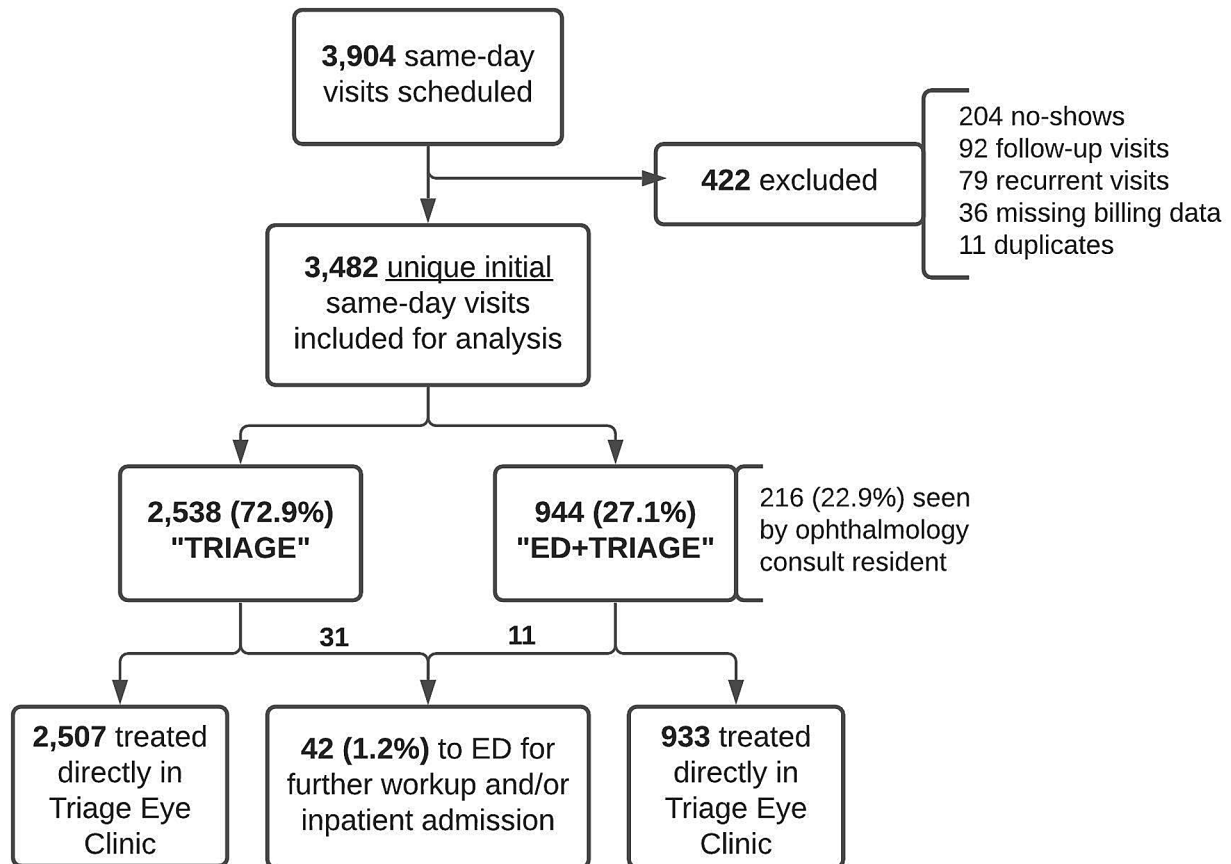


Fig. 1 Flow diagram of inclusion and exclusion criteria. Unique same-day visits with a primary ophthalmic complaint were included for analysis. Visits were divided into two groups based on the site of initial presentation—"TRIAGE" or "ED + TRIAGE" (bold).

Frequency of Primary Ocular Diagnosis

For each visit, the primary ophthalmic diagnosis at presentation was further subcategorized by the level of acuity (►Table 1). *Low-acuity* patients were more likely to present directly to the triage clinic than the ED ($p < 0.05$). Examples of *low-acuity* patients included those with a diagnosis of ocular surface disease, cataract, benign eyelid mass, and refractive error ($p < 0.05$). However, a large number of patients with *low-acuity* diagnoses ($n = 225$; 18.2%) still presented to the ED. *High-acuity* patients suffering from ocular trauma were more likely to initially present to the ED (59.9%; $p < 0.05$). In contrast, other *high-acuity* patients presenting for postoperative management, or with diagnoses of retinopathy or infectious keratitis, were more likely present directly to the triage clinic (90.7, 81.1, 57.4%, respectively; $p < 0.05$). Of the 42 patients (1.2%) that required more extensive emergent evaluation, the most common diagnoses included cranial nerve palsy, optic nerve abnormalities, infectious cellulitis, and headache/migraine.

Overall: Visit Duration, Charge, and Cost

►Fig. 2 summarizes the differences between the patients in the "TRIAGE" and "ED + TRIAGE" groups on visit duration, charge, and cost. On average, patients in the "TRIAGE" group saved a total of 292.2 minutes compared with those in the "ED + TRIAGE" group (158.2 ± 78.3 vs. 450.2 ± 232.7 minutes respectively; $p < 0.001$), generated \$3,847.50 lower charges

($\$870.20 \pm 802.90$ vs. 4717.70 ± 4188.00 ; $p < 0.001$), and saved \$578.40 in cost ($\330.40 ± 170.80 vs. $\$908.80 \pm 549.00$; $p < 0.001$). The "TRIAGE" patients saved an average of \$3373.00 in hospital charges and \$474.50 in professional charges, equating to a savings of \$3,847.50 compared with the "ED + TRIAGE" patients.

Similarly, the associated costs were also further subcategorized as "Hospital" or "Professional" based upon how the hospital accounts for each clinical environment. Mean hospital cost was $\$182.00 \pm 113.70$ (median: \$160.40; interquartile range [IQR]: \$142.30–194.80) for the "Triage" group, compared to $\$621.10 \pm 425.60$ (median: \$465.70; IQR: \$376.30–731.30) for the "ED + Triage" group. Mean professional cost was $\$148.40 \pm 78.80$ (median: \$147.50; IQR: \$104.10–184.60) for the "TRIAGE" group compared with $\$287.70 \pm 168.20$ (median: \$255.60; IQR: \$181.40–315.80) for the "ED + TRIAGE" group. The hospital saves on average a total of \$578.40 when patients present directly to the triage clinic, calculated as the sum of \$439.10 in hospital costs and \$139.30 in professional costs.

"By Level of Acuity": Visit Duration, Charge, and Cost

The visit duration and financial data were further sub-grouped by acuity and diagnosis (►Fig. 3; ►Supplemental Table S1 and S2 [online only]). Irrespective of where the patients initially presented, those with *high-acuity* diagnoses were found to require longer visit duration, and additionally

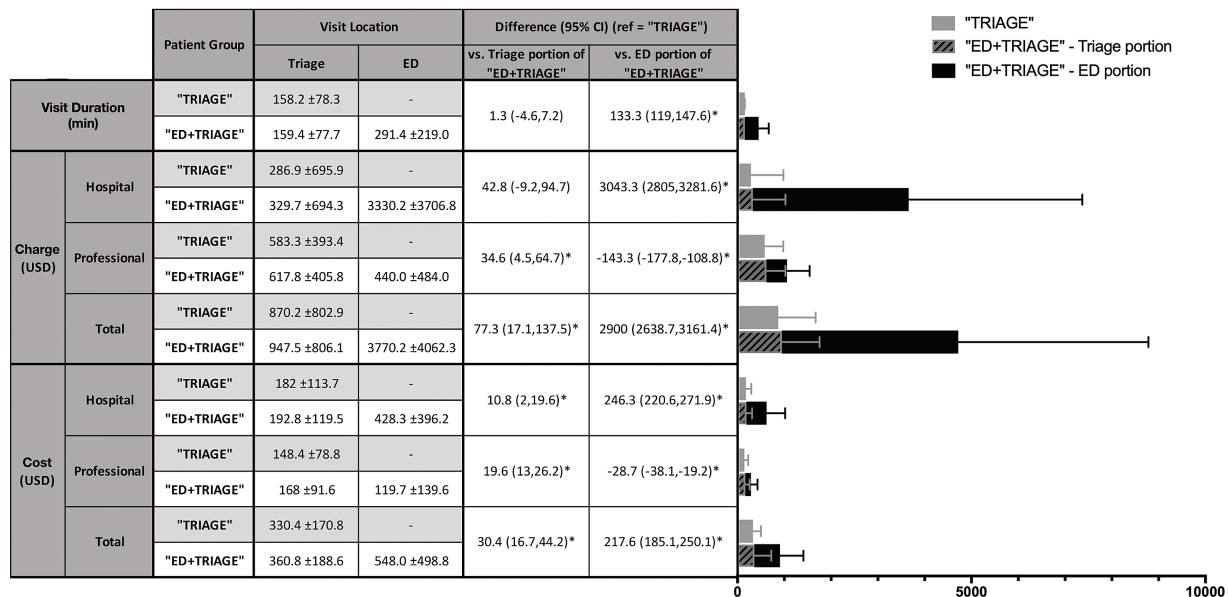


Fig. 2 Average visit duration, charge, and cost of unique same-day outpatient visits by site of presentation (triage eye clinic only "TRIAGE" vs. referred from emergency room "ED + TRIAGE"). The triage eye clinic provides significantly more time-efficient and cost-effective care.

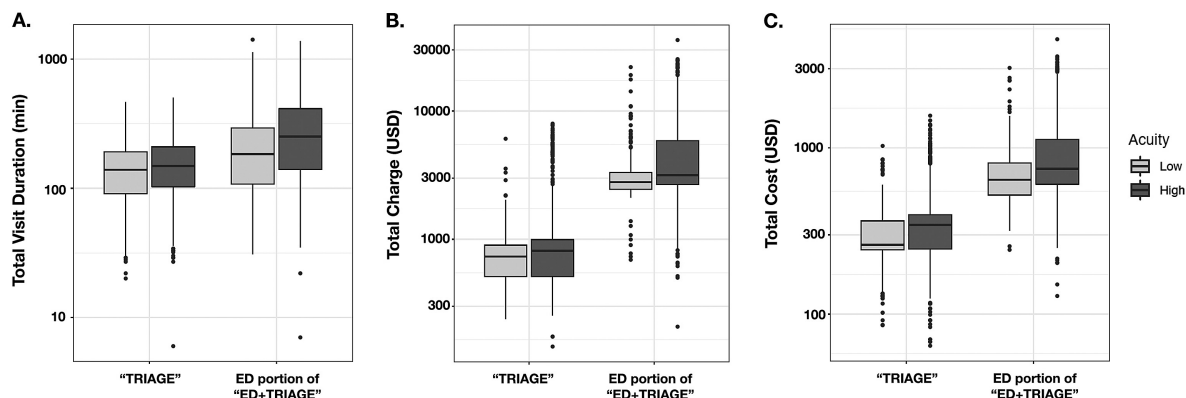


Fig. 3 Average visit duration (A), charge (B), and cost (C) at different sites of initial presentation (emergency department [ED] vs. triage) by acuity of ophthalmic concerns (low versus high). Differences between sites are all statistically significant ($p < 0.05$). (ref = at Triage).

had higher associated charges and costs compared with the *low-acuity* group ($p < 0.05$ for all). Within the "TRIAGE" group, *high-acuity* patients took longer (an additional 11 minutes, 95% confidence interval [CI]: 5–18), had higher charges (an additional \$228, 95% CI: \$164–291), and greater costs (an additional \$43, 95% CI: \$29–56) when compared with the *low-acuity* group ($p < 0.05$). Within the "ED + TRIAGE" group, *high-acuity* patients took longer (an additional 65 minutes, 95% CI: 30–100), and had higher associated charges (an additional \$1,571, 95% CI: \$1,951–2,191), and costs (an additional \$202, 95% CI: \$121–284) as compared with the *low-acuity* patients ($p < 0.05$).

"Site-Specific Charges": Relative Visit Duration, Charge, and Cost

– Fig. 2 also includes the average visit duration, charges, and costs for the ED portion of the visit for the "ED + TRIAGE" group. The ED portion of the visit within the "ED + TRIAGE"

group on average added 133.3 minutes in visit duration, \$2,900.00 in charges, and \$217.60 in cost relative to the "TRIAGE" group ($p < 0.05$ for all), and these differences remained significant in subgroup analysis when accounting for acuity (– Fig. 3, – Supplemental Table S1 and S2 [online only]). Using the "TRIAGE" group as a comparator, *low-acuity* patients in the "ED + TRIAGE" group took 40% longer (an additional 86 minute), had 210% higher charges (an additional \$2,003), and 20% higher cost (an additional \$117). Similarly, *high-acuity* patients in the "ED + TRIAGE" group took 70% longer visit duration (146 minute), generated 340% higher charges (an additional \$3,133), and 50% higher cost (an additional \$240).

Revenue Analysis

The majority of our study patients (62.2%, $n = 2,148$) were insured under a managed care plan and/or had government-assisted fee-for-service coverage, 30.4% ($n = 1050$) were

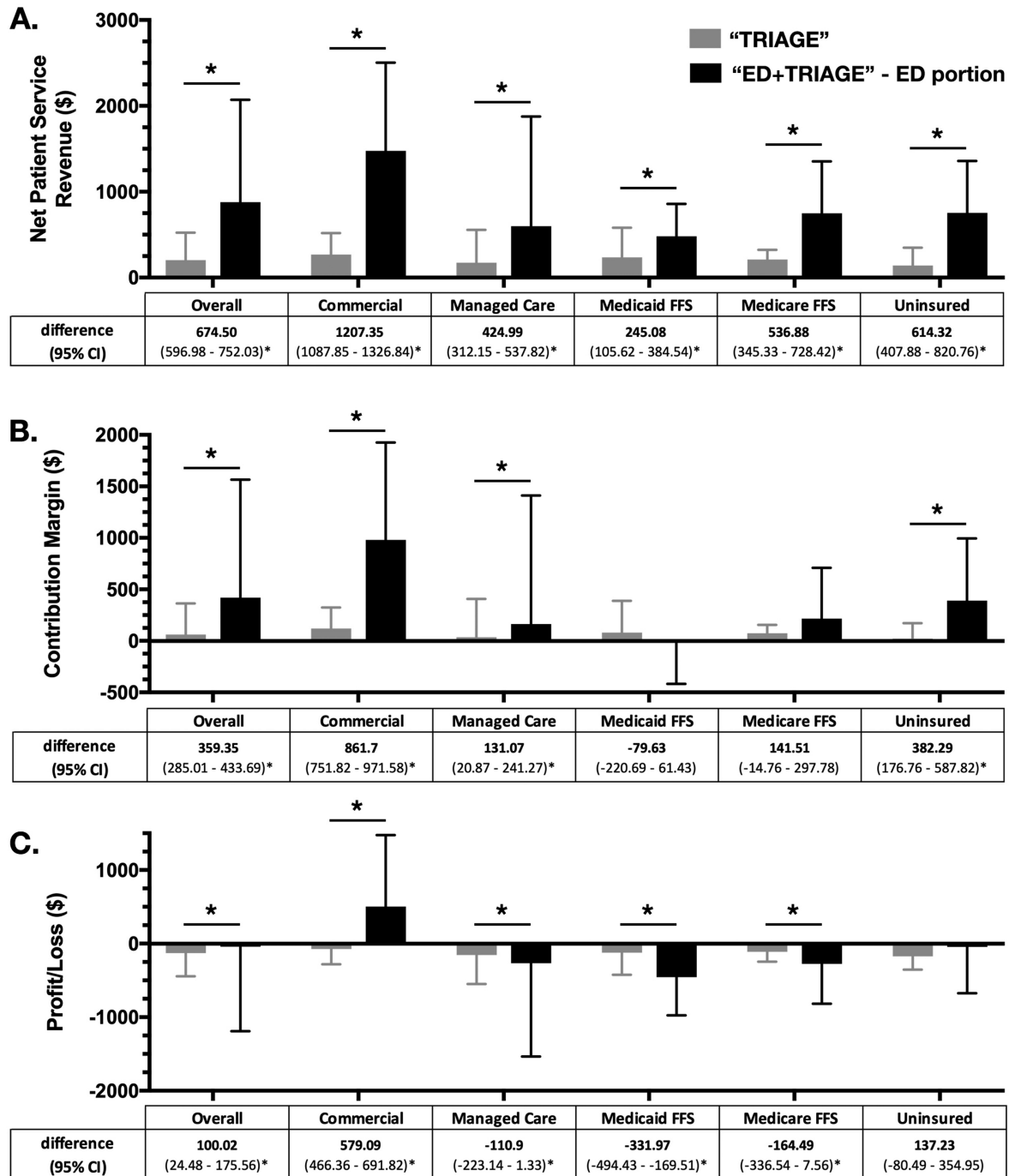


Fig. 4 Revenue analysis of net patient service revenue (A; NPSR), contribution margin (B; CM), profit/loss (C; PL). Visits were subgrouped by primary insurance carrier, and the financial impact of the initial site of presentation was analyzed. Despite higher reimbursements for patients seen in the emergency department [ED], the hospital generates more profit when noncommercially insured patients present to the triage.

commercially insured, and the remainder of patients were without documented coverage. **Fig. 4** shows NPSR, CM, and PL subgrouped by insurance carrier for all outpatient and ED encounters related to the primary ocular complaint only; this analysis excludes inpatient encounters and focuses on outpatient clinic, ED, and ancillary clinical encounters related to the primary ocular complaint. This analysis indirectly compares revenue at triage and ED by calculating the difference

between triage portion for the “TRIAGE” group and ED portion for the “ED + TRIAGE” group. Overall, ED visits generate higher NPSR (\$878.91 vs. 204.40), higher CM (\$420.39 vs. 61.04), as well as higher PL (−\$28.49 vs. −\$128.51; i.e., less loss) compared with visits in the triage clinic ($p < 0.05$). For commercially insured patients, the ED generates \$579.09 more profit per patient than the triage clinic. For patients with managed care plans, Medicare, or

Medicaid, ED visits result in a relative financial loss for the hospital relative to the triage clinic of $-\$110.90$, $-\$331.97$, and $-\$164.49$ loss per patient, respectively.

Discussion

Subspecialty urgent care clinics have the potential to provide an enormous benefit to our healthcare system.^{7,8} It is estimated that almost half of all ophthalmic-related visits to the ED are not truly emergent.² By simultaneously improving patient access and delivering cost-effective care, ophthalmology urgent care clinics are of particular value to both patients and EDs alike.

The Henkind Eye Institute at Montefiore Medical Center developed and incorporated an ambulatory triage eye clinic within its residency training program in 2014. This clinic was designed to not only improve patient access but also to provide a rich supervised learning environment to train residents in the acute management of eye diseases. Dedicated supervision is provided by rotating faculty during normal business hours along with real-time anterior and posterior segment faculty support for patients requiring subspecialty intervention, along with a dedicated on-call resident and night-float system for after-hours care. This infrastructure affords a graduated autonomy learning experience for students and residents, who benefit not only from the wide breadth of pathology as evidenced by **Table 1** but also from the expertise of a variety of subspecialty faculty. While our study only examined the characteristics of the initial patient encounter, it is important to note that patients requiring subsequent follow-up visits are also seen in the triage clinic, and residents can follow these patients with the appropriate continuity of care. Resident-driven clinics have also shown to increase surgical opportunities for trainees, especially in cataract cases.¹¹

Of the 3,482 visits analyzed in our 1-year study period, only 42 patients (1.2%) required an emergent workup in the ED and/or admission to the hospital. These figures provide further evidence that the majority of ophthalmic diagnostic and therapeutic interventions can efficiently be performed on an outpatient basis. Our analysis supports the current literature that many patients visiting the ED for ocular complaints do not have true emergencies.^{2,9,12}

More than a quarter of the patients seen in our clinic were referred for subspecialty evaluation from the ED. This figure is likely an underestimate of the actual ED burden, given the high likelihood that a proportion of patients never followed up after their initial ED visit. Consistent with the literature, patients with *high-acuity* ophthalmic complaints such as ocular trauma and acute corneal pathology were more likely to present to the ED when compared with those with *low-acuity* diagnoses.² The triage clinic is of particular benefit to postoperative patients experiencing acute symptoms, who may not have immediate access to their primary surgeon. A total of 150 patients came to the clinic for postoperative management, of which 136 (90.7%) bypassed the ED to present directly to the triage eye clinic ($p < 0.05$); this may be an underestimate as some postoperative patients

may have been coded differently for their postoperative complications.

Intuitively, a patients' perception of their ocular signs and symptoms are an important driver in the pursuit of acute care.^{2,12,13} A prospective survey by Hau et al¹⁴ reported stress, anxiety, and convenience as primary reasons for ED attendance for both acute and nonacute conditions such as chalazion, dry eye syndrome, and blepharitis. Our study found that 18.2% of *low-acuity* patients (225 of 1,234) presented to the ED for their nonurgent conditions. The decision to initially pursue ED care instead of accessing the triage eye clinic is multifactorial, and likely the result of a combination of access, awareness, and availability.

Regardless of the availability of a subspecialty urgent care clinic, accurate diagnosis and appropriate timely referral remain critical factors in delivering effective care in the ED setting. Prior studies have reported poor consistency in the measurement of ophthalmic vital signs (visual acuity and intraocular pressure), with frequent misdiagnosis of patients with eye complaints from nonophthalmologists.¹⁵⁻¹⁹ A recent cross-sectional multicenter survey demonstrated that many internal, emergency, and family medicine physicians do not feel comfortable with ophthalmic equipment, examination techniques, diagnoses, and procedures.²⁰ Inter-professional education and collaboration are critical in developing efficient triage and management algorithms for patients with ocular complaints.^{19,21} Many studies have proposed ophthalmic triage scales such as RESCUE (the Rome Eye Scoring System for Urgency and Emergency) and ATSO (Alphabetical Triage Score for Ophthalmology).²²⁻²⁵ Although our study did not evaluate accuracy of referral diagnoses from the ED, it is intuitive that diagnostic accuracy and quality of care is superior in a well-equipped and supervised eye clinic as compared with an ED environment; however, further validation studies would be helpful.

In the age of the COVID-19 pandemic, rapid adoption of remote evaluation and screening remain vital to maintaining care while minimizing unnecessary exposures.^{26,27} Additionally, remote care offers the potential of a solution to mitigate coverage gaps in hospitals lacking easy access to ophthalmic care, especially in rural areas.^{28,29} Indeed, even basic smartphones can be used to fairly reliably evaluate conditions such as cataract, glaucoma, age-related macular degeneration, diabetic retinopathy, and retinopathy of prematurity, among other conditions.^{15,30} In the ED setting, the Wills Eye Hospital recently reported on the accuracy of telephone triage by ophthalmology residents in the diagnosis of urgent and emergent ocular conditions at almost 70%, with near perfect recognition of the most critical vision threatening diagnoses ($>97\%$).¹⁵ In our analysis, almost a quarter (22.9%, 216/944) of our study patients presenting to ED ("ED + TRIAGE") were evaluated by an ophthalmology resident consult in-person. Implementation of remote evaluation from home would potentially save extra wait time, cost, and unnecessary physical encounters for patients.

With respect to the financial burden of urgent eye care, our triage clinic was both time-efficient and cost-effective for patients, physicians, and the hospital system. On average,

patients with an ophthalmic complaint presenting to the ED instead of the triage clinic took 184.6% longer visit duration, generated 442.1% greater hospital charges and 175.1% additional cost. In the literature, it has been demonstrated that nonurgent care was found to cost two to three times more when patients were seen in the ED relative to similar visits in an ambulatory setting.² A recent analysis from Singman et al⁹ recently estimated a savings of 5.75 hours in visit duration, and \$782 in charges for patients with nonemergent eye complaints after the implementation of their same-day access clinic at the Wilmer Eye Institute in Baltimore. Our analysis found the contribution margin for the hospital to be higher for ED encounters compared with the triage clinic for all payor groups except Medicaid Fee-For-Service. This indicates that the ED on average generates more revenue and contribution margin per encounter than outpatient clinic visits, attributable to the higher fees and reimbursement when comparing the two sites. Despite higher reimbursements for patients seen in the ED, the hospital generates more profit (i.e., less loss) when noncommercially insured patients present to the triage clinic.

To the best of our knowledge, this study is the first to analyze the *actual* payments and financial revenue implications of a same-day resident-faculty staffed ophthalmology clinic. Given the large discrepancy between hospital charges and actual reimbursement among carriers, we believe our financial analysis is an accurate representation of the actual financial implications of this care delivery model. While this model is not unique to Montefiore Ophthalmology, collaborative effort should be taken for a multicentered study.

Conclusions

A same-day ambulatory ophthalmic clinic provides efficient care to patients, while simultaneously providing broad learning opportunities for residents. Regardless of the acuity of the diagnosis, patients who presented directly to the triage clinic were seen far more efficiently than those who presented to the ED. Most importantly, patients in the triage clinic were supervised by skilled providers with appropriate subspecialty support and ready access to appropriate diagnostic modalities. Beyond the positive impact on our overburdened emergency rooms, implementation of an ophthalmic urgent care clinic can help improve quality, outcome, and satisfaction metrics for patients and physicians.

Disclosures

None.

Conflict of Interest

None.

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