Clinical Leadership in Quality: 2012-2013

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Dear Colleagues in Healthcare,

We are proud to present Massachusetts Eye and Ear’s 2013 Quality and Outcomes Report. Now is our fifth year of outcomes reporting. We are pleased to take a lead in setting standards for ophthalmology and otolaryngology-head and neck surgery. Highlighting data from our departments helps to provide a full view of our highly specialized care and surgery and allows us to see opportunity for improvement in one place.

While the number of outcomes that we are measuring has grown and changed since our first publication, our original reason for tracking these measures has remained constant. We believe great outcomes are a direct result of highest-quality care — and our goal is to continue improving each year.

We are proud of the many individuals who comprise the care team at Mass. Eye and Ear — from the surgeons, to the nurses, to the front-line staff — and who elevate that level of care each and every day. Their commitment and passion drive quality improvement and good outcomes for our patients and ultimately improve their quality of life.

We would like to express our appreciation to the Department Chairs (Joseph B. Nadol, Jr., M.D.; Joan W. Miller, M.D.; Hugh Curtin, M.D.; Sunil Eappen, M.D.), and the entire Mass. Eye and Ear quality team for their commitment to quality improvement. We hope their efforts will foster open communication and dialogue among caregivers around the world, ultimately helping them to deliver the highest quality care to patients everywhere.

In the following pages you will learn of the Mass. Eye and Ear team’s dedication to patient safety, collaboration-in-care, technologic advances and clinical research — all with a focus on fostering transparency, improving patient treatments and finding cures.

We hope you find this publication helpful. We welcome your comments and feedback. For an electronic version of this report and to see new innovations from Mass. Eye and Ear, please visit MassEyeAndEar.org/Quality.

John Fernandez
President & CEO,
Massachusetts Eye and Ear

Please note that information contained in this book focuses primarily on the work of the full-time staff at Mass. Eye and Ear’s main Boston campus, unless otherwise stated.
About Massachusetts Eye and Ear

Founded in 1824, the Massachusetts Eye and Ear Infirmary is a pre-eminent specialty, teaching and research hospital dedicated to caring for disorders of the eyes, ears, nose, throat, head and neck. Our dedicated staff provides primary and subspecialty care and serves as a referral center for inpatient and outpatient medical and surgical care.

Mass. Eye and Ear is the leading authority in its specialties throughout the northeast and is a resource globally for advances in patient care, research and education. As the primary academic center for Harvard Medical School’s Departments of Ophthalmology and Otology and Laryngology, we are deeply committed to providing a superb education to the next generation of visionary healthcare leaders. Our world-renowned experts are continuously innovating in the fields of translational and bench research, turning insights into cures that benefit countless people. We continue to forge new partnerships and alliances — locally, nationally and beyond our borders — to increase our reach and make our expertise, services and resources available to all who need them.

Pivotal to our clinical quality efforts is the use of the Longitudinal Medical Record (LMR), an integrated and secure system of communication and medical record sharing among the majority of Harvard Medical School’s network of hospitals and affiliates. This network facilitates quick and easy communication among referring physicians and Mass. Eye and Ear’s consulting ophthalmologists, otolaryngologists and radiologists. It also enables our physicians to instantly tap our in-house specialists, affording seamless and rapid access to some of the best ophthalmology and otolaryngology resources available.

Fiscal Year 2012 Volume

Fiscal Year 2012 Overall Operating Revenue ........................................................................ $312,538,635

Clinical Locations

Boston – Main Campus
Boston – Longwood
Boston – Joslin
Braintree
Concord
Duxbury
East Bridgewater
Milton
Newton
Quincy
Stoneham
Weymouth

For more information, please visit MassEyeAndEar.org.
The perioperative team at Mass. Eye and Ear continues to increase the volume of surgical care we deliver for a very specialized group of patients from around New England, the country, and the rest of the world. We have been establishing quality of care measures for all ophthalmology and otolaryngology surgical procedures and now are entering our third year of reporting this data.
Mass. Eye and Ear has a third operative site with the opening of Mass. Eye and Ear, Longwood, in December of 2012. No numbers for the new Longwood site are listed in the graph. These four additional operating rooms increase the total number of ORs to 21. Currently we only care for adult ambulatory patients at Mass. Eye and Ear, Longwood, but the same measures of quality and care are applied across all locations. The Major Operating Room (MOR) at the Mass. Eye and Ear main campus handles the majority of Otolaryngology procedures as well as the majority of the pediatric surgery we perform, and all of the urgent and emergency cases that occur in the evenings and weekends.

The Ophthalmology and Otolaryngology surgical volumes are split fairly evenly, and the numbers have been consistently rising over the last several years.
Mass. Eye and Ear cares for the most pediatric otolaryngologic patients in the area and for more pediatric surgical patients than any institution other than Boston Children’s Hospital. Pediatric surgical volume has remained a little more than one-third of Mass. Eye and Ear’s overall volume over the last few years.

Postoperative Nausea and Vomiting (PONV) in the Post Anesthesia Care Unit (PACU)

The numbers to the left reflect patients who had nausea and/or vomiting in the PACU despite therapy in the operating room and required additional treatment for their discomfort. The delay in discharge criteria reported reflects the number of patients who continued to have prolonged nausea despite additional therapy to alleviate (or lessen) their discomfort. Typical reports of PONV range from 20-30% incidence. Our numbers continue to be less than published benchmarks for PONV for ambulatory surgery patients. This is a reflection of the state-of-the-art techniques and medications utilized, as well as the close collaboration between the nurses, anesthesiologists and surgeons in caring for these patients.

The data reflects a sample subset of our total patient population who went through the recovery room. (N=6,204 for adults and N=3,638 for pediatric patients)

Nausea is one of the most common and troublesome complications occurring after surgery in both pediatric and adult patients. Additionally, it is well known that patients undergoing both ophthalmologic and otolaryngologic procedures are at significantly higher risk of postoperative nausea and vomiting (PONV) when compared to patients having other types of surgery. As a result, nearly every one of our patients receives prophylactic treatment with the latest combination of appropriate antiemetic medications in order to minimize the chances of PONV.
Pain after surgery is one of patients’ most common fears. Our goal is to have patients awaken in the operating room and arrive in the Post Anesthesia Care Unit (PACU) or recovery room as comfortable as possible. Often, in the recovery room, the patient may need more analgesics prior to leaving. Our goal is to ensure that every patient leaves this area either to home or to their hospital room feeling comfortable.

We use a 10-point visual analog score for adults to self-report their pain. The scores reported at left reflect the adults’ perception of their own pain assessment and their request for pain medications.

For pediatric patients old enough to assess their own scores, we use the same 10-point scale as used for adults. For patients too young to use the scale, the nurses in the PACU use the FLACC (Facial-Legs-Arms-Crying-Comfortable) scale that attributes behavioral characteristics to a 10-point pain scale.

Using these 0-10 scales, our goal is to treat pain above a ‘3’ and discharge patients from the PACU with scores less than 3.

We report a sample subset of patients from 2012. (N=6,204 for adults and N=3,638 for pediatric patients.)
At the Mass. Eye and Ear/Harvard Medical School Department of Ophthalmology, we have nearly two centuries of experience in developing innovative approaches to treating eye disease and reducing blindness worldwide. We founded subspecialty training in cornea, retina and glaucoma, and have pioneered tools and treatments for numerous diseases and conditions ranging from retinal detachment to age-related macular degeneration to corneal scarring. Our core values are patient-centered and focus on delivering the highest quality of care through education, innovation and service excellence.

We are the:

• Primary teaching hospital of Harvard Medical School’s Department of Ophthalmology.

• Home to Schepens Eye Research Institute, Retina Research Institute, Howe Laboratory of Ophthalmology, Berman-Gund Laboratory for the Study of Retinal Degenerations, the Ocular Genomics Institute and Ocular Regenerative Medicine Institute.
Clinical Affiliations

- Massachusetts General Hospital (MGH) Department of Ophthalmology
  - Mass. Eye and Ear provides comprehensive and subspecialty care and inpatient consultations to MGH patients, including 24/7 emergency eye care and trauma coverage. Mass. Eye and Ear clinicians also coordinate Neuro-Ophthalmology and Burn Unit consultations at MGH.
  - Mass. Eye and Ear staff screen patients at high risk for diabetic eye disease through MGH’s Chelsea Health Center teleretinal screening program.

- Joslin Diabetes Center/Beetham Eye Institute
  - Mass. Eye and Ear and BEI clinicians provide coordinated, integrated and comprehensive care to patients throughout Boston to prevent, diagnose and treat patients at risk for diabetic eye disease.

- Brigham and Women’s Hospital (BWH)
  - Mass. Eye and Ear provides comprehensive and subspecialty care and inpatient consultations to BWH patients, including 24/7 emergency eye care and trauma coverage.
  - BWH patients may also receive a full range of ophthalmic care at Mass. Eye and Ear, Longwood, staffed by Mass. Eye and Ear physicians with participation from Joslin specialists.

- Children’s Hospital Ophthalmology Foundation (CHOF)
  - Mass. Eye and Ear ophthalmologists provide subspecialty care in glaucoma and cornea disease at Boston Children’s Hospital.
  - Children’s Hospital ophthalmologists staff the comprehensive pediatric ophthalmology and strabismus clinic at Mass. Eye and Ear.

Ophthalmology Resources at Mass. Eye and Ear

- Full spectrum of primary and subspecialty ophthalmic care with highly skilled teams.
- Dedicated 24/7 eye emergency department.
- Morse Laser Center provides advanced laser procedures using state-of-the-art refractive, glaucoma, retinal and anterior segment lasers.
- Ocular Surface Imaging Center enables rapid, non-invasive corneal biopsies.
- Electroretinography Service performs evaluations of patients with retinal disease referred for diagnosis, prognosis, genetic counseling and treatment.
- The David Glendenning Cogan Laboratory of Ophthalmic Pathology provides enhanced diagnostic services in conjunction with the MGH Surgical Pathology Service.
- Newly formed Optometry Service provides screening and vision care in the context of ophthalmic practice.
- Full service Contact Lens Service specializes in therapeutic fits, bandage and specialty contact lenses.
- The Howe Library houses one of the most extensive ophthalmology research collections in the world.
- Mass. Eye and Ear Medical Unit, staffed by MGH physicians.
- Mass. Eye and Ear Radiology Department houses a dedicated MRI/CT imaging suite.
- Dedicated Social Work and Discharge Planning Department.
- The International Program offers patients assistance with appointments, transportation, accommodations and language translation.
- Mass. Eye and Ear’s Retina Service houses a dedicated Ophthalmic ultrasound imaging suite.

For more information about the Mass. Eye and Ear Quality Program or the Department of Ophthalmology, please visit our website at www.MassEyeAndEar.org.
This bar graph shows the number of ophthalmology patients seen monthly by the Mass. Eye and Ear Emergency Department during the 2009, 2010, 2011 and 2012 calendar years. During this four year period, the Emergency Department maintained a high volume of ophthalmic emergency visits, with an average of 1,060 patients per month in 2009, 1,050 in 2010, 1,091 in 2011, and 1,304 in 2012. Patient volume generally increases in the summer.
Emergency Department:
Ophthalmology Visit Times

The average ophthalmology visit time in the Mass. Eye and Ear Emergency Department for 2012 was 2.5 hours. The 2012 average visit time was similar to 2009, 2010 and 2011 visit times, which were 2.3, 2.1 and 2.3 hours, respectively. The visit time is defined as the total time from when the patient walked in the door at the Mass. Eye and Ear Emergency Department to when the patient walked out the door after having seen the ophthalmologist. According to the 2010 Press Ganey Emergency Department Pulse Report, patients across the United States spent an average of four hours and seven minutes (4.12 hours) per Emergency Department visit. The Massachusetts (State) average visit time was 4.06 hours.

Emergency Department:
Ophthalmology Elopement Rate

The Mass. Eye and Ear Emergency Department reported a patient elopement rate of 1.1% (176/15,650) for all ophthalmic emergency visits in 2012. Elopement is the term used to describe those patients who present to an emergency department but leave before being seen by an ophthalmologist. According to a 2009 report by the Society for Academic Emergency Medicine, the national “left-without-being-seen” (LWBS) rate is 1.7%.1 LWBS rates vary greatly among hospitals; a review of the literature suggests a national range of 1.7% to 4.4%.1-3

References:
In a retrospective review of 124 pediatric open-globe injuries managed by the Eye Trauma Service and/or Retina Service between February 1999 and April 2009, analysis showed a median visual acuity at presentation of “hand motions” (N = 123), and a final best-corrected median visual acuity of 20/40 (N = 124) at ten months median follow-up.¹

Eye trauma surgical results from calendar year 2012 were similar to those from calendar years 2011 and 2010. Visual prognosis after ocular trauma is highly dependent on the severity of the initial trauma, but these data show that patients suffering from traumatic eye rupture can regain useful vision after surgery.

Eye Trauma Surgery: Rates of Endophthalmitis after Open-Globe Repair

During calendar year 2012, 122 patients had open-globe repair by the Eye Trauma Service, with no cases of endophthalmitis reported. This is similar to calendar year 2009, 2010 and 2011 results, where no cases of endophthalmitis were reported among the 95, 96 and 98 patients, respectively, who had open-globe repair by the Eye Trauma Service.

During a 7.5-year period (January 2000 to July 2007), 675 open-globe injuries were treated at Mass. Eye and Ear. Intravenous vancomycin and ceftazidime were started on admission and stopped after 48 hours. Patients were discharged on topical antibiotics, corticosteroids, and cycloplegia. Of these 675 eyes, 558 had at least 30 days of follow-up (mean, 11 months). The overall percentage of endophthalmitis was 0.9% (or 5/558 cases). Three were culture-positive cases, and two were culture-negative cases.1

The standard Mass. Eye and Ear protocol for eye trauma (i.e. surgical repair by a dedicated trauma team and 48 hours of intravenous antibiotics) is associated with post-traumatic endophthalmitis in fewer than one percent of cases. A review of the literature suggests that endophthalmitis rates around the world range from 2.6% to 17%. The United States National Eye Trauma Registry has reported an endophthalmitis rate of 6.9% after open-globe repair.1


Eye Trauma Surgery: Time to Surgical Repair for Open-Globe Injuries

During calendar year 2012, 122 patients suffered open-globe injuries that required urgent surgical repair by the Eye Trauma Service. Of those patients needing emergency surgery for ocular trauma, 121 (99.2%) were taken to the operating room within 24 hours of arrival at Mass. Eye and Ear. In one case, the decision was made to delay surgery until 48 hours after injury due to the patient’s history of scleral melts and the need for scleral tissue from the tissue bank. The mean time from presentation at the emergency department to arrival in the operating room was 524.9 minutes, or 8.7 hours (range: 36 minutes to 48 hours). Eighty-five of the 122 (69.7%) patients were taken to the operating room in under 12 hours.
Cataract Surgery

The Comprehensive Ophthalmology and Cataract Consultation Service at Mass. Eye and Ear provides a full spectrum of integrated patient care, from annual eye exams and continued ophthalmology care, to subspecialty referrals. The most common surgery that we perform is cataract extraction with intraocular lens implantation.

Cataract Surgery:
Achieving Target Refraction (Spherical Equivalent)

During the 2012 calendar year, the Mass. Eye and Ear Comprehensive Ophthalmology and Cataract Consultation Service performed cataract surgery on 1,464 eyes. This chart depicts the results of the 1,437 eyes that had at least one month of follow-up data. Of these 1,437 eyes, 93.9% (1,350/1,437) of cataract patients achieved within one diopter of target refraction after cataract surgery.

These results are comparable to calendar year 2011, when 94.4% (1,180/1,250) of eyes with at least one month follow-up data achieved within one diopter of target refraction. Similar results were also reported for calendar year 2010, during which time 93.1% (1,196/1,285) of eyes with at least one month of data achieved success. During the July 2008 to June 2009 period, there were 974 eyes with at least three months of follow-up data, and of these eyes 91.8% (894/974) were successful.

A Bright Future after Cataract Surgery

When sawdust blew into Craig Davis’ eye at work, an emergency department visit changed his life. The good news: the sawdust didn’t harm his eye. The bad news: Craig had a cataract, a clouding of the eye’s lens that can blur vision, in each eye.

Craig is not the usual cataract patient, an adult in the later years of life. He was in his thirties and had congenital cataracts, which can be present at birth or develop in early childhood.

As Craig’s vision slowly deteriorated, he began to lose his independence. Removing cataracts is common. Craig’s condition was uncommon and more complicated. Removing his cataracts could leave him with no vision at all.

“Craig’s condition was complex, but there is a special technique that can lower the risk of complications,” said Dr. Katie Luo, who performed the surgery.

The operation went well. With eyeglasses, Craig now has 20/20 vision. “Before surgery, I saw the world as if someone had smeared petroleum jelly on my eyeballs,” Craig said, “After the surgery, everything appeared sharper and clearer. It feels like I have a whole new set of eyes.”
Cataract Surgery: Intra-Operative Complication Rates

Of the 1,464 cataract surgeries performed by the Mass. Eye and Ear Comprehensive Ophthalmology and Cataract Consultation Service during the 2012 calendar year, only 2.5% (36/1,464) had intra-operative complications. These results are displayed in the graph above.

Prior to 2012, the last time period for which intra-operative complications data was reported was from July 2008 to June 2009. During this one-year period, 95.2% of the 974 cataract surgeries with sufficient follow-up for analysis had no intra-operative complications. Intra-operative complications included incision burn (0.21%), iris trauma (0.82%), retained lens (1.54%), and posterior capsule (PC) tear and/or vitreous loss (2.26%).

Mass. Eye and Ear 2012 Intra-Operative Complication Rates:
- Descemet’s tear: 0.20% (3/1,464)
- PC tear and/or vitreous loss: 1.71% (25/1,464)
- Nuclear fragment/dropped fragment/retained lens fragment: 0.34% (5/1,464)
- Zonular dialysis: 0.20% (3/1,464)

International Benchmarks:1-5
- Descemet’s tear: 0.0% - 0.9%
- PC tear and/or vitreous loss: 0.32% - 4.4%
- Nuclear fragment/dropped fragment/retained lens fragment: 0.04% - 1.7%
- Zonular dialysis: 0.1% - 1.2%

Primary rhegmatogenous retinal detachment is one of the most common retinal conditions that require surgical repair by the Mass. Eye and Ear Retina Service. During calendar year 2012, the Retina Service performed 489 retinal detachment repairs on 391 eyes, with the majority involving rhegmatogenous retinal detachments (79% or 385/489 surgical repairs, 312 eyes). For these retinal detachment repairs, techniques included pneumatic retinopexy, pars plana vitrectomy, and/or scleral buckle surgery.

The single surgery success rate of retinal reattachment was determined for primary, uncomplicated rhegmatogenous retinal detachments of less than one month duration for a total 173 eyes. Of the 173 eyes with primary rhegmatogenous retinal detachment, 79.7% (138/173) of the retinas were successfully reattached after one surgery at three months or greater of follow-up.

This single surgery success rate is comparable to international benchmarks reported in the literature that show single surgery success rates ranging from 59% to 95% for primary rhegmatogenous retinal detachment repair.1-5

Retina Surgery:
Final Retinal Reattachment Rate for Primary Rhegmatogenous Retinal Detachment

During calendar year 2012, the Mass. Eye and Ear Retina Service performed 385 surgical repairs on 312 eyes with rhegmatogenous retinal detachments. Surgical techniques included pneumatic retinopexy, pars plana vitrectomy, and/or scleral buckle surgery. This analysis includes the 173 eyes with primary uncomplicated rhegmatogenous retinal detachments with at least three months of follow-up.

Retinal reattachment was successfully achieved in 99.4% (172/173) of eyes with a primary rhegmatogenous retinal detachment during calendar year 2012. This success rate reflects eyes that had one or more surgeries, which may have included pars plana vitrectomy, scleral buckle, and/or pneumatic retinopexy. The 2012 final reattachment rate is similar to calendar year 2011 and 2010 results, as well as the previously reported 12 month period of March 2008 to February 2009. The smaller number of cases in calendar year 2010 may be attributable to a more stringent follow-up criteria of having at least five months of follow-up data.

With a 99.4% success rate for primary rhegmatogenous retinal detachment repair after one or more surgeries, the Mass. Eye and Ear Retina Service continues to maintain high success rates for rhegmatogenous retinal detachment repair.

International benchmarks report success rates of rhegmatogenous retinal detachment repair ranging from 97% to 100%.1-4

** Additional cases for calendar years 2010 and 2011 were identified that were not included in prior publications. Inclusion of these cases changed success rates from 61/63 (96.8%) to 76/78 (97.4%) in 2010 and from 173/175 (98.9%) to 187/189 (98.4%) in 2011.


Macular Hole Surgery:
Single Surgery Success Rate at Three Months

During calendar year 2012, the Mass. Eye and Ear Retina Service performed 62 surgeries on 55 eyes for macular hole repair (including pars plana vitrectomy, membrane peel, and gas tamponade) for macular hole repair on 55 eyes. Of these eyes, 16 had macular holes in the setting of retinal detachment and were excluded from the analysis. Also excluded were eyes with traumatic macular holes and recurrent macular holes, of which there were one and four eyes respectively. One eye was excluded because the patient deferred surgery for more than a year after initial diagnosis. Lastly, four eyes were excluded because of insufficient follow-up data of less than three months. Of the remaining 29 eyes that underwent macular hole surgery in 2012, 27 eyes (93.1%) achieved surgical success with a single operation. Success was defined as any primary macular hole that remained fully closed at greater than three months after the first surgery.

A review of the literature suggests that single surgery success rates for macular hole surgery range from 89.8% to 93.0%.1-3 With 93.1% of macular holes successfully repaired after one operation, the Mass. Eye and Ear Retina Service has a high single surgery success rate that is comparable to national benchmarks.

During the 2012 calendar year, the Mass. Eye and Ear Retina Service performed 3,515 intravitreal injections. Of these, two reported cases of endophthalmitis subsequent to intravitreal injection were identified.

In one case of acute endophthalmitis in calendar year 2012, the patient presented three days after the injection. The patient underwent pars plana vitrectomy with injection of intravitreal antibiotics; vitreous cultures revealed coagulase-negative Staphylococcus species. At six months follow-up after treatment, visual acuity with correction improved to 20/63+2 which was the patient’s baseline vision. In the second case, the patient presented two days after the injection and underwent a tap and inject. An anterior chamber tap revealed no growth. This case was unusual because the patient was not given betadine pre-injection due to a documented betadine allergy. The patient had, however, been given a drop of gatifloxacin pre-injection. Treatment of the infection resulted in a best-corrected visual acuity at eight months follow-up of 20/80-1; the patient’s baseline vision was 20/50-1.

In order to identify cases of acute endophthalmitis, a retrospective review was performed of all consecutive eyes that underwent intravitreal injections from January 1, 2007 to December 31, 2012. During this six-year period, 14,420 intravitreal injections were performed. The overall incidence rate of endophthalmitis subsequent to intravitreal injection throughout this six-year period was 0.03% (five of 14,420 injections).

Tumors located within the eye can be challenging to diagnose and treat effectively without causing damage to the eye and loss of vision. Proton beam irradiation is one of the most effective therapies for treating intraocular tumors without causing additional vision loss to the majority of patients.

During calendar year 2012, the Ophthalmic Oncology Service at Mass. Eye and Ear performed tantalum ring surgery in preparation for proton beam irradiation on 99 eyes. Zero cases of globe perforation from surgery were reported. A review of the literature suggests that perforation and injury to the globe are potential complications when treating intraocular tumors.1,2

Ocular Melanoma Patient Has Her Eyes on the Future

Life is good right now for retiree Judy Poindexter. She travels in her motor home and rides her motorcycle. Fortunately, her diagnosis of eye cancer is in the past, thanks to Mass. Eye and Ear.

Twenty years ago, Judy’s doctor noticed a ‘freckle’ in her eye during an exam. She received a frightening diagnosis: ocular melanoma, a rare type of eye cancer that can be life-threatening. He referred her to Dr. Evangelos Gragoudas at Mass. Eye and Ear.

Dr. Gragoudas spent much of his career developing proton beam radiation to treat eye cancers.

“The benefit of proton beam therapy is that you can deliver treatment to the tumor with sub-millimeter precision so that it doesn’t damage surrounding tissues,” he explains. “The rates of recurrence are lower and visual acuity is better than treatment with plaque radiation.”

Judy has been cancer-free for more than 20 years. She travels from South Carolina for follow-up at Mass. Eye and Ear, where she often meets others who have been diagnosed with ocular melanoma. “There is a long future for them with the good care they will get at Mass. Eye and Ear,” she says.
Glaucoma is a group of disorders in which the main risk factor is elevated eye pressure. Glaucoma is characterized by vision loss due to damage to the optic nerve, which provides the pathway from the eyeball to the brain. Members of the Mass. Eye and Ear Glaucoma Consultation Service are trained in the most advanced laser and surgical procedures to treat glaucoma.

The Mass. Eye and Ear Glaucoma Consultation Service has one of the lowest trabeculectomy and tube shunt infection rates compared to international benchmarks.

The most common incisional surgeries performed by the Mass. Eye and Ear Glaucoma Consultation Service are trabeculectomy surgery and tube shunt surgery. Trabeculectomy surgery is the gold standard incisional surgery that is usually performed first in patients who require glaucoma surgery. The total number of trabeculectomy and tube shunt surgeries performed by the Glaucoma Consultation Service increased from 245, to 270, to 323 for calendar years 2010, 2011, and 2012, respectively.

During the 2012 calendar year, the Glaucoma Consultation Service performed trabeculectomy surgery (with or without previous scarring) on 141 eyes and performed tube shunt surgeries (primary or revision) on 182 eyes. Zero cases of endophthalmitis were reported, and similar rates were reported in calendar years 2010, and 2011.

Complete success is defined as a zero percent infection rate per year. A review of the literature suggests that trabeculectomy and tube shunt infection rates range from 0.12% to 8.33%.1

Of the 323 cases of trabeculectomy surgery or glaucoma implant surgery performed by the Glaucoma Consultation Service during the 2012 calendar year, 97.2% (314/323) of patients had no intra-operative complications. Similar results were reported for calendar year 2011 and 2010, during which time 99.6% (269/270) and 95.5% (234/245) of patients had no intra-operative complications, respectively. These results are also consistent with an earlier 24 month period between July 2007 and June 2009, where 97.1% (299/308) of eyes had no intra-operative complications from trabeculectomy or tube shunt surgery.

**Mass. Eye and Ear 2012 complication rates:**
- Conjunctival tear/buttonhole: 0.92%
- Hyphema: 0.62%
- Scleral flap trauma: 0.30%
- Vitreous loss (vitreous prolapse): 0.92%
- Suprachoroidal hemorrhage: 0%
- Scleral perforation: 0%

**International benchmarks:**
- Conjunctival tear/buttonhole: 1.1% - 3%
- Hyphema: 1% - 8%
- Scleral flap trauma: 0.7%
- Vitreous loss (vitreous prolapse): 1%
- Suprachoroidal hemorrhage: 0% - 1%
- Scleral perforation: 0% - 3%

The 323 cases evaluated included:
- 134 trabeculectomies without scarring
- 7 trabeculectomies with previous scarring
- 149 primary tube surgeries
- 33 tube revisions

References:
Glaucoma Laser Surgery: Intraocular Pressure (IOP) Spikes

Pre- and post- intraocular pressure (IOP) measurements were taken by a skilled technician using the Tono-Pen (Reichert, Buffalo, NY) prior to the laser procedure and within one hour of the conclusion of the laser procedure. For this analysis, if multiple pressure readings were taken, the average pressure reading was used when calculating the pressure difference (post-op – pre-op). All patients received either brimonidine 0.1% or 0.15% or apraclonidine 0.5% before the laser procedure and prednisolone 1% after the procedure.

During calendar year 2012, the Glaucoma Consultation Service performed anterior segment laser procedures on 726 eyes. Of the 726 eyes, this analysis includes the 556 eyes that had laser peripheral iridotomies (243), capsulotomies (69), and laser trabeculoplasties (244). Of the 244 laser trabeculoplasties, 30 were argon laser trabeculoplasty (ALT) and 214 were selective laser trabeculoplasty (SLT).

Mass. Eye and Ear rate of IOP spike (≥5 mm Hg):
- Laser peripheral iridotomy: 24.3%
- Capsulotomy: 10.1%
- Laser trabeculoplasty: 17.2%
- Overall: 19.4%

Mass. Eye and Ear rate of IOP spike (≥10 mm Hg):
- Laser peripheral iridotomy: 6.6%
- Capsulotomy: 1.4%
- Laser trabeculoplasty: 2.5%
- Overall: 4.1%

International benchmarks:

- Laser peripheral iridotomy: 0% - 35%
- Capsulotomy: 5.7% - 13%
- Laser trabeculoplasty: 7% - 10.3%
- Overall: 0% - 31.7%

References:
8. Chen TC, Ang RT, Grosskreutz CL, Pasquale LR, Fan JT. Brimonidine 0.2% versus apraclonidine 0.5% for prevention of intraocular pressure elevations after anterior segment laser surgery. Ophthalmology 2001; 108:1033-1038.
9. Chen TC. Apraclonidine 0.15% versus apraclonidine 0.5% for prevention of intraocular pressure elevation after anterior segment laser surgery. J Cataract Refractive Surg 2003; 29(9): 1707-1712.
Refractive surgery, commonly known as laser vision correction, is a term given to surgical procedures designed to correct certain visual problems such as myopia (nearsightedness), hyperopia (farsightedness), and astigmatism. The Mass. Eye and Ear Cornea and Refractive Surgery Service offers a number of refractive procedures, the most common of which are LASIK (laser-assisted in situ keratomileusis) and PRK (photorefractive keratectomy).

Of the 323 eyes that had LASIK (laser-assisted in situ keratomileusis) surgery during the 2012 calendar year, 307 had sufficient follow-up data for analysis. Of these 307 eyes, 6.8% (21/307) had an enhancement/retreatment procedure within six months.

LASIK retreatment rates of between 3.8% and 29.4% have been reported in the literature.\textsuperscript{1-3}

References:
During the 2012 calendar year, 307 of the 323 eyes that had LASIK (laser-assisted in situ keratomileusis) surgery had sufficient follow-up data for analysis. Sufficient follow-up was defined as at least one month of follow-up for myopia and three months follow-up for hyperopia.

In calendar year 2012, the overall LASIK success rate for achieving within 0.5 diopters of target refraction for both myopes and hyperopes was 87.9% (270/307 eyes). The success rate for all myopes was 89.3% (242/271 eyes) and for hyperopes was 77.8% (28/36 eyes). This compares favorably to an overall success rate of 86.3% (246/285) for myopes and hyperopes in calendar year 2011, 86.1% (242/281) for myopes and hyperopes in calendar year 2010, and 86.6% (285/329) between July 2008 and June 2009. The Mass. Eye and Ear Cornea and Refractive Surgery Service continues to maintain a high overall success rate for LASIK surgery.
Refractive Surgery LASIK for Myopia: Achieving Target Refraction (Spherical Equivalent)

The LASIK success rate for myopia at one month was 89.3% (242/271 eyes) for calendar year 2012. These 2012 calendar year results were similar to the success rates of 88.1% (229/260 eyes) for calendar year 2011, 86.9% (219/252 eyes) for calendar year 2010, and 86.9% (251/289) for the 12 month period between July 2008 and June 2009. The Mass. Eye and Ear Cornea and Refractive Surgery Service continues to maintain high LASIK surgery success rates for myopia.

Benchmark data from FDA trials for LASIK for myopia showed that 71.6% of eyes resulted in a refractive error within 0.5 diopters of the intended target correction. Further review of the literature suggests that after LASIK surgery for myopia, approximately 70% to 83% of eyes achieve within 0.5 diopters of the intended target correction.1-2


Refractive Surgery LASIK for Hyperopia: Achieving Target Refraction (Spherical Equivalent)

Of the 50 eyes that had LASIK surgery for hyperopia during the 2012 calendar year, 36 had three months or more of follow-up data for analysis. The overall 2012 LASIK success rate for achieving within 0.5 diopters of target refraction was 77.8% (28/36 eyes) for hyperopia. The success rate in 2011 was 68% (17/25 eyes) for hyperopia, 79.3% (23/29 eyes) in 2010, and was 85% (34/40) between July 2008 and June 2009.


A review of the literature suggests that the success rate for achieving within 0.5 diopters of the intended target correction after LASIK for hyperopia ranges between 66.7% and 91%.1-3
Keratoprosthesis (KPro) Surgery: Surgical Indications

Thirty-six patients received the type 1 Boston KPro during calendar year 2012. Of these 36 patients, 25 (69.4%) received a KPro for the first time and are included in this analysis. Similar data were reported for calendar year 2011, during which time 33 patients received a type 1 KPro, with 27 of them having a primary type 1 KPro with at least three months of follow-up data.

Indications for KPro surgery included failed corneal grafts (10/25, 40%), aniridic keratopathy (9/25, 36%), vascularized corneal scar (5/25, 20%), and band keratopathy (1/25, 4%). Thirteen patients (52%) received the KPro as a primary procedure. Two aniridic eyes had prior failed grafts but were only graphed in the aniridic keratopathy category.

Keratoprosthesis (KPro) Surgery: Visual Outcomes

During calendar year 2012, 25 patients underwent primary type 1 keratoprosthesis (KPro) surgery and had at least three months of follow-up data available for analysis. Of these 25 patients, 21 (84%) achieved 20/200 vision or better at any point within the three month post-operative period or beyond. In 2011, 18 of the 27 patients (66.7%) who received primary type 1 KPro achieved a post-operative vision of 20/200 or better within the three month post-operative period or beyond. This is comparable to national benchmarks of 56% to 89% reported in the literature.1-3

Four patients did not achieve a post-operative vision of 20/200 or better, and in each case, the patient had pre-existing severe retinal disease or advanced glaucoma, which limited the visual acuity prognosis.

References: 1Kang JJ, de la Cruz J, Cortina MS. Visual outcomes of Boston keratoprosthesis implantation as the primary penetrating corneal procedure. Cornea 2012; 0(0): 1-5. 2Zerbe BL, Berlin MW, Ciolino JB. Results from the multicenter Boston type I keratoprosthesis study. Ophthalmology 2006; 113(1): 1779.e1-1779.e7. 3Greiner MA, Li JY, Mannis MJ. Longer-term vision outcomes and complications with the Boston type 1 keratoprosthesis at the University of California, Davis. Ophthalmology 2011; 118: 1543-1556.

Keratoprosthesis (KPro) Surgery: Retention Rates

Of the 25 primary type 1 Boston keratoprosthesis (KPro) surgeries in calendar year 2012 for which three months of follow-up data were available, 100% of patients retained the KPro at three months. Retention rates were first reported in calendar year 2011, during which time 27 patients received a primary type 1 KPro and 100% retained the KPro at three months. A review of the literature showed that 90.5% to 95% of patients retain their KPro at six months.1-2

Cornea Surgery: Penetrating Keratoplasty

During the 2012 calendar year, 135 penetrating (full-thickness) keratoplasties (PKs) were performed by the Mass. Eye and Ear Cornea and Refractive Surgery Service. The current analysis includes only those elective PKs for which up to three months of follow-up data were available and which were not done in combination with retinal, glaucoma or KPro procedures. Elective PKs included first time grafts in uninflamed host beds as well as those performed in eyes at high risk of rejection. This left 60 (44.4%) elective PKs for analysis for calendar year 2012.

Indications for elective PKs included failed corneal graft (24/60, 40%), bullous keratopathy (11/60, 18.3%), keratoconus (9/60, 15%), Fuchs’ dystrophy (6/60, 10%), corneal scar (4/60, 6.6%), granular dystrophy (2/60, 3.3%), corneal opacity with neovascularization (2/60, 3.3%), congenital corneal edema (1/60, 1.7%), and corneal blood staining causing dense corneal opacity (1/60, 1.7%).

Cornea transplant surgery provides clear cornea tissue from a donor to replace diseased host tissue.
Cornea Surgery: Clear Corneal Grafts after Penetrating Keratoplasty (PK) Surgery at Three Months Follow-up

Sixty of the 135 PKs performed in 2012 were elective (full-thickness) PKs with up to three months follow-up data available and were included in the analysis. Of these elective PKs, 22 (37.3%) were performed in combination with cataract surgery or IOL removal/exchange cases. Fifty-nine of 60 elective PKs (98.3%) achieved surgical success, which is defined as a graft at three months follow-up with minimal (to no) clinical edema and which possesses clarity sufficient to permit the examiner to have an unencumbered view of the interior of the eye including iris details.

During the 2011 calendar year, 96 (full thickness) PKs were performed and of these, 69 elective PKs had three months follow-up data. Sixty-four of the 69 elective PKs (92.8%) achieved surgical success. In addition, during the 2010 calendar year, 66 or 71 (93.0%) elective PKs achieved surgical success; and from July 2008 to July 2009, 122 of 126 (96.8%) elective PKs achieved surgical success.

During the 2012 calendar year, the Mass. Eye and Ear Ophthalmic Plastic Surgery Service performed external dacryocystorhinostomy (DCR) procedures on 85 patients. Twenty-three patients were excluded for preexisting ocular conditions such as Wegener’s granulomatosis, sarcoidosis, any type of cancer (including lymphoma), and benign tumors. This analysis includes the remaining 70 eyes of 62 patients who underwent primary external DCR in 2012 for primary acquired nasolacrimal duct obstruction. Of these eyes, 0% (0/70) required a second procedure within six months in order to achieve surgical success.

Calendar year 2012 was the first 12 month period for which external DCR data was analyzed. DCR is often considered the gold standard of care for nasolacrimal duct obstruction (NLDO). A review of the literature suggests that 7.8% to 12.5% of patients who undergo primary external DCR for primary acquired nasolacrimal duct obstruction require a revision.1-3

Oculoplastic surgery:
Re-Operation Rate for Lid Surgeries at Six Months Follow-up

During the 2012 calendar year, the Mass. Eye and Ear Ophthalmic Plastic Surgery Service performed eyelid surgeries on 471 eyelids in 273 patients. Re-operations involving eyelid retraction from thyroid eye disease were excluded from the analysis. This left 467 eyelids for analysis. Of these eyelids, only 1.7% (8/467) required a second procedure within six months in order to achieve surgical success. These results are consistent with the 2.6% (11/416) and 2.9% (10/343) of eyelids that required an eyelid re-operation after having had surgery during the calendar year 2011 period and the March 2008 to February 2009 period, respectively.

International benchmarks suggest that re-operation rates after eyelid surgery range from 2.6% to 8.7%.


Oculoplastic surgery:
Incidence of Post-Operative Infection at Six Months Follow-up

The incidence of post-operative infections following surgeries performed by the Mass. Eye and Ear Ophthalmic Plastic Surgery Service is very low. Of the 864 surgeries performed during the 2012 calendar year, no patients developed a post-operative infection. There were also no cases of post-operative infection following any of the 795 surgeries performed in calendar year 2011.

Data collected from the twelve month period of March 2008 to February 2009 revealed a post-operative infection rate of only 0.16% (1/632). One patient developed MRSA (methicillin-resistant Staphylococcus aureus) cellulitis following resection of an orbital tumor. The infection was successfully treated without permanent ocular sequelae.

A review of the literature suggests that infection rates after oculoplastic surgery range from 0.04% to 1.0%.

Pediatric and Adult Strabismus Surgery: Outcomes Criteria

Strabismus surgery is the most commonly performed ophthalmic procedure in children and is also used in adults. Surgery is performed for a variety of conditions including restoration of binocular vision, reconstructive surgery for restoration of normal eye contact, treatment of double vision, or reduction of anomalous head posture (torticollis). Since the desired surgical outcome depends on the primary indication for surgery, we developed a unique goal-directed methodology to assess surgical outcomes at two to four months. This approach provides the most clinically relevant appraisal of strabismus surgery outcomes. This model excludes no patient based on diagnosis and therefore facilitates stratification based on the presence or absence of risk factors (ophthalmic or systemic) that might impact surgical outcomes. Since these outcomes are unique, the data can’t be compared to benchmarks in the literature. The tables below summarize the criteria, and the following figures describe our outcomes using these goal-directed measures.

### Goal—Binocular Potential (ET)

<table>
<thead>
<tr>
<th>Subjective</th>
<th>Distance angle$^\Delta$</th>
<th>Near angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>ET $\leq 10$ or XT $\leq 5$</td>
<td>No XT, any ET</td>
</tr>
<tr>
<td>Good</td>
<td>ET $\leq 15$ or XT $\leq 10$</td>
<td>X(T) $\leq 10$ any ET</td>
</tr>
<tr>
<td>Poor</td>
<td>Planned re-operation (horizontal)</td>
<td>ET $&gt; 15$ or XT $&gt; 10$</td>
</tr>
</tbody>
</table>

$^\Delta =$ prism diopter

1. Order of preference for angle used: SPCT > APCT > Krimsky
### Strabismus surgery outcomes

Strabismus surgery outcomes were defined as excellent, good, or poor based on goal-determined criteria.

**ET** = estotropia

**XT** = exotropia

**SPCT** = simultaneous prism-and-cover test

**APCT** = alternate prism-and-cover test.

^ = prism diopter

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<table>
<thead>
<tr>
<th>Goal—Binocular Potential (XT)</th>
<th>Sensory</th>
<th>Distance angle$^1$</th>
<th>Near angle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong></td>
<td>Nearestor-aucity $&lt;$2 octaves worsened from pre-op and not diminished to nil$^2$</td>
<td>XT $&lt;$10$^\Delta$ or ET $&lt;$6$^\Delta$</td>
<td>XT $&lt;$10$^\Delta$ or ET $&lt;$6$^\Delta$</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td>Nearestor-aucity $&lt;$2 octaves worsened from and not diminished to nil$^2$</td>
<td>10$\leq$ XT $&lt;$15$^\Delta$ or 6$\leq$ XT $\leq$10$^\Delta$</td>
<td>10$\leq$ XT $&lt;$15$^\Delta$ or 6$\leq$ XT $\leq$10$^\Delta$</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>Planned re-operation (horizontal)</td>
<td>XT $\geq$15$^\Delta$ or ET $\geq$10$^\Delta$</td>
<td>XT $\geq$15$^\Delta$ or ET $\geq$10$^\Delta$</td>
</tr>
</tbody>
</table>

1. Order of preference for angle used: Krimsky > SPCT > APCT
2. Accept W4D (Worth-4-dot test) fusion if stereo-acuity data not available

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<table>
<thead>
<tr>
<th>Goal—Reconstructive (ET/XT)</th>
<th>Subjective</th>
<th>Angle$^{1,2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong>$^3$</td>
<td></td>
<td>$\leq$$\pm$10$^\Delta$ ET or XT</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td></td>
<td>$\leq$$\pm$15$^\Delta$ ET or XT</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>Planned re-operation (horizontal)</td>
<td>$&gt;$10$^\Delta$ if plan re-op or $&gt;$15</td>
</tr>
</tbody>
</table>

1. Order of preference for angle used: Krimsky > SPCT > APCT
2. Near angle (unless stated goal of distance angle)
3. Ignore co-existing vertical deviation

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<table>
<thead>
<tr>
<th>Goal—Resolution of Diplopia (ET/XT)</th>
<th>Subjective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong>$^1$</td>
<td>No diplopia in primary</td>
</tr>
<tr>
<td><strong>Good$^1$</strong></td>
<td>Diplopia controlled with prism</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>Planned re-operation for diplopia and/ or diplopia not comfortably controlled with prism correction</td>
</tr>
</tbody>
</table>

1. At distance and near but may have rare diplopia in primary, or diplopia away from primary
2. Pre-existing vertical alignment controlled with prism does not affect result if no increase
3. New vertical alignment requiring prism cannot exceed “good” outcome

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<table>
<thead>
<tr>
<th>Goal—Reduction of Torticollis (ET/XT)</th>
<th>Torticollis$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excellent</strong>$^1$</td>
<td>$\leq$8$^\circ$</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td>$\leq$$\pm$12$^\circ$</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>Planned re-operation for diplopia or torticollis</td>
</tr>
</tbody>
</table>

1. Subjective category trumps the other categories
2. Distance (unless stated goal of near)
Pediatric and Adult Strabismus Surgery: Exotropia Outcomes

Of the 122 children and adults with exotropia, 28 patients underwent surgery to restore binocular vision, 78 for reconstructive purposes, 14 for diplopia, and two for torticollis. Exotropia patients are grouped according to the primary goal of the surgery was met.

This figure presents exotropia outcomes data for surgery performed by ophthalmologists with joint appointments at the Mass. Eye and Ear Pediatric Ophthalmology and Strabismus Service and Boston Children’s Hospital during calendar year 2012. Outcomes were graded as excellent, good or poor, based on whether the primary goal of the surgery was met.

Pediatric and Adult Strabismus Surgery: Exotropia Outcomes Stratified by Risk Factors

This figure represents surgical outcomes for exotropia in patients with or without associated risk factors. Risk factors included the following: prior strabismus surgery, bilateral vision limitation (e.g. albinism), systemic conditions resulting in hyper- or hypotonia, craniosynostosis or craniofacial anomalies, Graves’ orbitopathy, antecedent orbital trauma with or without orbital fracture, fat adherence syndrome, prior surgery for retinal detachment, heavy eye syndrome, Brown syndrome, Duane syndrome, 6th nerve palsy, exotropia ≥ 50 prism diopters, congenital fibrosis of the extraocular muscles (CFEOM), simultaneous surgery for A or V patterns, or other vertical deviation.
Pediatric and Adult Strabismus Surgery: Esotropia Outcomes

Of the 153 children and adults with esotropia, 71 underwent surgery to restore binocular vision, 60 for reconstructive purposes, 20 for diplopia, and two for torticollis.

This figure presents esotropia outcomes data for surgeries performed by ophthalmologists with joint appointments at the Mass. Eye and Ear Pediatric Ophthalmology and Strabismus Service and Boston Children’s Hospital during calendar year 2012. Outcomes were graded as excellent, good, or poor, based on whether the primary goal of the surgery was met.

Pediatric and Adult Strabismus Surgery: Esotropia Outcomes Stratified by Risk Factors

This figure presents the esotropia outcomes above, but stratified by risk factors. Risk factors included the following: prior strabismus surgery, bilateral vision limitation (e.g. albinism), systemic conditions resulting in hyper- or hypotonia, craniosynostosis or craniofacial anomalies, Graves’ orbitopathy, antecedent orbital trauma with or without orbital fracture, fat adherence syndrome, prior surgery for retinal detachment, heavy eye syndrome, Brown syndrome, Duane syndrome, 6th nerve palsy, esotropia ≥ 50 prism diopters, congenital fibrosis of the extra-ocular muscles (CFEOM), simultaneous surgery for A or V patterns, or other vertical deviation.
Neuro-Ophthalmology: Imaging Study Results to Patients

During calendar year 2012, the Mass. Eye and Ear Neuro-Ophthalmology Service ordered 404 outpatient neuro-imaging scans (e.g. MRI, CT scans, etc.). Fifty-six of these scans were excluded from analysis, because they were cancelled, performed at outside hospitals, or lacked sufficient documentation of follow-up. This left a total of 348 scans for the current analysis.

Of the 348 imaging studies included in the analysis for the 2012 calendar year, the results of 150 scans (43.1%) were reviewed with the patient within one business day of the scan being performed. Two hundred and three scans (58.3%) were performed and reviewed with the patient within two business days. Three hundred and twenty seven scans (94.0%) were performed, read and subsequently reviewed with the patient within seven calendar days. There were 21 scans (6.0%) for which the patients received the results more than seven days after the scan; the follow-up time for these scans ranged from eight to 17 days, with an average of 11 business days. Follow-up rates reflect the length of time from when the scan was performed to when the ordering physician was able to successfully reach the patient (not necessarily the first call to the patient).

To the best of our knowledge, there are no ophthalmology studies that report the percentage of patients who receive their imaging results at specified time points. The Veterans Health Administration (VHA) published guidelines in 2009 stating that all test results should be given to patients within 14 calendar days after the test results are made available to the physician. Similar guidelines have been published in the European community.1-3

The Mass. Eye and Ear Neuro-Ophthalmology Service has better follow-up times than published guidelines, with 94% of scans being reviewed with the patient in seven days or less from the time the scan was performed. New steps are being implemented to further reduce the average time between the MRI scan and notification of the results to our patients.

The Mass. Eye and Ear Ocular Immunology and Uveitis Service saw a total of 2,525 patients over 5,072 office visits during calendar year 2012.

Of the 2,525 patients seen in 2012 by the Ocular Immunology and Uveitis Service, 492 patients (19.5%) were treated for ocular inflammation with some form of systemic medication, ranging from prescription oral NSAIDs (e.g. ibuprofen, naproxen, etc.) to oral corticosteroids (i.e. prednisone) to immunosuppressive agents (e.g. methotrexate, mycophenolate mofetil, etc.).

This graph depicts the systemic drugs used by the Immunology and Uveitis Service in the treatment of patients with ocular inflammation. Patients with inflammatory eye diseases may require a combination of systemic medications (e.g. an approach in which a corticosteroid is combined with another immunosuppressive drug).1 The graphed data reflects the systemic medications prescribed for uveitis, scleritis, or other ocular inflammatory disease at any time during calendar year 2012.

The Department of Otolaryngology at Mass. Eye and Ear has a long tradition in delivering excellence in clinical care, research and teaching. We provide comprehensive medical and surgical care in a variety of specialties in the field of otolaryngology, including:

- general otolaryngology
- otology and neurotology
- otoneurology
- head and neck surgical oncology
- laryngology
- rhinology and sinus disease
- pediatric otolaryngology
- facial plastic and reconstructive surgery
- facial nerve disorders
- dermatology
- laser reconstructive surgery
- thyroid and parathyroid surgery

We are also a center of research in these areas of expertise, with a long history of medical breakthroughs, including the discovery of stem cells in the adult inner ear, and the ability to screen infants at birth for deafness. Our physicians and scientists are committed to advancing the care provided to our patients.
Silencing the Sounds in Manny’s Head

Imagine hearing your eyes move as you read this sentence. Unusual sounds like this echoed in Manny Pavao’s head, from his eyes moving to his heart beating, all day, every day. Living a normal life was impossible. Finding the cause of the symptoms seemed impossible, too — until he came to Mass. Eye and Ear.

Manny suffered without a diagnosis for a decade. Communicating with his family was a challenge. He grew depressed. Then his wife watched a story on TV about a patient who had similar symptoms. The story gave them hope — and revealed that there is a cure.

Manny visited Dr. Daniel Lee, who diagnosed him with Superior Semicircular Canal Dehiscence Syndrome (SCDS). A hole in a bone in the inner ear causes SCDS. Symptoms include hearing an echo when chewing, speaking or swallowing.

“SCDS is missed because it resembles many common ear conditions,” said Dr. Lee, who performed Manny’s surgery. “We identify the hole with a surgical microscope, plug the hole and repair any other holes with his own tissues,” said Dr. Lee.

“After the surgery, I almost broke down,” said Manny. The sounds echoing in Manny’s head were gone. He now has his life back.
Clinical Affiliations

- Massachusetts General Hospital (MGH)
  - Mass. Eye and Ear physicians and audiologists provide comprehensive and subspecialty care, including consultations and coordination of inpatient consultations for urgent patient care concerns and newborn infant auditory screening.

- Brigham and Women’s Hospital (BWH)
  - Mass. Eye and Ear provides otology/neurotology subspecialty support to the Otolaryngology Division of BWH.

  - Mass. Eye and Ear physicians and audiologists provide comprehensive community based-care throughout the Greater Boston Area.

- Braintree Rehabilitation Hospital Unit of the Mass. Eye and Ear Balance and Vestibular Center
  - Mass. Eye and Ear specialists provide comprehensive vestibular diagnostic services, and otologic and neurologic assessment and care in a specialty clinic housed at the Braintree Rehabilitation Hospital.

Otolaryngology Resources at Mass. Eye and Ear

- Full spectrum of primary and subspecialty otolaryngology care.
- Highly skilled clinical teams staff each area.
- Emergency Department open 24/7 for otolaryngology emergency care.
- Audiology Department providing a full range of diagnostic and treatment services, including newborn infant screening, audiometry, evoked response testing, electrocochleography and electroneuronography, hearing aid services and cochlear implant and auditory rehabilitation services for adults and children.
- The Laryngology Division provides care for patients suffering from laryngeal cancer, laryngeal motion disorders, hoarseness, papillomatosis, and keratosis, and airway and voice disorders. Physicians work closely with speech language pathologists in the Mass. Eye and Ear Voice and Speech Laboratory, which provides state-of-the-art audio and video diagnostic facilities, technicians, and therapists.

Mass. Eye and Ear Department of Otolaryngology

- Primary teaching hospital and coordinating center for the Harvard Otolaryngology Residency Program
- Home to the Eaton-Peabody Laboratories of Auditory Physiology, Jenks Vestibular Physiology Laboratory, Jenks Vestibular Diagnostic Laboratory, Amelia Peabody Otoimmunochemistry Laboratory, Otopathology Laboratory, Norman Knight Center for Hyperbaric Medicine, Cochlear Implant Research Laboratory, National Temporal Bone, Hearing and Balance Pathology Resource Registry, Facial Nerve Center, Carolyn and Peter Lynch Center for Laser and Reconstructive Surgery, and the Tillotson Cell Biology Unit.
• Mohs Cutaneous Surgery Unit and Carolyn and Peter Lynch Center for Laser and Reconstructive Surgery provide care for a wide array of dermatologic disorders and cancer.

• Jenks Vestibular Diagnostic Laboratory offers an array of the latest equipment and highly trained staff to aid in diagnosis of vestibular and balance disorders.

• Head and Neck Cancer Center provides the most up-to-date and effective evaluation and treatment modalities for patients with head and neck cancer, including medical oncology, microvascular surgery, and collaboration with MGH radiation oncology and proton beam facilities.

• Thyroid and Parathyroid Surgical Unit offers diagnostic and surgical care for patients with thyroid and parathyroid diseases of the head and neck, with world-renowned expertise in nerve preservation and electrophysiological intraoperative monitoring in thyroid/parathyroid surgery.

• Facial Nerve Center offers full diagnostic, surgical, and rehabilitative services for patients with facial paralysis and movement disorders.

• Sinus Center provides clinical care to patients with all diseases of the nose and sinuses.

• Pediatric Airway, Voice and Swallowing Center performs assessments and treatment of a wide spectrum of these congenital, developmental and acquired disorders in children.

• Sleep Center provides polysomnography sleep diagnostic studies for assessment of adults and children with sleep disturbances.

• Clinical Vestibular and Balance Center offers full service multidisciplinary evaluation and treatment of patients with dizziness and vestibular and balance disorders.

• Fully integrated access to all hospital support services and infrastructure, including social work and discharge planning, the Howe Library, clinical and research IT, medical unit, infectious disease unit, radiology unit, child life specialists, surgical pathology unit, international program and language translation support, dietary and pharmacy.

Academic Affiliations
• Massachusetts General Hospital
• Brigham and Women’s Hospital
• Beth Israel Deaconess Medical Center
• Boston Children’s Hospital
This bar graph shows the number of otolaryngology patients seen monthly by the Mass. Eye and Ear Emergency Department during the 2009, 2010, 2011 and 2012 calendar years. During this four-year period, the Emergency Department maintained a high volume of otolaryngologic emergency visits, with an average of 591 patients per month in 2009, 542 in 2010, 546 in 2011, and 534 in 2012.

The average otolaryngology visit time in the Mass. Eye and Ear Emergency Department for 2012 was 2.19 hours. The average visit time is defined as the total time from when the patient walked in the door at the Mass. Eye and Ear Emergency Department to when the patient walked out the door after having seen an otolaryngologist. According to the 2010 Press Ganey Emergency Department Pulse Report, patients in the United States spent an average of four hours and seven minutes (4.12 hours) in the Emergency Department. The Massachusetts state average visit time was 4.06 hours.

For the past four years, the average otolaryngology visit time in the Mass. Eye and Ear Emergency Department was half the national and state average visit times.
Pediatric Otolaryngology:

The Pediatric Otolaryngology Division is dedicated to delivering specialized, compassionate care in the treatment of pediatric patients suffering from ear, nose, and throat conditions. These conditions vary from routine to complex, including ear and sinus infections, obstructive or infectious problems of the tonsils and adenoid, malformations or tumors of the head and neck, hearing and language disorders, and breathing and voice problems.

Tonsillectomy with or without Adenoidectomy

In 2012, four full-time surgeons in the Division of Pediatric Otolaryngology performed 585 tonsillectomies with or without adenoidectomy. Of these patients, 4.3% returned to the Mass. Eye and Ear Otolaryngology Emergency Department for evaluation of possible post-operative bleeding, and 1.5% were taken back to the operating room for additional repair.

Number of Tonsillectomies by Year

These percentages represent children undergoing tonsillectomy or tonsillectomy and adenoidectomy who then needed to return to the emergency department (ED) for evaluation of possible postoperative bleeding.

Postoperative bleeding after tonsillectomy or tonsillectomy and adenoidectomy is a common complication of this surgery. Anytime a parent suspects postoperative bleeding, they are encouraged to return their child to the ED for evaluation. Mass. Eye and Ear reports a rate of return to the ED for possible bleeding that is better than the national average.
Pediatric Otolaryngology: Tonsillectomy with or without Adenoidectomy

Returned and Admitted for Postoperative Bleeding

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2.0</td>
</tr>
<tr>
<td>2009</td>
<td>2.0</td>
</tr>
<tr>
<td>2010</td>
<td>2.0</td>
</tr>
<tr>
<td>2011</td>
<td>2.0</td>
</tr>
<tr>
<td>2012</td>
<td>2.0</td>
</tr>
</tbody>
</table>

These percentages represent children undergoing tonsillectomy or tonsillectomy and adenoidectomy who then developed tonsil bleeding severe enough to require a return to the operating room for surgical treatment.


Complications after Endoscopy for Airway Obstruction

Laryngoscopy and bronchoscopy are performed in the operating room and allow the physician to view the structures of a child’s upper airway. A small scope with a camera on the end is placed inside the mouth and is guided into the upper airway. Common complications associated with this procedure include laryngospasm, tooth loss and difficulty breathing postoperatively.

Our experienced surgeons in the Center, along with the pediatric anesthesiology and pediatric nursing teams, are committed to eliminating these complications and providing the highest quality care in endoscopy. We have achieved extremely low complication rates by using a procedural checklist system, which ensures surgeons use tooth guards and topically anesthetize the vocal cords prior to placing the scope, and anesthesiologists administer steroids during surgery to prevent unexpected airway obstruction.

Between July 2012 and February 2013, 150 pediatric patients underwent endoscopy for airway obstruction. Out of those 150 patients, two experienced laryngospasm. None experienced tooth injury or post-op airway obstruction.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laryngospasm</td>
<td>2</td>
</tr>
<tr>
<td>Tooth Loss</td>
<td>0</td>
</tr>
<tr>
<td>Airway Obstruction</td>
<td>0</td>
</tr>
</tbody>
</table>


Mass. Eye and Ear reports a rate of return to the operating room for surgical intervention for postoperative bleeding after surgery that is better than the national average.

When pediatric patients suffering from airway obstruction come into the Pediatric Airway, Voice and Swallowing Center at Mass. Eye and Ear, an endoscopic exam is often needed to determine why they have trouble breathing.

A complication associated with laryngoscopy, laryngospasm is a temporary vocal cord spasm that can cause difficulty breathing and swallowing.
A primary goal of hearing screening in the newborn period is to improve, through early identification and treatment, speech and language outcomes for children with hearing loss.

Mass. Eye and Ear has been involved in the early identification of hearing loss in children and the implementation of early intervention for childhood hearing loss for decades. In the 1940s, the Mass. Eye and Ear's Winthrop Foundation developed a pioneering program to diagnose and rehabilitate hearing loss in children as young as three years of age. In the 1980s, Drs. Thornton and Herrmann of the Audiology Department developed techniques for infant hearing screening and evaluation to identify children with hearing loss soon after birth. Audiology staff teamed with colleagues across the state and with the Department of Public Health in the 1990s to establish universal infant hearing screening in Massachusetts and to design a process that has resulted in a statewide ‘lost to follow-up’ rate for infants who do not pass their screening that is the lowest in the nation. The department also performs detailed diagnostic evaluations of infants who do not pass their screening.

Audiology: Newborn Hearing Screening Outcomes

Newborns screened 2003 - 2012

Newborn hearing screening is highly accurate and leads to earlier identification and treatment of infants with hearing loss. The above graph indicates that, in the past ten years, over 85,000 newborns have been screened for hearing loss under the supervision of the Mass. Eye and Ear Audiology Department using the technology that was developed at Mass. Eye and Ear in the 1980s. About 2.5% of those infants do not pass their hearing screening and these infants receive a thorough evaluation using evoked response audiometry in the first few weeks of life. Identification of this smaller group for full evaluation allows for diagnosis and treatment to minimize the speech and language delays otherwise common with untreated hearing loss.

According to the CDC Summary of Diagnosis and Loss to Follow-Up, the Massachusetts “lost to follow-up” rate for 2011 is 3.0%, compared to a national average of 36% (range 3% to 75% in the continental USA).
Twenty-three percent of the babies referred for further testing still have some hearing loss when they are tested at 3-4 weeks of age. The rest of the babies likely had transient middle-ear fluid that is no longer a problem. Tabulation of the infants with hearing loss indicates that about half of those hearing losses resolve by 3 months of age and about half are permanent, yielding an incidence of permanent hearing loss of about 2 in 1000 births (see graph above).

Infants and children with hearing loss receive comprehensive medical evaluation and ongoing medical management by Mass. Eye and Ear Pediatric Otolaryngology, along with other assessments as indicated. Rehabilitative follow-up in Audiology may include hearing loss management with devices. Two-thirds of the babies with hearing loss at birth have mild to moderate hearing losses and benefit from standard amplification; they often are fit with hearing aids by three months of age. Children with severe to profound loss may undergo cochlear implantation. The Audiology Department’s Auditory Rehabilitation Center provides guidance for language intervention and ongoing aural (re)habilitation, coordinating efforts with the child’s other health care providers and educators to facilitate best outcomes.

Because of the early identification of their hearing loss and the comprehensive, continuing care provided during childhood, most of our young patients meet normal speech and language milestones and are mainstreamed for their education. Our experience is similar to research studies that have found that, regardless of the severity of hearing loss, over 90% of children identified early and receiving consistent intervention have normal speech and language by three years of age.

References:
1. 2011 CDC EHDI Hearing Screening & Follow-up Survey (HSFS) (www.cdc.gov/ncbddd/hearingloss/ehdi-data.html)

Evoked response audiometry consists of using a brainwave response to sounds to measure hearing sensitivity. The technique was developed at Mass. Eye and Ear and elsewhere during the 1980s and this type of hearing test is now considered the gold standard for measuring hearing in babies. Responses are recorded to short tonal sounds of different frequencies to define the hearing in each ear across frequencies and can be considered the baby’s “hand raise” for testing hearing.
After surgery, cochlear implant patients report the following benefits: 1) improved oral communication at home and at work, 2) improved telephone use in the majority of patients, and 3) an overall improved quality of life.

We have reviewed the outcomes from adults who underwent cochlear implant (CI) surgery at Mass. Eye and Ear between 2005 and 2012. All implant recipients included in this analysis initially presented with post-lingual hearing loss and received post-implant speech perception testing more than five months after surgery. Single syllable word testing (CNC testing) is used before and after cochlear implant surgery to assess word intelligibility. Our data demonstrate improvement following implantation in adults of all ages with severe to profound acquired deafness. There were no permanent facial nerve injuries or cases of meningitis associated with cochlear implant surgery performed by full-time faculty at Mass. Eye and Ear.

Figure 1 shows the increase in number of cochlear implant surgeries performed at Mass. Eye and Ear from 1985 to 2012.

The consonant nucleus consonant (CNC) test is used before and after implantation to assess word intelligibility. During a CNC test, an audiologist measures the patient’s ability to recognize a series of three-letter words such as “hat” and “car.” The higher postoperative scores represent an improved speech perception in cochlear implant patients at Mass. Eye and Ear after surgery.
Otology: Stapedectomy Outcomes

There are three ossicles (hearing bones) in the middle ear that vibrate in response to sound. In patients who suffer from otosclerosis, an abnormal, microscopic growth of bone in the walls of the inner ear causes the third ossicle, called the stapes (or “stirrup”) to be fixed or frozen in place. Normally, the stapes moves freely to allow the transmission of sound into the inner ear, but in otosclerosis the stapes cannot vibrate, resulting in hearing loss. These patients will often report difficulty with conversational speech at normal speaking levels while speaking to family or friends that becomes worse in social settings.

Stapedectomy surgery involves the removal of the diseased stapes bone using a specialized laser and replacement with an implant to restore hearing. Outcomes are measured by comparing the “air-bone gap” seen on hearing testing before and after surgery. The air-bone gap is the difference between nerve sensitivity (hearing potential) and what the patient actually hears. The goal of surgery is to improve sound conduction for the patient, closing the air-bone gap. The better the reconstruction, the smaller the air-bone gap seen after surgery.

Forty-eight patients underwent primary stapedectomy surgery in the Otology and Neurotology Division in 2012. Of those 48 patients, 96 percent showed closure of the preoperative air-bone gap to within 20dB or better. One patient reported closure of better than 10dB. There were no dead ears following primary stapedectomy surgery.

Closure of Pre-operative Air-Bone Gap

The graph below shows the percentages of those 48 patients with closure of the preoperative air-bone gap to within 10dB or better and to within 20dB or better.

In patients with otosclerosis, sound vibrations are blocked by an immobile stapes bone, resulting in a large air-bone gap seen on hearing testing (this is also known as conductive hearing loss).

A patient with hearing thresholds of better than 20 decibels (dB) will report significant improvements in communication.
**General Otolaryngology:**
**Sinus Center Quality Control Measures**

Staffed by fellowship-trained otolaryngologists and other specialists in allergy and immunology, infectious disease, neurosurgery, and radiology, the Sinus Center is dedicated to providing a comprehensive approach to managing nasal and sinus disorders.

**Epistaxis Outcomes**

Our team has developed an evidence-based approach to the management of epistaxis (nosebleeds). The condition may be medically managed without surgery through the use of absorbable or non-absorbable nasal packing, or balloon packing for severe epistaxis, particularly when the bleed occurs in the posterior nasal cavity. Surgical interventions include cauterization of the offending blood vessel, clipping the arterial supply of the bleed (including the anterior ethmoid artery and/or sphenopalatine artery), or embolization.

Our data demonstrates that our surgical interventions for epistaxis require fewer overall interventions, fewer days in the hospital, and have proven to be more effective overall.

**Table: Univariate and multivariate comparison of outcomes of conservative and invasive management modalities following primary treatment failure for spontaneous epistaxis**

<table>
<thead>
<tr>
<th>Modality</th>
<th>N</th>
<th># Interventions Mean (95% CI)</th>
<th>Admission % (95% CI)</th>
<th>Inpatient Days Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Surgical</td>
<td>35</td>
<td>2.7 (2.4-3.0)</td>
<td>42.9 (26.2-59.5)</td>
<td>7.6 (5.0-10.2)</td>
</tr>
<tr>
<td>Surgical</td>
<td>18</td>
<td>2.3 (2.0-2.6)</td>
<td>94.4 (83.7-1.0)</td>
<td>4.2 (3.1-5.4)</td>
</tr>
</tbody>
</table>


Epistaxis or “nosebleeds” are very common and can occur for a variety of reasons. The inside lining of the nose is very vascular and has a rich blood supply, with blood vessels located very close to the surface. The vascular membrane that lines the nose can split, breaking a blood vessel, and causing nasal bleeding to occur. Nosebleeds are especially common in the Northeast region due to the dry climate. Installing humidifiers in the house, especially during winter, can reduce the occurrence of nosebleeds.
Inverting Papilloma Recurrence Outcomes

Inverting papilloma is a common benign nasal lesion that has the potential to become cancerous. As such, complete removal is imperative. Open approaches requiring long incisions have been used historically; however, the Sinus Center employs a minimally invasive endoscopic approach for the vast majority of lesions encountered.

Our team has an outstanding track record for treatment of inverting papilloma, with recurrence rates far lower than those reported in the literature. Successful resection involves not only removal of the tumor, but also identification of the bony tumor pedicle that may harbor any remaining tumor cells. This pedicle must be carefully drilled down to eradicate all residual tumor cells to promote low risk for recurrence.

In 2012, the Mass. Eye and Ear Sinus Center exceeded the guidelines set by the Centers for Medicare and Medicaid Services by providing patients with visit summary reports which detail their active medications and problem lists. These help patients to understand how to care for their sinus problems and how this fits into their overall health.
The Thyroid and Parathyroid Surgery Division is dedicated to the management of thyroid disorders with a special focus on surgical management of thyroid cancer. The incidence of the most common type of thyroid cancer (papillary thyroid carcinoma) has more than doubled in the last several decades in the U.S. Approximately 35% of patients with papillary thyroid cancer (PTC) have metastatic lymph nodes present when they are first treated for their cancer and up to 20% develop lymph node cancer recurrence after initial treatment. The Division strives to decrease the recurrence rate of thyroid cancer by providing more thorough and effective initial treatment by obtaining an accurate and complete preoperative assessment of the extent of thyroid cancer nodal disease at the time of initial diagnosis.

**Thyroid Cancer Surgery: Determining the extent of lymph node disease:**
Most centers currently assess nodal metastasis prior to the surgery by physical exam, ultrasonography (US), and through intraoperative assessment by the surgeon. At Mass. Eye and Ear, we routinely add a CT scan (CT) prior to the surgery. In a study of 162 patients, we have found that CT scan has great utility in the nodal assessment of papillary thyroid cancer patients. CT scan information correctly changed nodal dissection surgery in 25% of first time cases and 27% of revision surgery cases. Utility of CT scanning is clear, especially in the central neck, where US sensitivity is only 26% in primary (first-time) PTC patients. The Division’s radiographic preoperative algorithm of combining ultrasound and CT scanning allows for a more accurate assessment of nodal disease in patients with thyroid cancer. This allows for a more focused and complete surgery.

**Figure 1.** The percentage of all patients, first surgery and revision surgery cases, in whom additional correct information was provided by CT scanning, which changed the surgery to achieve complete removal of the lymph nodes affected with cancer.
Airway stenosis, or abnormal narrowing of the airway, is a medical problem that affects children and adults. There is a particularly insidious form that affects women between the ages of 40 and 60 that does not have a known cause called Idiopathic Subglottic Stenosis (ISS). Treatment consists of either repeated surgery to open the subglottis (the lower part of the voice box) or a more complicated open surgery to remove the narrowed area. Most patients do not choose to have the more complicated surgery, but rather manage their airway stenosis with repeated surgeries to open the airway.

We have developed an additional alternative that is minimally invasive using repeated awake injections of steroids every three weeks over a course of four to six injections to reverse the disease course and allow these patients to breathe. The entire procedure takes about five minutes from consent signing to the end of the treatment, with the injection taking anywhere from 30 seconds to one minute. This technique takes advantage of the natural anti-inflammatory and anti-scarring properties of steroids.

We have shown treatment equivalence with surgery alone (dilations) \((p=0.99)\) and surgery plus steroid injection at the time of surgery \((p=0.9)\). This means the repeated steroid injections are equivalent to the more traditional, more invasive, and inconvenient forms of treatment.

This alternative demonstrates the potential for a less invasive procedure to have a similar outcome, thus saving the complications and costs associated with procedures under general anesthesia.

In 2012, the Laryngology Division began treating patients with an innovative and non-invasive approach to treat ISS, offering a third option for patients suffering from this condition. This represents an innovation, as this is the first time that steroids have been used successfully as the treatment for this disease process.
The top left photograph shows the larynx (voice box) during laryngeal endoscopy performed in the office. The narrowing in the subglottic region (lower part of the voice box) can be seen. This opening is usually much larger to allow air to flow into the trachea (windpipe) with minimal exertion. Prior to treatment, this patient needed approximately 5 to 7 seconds to draw a lungful of air in and the same amount of time to exhale.

The bottom left photograph is a close-up view from just under the vocal folds at the area of stenosis that was treated with steroid injections. Notice how the opening is much larger after treatment. The trachea is the dark area beyond the stenosis. The patient feels much better and is able to breathe normally after treatment.

Reference: Collected by Ramon A. Franco, Jr., M.D., and clinical staff, 2012-2013 (unpublished)
The above graph is a flow-volume loop recorded when a patient was asked to breathe into a portable spirometry machine. We use these tests to keep track of how much air the patient is able to get through the larynx, especially through the area of stenosis. The upper part of the graph represents breathing out. The lines do not reach the normal areas shaded in gray/blue, which indicates that the patient’s maximum flow is under 5 liters per second, causing breathing difficulty. The patient’s peak expiratory flow, a measure of how quickly air is exhaled, is 55% of predicted (80% or better is considered normal).

The above graph shows the patient’s results after the steroid injections were stopped over one year ago. The lines now extend well into the normal areas shaded gray/blue. Importantly, the peak in the top part of the graph (breathing out) can be appreciated, representing the ability to rapidly exhale air. The patient’s peak expiratory flow is 94% of predicted. This patient no longer suffers from respiratory problems from subglottic stenosis.
In patients suffering from facial nerve injury and recovery, development of a “frozen” smile can contribute to disfigurement, psychological difficulties, and an inability to convey emotions through facial expressions. With the goal of improving facial function and achieving facial symmetry, chemodenervation performed in conjunction with facial nerve physical therapy is the mainstay of treatment. However, even with these treatments, some patients still do not obtain a meaningful smile. In these cases, free gracilis muscle transfer is an important modality in managing the frozen face.

The Facial Plastic and Reconstructive Surgery Division evaluated 20 patients who underwent free gracilis muscle transfer surgery between June 2009 and December 2012 using the quality of life FaCE survey, the Sunnybrook Facial Grading System and the Facegram to quantify smile excursion and symmetry before and after muscle transfer. Facial photography and videography was also used to document patient outcomes.

Free gracilis muscle transfer for facial reanimation is a surgical intervention that may offer patients a variety of quality of life benefits postoperatively, including improved commissure excursion when smiling, which promotes facial symmetry and often alleviates some psychological distress that may be associated with the patient’s inability to make facial expressions.

The study revealed a statistically significant increase in the FaCE scores after muscle transfer (paired two-tailed t-test, p<.039), which suggests a meaningful improvement in overall quality of life for patients after surgery. Using the Facegram, we were able to quantify smile excursion and the level of oral commissure symmetry at rest and with smile from pre- and post-operative photographs. This was statistically significant, showing improved lower lip length at rest (p=.01), with smile (p=.0001), and with smile symmetry (p=.0077) after surgery.

The gracilis muscle is a thin muscle in the inner thigh that is ideally suited for facial reanimation. The removal of this muscle does not adversely change a patient’s ability to walk and a very thin portion of muscle can be used to obtain a significant improvement in smile motion.

Quality measurement tools:

The FaCE scale is a validated patient-based instrument designed to measure facial impairment and disability.

Facial Assessment by Computer Evaluation software (facegram) uses 2-dimensional photographs to accurately measure facial movements, including oral commissure excursion.

The Sunnybrook facial grading system (FGS) is a validated scoring method used to evaluate resting facial symmetry, symmetry of voluntary movement, and synkinesis.
The table to the left shows the average results of 20 patients who underwent free muscle transfer for smile reanimation in the frozen face. Their results were measured using the FaCE scale, the Facegram, and the FGS. After surgery, patients experienced a statistically significant improvement in smile symmetry and oral commissure excursion.

<table>
<thead>
<tr>
<th>Table 3. Outcome Assessment</th>
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<tbody>
<tr>
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<tr>
<td>Quality of Life Instruments (mean ± SD)</td>
</tr>
<tr>
<td>FaCE Score</td>
</tr>
<tr>
<td>FGS Score Rest</td>
</tr>
<tr>
<td>FGS Score Smile</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective Measurements mean ± SD (affected side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Score at</td>
</tr>
<tr>
<td>Rest (mm)</td>
</tr>
<tr>
<td>C-Score with Smile (mm)</td>
</tr>
<tr>
<td>Symmetry C-score at Rest (mm)</td>
</tr>
<tr>
<td>Symmetry C-score with Smile (mm)</td>
</tr>
<tr>
<td>Symmetry Angle at Rest (degrees)</td>
</tr>
<tr>
<td>Symmetry Angle with Smile (degrees)</td>
</tr>
</tbody>
</table>

SD = standard deviation, FaCE = Facial Clinimetric Evaluation Scale, FGS = Facial Grading System, Symmetry = difference between normal and affected side in mm or degrees (C-score and angle, respectively), * = comparative statistics performed using two-tailed paired t-test.

Free muscle transfer has become a viable option in the management algorithm for patients that develop severe retraction of oral commissure movement after facial nerve insult and recovery. There is a high success rate, and innovations involving transplanting a thinner segment of muscle to achieve oral commissure excursion avoid a secondary cosmetic deformity in the way of excess bulk.

This study demonstrates a quantitative improvement in quality of life and facial function after surgery in patients who failed to achieve a meaningful smile after physical therapy and suggests an updated management algorithm.
Figures 1 and 2 demonstrate the improvement in symmetry and oral commissure excursion in a typical patient after free gracilis muscle transfer surgery.

Figure 1. Patient smiling before surgery.

Figure 2. Patient smiling after surgery.

Reference: Free Muscle Transfer for Smile Reanimation in Patients with a “Frozen” Smile, Robin Lindsay, M.D., Prabhat Bhama, M.D., Julie Wenberg, B.A., Tessa A. Hadlock, M.D., Accepted for publication, Annals of Plastic Surgery

Guide to figures 1 and 2

$c$: The distance from the midline of the lower lip to the oral commissure

$a$: The angle between the horizontal and line $c$. This measures the angle of oral commissure movement
The skull base forms the floor of the cranial cavity (which houses the brain) and separates the brain from the nasal cavity and face.

The Head and Neck Surgical Oncology Division at Mass. Eye and Ear treats a large volume of head and neck cancer patients with tumors arising from all sites within the upper aerodigestive tract, salivary glands and skin.

In collaboration with the Neurosurgery, Medical Oncology, and Radiation Oncology departments at Massachusetts General Hospital, the Cranial Base Center was established in order to provide world-class care for patients with malignancies of the skull base. These rare and unusual tumors are not only life-threatening, but often lead to significant sensory dysfunction and cosmetic disfigurement.

Esthesioneuroblastoma is one such malignancy of the anterior skull base (Figure 1). These tumors demonstrate a propensity for frequent recurrence and have a relatively high incidence of spread to the lymph nodes and other parts of the body. Conventional treatments typically include surgery, external beam radiation therapy, and chemotherapy. These have produced survival rates ranging from 60 to 76%. Furthermore, complications from treatment can be severe, with up to 24% of patients losing sight in at least one eye.

Figure 1. Coronal CT scan of a patient with an esthesioneuroblastoma that has eroded through the skull base and invaded the brain.

Esthesioneuroblastomas are believed to originate from the cells that produce our sense of smell — the olfactory bulbs.
The Mass. Eye and Ear and Mass. General Cranial Base Center has developed a standardized treatment protocol that incorporates aggressive surgical techniques, state-of-the-art proton beam radiation, and chemotherapy. In 16 years, we have treated 22 patients with esthesioneuroblastoma and have achieved an overall survival rate of 95% (Figure 2). Severe complications to the eye were also minimized and occurred in only 4.5% of patients. As we move forward, we will strive to make further gains in outcomes and focus on improving quality of life after the treatment of these rare, and often devastating, tumors.

Figure 2. Survival curve demonstrating overall survival of 95%.
The Radiology Department has established and maintains effective quality, safety and performance improvement programs. Quality improvement requires a careful, dedicated and continuously planned effort by a number of skilled and committed team members, with the goal being to perform the right exam in a timely fashion in every case. Quality improvement efforts can facilitate continuous improvement in safety, performance and outcomes in the radiology department.
Radiology Performance Monitoring and Results

Physician Peer Review/Double Read Monitor: Provide insight into potential areas for clinical and technical improvement

- 282 exam reports approved/confirmed and 12 reports referred back to originating radiologist for information only. Report addendums completed as necessary.

Radiographic Repeat/Reject Analysis: Monitor total number of repeated and/or rejected radiographs to minimize radiation exposure to patients. Radiographs can need repeating or be rejected because of education, technique, equipment, patient movement, etc. Target is 0% repeat exposure rate.

- Results: 4,935 total exposures and 80 repeats (144 total exposures greater than prior year and 10 fewer repeats than prior year)

Report Turnaround Time:
Exam date to finalized report completion. Target is < 2 business days.

- Results: 1.7 business days (.6 business day less than prior year)

Transcription turn-around time (dictation end to transcription return). Target is < 24 hours.

- Results: 3.07 hours (target achieved)

Employee Radiation Dose Compliance: Target is 100% compliance (radiation dose below annual regulatory limits)

- Results: Achieved 100% compliance

Fluoroscopy Patient Exposure Time and Radiation Dose Compliance: Target is 100% of fluoroscopy exam exposure times and/or radiation dose documented for each fluoroscopy patient.

Annual Testing of: 1) lead garments, 2) physicist equipment inspection and 3) patient care equipment preventative maintenance: Target is 100% compliance

- Results: Achieved 100% compliance

Adverse Reactions due to IV Contrast Administration (allergies and extravasations)

- (1) - MRI and (2) - CT (-4 adverse reactions less than prior year total)

Regulatory Compliance: American College of Radiology (CT and MRI) and Department of Public Health - Radiation Control and Quality Requirements: Target is 100% compliance

- Achieved 100% compliance (internal compliance monitor)
- In 2012, there were no ACR or DPH on-site radiology inspections
- 2013 ACR and DPH on-site inspection results will be reported in the 2013 Quality and Outcomes report
The Department of Nursing at Mass. Eye and Ear is a service-oriented department dedicated to providing safe, effective, patient-centered, timely, efficient and equitable care to our adult and pediatric patients.

The Department of Nursing operates within the tenet that the knowledge base of professional nursing is derived from the biological, psychological, physical and social sciences and that quality nursing care arises from the clinical application of evidence based care.

Nursing care is delivered within a framework of care, compassion and respect for the dignity of the patient and his/her family or significant other using a patient-centered care model.

During 2012, the Department of Nursing defined quality and outcome measures with the aim of providing quality nursing care to our patients to restore them to their optimal level of health.
The Department of Nursing recognizes that a professional work environment supports professional practice and improves patient outcomes. The Department of Nursing conducts an annual nursing work environment survey to assess the professional practice environment of its nursing staff. This voluntary survey, completed by 91% of the registered nurse workforce in 2012, is designed to assess how the nurses feel regarding the quality of care they deliver and their nurse-physician relations.

Nursing Practice Environment Scale (PES) Annual Response Rate

As a member of the National Database of Nursing Quality Indicator (NDNQI®), the Department of Nursing has chosen the R.N. survey with Practice Environment Scale (PES) survey tool for this annual assessment of the Nursing Practice Environment.

The PES is endorsed by the National Quality Forums and includes a focus on:

- Nursing Foundation for Quality of Care
- Collegial Nurse-Physician Relations
Using a 1 to 4 scale, our nurses assessed the quality of the care they delivered. Elements of this assessment included the high standards of nursing care expected, competence of their peers, and if there is a clearly defined philosophy of nursing.

The nurse-physician relations assessment included questions related to team work and collaboration between the disciplines.

The 2012 PES survey results have shown favorable improvements in all categories.
Pressure Ulcer Prevalence Study (PUP)

The PUP study team consists of the Adult Unit’s Nursing Leadership, a Nursing Staff Champion, and a Staff Specialist from the Center for Quality & Patient Safety. The team is guided by the National Quality Forum’s Nurse Sensitive Care Outcome Measure® (NSC-2), Patients with at least One Stage III or Greater Nosocomial Pressure Ulcer (PU) (NQF®). The Center for Medicare & Medicaid Services (CMS) reports that there are preventable pressure ulcers in hospitalized patients. Pressure ulcers can be prevented and Mass. Eye and Ear adheres to evidence based practices and protocols. The following table depicts Mass. Eye and Ear’s PUP Study data and benchmark data.

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Start Date</th>
<th>End Date</th>
<th>Number of Occurrences</th>
<th>Sample Population</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>12/1/2010</td>
<td>12/31/2011</td>
<td>0</td>
<td>57</td>
<td>0</td>
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<tr>
<td>Monitoring</td>
<td>3/1/2012</td>
<td>3/31/2012</td>
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<tr>
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<td>6/1/2012</td>
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<tr>
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<td>9/1/2012</td>
<td>9/30/2012</td>
<td>0</td>
<td>11</td>
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<tr>
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<td>10/1/2012</td>
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<td>0</td>
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<tr>
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<tr>
<td>Monitoring</td>
<td>12/1/2012</td>
<td>12/31/2012</td>
<td>0</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

National Presentations

Society of Otorhinolaryngology Head-Neck Nurses
Washington, D.C. September 2012 Poster Presentations

*Emergency Management of Epistasis*, Maureen Martinez, M.S., R.N.
*Secondary Tracheoesophageal Puncture in the Adult Patient*,
Lauren (Neelon) McEvilly, R.N., B.S.N.

American Society of Ophthalmic Registered Nurses
Chicago, IL November 2012 Paper Publication—Insight Magazine and Poster Presentations

*Killing the Amoeba*, Julie Dorgan, R.N.
*Stepping Stones to Success: How to keep OR staff trained and competent in low volume eye surgeries*, Marjorie Kissell, R.N., and Sheila O’Keefe, R.N.
Mass. Eye and Ear strives to provide the highest quality patient care. The Emergency Department implemented Purposeful Rounding following the AIDET® method (acknowledge, introduce, duration, explain, and thank you). The goal is to keep patients and their families informed, to reassess pain, and to monitor for patient safety. Our Measures of Success (MOS) is reflected in a decrease in patient elopement numbers.

Hand hygiene is the single most important way to prevent the transmission of infection. Through daily monitoring and educational feedback, we have achieved high levels of employee compliance. For accuracy, infection control representatives (e.g. nurses, physicians and technicians) in various parts of the hospital monitor compliance.
Improving Outcomes through Simulation: Pediatric Simulated Cardio Pulmonary Resuscitation Event Response

Recommendations were made to increase the number of pediatric simulated events in collaboration with Massachusetts General Hospital.

The goals of this endeavor included improved:
- Clinical skills
- Response times
- Closed loop communications
- Team building

As a referral center, Mass. Eye and Ear’s pediatric nursing staff cares for some of the world’s most critical and challenging Otolaryngology patients.

In the future, we plan to increase the simulation program by incorporating adult and operating room simulated events.
Narissa’s Smile

Narissa smiles deeply, especially when her father laughs. But she didn’t always have a smile.

For her first three years, Narissa lived in a Chinese orphanage. A tumor had been removed from her face, resulting in partial paralysis. Her adoptive family thought she was beautiful and never thought twice about her crooked smile until she was in the first grade.

“One of the little boys asked why Narissa didn’t smile right and what was wrong with her face,” her father, Craig, said.

Narissa came to Mass. Eye and Ear, where Drs. Kevin Emerick and Tessa Hadlock took muscles and a nerve from her leg and placed them in her face in two procedures. Slowly but surely she has developed a smile.

Today Narissa lights up with laughter, thanks to her loving parents and dedicated doctors.
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Sheila Borboli-Gerogiannis, M.D., F.A.C.S.
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Kenneth Chang, M.D., M.P.H.
Matthew F. Gardiner, M.D.
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Zhonghui Katie Luo, M.D., Ph.D.

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