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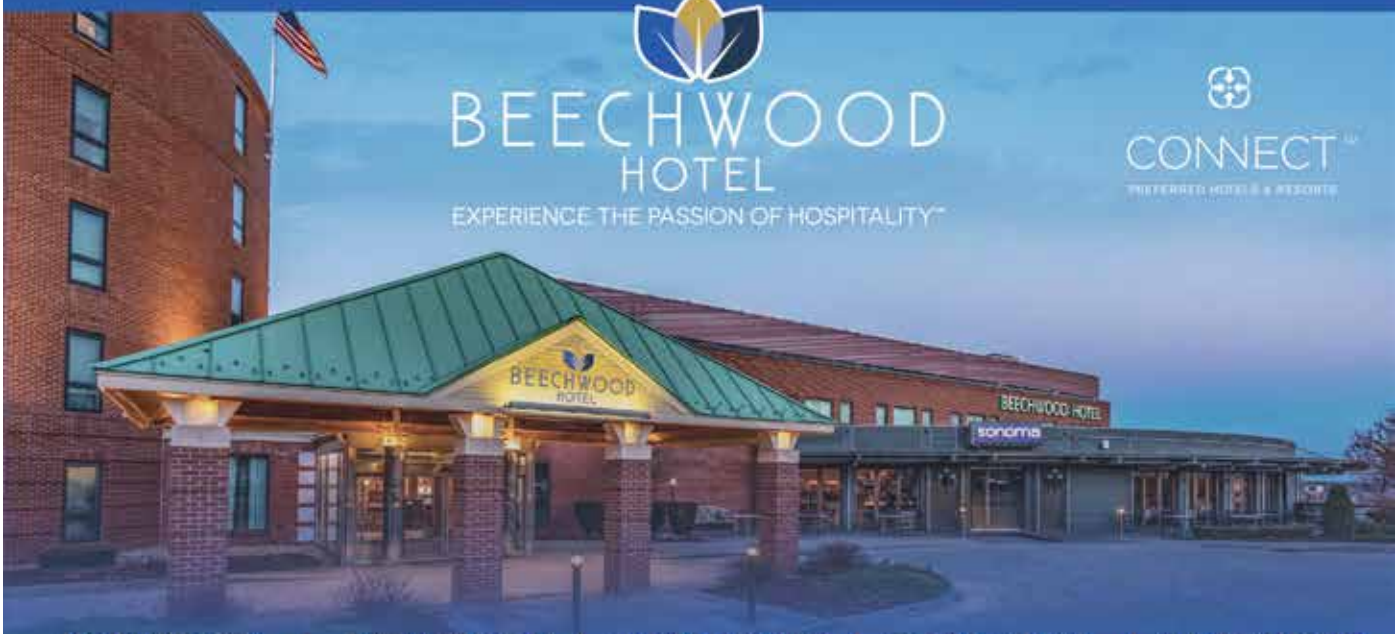

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contents

volume 83, number 2

on the cover: update in ophthalmology

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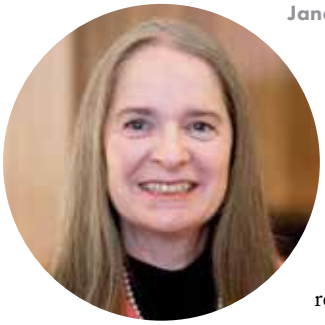

Jane Lochrie, MD

When I was a student nurse, I did a two-week rotation at the Massachusetts Eye and Ear Infirmary. My job was to sit with the elderly patients who had recent cataract surgery and try to keep them oriented to prevent delirium. The patients had both eyes patched and sand bags on both sides of their head to prevent them from moving their head for two weeks. Many patients did become delirious and were very deconditioned when they were able to ambulate.

Cataract surgery is the number one surgical procedure performed in the United States. Since my early nurse days, this procedure has become so much more dependable, safer and patients have better visual acuity. In this issue of *Worcester Medicine,* we will explore the advances in Ophthalmology over the past 25 years. I want to extend my heartfelt thanks to Dr. Peter Zacharia for coordinating all the articles for this issue.

In the first article, Peter Zacharia, MD discusses the pathophysiology of glaucoma and the resultant damage to the optic nerve that may lead to complete blindness. The aim of treatment is to reduce the eye pressure either by reducing the production of aqueous fluid or to facilitate the egress of aqueous fluid from the eye. When medical treatment and less invasive laser treatment fails, surgical intervention is required. Dr. Zacharia describes the new alternative surgical treatments to the former preferred trabeculectomy and glaucoma drainage tube surgery.

Helen Wu, MD opines that refractive errors are the most common ocular problem world-wide. She introduces us to refractive surgery, surgery that changes the refractive error and may obviate the need for corrective lens. She discusses the different types of surgery, their indication, the risks and benefits of each procedure.

The newest ophthalmic imaging techniques are discussed by Bryan Hong, MD. Optical Coherence Tomography (OCT) is an ultrasound device that uses reflective light rather than echoes of sound and can image a patient's eye in seconds. It is an indispensable tool in the diagnosis and treatment of ocular disease including diabetic retinopathy, age related macular degeneration (ARMD), retinal vascular occlusions and glaucoma. Almost every article refers to this technique.

Age-Related Macular Degeneration is the leading cause of irreversible vison loss for people over the age of 50. Doctors Michael Bradbury and Peter Chang describe the difference between "wet" and "dry" ARMD and they stress the importance of routine eye exams and patient education. The diagnosis and treatment of these two disorders are very different.

I was very surprised to read that the first corneal transplant was performed in 1905. Erin Fogel, MD reviews the major changes in the surgical approaches to corneal surgery. This procedure replaces only the part of the cornea that is diseased rather than the entire full thickness. She examines the advantages and disadvantages of these new techniques.

Jeremy Meltzer, MD informs us that prior to cataract surgery progressive vision loss with age was a near certainty. Modern pharmacoemulsification surgery utilizes high frequency ultrasound waves to fragment and pulverize that cataract insitu. This has decreased the time for the procedure from 2 hours to 15 minutes and the suture size from 10 mm to 2 mm. Intraocular implants have also markedly improved allowing the patient to have excellent vision without glasses. In addition, he discusses the pros and cons of laser-assisted cataract surgery.

Kathryn Deliso, OD declares a call to action for greater participation from all healthcare professional to make low vision referrals a standard of care when patients express visual difficulty that interferes with their activities or daily living regardless of their measured visual acuity.

In our final article, Tracy Condron reminds us of the importance of the nurse's role in preoperative preparation, during surgery and post-operative care. She also examines the discharge teaching of the patients requiring ophthalmological surgery.

As always, don't close the cover of this issue without reading Legal Consult and Society Snippets.

Hope for Haiti: Healing One Patient at a Time

Jane Lochrie, MD

Good Evening, it is truly an honor and a privilege to be here this evening and give the 223rd annual Worcester District Medical Society (WDMS) Oration. I would like to acknowledge my colleagues who went on this trip to Haiti with me, especially Dr. Nandana Kansra, who organized the trip.

No one receives an honor such as this in a vacuum. I would like to thank my colleagues at St. Vincent Hospital, Reliant Medical Group, U Mass, especially those that teach the Healer's Art course and all the volunteers at St. Anne's Free Medical Program and of course my colleagues at the Worcester District Medical Society for their support. And a special thanks to Martha Wright and Melissa Boucher for all their help making this evening special.

In his inaugural address, President Kennedy said, "If a free society cannot save the many who are poor, it cannot save the few who are rich."

Haiti is the poorest country in the Western Hemisphere and the third poorest in the world. Let's take a look at some statistics:

Key Statistics

	Haiti	U.S.
Total population	9.7 million	310 million
Percent population below the poverty line	80%	12%
Unemployment rate	80%	9.6%
Life expectancy	62.17 years	78.24 years
Infant mortality rate (deaths per 1,000 live births)	54.02%	6.14%
Primary school enrollment	50%	92%
Percentage of population with access to adequate sanitation (a simple pit latrine)	10%	100%

The island has a uniquely tragic history. Natural disasters, poverty, racial discord and political unrest have plagued the small country throughout history. Today, Haiti is a nation in disarray, unsafe, economically desperate without much clear hope of improvement in the near future. In order to understand Haiti today, you have to know the history.

The island of Hispaniola was discovered by Christopher Columbus is 1492. At that time the island was inhabited by the Arawak Indians. Twenty-five years later the Spanish virtually annihilated the Arawak society as a result of brutal labor practices and disease. The Spanish sailors carried Eurasians infectious diseases. The natives lacked immunity to these new diseases and died in great numbers in epidemics. The first recorded smallpox epidemic in the Americas erupted on Hispaniola in 1507. By 1520, nearly all the original inhabitants were dead and the Spanish imported African slaves in large numbers.

In the early 17th century the French had established a presence in Hispaniola. In 1697, Spain ceded the Western one third of the island to France which later became Haiti. The French colony became one of the wealthiest in the Caribbean based on forestry and sugar-cane, coffee, cotton and indigo and tobacco industry but only through continued heavy importation of African slaves and considerable environmental degradation.

In 1791, a slave rebellion was launched under Jamaican-born Boukman and Haiti's half million slaves revolted. The French achieved some victories but most of them died from Yellow Fever. The revolt lasted until 1804 when Napoleon's army was defeated and slavery was abolished, making Haiti the only nation in the world established as a result of a successful slave revolt.

Fearful of the slaves' revolution, US President Thomas Jefferson refused to recognize the new republic, as did most European nations some countries imposed economic blockades. With limited economic partners and limited international recognition, Haiti plunged into a crippling poverty.

Finally, in 1862 the U.S. granted Haiti diplomatic recognition. In the first decade of the 20th Century Haiti experienced great political instability and was heavily in debt to France, Germany and the United States. Fearing possible foreign intervention President Woodrow Wilson sent U.S. Marines into Haiti just after the outbreak of World War I in December of 1914. This began the 20-year occupation of the island by U.S. forces. The occupation greatly improved some of Haiti's infrastructure and centralized power in Port-au-Prince. Roads and bridges were built, many irrigation canals were rehabilitated, hospitals, schools and public buildings were built and drinking water was brought to the main cities. Due to peasant resistance, the U.S. was forced to leave Haiti in 1934.

After a period of Disorder, in September 1957, Dr. Francois Duvalier was elected President. Known as "Papa Doc" because of his paternalistic concern for the poor and sick. He remained in power by enlisting an organization known as *Tontons Macoutes* (Bogeymen) which maintained order by terrorizing the populace and political opponents. Following his death, Francois's 19-year-old son, Jean-Claude "Baby Doc" succeeded him as President for Life until he was ousted in 1986. It is estimated that 40,000 – 60,000 Haitians were killed during the father and son regime. They stole hundreds of millions. Baby Doc's wedding cost $2 million in 1980.

Since the Duvalier Dynasty Haiti entered into a very difficult period which is still ongoing. It is a period of a struggle for control of the country, frequent change in leadership that has resulted is a great deal of political and social instability. This is a struggle between the old Duvalierist trying to keep change coming to the country and the populist, most who are associated with the former President Aristide, looking for reforms. A new force has entered the fray which in not quite in the Duvalierist's camp but opposed to the popularist reforms. These are the drug lords and younger army officers.

Since 2004, Haiti has been plagued by storms, mudslides and the devastating earthquake in 2010 that left 300,000 people dead. The country had not yet recovered from earthquake when a massive cholera outbreak was triggered when cholera-infected waste from a United Nations peacekeeping station contaminated the country's main river. In October 2016, Hurricane Matthew brought deadly winds and rain that left Haiti with a large amount of damage and a death toll of approximately 3,000.

In July, three days of riots followed a gas price hike revealing how close the nation is to exploding.

On August 14 2018, a Haitian filmmaker in Montreal tweeted a photo of himself blindfolded with a piece of cardboard stating, "Where is the Petrocarbide money?"

On November 18, 2018, thousands of Haitians took to the streets of Port-au-Prince in a display of public protest that alleges that the Haitian

government misappropriated two billion dollars from a Venezuelan oil company earmarked for reconstruction after the earthquake. At least 60 people were killed by corrupt police officers and armed gangs close to the ruling party, just days before the protest. In addition, several people were killed by an out of control government care that lost a wheel and plowed into a crowd, further inflaming tensions.

"The idea that some lives matter less is at the root of what is wrong with medicine." This is a quote from Paul Farmer, an Infectious Disease physician who has spent most of his professional life in Haiti.

The problems in Haiti can be divided into three areas, social, environmental and Healthcare.

Social Issues

The social problems have intensified since 2004 when President Aristide fled into exile. The country has been plagued by violence and lawlessness. The chaos has hampered basic services and preventive humanitarian assistance from reaching the vulnerable. Haiti faces immense challenges in providing basic levels of nutrition, education and medical support to its population of 10.3 million people. Infrastructure remains inadequate. There is a lack of skilled personnel.
After the 2010 earthquake, foreign donors pledged more than $10 billion dollars in aid but less than 1% went to the people.

Government revenues remain low. Overseas donations are falling and foreign doctors are pulling out as the world's attention is focused on new crises such as the Islamic State militant group and Ebola. It will be almost impossible for Haiti's government to make up the huge deficit of oversea support with the economy being so weak and political stability being fragile as best.

Corrupt government, violent crimes and civil unrest, gangs, lack of resources for police work and education are all still problems. Children are working as messengers, spies and even soldiers for armed gangs. One of the slums in Port au Prince has been named the most dangerous place on earth. In November 2018, the U.S. State Department issued a level 3 travel advisory for Haiti.

Environmental Issues

Haiti faces many environmental issues which include: severe deforestation, over-population, lack of sanitation, natural disasters and food insecurity. A major reason for these environmental issues is that there is not sufficient protection or management of the country's natural resources. Haiti is already experiencing decreased average rainfall, increased average temperature, sea level rise, and depleted coral reefs that will likely lead to the intensification of drought conditions.

- **Lack of sanitation**: Lack of sanitation and sewerage treatment has led to an inadequate supply of safe drinking water. Local drainage systems consist primarily of open channels dug along the roads placing the population at risk for water-borne diseases. Only 46% of the population have access to safe water and 55% have access to "improved sanitation", which consists of a latrine.
- **Deforestation:** Today, 97% of the forests have been cleared for fuel or other uses leaving only 3% of the land with any forest cover. Deforestation has led to soil erosion, decreasing agricultural yields and resulting in deadly landslides. The two major reasons for deforestation is that wood is burned as charcoal for energy and the land is needed for agricultural production, which is the bassis of the Haitian economy. 67% of the land is used for agricultural purposes.
- **Food insecurity:** Following the hurricanes of 2012, 70% of residents reported suffering from moderate or severe hunger, and more than two thirds of farmers reported having their crops destroyed and/or losing farm equipment. Haiti depends on small rural farms for their food supply and struggles to transport enough food from the countryside to the village markets and urban centers.
- **Over population:** The increasing population also contributes to the degradation of the environment. The UN estimates an annual 3.9% increase in the population in the urban areas. Low-income individuals are largely concentrated in the cities, especially Port-au-Prince and are subject to poor environmental quality and reduced quality of life. In rural areas, over-population leads to over-cultivation of the land and leads to soil erosion, as nutrients are quickly depleted form the soil.
- **Natural Disasters:** As a small Caribbean island, Haiti is often victim to intense natural disasters such as hurricanes, tropical storms and earthquakes. Flooding and landslides often occur with the tropical storms. The intensity of Atlantic hurricanes has increased substantially since 1980 resulting in loss of life, loss of livestock, destruction of agriculture, soil erosion, a spike in water-borne diseases and decreased food security.

In Haiti, the inability to evacuate leads to a much larger loss of life than a country with good public infrastructure and paved roads would experience in the same situation.

Healthcare Issues

- **HIV/AIDS:** Haiti has the highest incidence of HIV/AIDS outside of Africa. According to the United Nations there are 7,900 new cases each year and 20 people die every day of AIDS. HIV prevalence is 5.6 % in the 15-49 age range and as high as 14.1% in women who are have a broken union, especially widows.
- **Tuberculosis**: The incidence of TB is more than 10 times as high as the rest of Latin America.
- **Malaria**: At least 30,000 cases are diagnosed per year.
- **Maternal/Child health:** Only 25% of births are attended by a skilled health professional. Life time risk for the death of a pregnant woman is 1 in 93. Infant mortality rate is 55 deaths per 1000 live births, compared to 6 per 1,000 live births in other countries.
- **Malnutrition:** Half the population lives on less than $2.50. Consequently, malnutrition is a significant problem. Half of all Haitian children are undersized as a result of malnutrition.
- **Poor compliance with immunizations:** WHO estimates that only 43% of the children age 12-23 months receives the recommended immunizations and only 22% of children under age 5 are completely immunized.
- **Mental Health:** Voodoo is still practiced, especially among the lower class. Mental health problems are often seen as a result of a spell or hex transmitted by an enemy or a failure to please the spirits.
- **Cholera:** An epidemic started in 2011 in the camp of a UN peacekeeping mission from Nepal contaminated Haiti's main river. This is one of the world's worst outbreaks with 353,033 suspected cases and thousands of deaths.

Hope for Haiti

- **HIV/AIDS:** The number of patients enrolled in treatment hit a record high in 2013. (CDC) Testing for HIV has significantly increased for the general population and in pregnant women. (CDC)
- Voluntary counselling and testing have kept mother to child transmission of HIV to under 10%. (UNICEF)
- **Cholera:** Cholera has declined 42% and the number of deaths has halved. (CDC).
- **Immunizations:** UNICEF reports that immunization coverage has improved significantly. Haiti has been free of polio and measles since 2001.
- **Education:** UNICEF has a back to school initiative and encouraged 19,000 children and 350 teachers to return to school.
- **Nutrition:** Extreme food security is down by 60% but still affects 600,000 people.
- **Campaign for Change:** More than half the population is under 24 and with social media they are becoming more active in the political future. Thousands of demonstrators took over the streets in the capital city, Port-au-Prince this month demanding the resignation of President Jovenel Moise who is being blamed for Haiti's economic crisis. Violence has erupted on the small island and has plunged the Western Hemisphere's poorest nation into political chaos. The struggle for power has not ended. These latest riots are the manifestation of a campaign for change. But for now, it is the possibility of change that has brought a modicum of hope for Haiti.

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The Cornucopia of New Glaucoma Surgery Approaches

Peter T. Zacharia, MD,
Worcester Eye Consultants

Patients with glaucoma develop damage to the optic nerve resulting in impaired transmission of visual information from the eye to the brain. This results in loss of portions of the field of vision and can sometimes progress to complete blindness. Intraocular pressure which is elevated (above average levels found in the population) is only one of the factors which causes optic nerve damage from glaucoma, and at this time reducing intraocular pressure medically or surgically from pre-treatment levels is the only known effective method of treating glaucoma.

Aqueous fluid is constantly produced within the eyeball to maintain the structure and shape of the eye and to nourish and provide oxygen to the various parts within the eye. Aqueous fluid must circulate within and leave the eye mostly through a circumferential drain, called Schlemm's canal which is covered by the trabecular meshwork (TM), a structure analogous to the strainer covering the drain in a sink. The TM is located anterior to the peripheral iris (where the iris attaches to the wall of the eye, the sclera). A secondary route for aqueous egress from the eye is through the vascular tissues of the eye which make up the uvea which includes the tissue between the retina and the sclera. To reduce eye pressure, glaucoma treatment must either reduce the production of the aqueous fluid or facilitate aqueous fluid egress from the eye.

For the last five decades, the two preferred incisional surgical treatments to reduce intraocular pressure in glaucoma when medical and less invasive laser treatment have failed have been: trabeculectomy surgery or glaucoma drainage tube surgery. In trabeculectomy, a scleral window or fistula is created allowing aqueous egress to the space between the sclera and overlying conjunctiva resulting in the formation of a bubble or "bleb" under the upper eyelid which is gradually absorbed by the tissue surrounding the eye (Figure 1). While often an effective and sight saving procedure, the trabeculectomy can sometimes result in bleb related discomfort, sight threatening infection of the bleb, or even excessively low pressure which can adversely affect the optical properties of the eye resulting in poor vision.

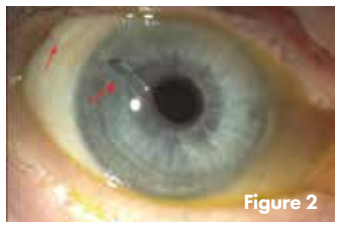
Glaucoma drainage devices are tubes which extend into the anterior chamber of the eye (Figure 2) and drain to a subconjunctival silicone or plastic reservoir which is sutured onto the outside of the sclera and underneath the conjunctiva. Aqueous draining out to the reservoir is gradually absorbed by surrounding tissues. Like trabeculectomy, this treatment can be very effective in most cases, but there can be complications resulting from the tube itself which can injure the cornea and other intraocular structures or become blocked, or from the relatively large reservoir which can sometimes interfere with eye movement, cause discomfort or erode through the tissues covering the eye.

The goals of newer surgical approaches developed in recent years have been to avoid the potential complications from trabeculectomy surgery and large glaucoma drainage devices. The term "MIGS" for "microinvasive glaucoma surgery" has been popularized to describe these new techniques and devices, although they are really too varied in mechanism of action to be lumped under this one term. Most of the newer surgical approaches do not require formation of a fluid bleb overlying the sclera or use of a bulky external reservoir in efforts to prevent accompanying complications. Alternatives to trabeculectomy surgery and glaucoma drainage tubes are summarized below, grouped by mechanism of action.

Procedures enhancing aqueous egress through Schlemm's canal without implant

- Trabectome is a device which ablates trabecular meshwork (TM) electrosurgically (Figure 3) to allow aqueous to bypass resistance created by TM especially when elevated intraocular pressure in glaucoma results from pathologically higher resistance. Once TM is ablated, aqueous can flow directly into Schlemm's canal and from there out through several collector channels with ostia lining the outer wall of the canal and which drain into aqueous veins, so that aqueous flows out with venous drainage from the eye.
- Kahook Dual Blade (KDB) is a device with a hockey stick like tip using parallel double blades to slice through each side of TM to allow excision of a strip of TM and similarly expose Schlemm's canal.
- GATT (Goniosocopy Assisted Transluminal Trabeculotomy) uses a suture fed through an opening in TM and threaded around Schlemm's canal. This suture is then pulled like a ripcord to slice through TM for the entire circumference and creates a 360-degree opening into Schlemm's canal.
- Canaloplasty describes group techniques in which a catheter is fed into Schlemm's canal to dilate the canal with a viscoelastic substance, sometimes with the aid of a suture which is threaded through and distends the canal to improve aqueous flow.


Figure 1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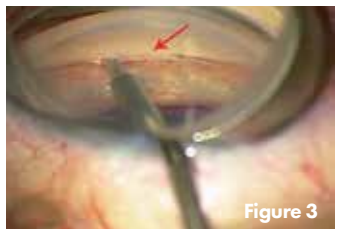


Figure 3

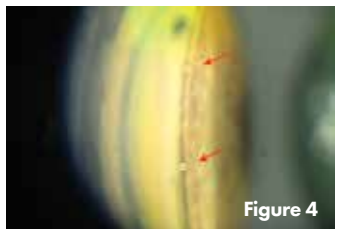


Figure 4

Procedures with implant to enhance aqueous egress through Schlemm's canal

- The iStent is a titanium tube, the size of the letters on the front of a Lincoln penny. It is implanted into TM with an applicator to create a direct communication (through the lumen of the stent) from the anterior chamber of the eye into Schlemm's canal (Figure 4).
- The Hydrus microstent is a nitinol alloy device the size of an eyelash which is fed through an opening in TM to provide direct communication from the anterior chamber of the eye to Schelmm's canal and which also prevents collapse of Sclemm's canal by acting as a scaffold to maintain flow of aqueous within the canal.

Transscleral drainage procedure offering advantages over trabeculectomy and drainage tubes

- The Xen gel stent is an implant also about the size of an eyelash and constructed from gelatin derived from porcine dermis. It is released from an injector and inserted through the sclera to create a channel for flow of aqueous out from the eyeball and into the subconjunctival space. Thus, the mechanism of intraocular pressure reduction is similar to trabeculectomy and glaucoma drainage tube surgery but using a much smaller stent inserted through a smaller incision. It does not require use of a bulky reservoir and controls aqueous flow out of the eye to protect against excessive intraocular pressure reduction.

Laser procedures which reduce production of aqueous

- Endoscopic cyclophotocoagulation (ECP) uses a laser probe inserted through a small incision to shrink the ciliary processes, structures behind the iris which produce the aqueous fluid, and by doing so reduces the rate of aqueous formation and the intraocular pressure.

Figure 1: Bleb formation after trabeculectomy procedure
Figure 2: Glaucoma drainage tube in anterior chamber of eye
Figure 3: Trabectome instrument inserted through incision and visualized through surgical lens ablating trabecular meshwork and exposing Schlemm's canal (depigmented area to right of tip)
Figure 4: iStents (2) implanted into the trabecular meshwork to allow aqueous flow through lumen across TM into the Schlemm's canal

Update on Refractive Surgery

Helen Wu, MD

If you are like the majority of people reading this article, you are probably wearing either glasses or contact lenses to see clearly. Refractive errors (myopia, hyperopia, astigmatism, and presbyopia) are the most common ocular problem around the world, and affect people of all ages. Uncorrected refractive errors account for distance visual impairment in over 100 million people, and blindness in over 6 million people globally. The economic impact of uncorrected refractive errors in one study was estimated to be a loss of 269 billion dollars worldwide annually.

The prevalences of hyperopia (farsightedness) and astigmatism (non-spherical curvature of the cornea or lens) vary depending on global region, with astigmatism currently being the most common refractive error, and hyperopia the least common worldwide. Presbyopia, the progressive loss of near vision due to stiffening of the crystalline lens, occurs in all individuals beginning in middle age. The rapidly increasing prevalence of myopia, however, has gained attention and is thought to be due in part to increasing near work and screen time, with decreased time spent outdoors. In the United States, the prevalence estimates of myopia, or nearsightedness, have increased from 25% to 41.6% between 1971-72 and 1999-2004. Estimates of myopia and high myopia from years 2000 to 2050 suggest a significant increase in the prevalence of myopia around the world. In some Asian countries, the prevalence of myopia is already as high as 80-90%.

As our eyes mature, we reach several visual milestones in our lifetime. From childhood to teenage years, refractive error changes and eventually becomes stable. Glasses and contact lenses are most commonly recommended for refractive errors as the eye develops, and may change prescription strength until stability or ocular maturity occurs, usually in the mid 20s. Atropine eyedrops and bifocal glasses have been utilized to slow the progression of myopia in childhood, although this is not commonly practiced in the U.S. Another method of slowing myopic progression is orthokeratology, the practice of placing contact lenses overnight to reshape the cornea. This method is particularly popular in Asia, despite the potential for contact lens associated microbial infection. The second milestone, presbyopia, occurs in the mid forties, when close vision becomes progressively problematic due to stiffening of the crystalline lens within the eye. Reading glasses or bifocals are commonly prescribed. Monovision, correcting one eye for distance and one eye for near, is sometimes recommended in contact lens wearers to minimize dependence on readers. The third milestone occurs in the 50s to 70s as the lens in the eye becomes cloudy, and is termed a cataract when it becomes visually significant. At this stage, the cataract is removed and replaced with an artificial lens during surgery.

Refractive surgery, which is any surgery that changes the refractive error of the eye, is an option that may obviate or reduce the need for glasses or contact lenses after ocular maturity is reached. Refractive surgery can either be performed on the cornea by changing its shape with a laser, or intraocularly, in which a lens implant is placed in the eye. Cataract surgery itself can also correct vision and reduce the need for glasses, and is thus considered another form of refractive surgery.

Laser vision correction is the most common form of corneal refractive surgery. Laser in situ keratomileusis, or LASIK, is the most popular form of laser vision correction around the world. Currently, over 600,000 procedures are performed yearly in the United States. With LASIK, a partial thickness flap is created in the cornea, either with a femtosecond laser or a microkeratome, and the cornea is then reshaped with an excimer laser. An alternative procedure called photorefractive keratectomy (PRK), or surface ablation, similarly reshapes the cornea utilizing an excimer laser, without creating a flap. A newer procedure called small incision lenticule extraction (SMILE), utilizes a femtosecond laser to fashion a small piece of corneal tissue that is removed, changing the shape of the overlying cornea. Laser vision correction or SMILE procedures are typically utilized in patients with stable refractive error and healthy eyes who do not have cataracts or corneal pathology. Considered a safe and effective procedure, LASIK has a patient satisfaction rate of around 95%. Side effects commonly include transient dry eye and night vision disturbances, while serious complications such as infection, irregular astigmatism ectasia (weakening of the cornea), or neuropathic pain are rare.

For patients with high myopia (up to 20 diopters of myopia), or in those whose corneal shape and thickness are not appropriate for one of the aforementioned procedures, a phakic intraocular lens (IOL) may be considered as an alternative to laser vision correction. The most commonly implanted lens currently is the Visian ICL, or intraocular collamer lens (ICL), which is placed anterior to the crystalline lens and posterior to the iris. It is also typically used in younger patients with healthy eyes. This surgery is performed in an operating room setting, and potential side effects include increased intraocular pressure after surgery, halos, glare, slightly accelerated attrition rate of corneal endothelial cells and early cataracts. Rare complications include infection and severe inflammation intraocularly. One advantage of phakic IOLs is that they may be removed, and the optics of the eye otherwise remain the same.

In presbyopic patients, typically ages 40-50, one of several possible refractive surgical approaches may be recommended. Monovision correction may be achieved with LASIK, PRK, SMILE, or with the phakic IOL. Often, these patients have successfully achieved monovision correction with contact lenses previously. In certain cases where the crystalline lens is starting to age but has not yet become a visually significant cataract, patients may choose refractive lens exchange (RLE), where the crystalline lens is removed and an IOL is inserted. This surgery is similar to cataract surgery, and the currently available IOLs enable surgeons to offer their patients a refractive solution for distance and near acuity. Currently, the most commonly implanted IOLs are monofocal lenses, allowing patients to see clearly at one distance without glasses. Typically, at least one eye will have good distance vision, while the second may either also be set for distance, or alternatively for intermediate or near vision to allow for monovision correction. Toric lenses will correct for astigmatism, or non-roundness of the cornea. Multifocal IOLs allow the eye to see both distance and near by having different focusing zones in the lens, or by having a nbuilt-in prism through diffractive technology. These lenses allow the greatest independence from spectacles, but patients may experience halos and glare at night due to their optics. Accommodating IOLs will move slightly with flexion of the ciliary muscle within the eye, although their near vision is limited relative to natural lens accommodation, and the patients will still usually need some reading correction for small print.

As the prevalence of myopia continues to increase, the treatment and prevention of myopia have become increasingly important. While refractive surgical procedures offer patients a wide array of possibilities for decreasing their dependence on glasses and contacts, expectations must be tempered with the knowledge that there is no single procedure that provides perfect distance, intermediate and near vision for a lifetime. As technology improves, we fortunately have an ever-increasing number of therapeutic options to offer our patients at each stage of their visual development.

Update on OCT and OCT-Angiography

Bryan K. Hong, MD, Partner, Vitreo-Retinal Associates, Worcester MA

Since its invention in 1991, optical coherence tomography (OCT) technology has made rapid advances in ophthalmic image acquisition, specifically in imaging the macula, the optic nerve's retinal nerve fiber layer (RNFL), and anterior segment structures (cornea, angle, lens-iris diaphragm).

With OCT, a patient's eye can be imaged in a matter of seconds, yielding instant cross-sectional images that rival microscopic resolution without the hassle of sample/subject preparation or ionizing radiation. For these reasons, OCT has also attracted the attention of other medical subspecialties and research laboratories. However, due to their unique transparent nature, ocular tissues are the ideal subject for OCT imaging.

A Basic Conceptual Primer

OCT is essentially an optical ultrasound device that relies on reflected light, rather than the echoes of sounds used in ultrasound imaging.

An optical source is directed at the tissue to be imaged, and the small amount of light that is reflected back is collected and analyzed. As most of the reflected photons are not reflected directly back to the sensor but rather scatter away at large angles, a technique called interferometry (which is outside the scope of this article) is used to reject the background signal which would otherwise obscure the final image. The final result is a three-dimensional image which is a composite of "stacked" two-dimensional, B-scan images-- which in turn are "stacked" one-dimensional, A-scan images (Figure 1: OCT Scanning Schematic).

The novel use of Fourier-domain acquisition has more recently yielded "FD-OCT," which uses a spectrometer to simultaneously detect reflections from a broad range of tissue depths rather than scanning them sequentially like the older time-domain (TD-OCT) technology which relied on a simpler sensor and moving mirror. Whereas TD-OCT generated 400 scans/second at a resolution of 10 microns and was slower than eye movements, FD-OCT can generate >26,000 scans/second at a resolution of 5 microns while being faster than eye movements.

Faster image acquisition has in turn paved the way for optical coherence tomography angiography (OCT-A; Figure 2), a non-invasive technique for imaging the microvasculature of the retina and choroid in 2014. OCT-A uses information provided by photons reflecting off the surface of moving red blood cells at varying angles to determine speed and direction of blood flow to accurately depict vessels through different segmented areas of the eye, thus eliminating the need for intravascular dyes (e.g. fluorescein and indocyanine green) and their potential side effects. These angiograms are generated by repeatedly imaging the same area and analyzing the difference between scans, using complex algorithms (amplitude decorrelation or phase variance) to detect motion. The data acquisition takes less than five seconds and yields a multiplicity of images, showing vascular structures from the choroid to the inner retina, segmented by depth.

Clinical Applications

As OCT is a safe, fast, and non-invasive way to reliably image the micro-structure and micro-vasculature of the retina, choroid, and optic-nerve head, it has quickly gained acceptance as an indispensable tool in the diagnosis and treatment of ocular diseases (by no means an exhaustive list):

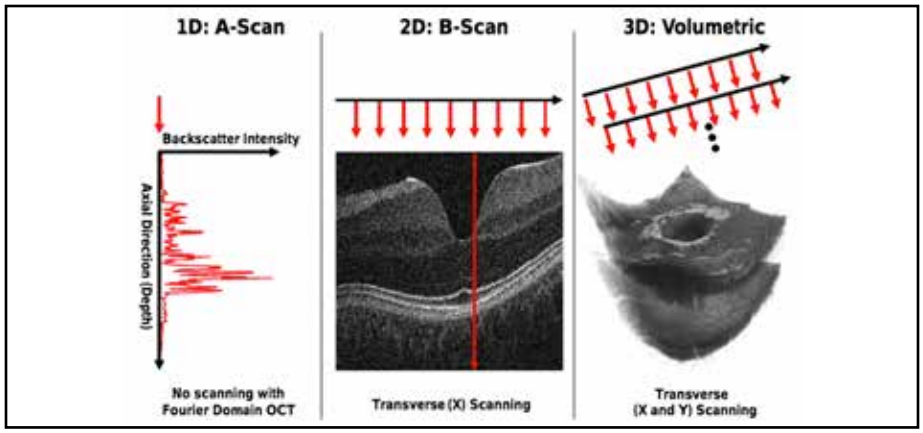
Retina Application

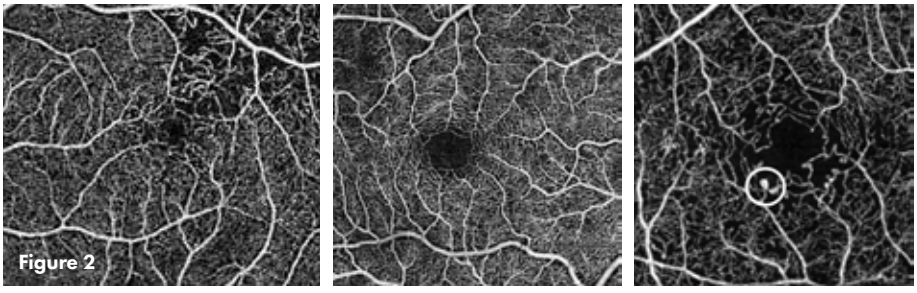
- **Diabetic retinopathy:** Macular ischemia, micro-aneurysms, intra-retinal microvascular abnormalities, and neovascular complexes, in addition to the structural changes of sub-retinal fluid, macular edema, and lipid exudates, are readily visible on a combination of OCT and OCTA scans. Some diabetic retinas can have a "featureless" appearance, meaning that the typical clinical findings such intraretinal hemorrhages that are used to stage the level of diabetic retinopathy are not readily apparent on a clinical exam. In these cases, OCTA is an invaluable tool for determining hypoperfusion states and microvascular density (Figure 3) which are important factors in determining progression of disease and visual prognosis.
- **Age-related macular degeneration (ARMD):** Oftentimes, the distinction between types of choroidal neovascular processes, for example myopic choroidal neovascular membrane and ARMD, can guide the discussion with patients in terms of expectations, treatment plan, and prognosis. OCT examination for the presence or absence of macular exudation is the primary method of determining response to treatment (i.e. intravitreal injection of anti-vascular endothelial growth agents). (Figure 4)
- **Retinal vascular occlusions:** Retinal vein occlusions and retinal arterial occlusions together make up the third most commonly diagnosed retinal disease after ARMD and diabetic retinopathy. Distinguishing one from the other is important because they each entail a very different medical work-up (i.e. arterial occlusions should be treated with the urgency of a cerebrovascular accident). Although distinguishing one from the other is usually quite straightforward, the more difficult tasks of prognosticating visual prognosis and tracking recovery and response to treatment are simplified by imaging edema/congestion, macular atrophy, and perfusion with OCT and OCTA.
- **Macular puckers and holes:** The bread-and-butter surgical diagnoses, aside from the more sinister retinal detachment, are easy to diagnose via clinical exam. However, post-surgical visual prognostication is a difficult task. High-resolution OCT and OCTA allow for more reliable determination of visual potential as one can examine presence of absence of photoreceptors and central-macular microvasculature prior to even offering surgery to the patient. (Figure 5 & 6)

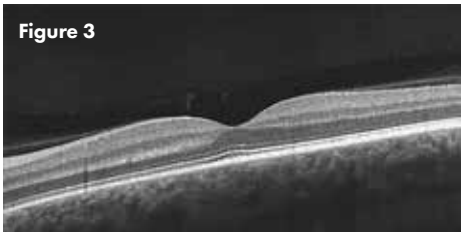
Glaucoma Application

Although the layperson understands glaucoma as "high eye pressure," it is in fact a complex diagnosis characterized by progressive visual field defects which correlate with loss of the optic nerve's retinal nerve fiber layer (RNFL). Measurement of the RNFL thickness, along with intraocular pressures and visual field, has been a mainstay in tracking disease progression from the earliest days of OCT technology (Figure 7). Now that OCTA is available, the ability to detect abnormalities in optic nerve and circumpapillary circulation has spurred research and has given clinicians another data point to potentially stage disease, distinguish disparate etiologies, and track progression in ways previously unimagined.

Figure 1







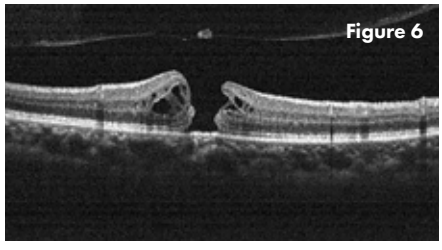


Figure Legends:

Figure 1. OCT Scanning Schematic. Left: 1-dimensional A-scan showing peaks, which correspond with tissues of higher density and reflectance, and troughs, which correspond with tissues of lower density. The distance between peaks and valleys are proportional to linear dimensions of the imaged tissue. Middle: 2-Dimensional B-scan, which is a composite of multiple A-scans (red arrows)—akin to taking an integral of a curve. Right: 3-Dimensional image produced by "stacking" multiple sequential 2-Dimensional images. *(Used with permission. Kraus, Martin & Potsaid, Benjamin & Mayer, Markus & Bock, Ruediger & Baumann, Bernhard & Liu, Jonathan & Hornegger, Joachim & G Fujimoto, James. (2012). Motion correction in optical coherence tomography volumes on a per A-scan basis using orthogonal scan patterns. Biomedical optics express. 3. 1182-99. 10.1364/BOE.3.001182. License: by-nc-nd/3.0)*

Figure 2. Example of "dye-less" OCT Angiogram of the macular capillary plexus.

Figure 3. Panel A. Normal OCT Angiogram with dense capillary population. Panel B. Diabetic OCT Angiogram with evidence of capillary dropout and microaneurysm formation (circle).

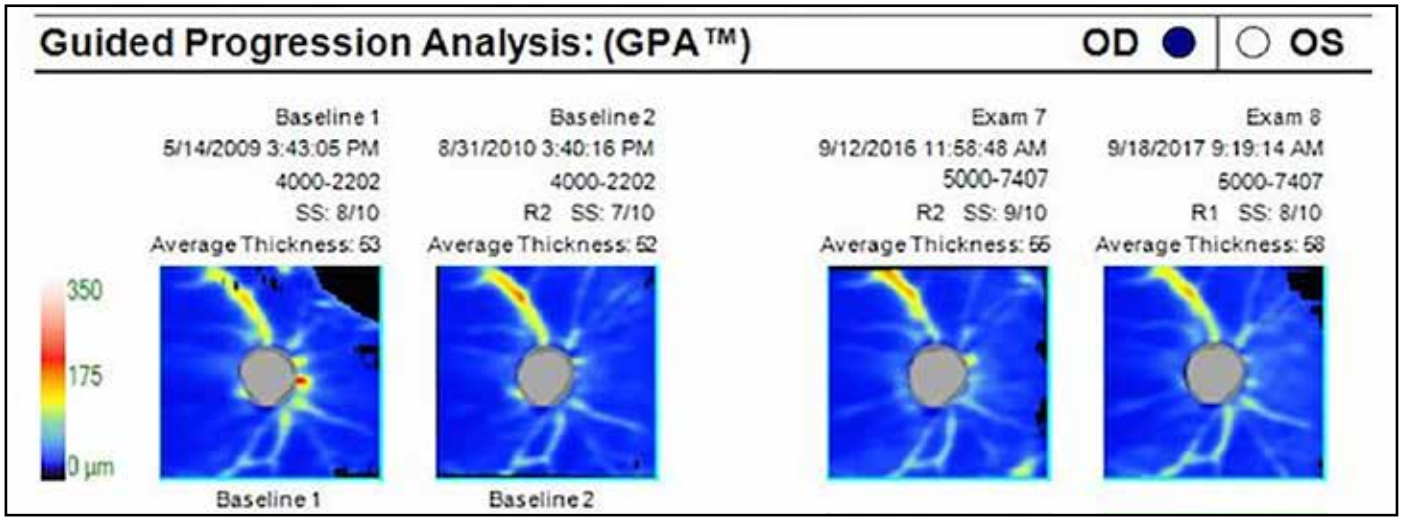
Figure 4. Panel A. Normal OCT. Panel B. Abnormal OCT showing changes related to "wet" macular degeneration.

Figure 5. "Macular pucker" or epiretinal membrane distorting macular architecture, thereby distorting central vision.

Figure 6. Macular hole, with permanent avulsion of foveal photoreceptors. Surgical closure is necessary, but there will be a permanent deficit in visual potential.

Figure 7. Glaucoma Guided Progression Analysis which allows for detection in minute changes in the retinal nerve fiber layer. This is an example of a very stable longitudinal scan. (Courtesy of Benjamin Xu MD PhD, USC-Roski Eye Institute).

Figure 7



Age-Related Macular Degeneration: Current Status and Treatment

Michael J. Bradbury, MD[1] and Peter Y. Chang, MD[2]

Age-Related Macular Degeneration (ARMD) is the leading cause of irreversible vision loss over the age of 50. It affects about 15 million men and women in the United States with about 200,000 new cases diagnosed each year. About 1.7 million U.S. citizens have the advanced form of the disease, projected to grow to 3 million by 2020. About 200 million people are affected worldwide. While it does not usually cause total blindness, ARMD is the leading cause of functional or legal blindness. Risk factors include: female gender, white race, family history, obesity, hypertension, hyperlipidemia, and smoking.

"Dry" Versus "Wet" ARMD

Broadly speaking, there are two types of ARMD – non-exudative ARMD (also known as DRY or non-neovascular), and exudative ARMD (WET or neovascular). The non-exudative form accounts for 90% of all ARMD cases and is characterized by changes in the outer retina layers leading to atrophy and loss of the photoreceptor (rods and cones) function. Exudative ARMD is defined by the invasion into the retina of abnormal choroidal vessels (called choroidal neovascularization, or CNV) that results in leakage of serous fluid or hemorrhage which can be devastating to the photoreceptors. Even though only 10% of ARMD is exudative, these cases are responsible for the greatest visual disability- and thus economic burden- among all ocular diseases in developed countries. It is important to recognize that non-exudative diseases may undergo exudative conversion at any time, hence the importance of routine eye exams and patient education so that any vision change is detected as early as possible.

Symptoms

Patients with non-exudative ARMD may complain of gradual visual acuity loss or distorted vision (metamorphopsia), whereas patients with the exudative disease can have more acute onset of such complaints. Vision loss is painless and not associated with any systemic symptoms. Color vision may also be affected.

Diagnosis

The diagnosis of ARMD is made during a comprehensive eye exam, supported by imaging studies, while ruling out other causes of macular or retinal disease such as diabetic maculopathy, retinal vascular disease, and macular hole or pucker. The characteristic exam findings for non-exudative ARMD are drusen (pale yellow deposits under the retina) and pigmentary atrophy of the outer retina layer (Figure 1). Exudative ARMD eyes exhibit subretinal fluid, hard exudate, subretinal fibrosis, and/or hemorrhage secondary to choroidal neovascularization (Figure 2).

Confirmatory studies can be done in the office and include fundus photos, fluorescein angiograph, and optical coherence tomography (OCT). Fundus photos are especially useful in monitoring non-exudative ARMD, as the increase in the number and size of drusen can be very subtle and annual photos allow for side-by-side comparison. Fluorescein angiography is a series of photographs taken with special filters after the intravenous injection of fluorescein dye, which allows imaging of the retinal vasculature and the retinal layers. This imaging can help detect leakage otherwise not apparent on a fundus exam. OCT is a detailed high-resolution laser scan of the retina, showing drusen, atrophy of retinal layers, abnormal blood vessels, edema, hemorrhage and other abnormalities otherwise nearly impossible to discern. The OCT is essentially an "optical biopsy" of the retina and the choroid (Figure 5). These studies are useful for diagnosis, patient education, follow-up, and treatment guidance.

Treatment

Treatment differs greatly between non-exudative and exudative ARMD. Currently, there is no effective treatment for non-exudative ARMD, but fortunately most cases do not lead to severe visual loss. It is managed with periodic exams, self-monitoring by patients, antioxidant vitamin supplements (AREDS vitamins, which contain zinc, copper, vitamin C, vitamin E, lutein, and zeaxanthin), and low-vision aids when appropriate. A healthy diet, control of hypertension, smoking avoidance, and wearing sunglasses are recommended. Some evidence suggests a benefit from lenses blocking blue light that is emitted from smart devices and LED light bulbs. Patients are instructed to report new symptoms suggestive of exudative conversion.

Treatment of exudative ARMD is targeted at CNV to reverse retinal edema and hemorrhage. In the past, direct destruction of CNV by thermal laser was the only method. This process rarely improved vision and was associated with disease recurrences and scar formation that led to further vision loss. Another type of treatment called photodynamic therapy (PDT) involves intravenous injection of a photoactivated chemical dye, followed by laser activation of the dye to coagulate CNV. However, this treatment tends to stabilize but not reverse vision loss.

The mainstay of current treatment is an intraocular injection of anti-VEGF (vascular endothelial growth factor), which has been in widespread use since 2005. These biologic drugs work by either inhibiting VEGF receptors or by removing VEGF from the vitreal cavity. Treatment is given initially monthly and then at extended intervals depending on the patient's response. There are three anti-VEGF drugs currently in use – bevacizumab (Avastin®), ranibizumab (Lucentis®), and aflibercept (Eylea®). Bevacizumab was developed to treat colorectal cancer, but is specially formulated by compounding pharmacies in doses safe for the eye. Ranibizumab and aflibercept were designed specifically for ophthalmic uses, including ARMD, diabetic macular edema, and retinal edema associated with retinal vein occlusion. This new class of drugs has revolutionized the management, prognosis and visual outcomes for patients with exudative ARMD. Many patients are now able to regain lost vision, and almost all are stabilized. Once the diagnosis of exudative ARMD is made, anti-VEGF therapy can be given by a retina specialist in the office setting, with minimal ocular and systemic risks. Endophthalmitis is the main ocular complication which can result in blindness, but its incidence is about 1 in 5000.

Patient Counseling

ARMD patients are instructed to monitor their own disease with an Amsler Grid at home. This should be done at least once a week to detect any changes in vision or distortion. Changes should be reported to their Ophthalmologist so that the necessary treatment can be implemented quickly. With the advent of OCT technology, patients and family can now more easily understand the disease process of ARMD and appreciate the treatment impact. Patients who require anti-VEGF injections for exudative ARMD are educated about the need for frequent injections initially (i.e. every 4 weeks), but the interval between injections typically is extended to 6, 8, 10, 12 weeks, etc. once exudation is under control. Patients are reassured that while central vision may be affected, they will not lose all vision. Family members and caretakers are advised on how to assist their vision-impaired relatives. Consultation with a low vision specialist- usually an Optometrist or Vision Therapist- may be recommended so that the patient can learn to utilize low-vision aids, including illuminated magnifiers, special spectacles, closed circuit TV magnification, reading machines, large print books, large number telephones, etc. Because peripheral vision is not affected in ARMD, mobility is usually not an issue, in contrast to patients with advanced glaucoma or retinal degeneration.

On the Horizon

Imaging technologies are fast evolving: higher-definition OCT and OCT angiography are becoming commonplace. Even optometric practices are often equipped with basic OCT machines to help diagnose AMRD during routine eye exams. Future therapies for exudative ARMD include longer acting anti-VEGF drugs, an extraocular reservoir that allows anti-VEGF to enter into the eye without the need for repeat injections (thereby decreasing the risk of endophthalmitis and other complications), gene therapy that stimulates the retina to produce endogenous anti-VEGF, and viral vector delivery of genes for photoreceptor Rhodopsin production. For non-exudative ARMD and its advanced form (geographic atrophy), anti-complement therapy and stem cell transplants to regenerate photoreceptors are being studied.

Conclusion

ARMD is common and potentially blinding, but with proper diagnosis and timely treatment, it seldom has the same grim prognosis as it did two decades ago. When a patient complains of symptoms of painless central vision loss or appearance of wavy vision, they should be promptly referred to an Ophthalmologist for a thorough evaluation.

Recommended links for further reading and multimedia:

1. American Academy of Ophthalmology (AAO): https://www.aao.org/eye-health/diseases/amd-macular-degeneration
2. American Society of Retina Specialists (ASRS): https://www.asrs.org/patients/retinal-diseases/2/agerelated-macular-degeneration

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Innovations in Corneal Transplantation: Endothelial Keratoplasty

Erin Fogel, MD

The first successful corneal transplant was performed in 1905 by a Czech physician, Eduard Zirm. A corneal transplant involves replacing a cloudy or scarred cornea with a clear donor cornea. A nationwide system of eye banks facilitates this process, providing corneal tissue to surgeons who perform the transplant.

Up until 20 years ago, the most common technique in corneal transplantation was penetrating keratoplasty (PKP). It is performed using a circular cutting device or trephine to remove a round, full thickness disc of the patient's diseased or damaged cornea. The old cornea is then replaced with a similarly trephined portion of the donor cornea. Once in place, the new cornea is secured, using multiple sutures, evenly spaced around the 360-degree incision. The patient then undergoes a year long process of wound healing and suture removal until they can be fit with glasses or contact lenses. Most corneal diseases which required transplantation received this type of surgery.

In the past 15-18 years, there has been a major shift in the surgical approach to corneal pathology. Rather than replacing a full thickness cornea, only a partial thickness, or lamellar transplant, is carried out. Think targeted therapy; replacing only the layer of the cornea that is diseased or damaged, rather than the entire tissue.

Anatomically, the cornea can be divided into three layers: the outer epithelium, which regenerates after a corneal abrasion; the middle layer of stroma, which does not regenerate and becomes opacified or scarred in the event of infection or trauma; and the inner layer of endothelium with its basement membrane known as Descemet's membrane. While a conventional PKP removes and replaces all three layers, a DSAEK (Descemet's stripping automated endothelial keratoplasty) removes only the patient's Descemet's membrane and endothelium. The Descemet's membrane and endothelium are replaced with a donor lenticule that not only includes those layers but also a small amount of posterior stroma. In DMEK (Descemet's membrane endothelial keratoplasty), the Descemet's membrane and endothelium are removed and replaced without any additional stroma.

While the first of these lamellar techniques, DSAEK, was introduced in 2000-2003, surgeons were slow to adopt it. For one thing, it was more technically difficult and risky. In the early years, the surgeon took responsibility for preparing both the patient's cornea and the donor cornea. If the donor tissue was inadvertently damaged during the separation of the corneal layers in the OR, the surgeon bore the financial burden of lost tissue and the patient would be inconvenienced by needing to reschedule surgery. But these obstacles were mitigated as the eye banks developed the skill set and techniques to process the tissue and ship the prepared donors to the surgeon. This eliminated the risk of unusable donor tissue and the transition to endothelial keratoplasty quickly took off.

The newer DMEK technique which was introduced in 2008 and essentially replaces only endothelium has shown even better results than DSAEK in vision and speed of recovery due to thinner donor tissue.

The great advantage of DSAEK and DMEK over PKP is the smaller 3-4 mm corneal incision that affords quick healing. This imparts faster recovery of vision and improved tectonic stability of the eye with a lower lifetime risk of visual loss in the event of trauma. In addition, there is decreased incidence of rejection due to a smaller antigen load, lower use of topical steroid drops which reduces secondary glaucoma and other side effects, fewer suture related infections and corneal neovascularization, and less ocular surface disease due to smaller wounds and fewer eye drops.

To further illustrate these advantages, a PKP patient will generally be fit for glasses or contact lenses 12-18 months after surgery and may have significant surgically induced astigmatism due to the large wound and multiple sutures. This can affect the quality of vision despite excellent surgery. An endothelial keratoplasty patient can expect stable vision and a glasses prescription within 1-3 months after surgery. The astigmatism will generally not change significantly from the preoperative level. Patients maintain independence, return to driving and working more quickly, and enjoy vastly improved vision.

Who are good candidates for endothelial keratoplasty? The most common disease that affects the endothelial layer is Fuchs' corneal dystrophy and this is the leading indication for a DSAEK or DMEK. In addition, some patients who have undergone multiple eye surgeries or have had lens implants that have caused damage to their corneal endothelium would also be good candidates for endothelial transplants. To clarify, an endothelial keratoplasty would not be effective in restoring sight to a patient with a corneal scar from trauma or infection. These patients are managed first by a specialty contact lens or failing that, a PKP or perhaps a deep anterior lamellar keratoplasty (DALK). This is another lamellar transplant technique which replaces the outer layers of epithelium and stroma but leaves the patient's endothelium in place. It has similar benefits to DSAEK and DMEK, but is technically more difficult to perform and fewer are done in this country. A full discussion of this technique is outside the scope of this article.

Both DSAEK and DMEK have complications that include donor dislocation which may require a second trip to the operating room to reposition it or replace the donor. Graft rejection can occur although at a much-reduced incidence compared to PKP. Graft survival rates are comparable to PKP but long-term data continues to be collected to verify these initial findings.

How big an impact is this? The Eye Bank Association of America statistics for 2017 indicates a continued decreasing trend in PKP's with only 36% of the tissue placed in the U.S. used for that purpose. Meanwhile, 57% were either DSAEK or DMEK with an 18% increase in DMEK procedures compared to 2016. Looking ahead, research in endothelial cell layer repopulation without need for donor tissue is showing promising results and may be the next step forward in treating patients with corneal disease.

Erin Fogel, MD is a partner and Vice President of Concord Eye Center and the Medical Director of Concord Eye Surgery Center in Concord, New Hampshire.

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HANDCRAFTED NAUTI HARD SELTZER LOW CALORIE

Update in Cataract Surgery

Jeremy Meltzer, MD, Meltzer Eye Care Center

Cataract surgery is the most commonly performed elective surgery done in this country. The fact that cataracts are a progressive and universal aspect of normal aging (in addition to all of the medications, medical conditions, trauma, and other eye surgeries that can precipitate their formation) explains the high rate of surgical necessity. Prior to the development of cataract surgery, progressive vision loss with age was a near certainty. Across the undeveloped world, without access to cataract surgery, cataract formation remains the most common cause of acquired blindness.

Historically, ophthalmologists at the dawn of modern medicine heavily debated which approach to cataract surgery yielded the best outcomes. Ultimately, by the 1800's, dislodging the lens from the visual axis by pushing it into the vitreous with a sharp implement (a procedure known as couching) was supplanted by lens removal procedures. However, in the absence of a tool to break the cataract into small pieces inside the eye, removing the intact lens required a 10 mm incision. This large wound required suturing of the cornea, which induced astigmatism. Additionally, the instability of this large incision required patient immobility after surgery to allow for corneal healing. Equally important, without an intraocular implant lens to replace the removed cataractous lens, the use of thick, heavy, and cosmetically unappealing aphakic spectacles was necessary. Aphakic spectacles also fail to deliver normal vision due to a "pin-cushion" like image distortion of the peripheral vision.

Modern phacoemulsification cataract surgery, which utilizes high frequency ultrasound waves to fragment and pulverize the cataract in-situ, was first invented in the late 1960s. By the 1980s most surgeons had switched from large incisions and whole cataract removals to phacoemulsification. The major advantages of phacoemulsification allow for procedure times that are typically less than 15 minutes, instead of over an hour, and a 2 mm suture-less closure instead of a 10 mm sutured closure. As phacoemulsification technology has matured the hand-held instrumentation has become smaller, more elegant, and more efficient. Constant innovation to the phacoemulsification machines themselves has dramatically improved fluidics which benefits both patient safety and surgeon control.

The first intraocular implant lenses were inflexible and necessitated a large incision, sutures, and an iridotomy (a hole in the peripheral iris to prevent the implant lens from impeding the flow of fluid in the front of the eye). While these first implant lenses offered dramatic improvement in vision in comparison to aphakic spectacles, they were not without potential complications. These anterior chamber lenses were positioned on top of the iris where chaffing could occur, leading to inflammation, bleeding, and even glaucoma. In order to see the benefit of operating through a suture-less small incision for phacoemulsification, foldable lenses were developed. These flexible intraocular lenses could be inserted through a 2 mm incision and positioned into the capsular bag (the empty shell of the removed cataract). These flexible posterior chamber lenses could be inserted through a suture-less incision, did not require an iridotomy, and largely avoided the chaffing associated with anterior chamber intraocular lenses. As our ability to measure and calculate the appropriate lens power has improved, cataract surgery has evolved into a refractive procedure. Patients expect excellent post operative vision without spectacle correction. While it is possible to give patients either excellent distance or reading vision with a monofocal implant lens, the technology for implant lenses that allow for true accommodation (using muscle within the eye to change focus from distance to near) does not yet exist. In order to have both distance and near with the same implant lens, using currently available technology, the patient must be willing to sacrifice some contrast sensitivity and quality of vision, in addition to paying for a "premium" intraocular lens. These multifocal and extended depth of focus implant lenses are not covered by insurance.

Laser assisted cataract surgery (LACS) is the newest iteration of cataract surgery. It allows the initial steps in cataract surgery -including creation of a self-sealing corneal incision, opening of the lens capsule (capsulorrhexis), and pre-fragmentation of the lens nucleus (prior to employing ultrasound phacoemulsification) - to be performed under computer guidance. Computer guided laser involvement in the initial steps of the procedure allows for greater repeatability, more accurate centration, reduced total ultrasound energy application, and may give less experienced surgeons access to better outcomes. LACS is not covered by insurance and requires the patient to pay a premium for the procedure. Whether LACS is truly a benefit to patients or an unnecessary expense is currently a point of contention among ophthalmologists as studies comparing LACS to standard phacoemulsification have shown no improvement in patient outcomes.

Low Vision Referrals: The Standard of Care

Kathryn Deliso, OD and Caroline Toomey-Gitto, OD

While it is natural that Optometry has taken the leading role in providing Low Vision (LV) services to patients who are visually impaired or who are legally blind, there has been a call to action for greater participation throughout healthcare. With the current spotlight on advances in assistive technology, and the undeniable benefits of Vision Rehabilitation (VR) services, it is incumbent upon all healthcare providers to make the low vision referral the standard of care when patients express visual difficulty as it pertains to their activities of daily living, regardless of the patient's measured visual acuity.

Numerous studies highlight the benefits of the LV referral, particularly when a LV examination performed by an optometrist is coupled with VR services performed by a team of trained LV therapists which include occupational therapists, orientation and mobility instructors, and technology experts. This multidisciplinary approach almost always guarantees greater success, resulting in increased functional vision, and often decreased depression associated with vison loss.

While individuals with obvious vision impairments may be promptly referred, those serving this patient population agree that referral for LV services is warranted for any patient with functional complaints. This can be illustrated in a patient with Geographic Atrophy (GA) and foveal sparing. Unlike neovascular Age-Related Macular Degeneration, Geographic Atrophy progresses slowly and spares the foveal center until late in the course of the disease. Similarly, this presentation of parafoveal scotomas can be present in a patient with macular telangiectasia. These individuals might present with seemingly preserved central acuity and functional complaints disproportionate to best corrected acuity. A low vision evaluation includes an assessment of scotomas, as parafoveal scotomas impair visual performance by limiting the size of the seeing central region so that only a portion of a word or a facial feature can fit in the seeing area. Research has shown that after the foveal center is involved, the size of the atrophic area is a critical determinant of reading rate, suggesting that the overall size of the atrophy may play a role in a patient's daily activities. And while theoretically in a non-diseased eye central acuity is not affected by small changes in contrast, the diseased eye with loss of the retinal pigment epithelium will demonstrate a significant drop in acuity when contrast is reduced. When referred for LV services, a comprehensive evaluation includes not just a measurement of central Optotype acuity, but also contrast sensitivity and continuous text with calculations of the equivalent power a patient might need to just resolve text, to spot read text, or to continuously read text. It is this comprehensive assessment of an individual with preserved central acuity that will reveal a functional deficit, at which point a plan for accommodations and recommendations for a multidisciplinary approach to rehabilitation can be established.

As recently as May 2017, the American Academy of Ophthalmology released a video entitled "There Is Something Else You Can Do", urging its membership to make timely referrals to a LV specialist. Ophthalmology recognized that their residents do not receive enough exposure to and education about LV and VR services, prompting medical schools to require residents to rotate through LV clinics. This is a step in the right direction as it relates to patient outcomes.

The message is loud and clear: referring patients who have 20/40 or less acuity, scotomas, decreased contrast or visual field loss connects them with services that will improve their functional vision, their independence, and ultimately their quality of life.

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The Integral Role of Nursing in the Care of Patients with Ophthalmic Conditions

Tracy J. Condron, RN

The Registered Nurse (RN) plays an integral role in the health care experience of patients with ophthalmic conditions, from the initial clinic visit to discharge after a surgical procedure. Nursing care occurs in clinics, operating rooms and ambulatory centers. In this highly specialized area of medicine, there are subspecialties including: comprehensive, retina/uveitis, cornea, refractive, neuro-ophthalmology, glaucoma, strabismus/pediatric, oculoplastic/reconstructive, and refractive eye surgery (Tarbet). Within these specialties, nurses practice alongside ophthalmologists and technicians, always with a focus on the patient. Recent advances and new technological innovations have impacted nursing practices changing the nurse's role during pre-operative preparation, requiring acquisition of new knowledge and skills related to the nursing role during new complex surgical procedures, and changing the specifics of post-operative care and discharge teaching. Across the country RNs are leading the team in the practice of the Surgical Safety Checklist, adapted from the World Health Organization. Nurses keep safety first in every surgical case to make sure the correct procedure is performed on the correct eye on the correct patient. RNs do this for every patient, every surgery, every day.

Each year, approximately three million people have surgery to remove cataracts (Dallas, 2017) making cataract surgery the number one surgery performed in the United States. Nurses have seen cataract surgery progress from inpatient admission and long post-operative stays, to same-day surgery that is completed in a couple of hours. This surgery, which used to be routinely performed under general anesthesia and anesthetic eye blocks, can now be performed under topical anesthesia with eye drops and, in some practices, very little or no sedation at all. RNs now see countless types of intraocular lenses from monofocal, multifocal and accommodative to premium and toric (Boyd, 2018). Advanced technology and equipment such as: advanced phacoemulsification and vitrectomy systems, elite microscopes, and FEMTO lasers, all necessitate education and training of RNs to ensure their proficiency in helping the patient get the best care possible. We have safety checklists, patient care policies and procedures in place that are used by nurses, surgeons and surgical technicians. The nurse continually keeps a focus on patient safety, comfort and making sure patients have an adequate understanding of their post-discharge care.

Glaucoma is the leading cause of irreversible blindness and more than three million Americans are living with this disease. The goal is to lower the intraocular pressure which can be achieved through eye drops, laser therapy, and minimally invasive glaucoma surgery (Glaucoma Research Foundation). Today, there are a number of new stents that can be surgically placed in the patient's eye to reduce the need for what used to be a lifelong dependence on eye drop medications. Nurses play a role in keeping patients safe and comfortable during these complex procedures and teaching them the care needed for their discharge home.

Corneal transplants have also changed drastically over the past 20 years, going from full-thickness to different layers of the corneal with selective keratoplasty surgery, descemet membrane endothelial keratoplasty or descemet stripping endothelial keratoplasty where there is less rejection and a faster recovery, better quality of vision and less glaucoma (Haller, 2015). With partial thickness corneal transplants, patients need to lay face up looking at the ceiling for 48 hours, except to eat or go to the bathroom, which was not required for the full thickness transplants. Nurses help patients cope with this mobility restriction during this time.

Refractive surgery uses laser-assisted in situ keratomileusis (LASIK) and is performed in clinics with same day admission and discharge. Refractive surgery corrects common vision problems (nearsightedness, farsightedness, astigmatism and presbyopia) to reduce dependence on prescription eyeglasses and/or contact lenses (consumer.ftc.gov). RNs have been managing and assisting in these laser clinics for years. As with almost all eye procedures, postoperative teaching is very important and includes instructions to prevent any complications such as not rubbing your eyes for a full three weeks, using sunglasses when outdoors for the first three weeks to protect the eyes from wind and dust, no eye cosmetics and no swimming or hot tubs for two weeks after surgery.

Science and research trials in ophthalmology have led to break through therapies. In March 2018, a gene therapy for the rare genetic disorder, retinosa pigmentosa or leber congenital amaurosis, was injected into the first patient (Bellulz, 2018). For patients with complex and rare disease such as this, these treatments can both give hope and cause trepidation. Providing emotional support and allowing both the patient and their family members to express their fears and concerns are part of caring for these patients. Nurses working in ophthalmology will encounter new challenges as gene therapy moves forward and will acquire the knowledge and skills necessary to safeguard the patient and support them throughout the process.

As our nation's population continues to age and need for ophthalmic surgery grows, cataract removal is a prime example of the necessity for standardization, to decrease the cost of the surgery while increasing efficiency and quality care (Mets, 2012). Improving quality by adherence

to evidence-based practice guidelines has been a nursing practice since its introduction by Florence Nightingale in the Crimean War. The nurse will continue to play an important part in the future of ophthalmologic procedures. Standardizing and streamlining care with an eye on patient comfort and safety are integral to safe nursing practices.

New knowledge and advances in ophthalmic technology used in caring for patients with ophthalmic conditions requires ongoing education and training of nurses. The American Society of Ophthalmic Registered Nurses (ASORN), established in 1976, aims to foster excellence in ophthalmic patient care while supporting the ophthalmic team through individual development, education, and evidence-based practices. This organization, along with others such as the Association of Operating Room Nurses (AORN), ensures that educational opportunities will continue to be offered for the profession, to maintain excellence in practice. Nurses remain on top of all of the technology and processes while keeping a focus on the patient while striving for safe, comfortable and well-informed patients. With the medical and surgical advances in ophthalmology, nurses continue to advocate for and provide quality care to each person under our care.

Tracy J. Condron, RN is the Board Director at Large for the American Society of Ophthalmic Nurses /ASORN.

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In Memoriam: Guenter L. Spanknebel, MD

Mitchell J. Gitkind, MD

The Worcester medical community lost a true medical pioneer with the passing, on December 15, 2018, of Dr. Guenter Spanknebel. I had the great privilege of knowing Guenter from the early 1980s to the time of his retirement.

From the perspective of a medical student, he was a larger-than-life figure. During my time as a resident at what was then called Worcester Memorial Hospital, Guenter was ever-present, full of information, and always willing to help a patient, a family member, a trainee, or a colleague. As I got interested in gastroenterology, he was a great support, and when the time came to look for a place to work, he welcomed me back to Worcester, helped me set up a private practice, and taught me so much about medicine and life in general. We worked side-by-side as staff members from 1990 to 2003.

In addition to our professional connection, Guenter welcomed my family to his home on many occasions and my children, now adults, still vividly recall his German Shepard training demonstrations, his wonderful swimming pool and sprawling property in Sterling, and of course his wonderful family including his wife, Janet.

I learned much about Guenter's life from an obituary published in *The Boston Globe* on December 30, 2018. Born May 5, 1933 in Stuttgart, Germany, son of a musician and a piano teacher, he became an accomplished pianist, violinist, and cellist, and seemed bound for a musical career. However, as a boy growing up Germany during World War II, he vowed to become a priest should he and his family survive. His father did not, but a physician friend of the family guided Guenter to what became his life's calling, which was to, "bring a little religion and philosophy to patients while I'm healing their ills."

After graduating from medical school and completing an internship in Germany, he came to the United States to complete a residency in internal medicine at the former Memorial Hospital in Worcester, Massachusetts, and a fellowship in Gastroenterology at Tufts New England Medical Center in Boston.

Guenter returned to Memorial Hospital, now known as UMass Memorial Medical Center, and established a private practice in Gastroenterology in 1968, which he maintained until his retirement from active practice in 2008. Over a long and accomplished career, Guenter emerged as a true pioneer in his field, establishing a reputation for excellence in medical education and clinical care. In 1975, he was appointed Director of Medical Education and established the hospital as a recognized academic teaching affiliate of the University of Massachusetts School of Medicine, and served continuously as a faculty member.

Prior to establishing Memorial's GI Endoscopy Department in 1975 and his appointment as Chief of Gastroenterology and Endoscopy, he traveled to Japan in to learn what was then a novel procedure, "endoscopic retrograde cholangiopancreatography (ERCP)," and was the first to introduce this to the New England area. A decade later, he traveled to his native Germany to learn endoscopic laser therapy, a technology he then established at his institution.

Guenter served as president of Memorial's Medical Staff and chaired numerous committees. He was a founding member of the New England Endoscopy Society and of MassPRO, a statewide quality review organization. He served on the Board of Directors of the Foundation of Central Mass Health Care Inc., was former President of the Worcester District Medical Society and Chair of its committees on Medical Education and Legislation.

In 1995, Guenter was voted President of the Massachusetts Medical Society, the first international medical school graduate elected to the position. His message to members was to channel their energy into excellence in patient care, stating "we are in the profession as a calling."

In 2007, he was awarded the Worcester District Medical Society Career Achievement Award in recognition of his dedication and outstanding contributions to the community and the practice of medicine. In 2009, he received the Laureate Award from the Massachusetts Chapter of the American College of Physicians, for demonstrating an abiding commitment to excellence in medical care and education.

Guenter's commitments went beyond the medical world. He was a lifetime member of St. Michael's-on-the-Heights Church in Worcester, serving on the church's vestry and he was a member of the Quinsigamond Lodge of Masons. For decades, he presided over The Sterling Oktoberfest, a non-profit that raised scholarship money for local college bound students.

Guenter will be missed by the hundreds of trainees and colleagues he taught and guided, but even as he rose to lead large medical organizations, he never lost sight of his most precious work; the provision of quality patient care.

Thoru Pederson, PhD

In 2004, an elderly donor to the Worcester Foundation, to whom I was very close, was admitted to Memorial Hospital and an advanced GI malignancy was promptly diagnosed. He was well cared for by others on the oncology service but when Guenter [Spanknebel] heard about the patient and heard I was visiting, he came down the hall and greeted me. I will always remember what he said, to paraphrase: "What a lovely man, and so intelligent. I have to say things don't look good. Spend as much time with him as you can now, it will comfort him and it will comfort you." Those last words - "and it will comfort you" - say so much about this great physician, who practiced a venerable style of medicine which included a wise and caring perception of those around a patient nearing the end.

Janice B. Yost, ED. d

Among his many contributions to his profession, Dr. Spanknebel served as a Trustee of Central Massachusetts Health Care, Inc. (CMHC), which was a physician-initiated, not-for-profit health maintenance organization that began in 1997. He was involved in the decision to sell CMHC to a for-profit in 1996, which netted $42 million. In 1999, he then participated in the arduous process that lead to the establishment of The Health Foundation of Central Massachusetts, Inc. where he served on the Board for another eight years. To date, the Foundation has made grants totaling $42 million to nearly 200 organizations to improve the health of those who live or work in Central Massachusetts, and currently has assets of $70 million. "Dr. Spanknebel was a skilled and dedicated physician with a strong moral compass and a deep concern for humanity. The Foundation stands as a legacy to his vision and service to his profession," stated Janice B. Yost, Ed.D., the founding President & CEO of The Health Foundation of Central Massachusetts, Inc.

HPID: The confused birth, troubled life and untimely death of a federal regulation

Peter Martin

Congress passes a law, and designates a federal agency charged with promulgating regulations and carry out Congress' intent as expressed in the legislative language. The federal agency seeks input from concerned stakeholders through notice and comment rulemaking, issues proposed and final rules with prospective effect on the affected industry. Generally, this process works well, at least in the sense that - eventually - rules are issued with which the regulated industry must comply.

Why might this process not work well, and what recourse is available when that happens? A case in point might be the health plan identifier (HPID) originally required by section 262 of the HIPAA statute passed in 1996: the HPID was intended to aid providers and third-party payers with electronically engaging in a wide variety of HIPAA transactions - for example, patient eligibility determinations, claims billing and remittances of health care payments. By using these different numbers issued by different governmental or private organizations, the hope was that by instituting a national and unique identifier for each "health plan," confusion could be avoided in such transactions.

The course of HPID's lifetime, thus far, is as follows: after the initial passage of HIPAA, Congress in the 2010 Affordable Care Act renewed the requirement for development of the HPID, based on the input of the National Committee on Vital and Health Statistics (NCVHS), which is the statutory advisory committee responsible for providing recommendations on health information policy and standards to the federal Department of Health and Human Services (HHS). A NCVHS subcommittee held public hearings during July of 2010 and, after receiving the NCVHS recommendations, HHS published a proposed rule in April of 2012. A final rule was published in September of 2012. In October of 2012, organizations began to apply for HPIDs (some 11,000 numbers were assigned through October of 2014). As that process proceeded, payers and providers reported that the HPID policy was problematic, costly and burdensome. NCVHS held hearings in February and June of 2014 and sent HHS follow up letters in May and September of that year. Effective October 31, 2014, HHS issued a "statement of enforcement discretion," which delayed enforcement of the HPID rule. In May of 2015, HHS requested additional public input, which was overwhelmingly negative. NCVHS held a hearing in May of 2017 which "confirmed that the HPID did not satisfy a business need, did not provide other value, and its implementation would be costly and disruptive." A proposed rule to rescind the HPID requirement was issued in December of 2018, with public comments solicited through February of 2019.

If, as this writer anticipates, the HPID rule is rescinded, its lifespan will have reached over six years, though only during the first two of those years was it in practical effect. Its gestation, from initial HIPAA provision to final rule effective date, was approximately 16 years. Given the lengthy time period and elaborate public input process prior to its promulgation, how did it prove to be so defective?

The first issue may have been that the initial HIPAA definition of "health plan" was confusing, combining, as it did, both health plans and health insurance issuers. This almost guaranteed that there would be confusion as to whether "health plan" means the corporate payer entities (e.g., commercial insurers, ERISA group health plans, Medicaid programs) and/or the plans and products sponsored or administered by those entities (e.g., health, dental, PPO, HMO and indemnity plans, Medicare Advantage plans, and Medicare supplemental policies). This fundamental definition problem was pointed out in a letter from NCVHS to HHS as early as September of 2010. The resulting confusion was reflected in complaints regarding how to interpret regulatory definitions of "controlling health plan" and "subhealth plan."

Another issue may stem simply from the lengthy period of time it took to promulgate the regulation. HHS originally believed in 2012 that the HPID was presented with multiple and inconsistent numbers to "health plans" issued by a large variety of public and private organizations issuing - company codes issued by the National Association of Insurance Commissioners, IRS employer identification numbers, and proprietary numbers assigned by health care clearinghouses. However, as was pointed out by NCVHS in 2014, the industry in the meantime "has moved to the implementation of a standardized national payer identifier based on the [NAIC] identifier. This identifier is now widely used and integrated into all provider, payer and clearinghouse systems." Continued implementation of the HPID requirement would have required the industry to map or crosswalk existing payer ID numbers to the new HPID, possibly resulting in misrouting of claims.

At the end of this lengthy process, HHS conceded late last year that, "we now better understand the significance of providers being able to identify the payer in a HIPAA transaction…The organization that needs to be identified in transactions is the payer, rather than the health plan." Before it came to this realization, NCVHS recommended to HHS that it "rectify in rulemaking" that HPAA-covered entities not use the HPID and that the current payer ID will not be replaced with HPID. In response, HHS took the step of issuing a "statement of enforcement discretion" that gave it time to review the NCVHS's recommendations and consider any appropriate next steps.

An agency's ability to exercise its enforcement discretion has been the subject of court review under the federal Administrative Procedure Act. The leading case holds that an agency's decision not to take enforcement action is presumed immune from judicial review. That presumption can be overcome, however, if an agency has "consciously and expressly adopted a general policy that is so extreme as to amount to an abdication of its statutory responsibilities." A study published by the Congressional Research Service stated that there is very little case law defining this exception to the general rule, noting that "the dearth of case law relating to agency non-enforcement may be due to the difficulty of finding a plaintiff who has been sufficiently injured by agency inaction to obtain standing." Here, HHS's use of discretionary non-enforcement has enabled it to seek further public input and NCVHS recommendations, leading to the issuance of the recent rule proposing rescission of the HPID requirement. This pause, prior to issuing notice-and-comment rulemaking proposing a prior rule's rescission, can thus be distinguished both from a failure of a regulatory agency to meet a statutory deadline for issuing a rule, and from an agency's blank refusal to undertake its "statutory responsibilities."

Federal case law suggests that if an agency were to make a non-enforcement decision that imposed new legal obligations on the public, or violated specific statutory language specifying when enforcement action is to take place, it might be successfully challenged as acting beyond the recognized limits of its regulatory discretion. An example of how to avoid such a challenge was presented when the IRS issued a notice in 2013 announcing that it would not enforce the "employer mandate" under the Affordable Care Act during 2014, without issuing a new regulation. Because the ACA did not contain specific language as to exactly how that mandate was to be implemented and the IRS action did not impose any new legal obligations on any parties, issuance of a guidance document announcing its enforcement policy was within the agency's recognized discretionary power. These guardrails around agency discretion may be of some comfort to those concerned about the allegedly unchecked power of "the deep state."

This sad regulatory tale highlights the extraordinary difficulty of interpreting statutory language to effectively carry out legislative intent in a complex and rapidly changing industry such as health care. It is a tale of how imprecise or vague legislative language can open the door to an expansive exercise in implementing agency discretion. It is a tale of how, sometimes, a large number of intelligent, experienced people can consider a matter at length and get it disastrously wrong. It is not a tale that is unique or limited to the health care industry. It's a lesson that sometimes complexity in design should be considered not a feature, but a bug.

Peter J. Martin, Esquire, is a partner in the Worcester office of Bowditch & Dewey, LLP, his practice concentrating on health care and nonprofit law.

223rd Annual Oration

"Hope for Haiti: Healing One Patient At A Time"

February 13, 2019 • Beechwood Hotel • Worcester, MA

Orator: Jane A. Lochrie

WDMS Career Night
"If I Knew Then What I Know Now"

January 31, 2019

Moderator: Mary O'Brien, MD
Event Coordinator: Alex Newbury
The Panelists: Josiah Bote, MD • Jonathan Durgan, MD • Justin Chapman, MD
Louis Kuchnir, MD • Laura Desrochers Viens, MPH • Lidia Spaho, MD

Approximately 40 students gathered in the Jacob Hiatt auditorium to learn about "Work/Life Balance." Thank you to our panelists for sharing their wisdom and experiences, and to Dr. Mary O'Brien, Chair of the WDMS Medical Education Committee, Alex Newbury, our student liaison, and Melissa Boucher, WDMS Administrative Assistant, for organizing this event.

Czech National Symphony Orchestra

***Celebrating 100 years of Leonard Bernstein* Preconcert Reception**
Friday, March 1, 2019 • Mechanics Hall, Boyden Salon

Worcester District Medical Society

Calendar of Events

2018

September 14 — Friday, 7:30 a.m., Beechwood Hotel

27TH ANNUAL WOMEN IN MEDICINE BREAKFAST

Speaker: The Honorable Harriette L. Chandler, Massachusetts State Senator for the 1st Worcester District

Cosponsored by Physicians Insurance Agency of Massachusetts (PIAM)

October 11 — Thursday, 5:30 p.m., Beechwood Hotel

13TH ANNUAL LOUIS A. COTTLE LECTURE

Topic: TBD

A generous bequest from the Louis A. Cottle Trust was received allowing WDMS to establish an annual lecture series in memory of Dr. Cottle, a dedicated Worcester physician.

November 14 — Wednesday, 5:30 p.m., Beechwood Hotel

FALL DISTRICT MEETING AND AWARDS CEREMONY

The dinner meeting includes the Dr. A. Jane Fitzpatrick Community Service Award, the WDMS Career Achievement Award, and Scholarship Award Presentations.

November–December 30 & 1 — Friday and Saturday, 9:00 a.m., MMS Headquarters and the Westin Hotel, Waltham, MA

2018 INTERIM MEETING AND MEETING OF THE MMS HOUSE OF DELEGATES

All WDMS members are invited to attend as guests and may submit a resolution to the Massachusetts Medical Society.

December 13 — Thursday, 5:30 p.m., Washburn Hall, Mechanics Hall

HOLIDAY RECEPTION AND A NIGHT AT THE MOVIES

Join us for a holiday buffet and movie with a group discussion to follow.

2019

February 13 — Wednesday, 5:30 p.m., Beechwood Hotel

223RD ANNUAL ORATION

Hope for Haiti; Healing One Patient at a Time

Orator: Jane Lochrie, MD

Dr. Lochrie is the medical director of the St. Anne's Free Medical Program, editor of *Worcester Medicine*, past-president of the WDMS, and current chair of the Personnel Committee. She recently traveled to Haiti for a medical mission.

March 1 — Friday, 7:00 p.m. reception; 8:00 p.m. program, Mechanics Hall

CZECH NATIONAL SYMPHONY

100 Years of Leonard Bernstein, *Candide Overture*, *West Side Story* Dances, Selections from *Trouble in Tahiti* and *Songfest*, and *Mass* Meditations

March 13 — Wednesday, 5:30 p.m., Beechwood Hotel

WOMEN IN MEDICINE LEADERSHIP FORUM

Program to be determined

March 30 — DOCTORS' DAY

Event to be announced

March 30 is National Doctors' Day when patients, friends, family and colleagues honor physicians and express their gratitude for physicians' continuing commitment to patients and exceptional medical care.

The event will be sponsored by the Worcester District Medical Society Alliance.

April 10 — Wednesday, 5:30 p.m., Beechwood Hotel

ANNUAL BUSINESS MEETING

Meeting includes presentation of the 2019 Community Clinician of the Year Award.

May 2 & 4 — Thursday and Saturday, 9:00 a.m., the Seaport Hotel and World Trade Center, Boston

2019 MMS ANNUAL MEETING AND HOUSE OF DELEGATES

All WDMS members are invited to attend as a guest and may submit a resolution to the Massachusetts Medical Society.

May 16 — Thursday, 5:30 p.m., University of Massachusetts Medical School

MEET THE AUTHOR SERIES

"Attending"

Author: Ronald Epstein, MD, professor of Family Medicine, Psychiatry, Oncology and Medicine (Palliative Care), University of Rochester School of Medicine and Dentistry

Cosponsored by WDMS and Humanities in Medicine Committee of the Lamar Soutter Library at the University of Massachusetts Medical School

Save the Date

Worcester District Medical Society

225th Anniversary

1794 - 2019

Gala Celebration

Friday, September 27, 2019

Central Massachusetts Agency on Aging, Inc.

ElderCare 2019

Educational Event for Seniors including Raffle Bonanza!!

FREE EDUCATIONAL EVENT

Dynamic & Distinguished Speakers

Including:

Dr. Michelle Hadley, Cardiologist St. Vincent Hospital

Worcester County Sheriff Lew Evangelidis

Worcester County's Finest - First Responder Panel featuring—

WPD Chief Steven Sargent

Special Retirement Celebration — Dr. Robert Dwyer, CMAA Executive Director

Wednesday, June 12, 2019 from 9:30 am - 1:30 pm

Worcester State University

486 Chandler Street, Worcester, MA

ElderCare 2019 will take place at the Wellness Center

No Admission FREE for Seniors! ★ Plenty of Free Parking

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