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NEWSLETTER – VOL. VII

CONTENTS

CAR-T IN CONTEXT

2017 has been a landmark year that has seen the approval of two new immunotherapies known as chimeric antigen receptor T-cell (CAR-T) therapies, which are gene edited immune cells designed to recognize and attack certain cancers delivered in a one-time infusion. Much has been said about these products, and more still will be said as it is expected that these products get approvals in new indications, as well as the first-time approvals of other CAR-T products. Given the sophisticated science and novelty behind CAR-T, they are often mentioned in the same breath as gene therapy products. In some instances this may be merited, while in others it may sell CAR-T short relative to the slate of already approved gene therapies. Here, we will highlight key aspects of CAR-T, some lingering questions following these initial approvals, and points of differentiation from other gene therapy products.

Kymriah was the first CAR-T product approved in the US this year for certain acute lymphoblastic leukemias, and Yescarta was subsequently approved for certain large B-cell lymphomas. In both cases, eligible patients have already failed multiple lines of chemotherapy and even failed bone marrow transplantations (BMT) for their blood cancers. CAR-T has been shown to take patients who were otherwise nearly on death's doorstep and given some what appear to be fairly durable remissions. The upper bound of this range is still unknown simply because trial patients continue to be followed out in real time. In the case of Kymriah, roughly half of patients in clinical trials had a previous BMT, while 8% had two or more BMTs. With standard of care, these patients would otherwise have a median survival of roughly four to seven months, versus some patients out over 14 months post CAR-T treatment and still being followed. These late line ALL patients have had a near doubling of complete responses (disease remission) of roughly 83% versus roughly 20-40% depending on standard of care chemotherapy. Other patients, while they may initially have a good response to CAR-T but subsequently relapse, have gone on to a repeat CAR-T treatment in clinical trials, or possibly BMT. However, the interim CAR-T treatment is thought to improve post-BMT prognosis for some of these patients.

INSTITUTIONAL COMPLEXITY

The technical skillset required to administer these therapies limits the universe of locations to a select number of specialized cancer treatment centers, typically the centers of excellence that have historically performed the more difficult BMTs. Most of these centers, who also participated in the registrational trials, issued press releases in the hours and days following the approvals of these products noting their involvement in clinical trials and plans to offer commercially, as a testament to the medical community's excitement for them. There is also a competitive advantage for these types of centers to be proficient in the delivery of CAR-T, as more products and indications are expected to

follow, as mentioned above. It will likely only be incrementally more difficult to offer additional CAR-T options as compared to the initial legwork of preparing to offer CAR-T. This complexity is due to several factors: patients are already very sick before they arrive for treatment, and that a multi-specialty team needs to be assembled to deal with any side effects that may arise. The timing and severity of these side effects, most notably cytokine release syndrome (CRS), is somewhat variable, occurring anywhere from days to weeks post-infusion.

Though the administration of CAR-T is a simple infusion, many centers are choosing to administer in the inpatient setting rather than outpatient, as then there is some internal control over the availability of medical or neurological intensive care unit beds if and when CRS occurs. CRS is a result of the CAR-T cells destroying the patient's cancer burden, with that destruction causing a release of cytokines. The release of cytokines in general does not produce such a severe side effect, but rather the volume of cytokines the body needs to deal with as a result of the CAR-T doing its job so well. Some patients need to be placed into a medically induced coma depending on the severity of CRS. While a difficult side effect, it is somewhat of a catch-22 as it is a sign that the CAR-T is working appropriately.

There is an expectation that over time, the administration will migrate outpatient as we gain a better understanding of pre-treatment parameters that may influence the likelihood of severe CRS, and patients can be triaged for in or outpatient administration as appropriate.

OTHER LOGISTICAL CONCERNS

Novartis, the maker of Kymriah, announced a price of $475,000 upon approval, leading many to speculate that this was effectively the price of a cure for any CAR-T product, in any indication. However, Novartis also said it plans to pursue indication-based pricing for Kymriah, such that future approvals for the drug in other indications, with larger or smaller patient populations, could come with lower or higher prices, accordingly. Further, the Swiss pharmaceutical company said it has a collaboration in place with the Centers for Medicare and Medicaid Services (CMS) where CMS would only have to pay for Kymriah in patients who responded by the end of the first month after the one-time treatment.

As of yet, there are scant details on the CMS arrangement which some have criticized to be more optics than substance. There are several issues at play: that the one month outcomes point is less relevant than a three month clinical endpoint; concerns that what amounts to giving Kymriah away for free to patients who do not respond at one month would trigger anti-kickback concerns related to the Medicaid best price rule (whereby state Medicaid plans are supposed to have the least expensive drug prices compared to other government and commercial payers – so if a patient gets Kymriah for free because he/she did not respond, Medicaid patients are no longer getting the best price); and logistics of how to navigate indication-based pricing in the current infrastructure, whereby drugs are typically given a single billing code, applicable to all indications. Currently, both products are generally relegated to using unclassified billing codes, and the normal cycle and processes for new billing and procedure codes can take several years.

Subsequent press reports[1] have noted that Novartis has said it will be able to navigate these issues under the auspices of CMS' Center for Medicare and Medicaid Innovation (CMMI). The CAR-T specific demonstration project under CMMI will supposedly provide for subsequent distinct billing codes that are indication specific once follow-on indications are approved. Still, details of any such arrangement have not yet been released by CMS. The small patient population for the currently approved indication, less than 600 incident cases per year, should obviate the best-price concerns given that any unique payer is unlikely to see multiple claims in the same quarter.

[1] https://pink.pharmaintelligence.informa.com/PS121853/CART-IndicationBased-Pricing-May-Be-Evaluated-In-Medicare-Demo

Some two months after Kymriah's approval came the approval for Yescarta. Though its owner, Gilead Sciences, had paid $12 billion dollars earlier this year to acquire Kite Pharma, the original maker, it priced Yescarta at $373,000, coming in notably lower than expectations. No outcomes-based contracts have been specified for now.

Despite the high price tags and lack of clarity on the outcomes agreement, there does seem to be some resolve from both providers and payers to push ahead, though it is early days and still slow going. A recent news article reported only 5 patients have yet been treated with Yescarta as of mid-December, citing predominantly reimbursement issues from Medicare and Medicaid as being the rate-limiting factor[2]. Still, CAR-T treatment centers have had to assume a certain amount of financial risk just to become equipped to administer CAR-T, before even commercially treating a single patient, and there is still some willingness to take on risk with the first few patients if it means ironing out the process with different payers.

COMPARISON TO GENE THERAPY

The early bumps for CAR-T may leave some people keen to portend a similar fate for CAR-T as compared to some of the early gene therapy approvals in Europe, though this would not do CAR-T justice. There have been two European gene therapy approvals - Glybera, manufactured by UniQure, first approved in the EU in 2012 for an ultra-rare genetic disorder called lipoprotein lipase deficiency, and Strimvelis, for a rare autoimmune deficiency, developed by GlaxoSmithKline and approved in 2016. Neither of these products has fared well. In fact, in October UniQure announced that it would not renew the therapy's market authorization, and Glaxo has put Strimvelis up for sale after only a single digit number of patients were treated.

There are several factors which might determine whether or not these highly novel therapies are commercially successful. These include price tag, number of potential patients, ability for patients to access the treatment, and the degree of unmet need the therapy addresses. In Europe, it might be easy to point to high price tags as the reason for the gene therapy failures, with list prices of $1 million and $600,000, respectively, particularly as the EU system is far less tolerant of high drug prices. However, this was countered in part by innovative approaches, such as the money back guarantee for Strimvelis if the drug lacked efficacy. But it is also clear these weren't perfect drugs. Glybera, for instance was only tested in 27 patients and failed to demonstrate lasting effects. In contrast, the CAR-T clinical data is comparatively much more robust, and there are more than 30 treatment centers certified to administer these products at present in only the first few months post-approval.

Against that backdrop, with two US CAR-T approvals, and two European gene therapy approvals under our belts, the first gene therapy in the US was just approved – Luxturna, an ophthalmic gene therapy.

While Spark has not yet announced pricing for Luxturna, its CEO has previously said publicly that economic modeling studies would support a price tag over $1 million. An analysis done by *MIT Technology Review* would seem to closely corroborate that number[3]. By plotting the incident patient populations and prices of the four approved CAR-T and gene therapy products, and knowing the incident patient population for Luxturna of fewer than 30 patients per year, it interpolated a price around $900,000, effectively coming in between Glybera and Strimvelis, but on the opposite end of the spectrum from the CAR-T products. Spark has indicated it plans to announce pricing details in January, at which point we may get better clarity on whether Luxturna's launch will look more like that of the EU gene therapies or the US CAR-T products.

- by Christine Livoti

[2] https://www.bloomberg.com/news/articles/2017-12-14/cancer-patients-with-little-time-left-wait-for-gilead-s-new-drug

[3] https://www.technologyreview.com/s/609197/tracking-the-cost-of-gene-therapy/

NEW AND NOTEWORTHY APPROVALS FROM 2017

Having just discussed some of the important approvals from 2017, we wanted to dive deeper into other therapeutic areas, and also cover new device and digital health approvals. Below, we recap other significant approvals from this year.

PRODUCT	MANUFACTURER	INDICATION	APPROVAL DATE	WHAT YOU SHOULD KNOW
Dupixent (dupilumab)	Regeneron Pharmaceuticals and Sanofi	Moderate-to-severe eczema (atopic dermatitis)	March 2017	First biologic medication approved for this skin condition that results in cracked, dry, itching or oozing skin. It follows several approvals for biologics for psoriasis and other psoriatic conditions in recent years.
Ingrezza (valbenazine)	Neurocrine Biosciences	Tardive dyskinesia	April 2017	First drug approved to treat the abnormal, involuntary movements characteristic of tardive dyskinesia, a serious side effect sometimes seen in patients who have taken antipsychotic medications.
AirDuo RespiClick (fluticasone propionate and salmeterol)	Teva Pharmaceuticals	Maintenance treatment of asthma	April 2017	Competitor to GlaxoSmithKline's Advair, a blockbuster asthma drug, with the same active ingredient. Generic competition is still pending.
Renflexis (infliximab-abda)	Samsung Bioepis	Rheumatoid arthritis, adult ulcerative colitis, plaque psoriasis, psoriatic arthritis, ankylosing spondylitis, and Crohn's disease	April 2017	Second biosimilar approved in the US to Janssen's Remicade.
Brineura (cerliponase alfa)	BioMarin Pharmaceutical	Batten disease	April 2017	Enzyme replacement therapy for a pediatric neurologic disease that helps children retain the ability to crawl or walk.
Radicava (edaravone injection)	Mitsubishi Tanabe Pharma Corp.	Amyotrophic lateral sclerosis (ALS) (Lou Gehrig's disease)	May 2017	After a six month trial conducted only in Japan yielded positive results, the FDA approached the company for a US filing for the drug.
Endari (L-glutamine)	Emmaus Life Sciences	Amino acid deficiency resulting from sickle cell disease	July 2017	Indicated to prevent sickle cell attacks. Approval thought to bode favorably for Global Blood Therapeutics' GBT-440, currently in Phase III study.
Vosevi (Sofosbuvir/veltapasvir/voxilaprevir)	Gilead Sciences	Hepatitis C	July 2017	First drug combination approved to treat all genotypes of the hepatitis C virus.
Kymriah (tisagenlecleucel)	Novartis	Relapsed acute lymphoblastic lymphoma	August 2017	First CAR-T product approved.

Cyltezo (adalimumab-adbm)	Boehringer Ingelheim	Rheumatoid arthritis, plaque psoriasis, psoriatic arthritis, ankylosing spondylitis, Crohn's disease and ulcerative colitis	August 2017	Second biosimilar to AbbVie's popular Humira approved in the US. Launch date is unknown due to patent disputes.
Mvasi (bevacizumab-awwb)	Allergan and Amgen	Metastatic colorectal cancer, non-squamous non-small cell lung cancer, glioblastoma, metastatic renal cell carcinoma, and cervical cancer	September 2017	First biosimilar to Genentech's Avastin. Not approved in three indications still protected by orphan exclusivity – ovarian, fallopian tube, and primary peritoneal cancers. Commercial launch not expected before 2019.
FreeStyle Libre Flash Glucose Monitoring System	Abbott Diabetes Care	Blood glucose monitoring	September 2017	First continuous glucose monitoring system that does not require blood sample calibration.
Glatiratemer acetate injection, 40mg	Mylan Pharmaceuticals	Relapsing-remitting multiple sclerosis	October 2017	Generic to Teva's best selling Copaxone. While not a true biosimilar, Copaxone is a complex biologic drug to manufacture.
Yescarta (axicabtagene ciloleucel)	Kite Pharma, a Gilead company	Relapsed or refractory diffuse large-B cell lymphoma	October 2017	Second CAR-T approval in the US.
Heplisav-B	Dynavax	Hepatitis B vaccine	November 2017	Two dose vaccine Toll-Like Receptor 9 agonist that increases immune response. Existing vaccines are three doses.
Abilify Mycite (aripiprazole tablets with sensor	Otsuka and Proteus Digital Health	Bipolar disorder, major depressive disorder, and schizophrenia	November 2017	Drug contains a sensor to track ingestion. When the sensor comes in contact with a patient's stomach acid, a signal goes to a patch worn by the patient as a way to measure adherence.
Juluca (dolutegravir and rilpivirine)	ViiV Healthcare	HIV	November 2017	First two-drug combination to treat HIV, compared to conventional three drug combinations.
Sublocade (buprenorphine extended release)	Indivior	Opioid use disorder	November 2017	First once-monthly injection of buprenorphine, compared to daily doses or weekly patches.
Ogivri (trastuzumab-dkst)	Mylan Pharmaceuticals	Certain breast or metastatic stomach cancers	December 2017	First biosimilar to Herceptin. Launch date unknown.
Luxturna (voretigene neparvovec-rzyl)	Spark Therapeutics	RPE65 mutation-associated retinal dystrophy	December 2017	First US gene therapy approval.

PEER-REVIEWED ABSTRACTS

As part of Deerfield's mission of advancing healthcare, the Deerfield Institute is committed to publishing its proprietary research in peer-reviewed, open access scientific journals. Below is a selection of some of our recently published work. More information on the Deerfield Institute, and copies of certain past publications are available on the web at Deerfield.com/Institute.

CONTEMPORARY CLINICAL TRIALS COMMUNICATIONS

GLOBAL PERSPECTIVE ON COLONOSCOPY USE FOR COLORECTAL CANCER SCREENING: A MULTI-COUNTRY SURVEY OF PRACTICING COLONOSCOPISTS

CÉLINE AUDIBERT, ANNA PERLAKY, DANIEL GLASS

ABSTRACT

Objectives

To examine colorectal cancer screening practices among colonoscopy specialists from 5 countries and inform public health needs in improvement of the ongoing global crisis in colorectal cancer.

Methods

An online survey among colonoscopy specialists was conducted in France, Germany, the United Kingdom, Japan, and the United States. The survey covered topics on colonoscopy practices in the screening as well as in the treatment setting, as well as expected trends.

Results

Participating colonoscopy specialists included 114 physicians from the United States, 81 from France, 80 from Germany, 80 from the United Kingdom, and 156 from Japan. Survey results revealed that 59%–73% of colonoscopies were performed in patients aged 50–75 years old, with 15%–23% performed in patients <50 years old. The proportion of patients with age-based versus symptom-based first colorectal cancer screening varied by country and age. Sedation protocols varied by country; however, rate of incomplete colonoscopy was low in all countries. The proportion of negative first colonoscopies decreased with age in all countries.

Conclusions

This multi-country survey of real-world clinical practices suggests a need for improved participation in population age-based colorectal cancer screening and possibly younger age of screening initiation than currently recommended by guidelines. The variation among countries in the proportion of patients who received their first colonoscopy due to age-based colorectal cancer screening versus symptom-based initial colonoscopy indicates that population-based screening initiatives and improved health outcomes will benefit from public health awareness programs.

OPEN ACCESS EMERGENCY MEDICINES

NATIONWIDE TRENDS OF CLINICAL CHARACTERISTICS AND ECONOMIC BURDEN OF EMERGENCY DEPARTMENT VISITS DUE TO ACUTE ISCHEMIC STROKE

MARK STUNTZ, KATSIARYNA BUSKO, SHUMAILA IRSHAD, TAYLOR PAIGE, VERANIKA RAZHKOVA, TIM COAN

ABSTRACT

We aimed to provide estimates of the volume and associated charges of acute ischemic stroke (AIS) visits in the US, as well as to assess predictors of patient disposition following an emergency department (ED) visit for AIS. Our study was conducted using the 2010–2013 data from the Nationwide Emergency Department Sample. We identified adult visits with AIS as the primary diagnosis. A generalized linear model was used to calculate mean charges per visit after adjusting for covariates. Multinomial logistic regression was used to assess predictors of patient disposition following an ED visit for AIS. The national incidence did not appreciably change over time, increasing from 26.4 to 27.0 visits per 10,000 adults. Adjusted mean charges per event were highest in the West, increasing from $3,761 in 2010 to $4,575 in 2013. Multinomial logistic regression showed that older age was associated with increased likelihood of both hospital admission and mortality in the ED, while male sex was associated with lower odds of mortality in the ED. Despite improvements in primary and secondary prevention of cardiovascular disease, AIS remains a significant burden on the health care system with a high volume of ED visits and increasing charges for care.

IP CORNER

Intellectual Property (IP) is a vital asset to any emerging company in the healthcare space. Here, we highlight noteworthy trends and events in the IP realm with implications for both young and established healthcare companies alike.

OIL STATES ENERGY SERVICES, LLC V. GREENE'S ENERGY GROUP, LLC

On November 27, 2017, the Supreme Court heard oral arguments in the *Oil States Energy Services, LLC v. Greene's Energy Group, LLC* case. The parties argued whether the *inter partes* review (IPR) process violates the Constitution by permitting a non-Article III court to invalidate patents. If the Court rules that the IPR procedure is unconstitutional, this popular form of adjudication will be eliminated and all patents previously invalidated in IPR proceedings will be restored. Many pharmaceutical products may be affected by this decision.

IPRs are trial-like adjudication proceedings introduced by the America Invents Act on September 16, 2012. Congress was concerned with low quality patents and created IPRs to provide a rapid low-cost alternative to litigation. They allow any party to challenge the validity of an issued patent based on published prior art. The Patent Trials and Appeals Board (PTAB) of the U.S. Patent and Trademark Office conducts the proceedings between the patent owner and the petitioner who challenges the patent's validity. The PTAB is an "Article I" tribunal within the executive branch, not an "Article III" court within the judicial branch.

Oil States argued that IPRs are unconstitutional because patents are private property rights historically adjudicated by Article III courts. Therefore, IPRs are an improper exercise of judicial power by an executive agency. Oil States also argued that the IPR is not an adjudication of a public right because it is a proceeding between two private parties and not an action against a government agency.

Greene's Energy argued that IPRs are constitutional because patents are public rights, rights that exist exclusively by an act of Congress to promote the progress of useful arts. As such, these proceedings are rightfully conducted by the executive branch, merely with the assistance of a third party. IPR proceedings correct mistakes made by the USPTO in issuing "bad" patents. Justice Sotomayor questioned whether there is really any constitutionality issue because IPR decisions are still under the purvey of the Article III court: IPR decisions can be appealed to the Article III appellate court.

The views on IPR proceedings are mixed. Large technology firms like Alphabet's Google and Intel Corp filed briefs in support of Greene's Energy. High tech industries are besieged by nuisance litigation from non-practicing entities known as "patent trolls" and so largely welcome the proceedings. The reaction from the life science industry was far more mixed. While the intent of IPRs was to provide an alternative to litigation, they have in practice provided alleged infringers with an additional chance to invalidate a patent, often resulting in duplicative adjudication. The Pharmaceutical Research and Manufacturers of America (PhRMA), the Biotechnology Innovation Organization (BIO) and the Association of University Technology Managers (AUTM) have filed briefs in support of Oil States.

The U.S. Supreme Court justices appeared divided during the hearing. The Court's liberal justices appeared to support the constitutionality of the review process. The conservative justices appeared concerned with non-judicial review. The Court will likely issue a decision in the first half of 2018.

- by Mark Shtilerman, Senior Counsel

CAUGHT OUR EYE

A recent peer-reviewed paper written by employees of Lundbeck, the Danish pharmaceutical firm, looked at evidence standards for regulatory approvals of new medicines by the European Medicines Agency. In the 2012-2016 time period, 45% of new active substances were approved on the basis of a single pivotal clinical trial, whereas two positive, randomized and controlled clinical trials have been thought of as the rule rather than the exception. The authors argue the findings indicate greater flexibility to conduct case-by-case evaluations of new medicines for serious disease. *Clinical Pharmacology & Therapeutics*

Amazon has been making waves the last several months for many players in the healthcare space, including distributors, wholesalers, and even generic drug companies. In October, it was reported the e-commerce company was in the final stages of figuring out its strategy in the prescription drug market. *CNBC* Since then, Amazon has gained licensure status in roughly 12 states as a wholesaler, *St. Louis Post-Dispatch*, though a set of pending licenses in the state of Maine were ultimately cancelled *Business Insider*. More recently, it was reported Amazon was holding exploratory talks with several generic drug makers about potential entry into that market *CNBC*.

In November, it was announced that the European Medicines Agency headquarters are moving to Amsterdam in the wake of Brexit. The transition is expected to finish in the first half of 2019. While 19 European cities vied to take the seat of the drug regulator away from London, Amsterdam ultimately won out over Milan and Copenhagen in the final rounds of voting. *Regulatory Affairs Professional Society*

Despite the wave of additional transparency and public disclosure at the FDA since Scott Gottlieb took the helm as Commissioner, the drug regulator noted Complete Response Letters (CRL) will likely not be made public in due course any time soon. CRLs have historically not been made public as the information contained in them is considered to be commercially sensitive, though investors and biopharma competitors alike have wanted greater insight into these road blocks to approval. Gottlieb cited FDA's bandwidth to redact CRLs as appropriate before public release as one barrier to making these public, while staff resources might be better allocated to higher priority agency initiatives. *The Pink Sheet*

High out-of-pocket spending for Americans with health insurance through large employers is on the rise, according to a recent analysis done by the Peterson Center on Healthcare and the Kaiser Family Foundation. From 2005 to 2015, the percentage of enrollees with out-of-pocket spending above $1,000 grew from 17% to 24%. Older enrollees, patients with diseases of blood organs, and patients with heart and circulatory diseases also experienced higher out-of-pocket spending in the same analysis. *Peterson-Kaiser Health System Tracker*

The FDA has several expedited development pathways available to drugmakers that promise to shave the overall development timeline. A recent paper looked at which pathways, if any, actually have proven to do so. From 2012 to 2016, drugs with breakthrough designation had median development times of 4.8 years versus 8 years for non-breakthrough therapies. Fast-tracked drugs had median times of 7 years versus 8 for those without an expedited status. Priority review was not associated with overall faster development timelines. *JAMA*

Following its initial July announcement on digital health initiatives, the FDA recently released three policy documents outlining the proper approach and development of innovative digital health tools. These documents would affect the development of tools such as fitness trackers and those used for insulin administration. A public workshop will be held in January to discuss the agency's pilot precertification program. *FDA*

Pharmacy giant CVS has announced its plans to acquire Aetna, one of the nation's largest health insurers, for $68 billion. The deal would put the combined entity on more equal footing with UnitedHealth Group, which already has a pharmacy benefit manager, OptumRx, integrated into its health insurance business. Others view the deal as a preventive measure to get ahead of any movement by Amazon into the healthcare space. US regulators still need to give the deal its blessing before it might close, which CVS does not expect before the second half of 2018. *The Wall Street Journal*

DEERFIELD FOUNDATION

The Foundation has formed 39 partnerships and invested and committed over $34 million for the advancement of children's health in its 10 years, ranging from health clinics in Nepal to a mobile medical home for children in the South Bronx. In this newsletter we would like to highlight just one of the organizations that we feel is helping us fulfill our mission of advancing healthcare. We are proud to be critical supporters of Children's Health Fund (CHF).

CHILDREN'S HEALTH FUND

Mission: CHF is committed to providing health care to the nation's most medically underserved children through the development and support of innovative, comprehensive primary care programs, reducing the impact of public health crises on vulnerable children, and promoting the health and well-being of all children.

Partner since: 2007

Description: In 1987, the program was started with a single mobile medical clinic bringing care to children in homeless shelters. Today, through a national network, CHF provides care for 350,000 children in disadvantaged rural and urban communities through 50 mobile medical clinics and 301 medical service sites. Its Flagship Program in NYC serves Harlem, the South Bronx, and the NYC homeless population.

Total Funding: $6.8 million

The Deerfield Perspective: The need for the services of the CHF has grown over the years given the negative health outcomes associated with homelessness. The number of homeless in NYC is still growing with 14% more homeless families in the past year, and nearly 24,000 children sleeping in the NY municipal shelter system each night. The issue of homelessness is complicated by a dearth of affordable housing in NYC and also by the breadth and quality of homeless services available. Furthermore, drawing homeless patients into care is complicated. Homeless families are under pressure to address permanent housing, employment, and public assistance without delay; health care is often put on hold. In the South Bronx, poverty accompanied by high rates of substandard housing, homelessness, food insecurity, domestic and community violence, emotional distress, and unhealthy behaviors contribute to the high disease burden in the neighborhoods served by our program. The South Bronx, or NY Congressional District 15, is one of the poorest districts in the U.S. and where 47% of families with children live below the federal poverty line. Of 42 neighborhoods in New York City, the South Bronx community ranks last in most health indicators.

CHF Perspective: Children's Health Fund is enormously grateful for the ten years of our signature partnership with the Deerfield Foundation. Thanks to this extraordinary support, our New York Program is able to provide the highest quality, comprehensive care to thousands of the most vulnerable New Yorkers each year—to over 11,000 medically underserved kids and their families (homeless and domiciled) annually, who, otherwise, would not be able to see a doctor. In fact, from 2010 to 2016, the number of unique patients served at the New York Program increased by 26%. Without Deerfield support, it would have been impossible to grow capacity to meet the demand.

Most Recent Projects Funded: **Deerfield Child and Family Health Clinic**

In 2017, the Deerfield Foundation granted $300,000 to the Deerfield Child and Family Health Clinic. One in five visits at the clinic is by an uninsured patient, who is often undocumented and ineligible for Medicare/Medicaid coverage. The grant covers the funding gap at the clinic allowing it to enhance the services

and health care access for homeless children. The number of homeless children has grown 12% in the past year and is now at the highest level since the great depression. As a result of rising homelessness, the clinic began an expansion in 2015. This expansion is now complete and has more than doubled the capacity of the clinic

New York Flagship Program

In 2017, the Deerfield Foundation granted $100,000 to the NY Flagship Program to help fund all healthcare visits at the Flagship Program, which includes the NY Children's Health Project and the South Bronx Health Center. The program continues to deliver easily accessible and comprehensive medical, mental health, dental and case management services to thousands of underserved kids and their family members. Nearly all of the patients served by the New York Flagship Program live below the federal poverty line. These children have higher rates of chronic illnesses such as asthma, diabetes and depression. Despite having sicker patients, the program scored higher than the national average for commercially insured patients on six of eight measures of quality, including the number of children immunized by the age of three, the number of children with persistent asthma on an inhaler, and the number of children assessed for body mass index. In 2017, the homeless program is expected to reach 3,200 patients through 18,000 encounters. The South Bronx Health Center expects to reach an additional 7,900 patients through 50,000 visits.

NEWS YOU MAY HAVE MISSED

We've been busy at Deerfield the last few months! Here is a sampling of some of what we've been up to:

Deerfield Management Completes Acquisition of Adeptus Health
October 2, 2017
Read More

Wall Street Journal publishes, "Deerfield Management to Fund Biology Research at Broad Institute" by Jonathan D. Rockoff
October 10, 2017
Read More (subscription required)

Broad Institute and Deerfield Management launch innovative partnership to tackle serious unmet medical needs
October 10, 2017
Read More

Deerfield and The Johns Hopkins University Announce Collaboration to Catalyze Early Stage Therapeutic Research
November 16, 2017
Read More

Deerfield Supports Melinta Therapeutics Acquisition of The Medicines Company's Infectious Disease Business with a $240 million Commitment to Melinta and a $100 million Commitment to The Medicines Company
November 30, 2017
Read More

Deerfield Discovers Gender Affects Treatment and Outcome in Abdominal Aortic Aneurysm
December 21, 2017
Read More

MEET THE ASSOCIATES

Beginning in 2015, Deerfield started the Deerfield Fellows program, designed to attract students with interest in pursuing healthcare or finance fields from local NYC-area colleges and universities from diverse backgrounds for an immersive summer internship program. Successful summer interns are invited to stay through a yearlong Deerfield Fellowship program, with the most successful of those graduating to become Associates at Deerfield. We are extremely proud of the work our Associates do, and here will highlight an Associate in each issue.

MEET SHUMAILA IRSHAD

WHAT INITIALLY DREW YOU TO THE FELLOWS PROGRAM?

I always wanted a career in finance, but I was told that I would have a greater chance at success if I pursued medicine. My family is full of doctors so everything about my path was predetermined and choosing medicine would have been the path of least resistance. In college, I majored in management and minored in finance, while staying on the pre-med track. However, when I saw the flyer for the fellowship, I was immediately drawn to it. It was the perfect integration of finance and healthcare. It was the best utilization of everything I had learned, and I honestly could not have asked for anything better. At the start of the fellowship, I had already applied to medical school, but by the time the fellowship ended, I had already made my decision.

WHAT IN YOUR EXPERIENCE HAS MATCHED YOUR EXPECTATIONS ABOUT BEING A DEERFIELD FELLOW AND NOW ASSOCIATE?

I always wanted the ability to learn about trading and deal making from the experts, but I thought that was impossible. I thought, as a new employee, I would never get to interact with management. At Deerfield, I am able to have as many conversations with anyone and everyone, and take advantage of any and all opportunities to learn from the experts. Deerfield is nothing I could have expected. Everything at this company continues to surpass my expectations.

DESCRIBE A TIME OR TIMES YOU FOUND TO BE UNEXPECTED.

As a Fellow, I did not expect to be valued in the way that I was. The most unexpected moment was when we had to pitch the company on which we were conducting diligence during the morning meeting to our investment team. Afterwards, many of the partners commended us on a job well done. It illustrated the collaborative and encouraging atmosphere at Deerfield.

As an Associate, I did not expect to be incorporated into every deal that my team works on. Having the ability to play a pivotal role in our diligence process and interact daily with external management at these companies has been nothing short of incredible.

DESCRIBE YOUR MOST MEMORABLE EXPERIENCE AT DEERFIELD.

When I was a Fellow, every Monday, Jim would give us lessons on Deerfield and healthcare finance. He got to know us, and he always made an active effort to make himself available to us. The lessons, combined with the insight gained from the rest of the fellowship, completely reformed the way I think. My interactions with Jim coupled with the leadership and teachings from Tim became the basis for why I love working at Deerfield.

WHAT ADVICE WOULD YOU GIVE TO FUTURE FELLOWS?

Take advantage of your position and your environment. You are surrounded by some of the most intelligent and successful individuals in healthcare and finance, and they are willing to teach you. Just be curious, ask questions, and explore.

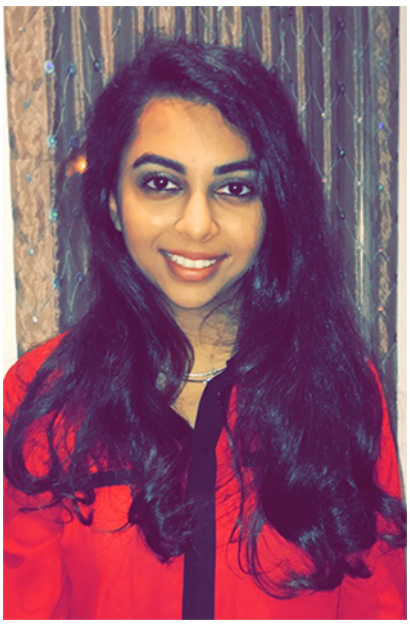

Photo courtesy of Shumaila Irshad

WHEN NOT AT DEERFIELD, I CAN BE FOUND:

Walking my cat around the neighborhood while catching up on the news.

ONE FUN FACT ABOUT YOU!

I have a chocolate cake every morning for breakfast.

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If you have any questions about this newsletter, please contact Karen Heidelberger at karenh@deerfield.com.