GENE THERAPY – "THERAPY" NOT MEDICATION

A white paper on understanding gene therapy

What is Gene Therapy?

Gene therapy is all the BUZZ in conversations about medication cost control and yet it is not a medication. So what is gene therapy and what makes it different than the 'medications' of the past. Why should we as stewards of health care cost mitigation be experts in understanding what gene therapy is, and how can that make us better at managing the costs associated with it. We are going to dive-in to the world of gene therapy in a way that all of us can understand it, from our clinicans to our financial analysts.

Gene therapy is truly a therapy. Most of us think about therapy as a medical treatment like physical therapy. When we think about medications, we think about a tablet or capsule, truly some chemical compound, something that we ingest, inject, inhale or rub on our skin. Gene therapy, like a medication, is used to treat a disease or condition, but unlike medications it is not some chemical compound or created biologic – it is truly unique. It is a therapy that allows the human body to treat or cure itself. How? It gives your body the genetic code to make what it needs.

Gene therapy is something that we can all be very excited about, and yet concerned in that same moment. Excited about a world in which gene therapies can become cures to diseases, some of which to date are without any curative treatments. Concerned at the extreme costs associated with these unique therapies.

2020 – The Year of the Virus

COVID-19 and the pandemic has lead to a much more educated population about viruses. Why is this important? Understanding COVID-19 and the vaccine we used to innoculate our population against the virus is a great 'starting point' in understanding gene therapy.

COVID-19, is a coronavirus which infects our cells by attaching and inserting the viral material into our cells. Understanding how vaccines enter our cells happens to also hold the key to understanding our vaccines used in the COVID-19 pandemic.

A viral vector can be thought of like a shuttle craft carrying the infectious virus (aka COVID-19). The viral vector by itself is not harmful, but when it lands, it creates a gateway opening up the cell and delivering the viral material for the coronavirus right into a normal healthy cell.

Like we said, the viral vector is just the shuttle craft, so the vaccine that was developed gets into our cells the same way, but instead of shuttling an infectious virus, the vaccine shuttles the mRNA (messenger RiboNucleic Acid) – which is nothing more than a recipe or blueprint that tells our cells what to make to fight the coronavirus.

2020 may have been the year of the virus we all remember, but it also made the word **VIRUS** a household term and so many aware of **mRNA** technology. Keep this in mind as we dive into the world of gene therapy.

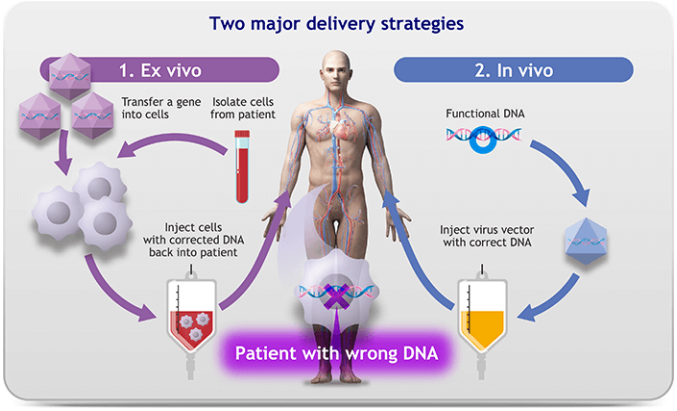
Gene therapy is unique in that it delivers on a new promise. A promise to deliver the blueprint to our human bodies that can help our bodies heal, fight, and cure diseases. It is not a medication meant for symptoms or fighting disease from the outside. Instead, gene therapy allows the body to be fixed from the inside.

Types of Gene Therapy

In Vivo and Ex Vivo. Sounds like complex science terms, but let's keep it simple. We health care junkies love our Latin, but let's use English. In Vivo – just remember it as IN THE BODY. Ex Vivo –you guessed it, OUT OF THE BODY. Literally this is just a definition of where the treatment took place. Whoa, Whoa. Treating outside the body? Yes, this isn't new right? Think about how we create embryos in a lab before implanting them into a hopeful woman who wants desperately to be a mom. The laboratory is where we did the creation of what can be a new life form, and with Ex Vivo those same labs can be used to insert a blueprint or recipe into our cells. So how do In Vivo and Ex Vivo work, and why should we care? Well, it is super important because with medications, we had pharmacies, wholesalers, manufacturers creating those chemical compounds, and with biologics, we were going to ingest, inject, etc. But in the world of gene therapy the players are different because of the way in which these therapies, not medications, occur in our medical system.

In Vivo (IN THE BODY)– Much like a vaccine, In Vivo treatment inserts a viral vector into the person's body. We let that shuttle craft carry the blueprint or recipe in its safe interior, and once it lands on the cell and inserts the blueprint, the body's cells can get to work using it to create the items needed to fight and sometimes even cure the disease.

Ex Vivo (OUT OF THE BODY)– In Ex Vivo, the treatment includes removing cells from the body and sending them to a lab, the lab then genetically modifies (typically transduction using a viral vector) to include a gene intended to treat disease, and then amplifies the volume of cells. Finally, the re-engineered cells are returned to the patient through a medical infusion procedure.



https://www.modalistx.com/en/science/gene-therapy/

Viral vector

Virus vectors are treatment tools used to deliver genetic material into cells of a patient with a disease resulting in wrong DNA. It utilizes the virus's ability to transduce DNA/RNA into cells.

Examples of a Gene Therapy

Zolgensma® changed the game in the medication market nearly over night. This chart topper for cost carries a price tag of $2.125 million for a single treatment. The cost of this novel therapy creates great discussion on how to incorporate into the benefit (should it be covered, under which benefit, can the plan afford these high-cost therapies) (which can be brought into future discussion), for now, we will use Zolgensma® as a case example of how gene therapy can be a hallmark of the future treatments using gene therapy.

Spinal Muscular Atrophy (SMA) is a rare childhood disease which causes muscle erosion leading to extreme muscular weakness and pulmonary infections; A previously untreatable condition that occurred in only 1 or 10,000 births, but was the leading cause of infant mortality.

Charleigh Jones – celebrates her THIRD birthday

Born with SMA, Charleigh's diagnosis was devastating; she would never sit up or eat on her own, her parents, Charles and Lacey, were told she would be dependent on a ventilator, and that she had a life expectancy of about 2 years of age. However, with a then experimental gene therapy, she has defied her original odds. She was the first patient at Le Bonheur Children's Hospital to receive Zolgensma®. Timing was key, as Zolgensma® can stop progression of SMA. She received the treatment 11 days after her diagnosis. Charleigh is now reaching milestones that SMA patients would never make: sitting up, eating, etc. She just celebrated her third birthday, and continues to be a symbol of what life looks like with a genetic illness treated with gene therapy. The new gene will allow her motor neurons to work as they should by stopping the progression of SMA. She is one of many children now living with a history of SMA, instead of dying with SMA. (For more about Charleigh's journey, see it at Le Bonheur Children's Hospital video or a tribute on for her third birthday by local news.)

Another group of gene therapies more prevalent today are a group of therapies named CAR-T. While we can take a deeper dive in a later white paper on this class of therapies, they are important to watch as they are gaining momentum with new approved uses across different types of cancer. CAR-T is an example of Ex Vivo treatment, in which T cells (immune cells) are used and harvested from the patient and then re-engineered in a lab to contain the CAR (chimeric antigen receptor) cells, which allow them to target and bind to cancer cells.

Newest Gene Therapy Approval Expected to Top the Charts on Cost

Gene therapy is not limited to treating cancer or SMA. On November 22, 2022, the FDA approved our most expensive gene therapy yet, Hemgenix®, for hemophilia B (this is a blood clotting disorder which impacts over 30,000 people in the US). Hemgenix® is expected to cost a whopping $3.5 million for a single infused dose, however, expected to prevent the need for 94% of ongoing infusions normally needed for the hemophilia patients it will treat. Time will tell; however, this gene therapy alternative to a devastating illness is bringing to life how gene therapy can change our marketplace.

Managing the Costs of Gene Therapy

Although the focus of our white paper is just to bring understanding to what gene therapy is… we need this basic understanding to help as we set to manage the costs. Understanding the background of gene therapy helps us then understand what we are facing and how to manage the costs.

Creating a strategy to manage gene therapy will be increasingly important. First, that includes understanding in-market solutions set to manage these therapies. However, it will also mean pushing the market to make these once unattainable treatments available, yet as cost-effective as possible. With gene therapy, the current in-market solutions include different mechanisms for payment (value based contracts, payment deferral programs) along with network management with centers of excellence, contracted labs, and providers can make differences in cost in addition to shared risk arrangements. All of these options with the supporting data and analytics behind each will be crucial in decision making.

What is coming? While we spoke to two examples, the pipeline of gene therapy is quite substantial. In 2022 we had treatments for talassemia and hemophilia (Kymriah, Breyanzi, Zyntegio, LentiD, Instiladrin, Roctavian). In 2023, we could see more than 10 therapies come to market to treat sickle cell disease and hemophilia. In 2024, we could see a bubble burst with even more; 13 therapies projected to hit the market with even a larger possible population need to treat diabetic peripheral neuropathy and metastatic malignant melanomas. Even in 2025, we already have projected launches of gene therapy products to treat: hemophilia, mesothelioma, osteoarthritis, and macular degeneration.

Another aspect for consideration is benefit coverage; deciding how to cover these therapies, on which benefit, with what benefit management strategies, and timing will be crucial (as seen with Charleigh Jones's case example) and imperative in ensuring a focus on patient care.

Who is PayerAlly? PayerAlly's mission is to provide cutting-edge support for our clients as they look to better manage their medication costs. We offer best-in-class clinical, financial, and consultative solutions to help better manage costs and improve performance.

