Given the current trajectory of pharmaceutical and biotechnical developments in the treatment of cancer, inherited diseases and infection, modern health care is on the precipice of unprecedented transformation. Rapidly approaching are abilities to correct genetic defects before a baby is born, change the DNA of mosquitoes that carry Zika and even snip away and insert genes to cure cancer. These are truly the best and the worst of times. While more lives will be saved and greater, quality longevity will become possible, economic costs will be high and ethical questions abound.

The treatment of cancer has already reached a tipping point where chemotherapy is no longer routine. The mainstay of cancer management is rapidly shifting toward immunotherapy and targeted, novel therapies that interfere with diseased cells with only minimal damage to healthy tissue. Additional benefits of these therapies compared with chemotherapy are the minimal risk of both permanent bone marrow dysfunction and secondary cancers which could form later.

Also, moving forward are vaccinations that cure cancer; the ability to program one part of the immune system to attack another cancerous part of the same system; and stem cell transplants from umbilical cord blood that work like bone marrow transplants. These new therapies are so promising that the pharmaceutical development pipeline does not even include any new chemotherapy.

The amazing rate of scientific progress is made possible by the confluence of pharmaceutical giants, the nation’s top universities and government support in the form of research grants such as those from the National Institutes of Health. The pharmaceutical industry also spends $200 million to $250 million annually and has spent $2.3 billion in the past decade to influence the political process. It is arguably the largest lobby in the United States, just ahead of the insurance sector and well ahead of the defense industry.

There is a lot at stake. Merger and acquisition activity within the global pharmaceutical industry is in high gear. AstraZeneca, a top-10 pharmaceutical company with a market capitalization of $26 billion, just purchased a 55 percent stake in Acerta for $4 billion.
billion to secure rights to acalabrutinib, one of these novel, targeted therapies that attack cancer cells without substantial harm to the patient.

With ongoing investment of financial and intellectual capital, new, targeted treatments for cancer will continue to develop rapidly as the use of chemotherapy wanes.

Yet there is another, more formative development in biotechnology — the very ability to manipulate the genome — that could one day trump or at least be used in concert with targeted therapies. In fact, we might someday look back and view targeted therapies as a transitional phase which gave way to genetic therapy, much the same way as chemotherapy is beginning to give way to targeted therapies.

The costs for these treatments is so impressive that it raises ethical issues. This column previously covered Gilead Sciences’ hepatitis C treatments, Harvoni and Sovaldi, which cost upward of $100,000 for a very successful one-time treatment regimen. In contrast, targeted therapies for cancer might cost $100,000 annually for years on end.

Meanwhile, rate increases for Obamacare could be twice what they were last year, according to The New York Times. This is partly because more Americans are now covered, which is a major accomplishment. It is also the result of the high cost of treatment.

Part of the reason treatment costs are so high is that Medicare is prohibited by the law that created Medicare Part D to negotiate for lower drug prices. This is the result of the pharmaceutical lobby’s dollars at work.

This law cannot stand. The federal government must be able to negotiate as the single largest buyer of health care services.

The other compelling ethical issue, associated specifically with the ability to manipulate the human genome, is that while these new medicines will be able to save lives from cancer, infection and inherited disease, the opportunity also exists to build designer people. China, among other countries, is now very active in this space. It is a Pandora’s box. With the ability to manipulate the human genome to cure disease, medical scientists will also be able to build a bigger, smarter, faster human being who could be either more obedient or more independent.

With these unprecedented breakthroughs in biotechnology, we face a gripping collective responsibility that they are skillfully deployed for the common good.