Negative Case: Health

By Josiah Hemp

Resolved: In the field of biomedical engineering, restraint ought to be prioritized over scientific advancement.

The resolutional analysis section seeks to capitalize on the fact that restraint can have a more negative connotation in this context. Restraint is not something that is good in and of itself. There are many reasons why it is important and necessary—but it is much easier to get people excited about advancing than it is to excite people about restraint. On negative this year, you have the ability to inspire—often the affirmative will at best be able to use fear. Inspiration and hope can be very powerful, so it can be very beneficial to practice this aspect of pathos.

Imagine that it’s the year 1958. Your kidneys have stopped functioning, and your heart beat is no longer regular. You will most likely die very soon. Fast forward to 1961. Kidney dialysis has been invented. The pacemaker has been invented. You can now live. becomes clear that in the field of biomedical engineering, restraint ought to be prioritized over scientific advancement.

Definitions

“Biomedical engineering.” Merriam-Webster.com Dictionary, Merriam-Webster, <https://www.merriam-webster.com/dictionary/biomedical%20engineering>. Accessed 5 Aug. 2021.

“the application of engineering principles, practices, and technologies to the fields of medicine and biology especially in solving problems and improving care (as in the design of medical devices and diagnostic equipment or the creation of biomaterials and pharmaceuticals)”

Resolutional Analysis: The Priority

With any debate resolution, it is crucial to know what we are talking about. In this resolution, we are talking about what should be the priority.

“Priority” Oxford English Dictionary. Accessed August 6, 2021. <https://www.lexico.com/en/definition/priority>

“The fact or condition of being regarded or treated as more important.”

We are not asking whether we should use restraint or throw out all restraints. We are not asking how much restraint is necessary. We are asking which is the priority—advancing in the field of biomedical engineering, or restraining that advancement.

Value: Health

Today we are dealing with the field of biomedical engineering, a field dedicated to taking care of people’s health needs. Thus, health is what we are trying to achieve.

CONTENTION 1: Advancements in Biomedical Engineering Provide Health

Jim Lucas “What is Biomedical Engineering” Live Science. September 25, 2014. <https://www.livescience.com/48001-biomedical-engineering.html>

“Biomedical engineers have developed a number of life-enhancing and life-saving technologies. These include:

Prosthetics, such as dentures and artificial limb replacements.

Surgical devices and systems, such as robotic and laser surgery.

Systems to monitor vital signs and blood chemistry.

Implanted devices, such as insulin pumps, pacemakers and artificial organs.

Imaging methods, such as ultrasound, X-rays, particle beams and magnetic resonance.

Diagnostics, such as lab-on-a-chip and expert systems.

Therapeutic equipment and devices, such as kidney dialysis and transcutaneous electrical nerve stimulation (TENS).

Radiation therapy using particle beams and X-rays.

Physical therapy devices, such as exercise equipment and wearable tech.”

Biomedical engineering prioritizing advancement have, within the past few years, included cancer treatments, created an artificial pancreas to help children, helped the mental health of caregivers of Alzheimer’s and dementia patients, and improved artificial lungs.

Wende Whitman “UVA Mechanical Engineers Use Nanotech to Advance Cancer Treatment” University of Virginia. February 27, 2018. Accessed August 6, 2021. <https://engineering.virginia.edu/news/2018/02/uva-mechanical-engineers-use-nanotech-advance-cancer-treatment>

Using nanotechnology, UVA mechanical engineers have developed a game changing new method for cancer treatment that will likely realize both improved cancer prognoses and reduced side effects from chemotherapy. Their research paper, as part of an international cross-cutting team, was recently published in NATURE COMMUNICATIONS.

MECHANICAL ENGINEERING ROLLS-ROYCE COMMONWEALTH PROFESSOR XIAODONG “CHRIS” LI and PH.D. CANDIDATE ZAN GAO have synthesized “smart” nanoparticles that can target and infiltrate resilient cancer cells so that chemotherapy drugs can get in to work more effectively. The nanoparticles “disable the shield” of the cell and stop it from “fighting off” chemo treatment. The disabled cell stays inoperative for a window of five days.

Eric Swensen “ARTIFICIAL PANCREAS BENEFITS YOUNG CHILDREN, UVA TRIAL SHOWS” UVA Today, April 28, 2017. Accessed August 6, 2021. <https://news.virginia.edu/content/artificial-pancreas-benefits-young-children-uva-trial-shows>

“A pilot study among young children with Type 1 diabetes found that a University of Virginia-developed artificial pancreas helped study participants better control their condition.”

Fariss Samarrai, “UVA ENGINEERS SEEKING TO HELP CAREGIVERS OF DEMENTIA PATIENTS THROUGH NEW TECHNOLOGY” UVA Today. June 21, 2019. Accessed August 6, 2021. <https://news.virginia.edu/content/uva-engineers-seeking-help-caregivers-dementia-patients-through-new-technology?utm_source=DailyReport&utm_medium=email&utm_campaign=news>

“Society often focuses on the patient, while overlooking the often acute and long-term needs of the caregiver,” said Jack Stankovic, the BP America Professor of Computer Science at the University of Virginia. “But the well-being of the caregiver is also critically important to the well-being of the person receiving care. It’s a reciprocal relationship.”

The system, which is early in its development, will monitor stress levels of caregivers, and, when needed, provide a prompt – a text to a smartphone – suggesting ways to settle down, breathe-deeply, take a break, relax, to be mindful of the need for self-care, too.

“Sometimes caregivers get so caught up in the moment, dealing with stressful conditions, that they will forget to take care of themselves,” Stankovic said. “We’re hoping to help make them aware whenever their stress level is rising so they can take a needed break for their own wellbeing.”

“Hitting a home run for artificial organ research” Carnegie Mellon University. April 27, 2021. Accessed August 6, 2021. <https://www.cmu.edu/bme/News_Events/story_archive/2021/artificial-organ-research-cook.html>

For tens of millions of patients who battle chronic lung diseases, present-day care options are mostly limited to short-term drug and oxygen therapy. Biomedical Engineering’s Interim Department Head and Professor Keith Cook is working on innovative technologies to advance the long-term effectiveness and future use of artificial organs to address this worldwide issue.

In new research published in Biomaterials, Cook’s team combines two independent technologies, polycarboxybetaine (PCB) surface coatings and the Factor XII Inhibitor (FXII900), to keep artificial lung devices from failing due to clot formation, without creating any negative side effects. This novel combination provides a safer alternative to heparin, the current gold-standard in anticoagulation treatment, which has been known to pose bleeding risks in patients.

In the field of biomedical engineering, we have a duty to improve health. We ought to make that our priority, and thus we need to prioritize innovating and advancing.

CONTENTION 2: Advancements in Biomedical Engineering Make Medicine Safer

Biomedical and biochemical engineer Matthew Lazzara explains that currently we have little way of knowing if drugs will work and be safe until they are tested on humans. But he and other biomedical engineers are working on a way to change that.

Charlie Feigenoff “A Quantitative Portrait of Cancer” UVA Engineering. September 26, 2018. Accessed August 6, 2021. <https://engineering.virginia.edu/news/2018/09/quantitative-portrait-cancer> (Matthew Lazzara is Associate Professor of Chemical Engineering and Associate Professor of Biomedical Engineering at UVA. He is also a member of the UVA Cancer Center. B.S. University of Florida, Ph.D. MIT, Post-Doc MIT.)

Leaving Less to Chance

One of the challenges with 21st-century drug discovery is that it still relies principally on trial and error, although there is a high-throughput, highly automated version of this process at early stages. Researchers comb through libraries of molecules, pulling out those that have a desired effect for further investigation. One problem with this method is that there is no way to forecast with any certainty whether a molecule that works in the lab or in an animal model will work in a human being. How a drug’s therapeutic molecules might work together is also typically unknown.

“Researchers need a rational way to whittle down their hypotheses,” Lazzara said. “Computational models can provide that starting point.”

As part of his collaborative NSF grant, Lazzara is working to create a three-dimensional computational platform for describing interactions between receptors on the surface of cells and the signaling cascade they initiate within the cell when they are activated. In parallel, his collaborators at the University of Pittsburgh are engineering cells expressing fluorescent fusions of signaling proteins, which can be used to track signaling processes using live-cell, 3D microscopy. By training his models on this data, Lazzara is creating a computational platform capable of representing these processes in space and time. Ultimately, that platform can be interrogated to find rational approaches for targeting specific pathways more efficiently in cancer.”

This approach could not only lead to reaching effective treatments more quickly, but could also lead to much safer treatments and testing procedures. If we can test medication using computers before we test it on people, we can make medical testing much safer.

We might think that restraint will make us safer. In some cases that is true. But we also need to realize that advancements in biomedicine can also be a major factor in making us safer.

CONTENTION 3: Restraint Threatens Improvement to Health

The innovations that we have been talking about today could not have been possible without creative biomedical engineers prioritizing advancement and working hard to make people healthier. The other side of this is that if we prioritized restraint, these innovations would not have been possible.

There are still many more ways we need to improve healthcare. In fact, several of the projects we have been talking about have made significant progress but still have a long way to go. If we are going to take care of people and promote health, we cannot prioritize restraint, because if we do we would lose the opportunity to improve health.

How To Respond

The following is advice on how to respond to the case. Don’t think that these are the only possible responses (or even the best responses—these are just a few ideas to help you get started in responding to the case.

I would recommend pointing out that while voting NEG does not mean we get rid of all restraint, prioritizing does have real world effects. The negative is trying to de-emphasize that with the resolutional analysis—make sure that it is clear that if we prioritize advancement above restraint there will indeed be less restraint.

You can also point out that while biomedical engineering can help health, it can also harm it. In fact, some think that medicine is a leading cause of death.

According to consultant cardiologist Dr. Aseem Malhotra “Why modern medicine is a major threat to public health” The Guardian. August 30, 2018. Accessed August 5, 2021. <https://www.theguardian.com/society/2018/aug/30/modern-medicine-major-threat-public-health>

The consequences have been devastating. Modern medicine, through over prescription, represents a major threat to public health. Peter Gøtzsche, co–founder of the reputed Cochrane Collaboration, estimates that prescribed medication is the third most common cause of death globally after heart disease and cancer.

Thus there is a strong argument to be made that we need to exercise restraint in order to protect health.

In response to contention 2, I would point out that while this one specific biomedical engineer may make things safer, that does not necessarily prove that biomedical engineering as a whole makes things safer. The negative is trying to argue that sometimes advancement is the solution to safety issues, but you can argue that while that might be true sometimes, most of the time restraint is the solution.