

2015 PSBR High School Essay Contest
Grand Essayist

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Imagine looking out into the distance and seeing smoke and flames erupting from a house. The siren of your fire truck roars in the background as you rush into the crumbling building to try to save the people stuck inside. This was the daily life of my grandfather, who was a Philadelphia firefighter for most of his life. All of those years of physical activity eventually took a toll on his joints; the ligaments in his knees were worn away and he was in a lot of pain, even when he made the slightest move. The man who had been a hero all of his life couldn't even bend down, so he had a surgery to fully replace both of his knees. This surgery changed his life completely, and that is due to biomedical research and a yearning to understand the complex wonder that is the human body.

Knee replacement isn't a current breakthrough of biomedical research; it has been around since the 1960's and has become a standard procedure for middle aged to elderly people. Over time, there have been many advancements to the procedure and there continues to be breakthroughs to help people receive the best outcome possible.

Like any other medical breakthrough, total knee replacement had to undergo a series of steps before it could become a standard procedure. First, scientists had to create models of prosthetic knees and develop plans for the surgical procedures. Next, in vitro research needed to occur, in which scientists observed cultured cells as they reacted to the materials of the implant. This was to ensure that the body's tissues would interact and healing would be complete. After that, animal research was conducted (Basics of Biomedical Research). In the case of a prosthetic knee, trials of the procedure were conducted on small and large animals. Small animals were first, to make sure the procedure was effective. It was more convenient because it costs less money and used less material. When the procedure was successful on animals such as mice and guinea pigs, the trials advanced to larger animals. This step was crucial because animals like dogs and horses resemble humans and suffer from the same knee problems (Gregory 1-2).

Today, there are many speculations about animal trials, but I believe they are crucial, especially in this case, because animals are in close relation to humans, and what proves to be effective on animals is almost always effective on humans. In my opinion, as long as animals aren't intentionally harmed and the testing is for the good of humankind, then it needs to be done. After all, animal research has done much more good than harm for animals, providing cures to medical problems that also affect them. After animal research was complete, clinical trials were conducted. People in need of knee replacements who were desperate enough volunteered to undergo the procedures, aware of the dangers and risks. Eventually, a technique became successful and was conducted as a commonplace surgery. Anytime an advancement to the surgery was proposed, the same process would repeat itself.

Knee arthroscopy was first performed in the 1960's with implants that didn't work very well. The implants didn't bend and hinge like the human knee did, which led to a restriction in movement. The hinge also loosened over time and infection often occurred because of the

materials of the implant. In the 1970's, a new model was designed, called a condylar total knee implant. They were ultimately successful and as a result, the surgery became more common. Over time, pieces and instruments were designed to make the surgery easier (Anderson).

Although the surgery is very common and almost flawless, research continues in an effort to perfect the knee arthroscopy procedure. For example, scientists are trying to design computer operated knee replacements and personalized implants for each person to further the longevity of the implant (Advancements in Knee Replacement). In the case of my family, I owe the happiness of my grandfather to knee arthroscopy. When he eventually got both of his knees fully replaced, recovery was slow and hard, but he was soon able to do all of the things he loves. My grandfather can be himself again and have full range of motion in both of his knees. Nothing gives me greater joy than to see him be able to play football with his grandsons on Thanksgiving and bend down to play fetch with my dog. His continued love of life is all due to the advancements of biomedical research.

Works Cited

- "Advancements in Knee Replacement." *Advancements in Knee Replacement*. N.p., n.d. Web. 20 Feb. 2015. <https://www.kneereplacement.com/DePuy_technology>.
- Anderson, C. "What Is Total Knee Replacement?" *The Anderson Orthopaedic Clinic*. N.p., n.d. Web. 20 Feb. 2015. <<https://www.andersonclinic.com/your-treatment/total-knee-replacement-arlington-alexandria-virginia.php>>.
- "Basics of Biomedical Research." *Basics of Biomedical Research*. N.p., n.d. Web. 25 Feb. 2015. <<http://j.whyville.net/smmk/aalas/aalas?topic=solitaire>>.
- "Biomedical Research." *Foundation for Biomedical Research*. Foundation for Biomedical Research, n.d. Web. 25 Feb. 2015. <<http://fbresearch.org/education/biomedical-research/>>.
- Gregory, Martin H. "A Review of Translational Animal Models for Knee Osteoarthritis." *A Review of Translational Animal Models for Knee Osteoarthritis*. Hindawi Publishing Corporation, 10 Aug. 2012. Web. 20 Feb. 2015. <<http://www.hindawi.com/journals/arthritis/2012/764621/>>.