

Surgery: The way of the future

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The devastation wrought by bacterial infection in the pre-antibiotic era is perhaps best exemplified by the First World War. Bacterial infection in soldiers was high because of soil-contaminated shrapnel and shells.¹ As a result, many soldiers lost life and limb. If antibiotics had been available, many may have lived.¹ The pioneering work of Sir Alexander Fleming on the battlefields led to his discovery of penicillin which revolutionised the treatment of bacterial infections and supports so much of modern medicine.

Ground breaking research and mass production capabilities meant a plethora of effective, affordable and easily accessible treatments against different types of microbes.² Nevertheless, accessibility of treatments coupled with inappropriate administration of antibiotics has resulted in emerging antimicrobial resistance, placing us on the cusp of the post-antibiotic era.³

According to the World Health Organization (WHO)

Antimicrobial resistance (AMR) is the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and anti malarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others.

With the discovery of antimicrobial agents, it was known that organisms could develop resistance against them.² This occurrence does not necessarily constitute a crisis so long as there are new antibiotics to take their place.² However, the increase in bacteria resistant to antibiotics, coupled with the lack of discovery of any new class of antibiotic in the last 28 years, means that for common bacterial infections, significant antimicrobial resistance is emerging.²

Antimicrobial resistance will have a profound impact on the practice of surgery. Stewardship efforts are often focused on prophylaxis to prevent surgical site infection (SSI).³ Optimising the prescription of antibiotics across the surgical pathway (pre-, peri- and postoperatively) is a critical step in grappling with important drivers of antibiotic resistance in surgery.³ Moreover, innovative ideas are needed to safely reduce the use of antibiotics in our surgical patients before antimicrobial resistance is established.²

When re-imagining the practice of surgery in an era with limited access to effective antibiotics, a two-fold approach needs to be taken. The biggest obstacle to the outcomes of modern

surgery are SSIs, which are caused by bacteria that get into the body via incisions or improperly sutured surgical sites.⁴ Therefore procedural optimisation in the surgical pathway is a necessary first step.³

In the *Global Guidelines For The Prevention Of Surgical Site Infection*, the World Health Organization has made thirteen preoperative and sixteen peri- and postoperative recommendations aimed at preventing SSIs.

Among these recommendations is that patient hair not be removed or, if unavoidable, hair should be removed only with a clipper. This procedure was long thought to be necessary but now appears not to be so. The University of Minnesota's *Center for Infectious Disease Research and Policy (CIDRAP)*, in "*WHO guidance says no routine post-surgery antibiotics*", reports that shaving increases cuts and micro-abrasions increasing entry of bacteria. Hence shaving prior to incision no longer has a role in surgery. Support is needed from organisations and national bodies through policies and legislation endorsing the guidelines to promote the buy-in of healthcare practitioners and adherence at a system level. Such genuine steps will go a long way to reduce SSIs and thus the need for antibiotics.

Secondly, the latest medical advances, such as in ethnopharmacology, need to be leveraged. In May last year, the International Business Times published an article titled "*World's 'first' Ayurvedic surgery conducted in Meerut, India*". In this operation, a prostatectomy was performed on an 83-year-old man allergic to allopathic medicines without the use of any antibiotics. The article reports that after a month of observation of the patient, no complications were encountered. The doctors administered calculated proportions of *giloy*, *shigru*, *amla*, *turmeric* and *guggul* extracts to the patient. *Shigru* has purported antimicrobial properties and is also a natural depressant. *Amla* is claimed to strengthen immunity while *giloy* is helpful in detoxifying the liver. This presents a unique opportunity for Allopathic-Ayurvedic collaboration which the pharmaceutical industry is well placed to play a leading role in. Without whom such novel possibilities may be left untapped.

Additionally, developments in wound care research have led to a transition from simple dressings to robust devices and products with antibacterial properties by incorporating pharmaceutically active ingredients.⁵ Negative pressure wound therapy has proven a viable approach to healing

various types of wounds. Hydroconductive dressings and other methodologies such as hyperbaric oxygen, growth factors, biologic dressings, skin substitutes and regenerative materials have also been shown to be successful in accelerating the wound healing process.⁴ The assimilation of these advances into surgery practice means that there will be a shorter window period within which SSIs can develop. The cost implications of more advanced dressings cannot be ignored⁵; however, their potential to disrupt SSI morbidity and mortality patterns justifies investment.

Lastly, laparoscopic surgery has great potential to minimise the risk of SSIs as the surface area exposed to infection is minimal compared to open surgery, and therefore there is a decreased need for antibiotics.

For any of these methodologies to be accepted as superior to the standard requires dedicated evaluation of their applicability and complications. Therefore, controlled randomised studies are needed. There are also limitations to the adoption of these innovations given the resource strapped context the public

healthcare systems of many developing countries. Hence, we cannot be utopian and need to bear in mind these complexities. Greater will, political and from private equity, nationally and internationally is required to make resources available so that these advances become palpable.

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Author's biography

I am a son of the Northern Kwa-Zulu Natal soil, born in rural Mbazwane, eMseleni Hospital. I spent my formative years in the cosmopolitan city of Durban, raised by my mother along with my younger brother. My grandmother, whom I am very fond of, was never far off and always at the ready to lend a helping hand. I am currently a second-year medical student at the University of the Witwatersrand. We stand on the brink of the 4th Industrial revolution, characterised by the intersection of the biological, physical and digital spheres. My life's mission is to be a positive disruptive force in the medical field in the areas of neuroscience, neurosurgery and precision medicine through innovation in virtual reality, artificial intelligence, big data, predictive modelling and electronics amongst others. After completing my medical degree, I aim to pursue engineering and computer science related courses at the Massachusetts Institute of Technology. Thereafter, I hope to undergo my neurosurgical residency at John Hopkins University or Harvard University.



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Victory of the resistance

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Author's biography

I am currently a fourth year student at the Nelson R. Mandela School of Medicine. Both my parents are doctors which inspired a love of medicine from a young age. I have a younger brother who is studying maths. I am still undecided about which specialty to pursue as a future career simply because I enjoy so much of medicine- admittedly a welcome problem to have. I especially love being in a clinical environment. I am also passionate about research and would love to incorporate this into whatever path I choose because the impact one can have with research alone is immense. My aspirations are strongly underpinned by the belief that every person has a right to quality healthcare. In my spare time, I enjoy reading, specifically Tudor history, learning languages, travelling and spending time with friends and family.



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Antimicrobial Resistance and The Surgical Renaissance

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Author's biography

Rivona Harricharan is a second-year medical student at the University of KwaZulu-Natal. In 2017, she became a member of the Golden Key International Honour Society. Miss Harricharan graduated with a Masters degree in Medical Sciences *Summa cum laude* and aspires to complete her PhD. Her research focuses on understanding the complex relationship between addiction and inflammation. She has recently joined the Centre for AIDS research in South Africa as part of their placement programme. She demonstrates excellently her ability to work on multiple projects simultaneously as she is also involved in traumatic brain injury research at the Department of Neurosurgery in Inkosi Albert Luthuli Chief Hospital. In addition, Miss Harricharan is passionate about cancer awareness and community education which is exemplified through her role in the Woodview Cancer Support Group. When she is not busy with medical school and her research activities, Miss Harricharan enjoys extreme outdoor activities and painting.



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