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“When Families Save Lives: The Ethical Impact of Martha’s Law on Patient Safety” - Adithi Arun Prasath

Medical ethics is not only about curing illness or saving lives, but also about how decisions are made and whose voices are listened to in healthcare. Two of the most important ethical principles in medicine are beneficence and non-maleficence. Beneficence means that healthcare professionals have a duty to act in the best interests of the patient and to promote their well-being. Non-maleficence means “do no harm,” requiring doctors and nurses to avoid actions or inaction that could cause unnecessary injury or suffering. Together, these principles guide medical professionals to help patients while preventing avoidable harm. Martha’s Law, introduced in the United Kingdom after the tragic death of 13-year-old Martha Mills, reflects these ethical duties. Martha died from sepsis after her condition worsened and her parents’ repeated concerns were not taken seriously. A coroner later concluded that she would probably have survived if her care had been escalated sooner. As a result, Martha’s Law gives patients and their families the right to request an urgent medical review if they believe care is failing. This policy raises an important ethical question: should patients and families have the power to challenge medical professionals when they believe something is wrong? Martha’s Law suggests that listening to families can be essential to ethical and safe medical care.

One of the strongest ethical arguments in favour of Martha’s Law is that it supports patient autonomy. Autonomy means respecting a person’s right to be involved in decisions about their own healthcare. Patients and families are often the people who know the patient best and may notice small but important changes in behaviour, pain, or alertness that healthcare staff might miss, especially in busy hospital wards. By allowing families to formally raise concerns and request a review, Martha’s Law ensures these observations are taken seriously rather than dismissed. Evidence suggests this approach can make a real difference. Between September 2024 and October 2025, there were more than 8,000 Martha’s Law escalation calls across NHS England, with around 36 percent related to sudden deterioration in a patient’s condition. In many cases, these calls led to changes in treatment or transfers to higher levels of care. These outcomes show how patient-led escalation can support beneficence by helping clinicians act earlier and reduce the risk of harm, aligning closely with the principle of non-maleficence.

However, despite its benefits, Martha’s Law also raises ethical concerns. Doctors and nurses are highly trained professionals, and some worry that frequent challenges to their judgment could undermine trust in medical expertise. There is also a concern that some families may request intensifying the level of treatment out of fear or anxiety rather than genuine medical urgency. This could lead to unnecessary tests, stress for patients, or added pressure on already stretched hospital staff. From an ethical point of view, this raises questions about justice, which focuses on fairness towards the care and healthcare of other patients and the responsible use of healthcare resources. If staff time and medical attention are diverted to cases that do not require an urgent elevation of medical care other patients who are equally unwell may receive less support and assistance.

Despite these concerns, Martha’s Law can be best understood as a safety net rather than a replacement for professional medical judgment. It does not give families the power to make clinical decisions, but instead ensures there is a clear and formal process for concerns to be reviewed by senior clinicians. This supports shared decision-making, where healthcare professionals can collaborate with patients and families in order to provide the best results possible for the patient with minimal risks involved.

In conclusion, Martha’s Law represents an important ethical development in modern medicine. While it challenges traditional medical hierarchy, it does so in order to promote patient safety, respect autonomy, and prevent harm. It shows that ethical healthcare is not only about making correct clinical decisions, but also about listening carefully to patients and families, especially when concerns are raised. Martha’s Law reminds us that speaking up and being heard can potentially save lives.

“Review of ‘Your Life in My hands’ ” - Asmitha Surenthiran

This book is a heartfelt personal account by Rachel Clarke on her life as a junior doctor. She captured the realities of practising on an overstretched, understaffed and underfunded NHS frontline during 2016 while still trying to conduct herself with humanity and compassion. She conveyed the significance of doctor-patient relationships, which she cherished given the difficulty of experiencing these moments due to the long hours and heavy workload that should have been shared among more doctors. Having these relationships with patients came at a heavy personal and emotional during this time of high stakes and debilitating pressures. Through Rachel I saw the type of doctor I want to become- a doctor who stays driven, compassionate and understanding, listening to patients' fears and above all reassuring them so that they never feel abandoned or alone. In particular, something in the book that touched me was when she said, ‘Sometimes the most important thing you can offer a patient is simply your presence, which again reiterates the crucial role of doctor-patient relationships.

Through her personal stories, Rachel Clarke highlights how medicine is not just about science and treatment which she had not fully understood during university. Before she had believed reading countless textbooks would prepare her for becoming a doctor, but she soon realised that this knowledge alone could not prepare her for the reality of being responsible for another human life. Medical knowledge alone is not enough; Rachel emphasises that being a good doctor also requires genuine human connection and empathy. Rachel reflects on her own experiences as a patient when she had just given birth to her son. Whilst breastfeeding at the edge of the unit, a consultant reacted with disgust and barked at her, leaving her feeling humiliated, crushed, and as though she had committed a crime. However, a nurse named Precious responded very differently. She comforted Rachel, wiped away her tears, and helped her, offering reassurance at a moment when she felt vulnerable. Rachel describes how Precious’ freely given and priceless kindness made her feel that despite what happened next, she would not face it alone. Even a decade later, the compassion and humanity shown by that nurse remained in her memory. Through this single moment alone, she realised that even a small act of kindness could be invaluable.

Throughout the book, it becomes clear how much this moment had influenced how she practised medicine, motivating her to go beyond what was expected from her in order to provide patients with not only medical care but also reassurance and compassion. Reading this made me reflect again on the type of doctor I hope to become in the future. Like Precious, I would want my patients to feel supported, respected and cared for. It has helped me recognise that even small acts of kindness can have a lasting impact especially during the vulnerable moments of being a sick patient.

Beyond the ideas of kindness explored in Your Life in My Hands, Rachel Clarke also highlights the importance of resilience and the need to speak up when things are not right. One example Rachel spoke about involved Ayesha, a child with a severe toxic infection. Initially, she was given antibiotics as a CT scan was too high of a radiation risk for a child. However, her condition did not improve, and she required immediate surgery. When the bed manager refused to provide a theatre bed for her, Sam, a junior doctor and Rachel's colleague, took the initiative to contact the consultant despite the fact that it was 2am and he could be disturbing his boss. By prioritising Ayesha's safety over his worries of getting in trouble with his boss he managed to make sure that Ayesha received the treatment she needed in time. Rachel reflects on this (as a junior doctor at the time) after Sam had visited her home feeling distressed and wanting to tell her what had happened. It made her realise how even a whisper of threat can enforce silence and conformity especially in the rigidly hierarchical profession of medicine, making it difficult to challenge unsafe practices. This, alongside Rachel's efforts outside the ward, such as speaking to Jeremy Hunt directly about the unrealistic expectations of a seven-day NHS portrays the commitment to patient safety that doctors show. In both occasions doctors prioritised patients over their own fears making personal sacrifices. For Rachel this included spending less time with her children to fight for what she believed was right and for Sam there was a risk of losing his job. Their courage, resilience, and willingness to speak out even in the face of personal cost provide an example of qualities that define a responsible and principled doctor.

Overall, this book is an inspiring read to any aspiring medic, and I would highly recommend it. It allows them to reflect on what it truly means to care for patients and demonstrates that medicine is as much about humanity and moral responsibility as it is about clinical knowledge. It is more than a book; it is a guide to the values that define good medicine and a reminder that even in the most challenging circumstances, humanity from a doctor can make all the difference.

“Medical Ethics” - Ellana O’Loughlin

Firstly, it’s important to outline and know the four pillars of medical ethics. Which are: beneficence, non-maleficence, justice and autonomy. Each of these pillars is equally important and need to be considered equally when studying and performing medicine. It is essential in medicine to always be concerned with their ethics concerning your activities and ideas.

Beneficence is the importance of doing good, the act of performing medicine in the best interest of a patient. To understand how to do good is to know and completely understand a person to know what actions would be the best for them. Such as their religious beliefs and fears. An example of beneficence is doing a high quality of work and doing the absolute utmost to care for their patients. However, it’s important to consider all the risks to know what actions to take to care for their patients however small, like the impact of using an X-RAY and CTs to discover an illness. With CTs and X-RAYS approximately 5% of them cause cancer. This means that you must make sure that the potential discovery of an illness outweighs the risk of cancer when using these machines. Every medicine has a side effect and every surgery has risks associated with it that need to be considered at every turn.

Additionally, non-maleficence is to “do no harm” to your patient. It is the action of making sure no unnecessary harm comes to a patient suffering. For example if a patient asks for antibiotics but may be suffering from a viral infection, the patient may not benefit from antibiotics as they could obtain a resistance meaning it would also not help them in the future. It is the act of being extra cautious and not doing anything that could hurt the patient. It considers the idea of consequentionalism by making sure that the ends justify the means, so that no unnecessary consequences for the choices the person caring for them is making. If there is a disregard to non-maleficence then it could be seen as an act of ignorance due to the want for an easier option.

The action of autonomy is defined as giving the attention the freedom to choose their treatment where they are able. This means that you need to respect the patients beliefs and their decision.

For example, a patient may be needing surgery they would need to be fully briefed on the risks of the surgery and should be able to make their decision and be respectfully responded to. As Immanuel Kant thought, autonomy is the ideal of free will, people will not be driven by desire but by rational morality. This is why it is vital to consider the patients opinions on themselves and to “treat them not as a means to an end but as an end” as thought by Kant, believing that they have the ability to demonstrate rational thought.

Justice. Justice has many different definitions and ways that it is enacted, in this case justice means ensuring fairness and equality. Everywhere struggles with nepotism and stigma, so there needs to be extra effort to ensure justice in a place where everyone is being treated and helped fairly. It is extremely necessary to ensure justice where people are struggling with fatal diagnosis and entrusting their lives to doctors. In a world of egotism it is pivotal that everyone is treated the same no matter how much money they have, what skin colour you have or where you come from. This is demonstrated by the transplant list where the organ donations are organised by the need the organ rather than any other factors, it is unbiased, which is justice.

I don’t believe you can conclusively decide which pillar is the most important, I think you have to attempt to keep the balance between the pillars. It’s essential to keep absolute fairness to make sure you are being completely ethical in their practices.

“Equine Gastric Ulcer Syndrome” - Oliver Mack

What is Equine Gastric Ulcer Syndrome?

Equine gastric ulcer syndrome (EGUS) is a general term for the condition characterised by lesions, erosions and ulcerations to the digestive tract of horses. The main areas of the digestive tract affected by EGUS are the oesophagus, stomach and the proximal duodenum. There are two main categories of EGUS: Equine Glandular Gastric Disease (EGGD) and Equine Squamous Gastric Disease (ESGD) depending on which part of the stomach is effected.

EGUS is a very common condition among the horse population and has been found to affect approximately 1/3 of all equines including >90% of training racehorses and ~37% of leisure horses.

General symptoms of ulcers (in adult horses) include the following:

Weight loss
Poor appetite
Dull coat
Poor / reduced performance
Mild or recurrent colic like symptoms
Behavioural changes (such a ‘girthy behaviour ’ or bucking whilst being ridden).

EGUS can only be definitively diagnosed by endoscopic examination of the stomach (gastroscopy) after a period of fasting to empty the stomach. The endoscope is passed through the nose, down the oesophagus and into the stomach where the stomach lining and the entrance to the duodenum can be visualised. Ulcers are graded using a grading scale of 0-4 depending on the number and severity of the lesions seen. Gastroscopy is still considered to be the gold standard for diagnosing EGUS however other, less invasive diagnostic tests such as using biomarkers from blood, faeces and urine samples are being trialled.

What causes Equine Gastric Ulcer Syndrome?

Equine squamous gastric disease affects the top 1/3 of the stomach which does not have much protection against acidic splashes and does not contain secretory cells. This means that ESGD is usually caused by over exposure to gastric acid.

Equine glandular gastric disease affects the lower 2/3 of the stomach which contains many secretory cells that secrete hydrochloric acid, digestive enzymes and mucus. A thick layer of mucus covers the glandular mucosa which provides protection against acid. This means ulcers commonly form when there is a disruption to the protective layer covering the glandular mucosa.

In general, ulcers can be caused by many factors including:
Diet – sudden dietary changes or high concentrate, low fibre diets
Stress – Extended periods of stabling, change of routine
Intensive exercise
Travelling frequently and for long periods of time
Wind sucking
Times of ill health (injuries or chronic, painful conditions)

“Foetal Alcohol Spectrum Disorder (FASD): the impact of alcohol consumption during pregnancy.” - Michelle Matthew

Foetal Alcohol Spectrum Syndrome also known as FASD for short is a neurodevelopmental condition caused by prenatal alcohol exposure. This disorder displays a spectrum of physical, cognitive and behavioural impairments with Foetal Alcohol Syndrome (FAS) being the most severe.

When alcohol is consumed – with ethanol being the main ingredient - it is absorbed into the bloodstream. The liver is the organ in the human body that is primarily responsible for the safe disposal of ethanol into its less toxic biproducts. As ethanol reaches the liver an enzyme called Alcohol Dehydrogenase (ADH) causes ethanol to be oxidised into acetaldehyde which is a carcinogen that is highly toxic. Therefore, Aldehyde Dehydrogenase (ALDH) enzyme converts acetaldehyde into acetate which is a compound that is less toxic. Acetate is converted into carbon dioxide and water by other tissues such as the muscle which that body can dispose of safely.

Alternatively, the alcohol in the woman’s blood can also reach the developing foetus via the umbilical cord from the placenta. But unlike adults, the foetus is not yet fully developed to minimise the harmful effects of alcohol due to their liver being underdeveloped. Therefore, alcohol is metabolised much slowly in a foetus, allowing the alcohol to remain in the foetal blood for a longer period. Alcohol is considered a teratogen, so it interferes with the development of the brain and other major organs including heart, kidneys and liver. This prevents the foetus from developing normally in the womb.

The permanent characteristics that someone can display due FASD can vary greatly. But some of the symptoms of this disorder include difficulty in learning which may cause a person to struggle to think, concentrate and may also impact their memory. Another common symptom is problems with communication which might present someone with a challenge in managing emotions as well as developing social skills due to problems with their speech. Cleft lip and palate are a congenital split present between the upper lip and or the roof of the mouth. This is a result of tissues making the lip failing to fuse together completely in the womb.

Although it is not completely proven that it is a direct cause of prenatal alcohol exposure, there is a correlation that cleft lip and palate may be caused by a combination of smoking and the consumption of alcohol during pregnancy.

Regrettably, there is no specific treatment that can reverse the damage to the brain and other crucial organs that prenatal alcohol exposure can cause. But an early diagnosis is vital in organising educational and behavioural strategies to help manage the symptoms.

Whilst the less severe prenatal alcohol exposure can lead to FASD, in more severe circumstances the exposure of alcohol to a foetus can lead to the loss of pregnancy. Although overcoming an addiction is immensely challenging and a long-term process, seeking support to stop the addiction is the most vital and successful measure of prevention against Foetal Alcohol Spectrum Disorder as well as the chances of still birth, as there is no proven “safe” amount of alcohol that can be consumed during pregnancy. Hence not consuming any alcohol helps to ensure the normal growth and development of the foetus.

“The Rise of Abuse towards Healthcare Workers ” - Clemmie Anstead

One in seven NHS staff members have experienced physical violence from patients. This equates to more than 100,000 NHS workers a year and around 285 incidents every single day.

Abuse towards NHS staff has increased drastically over the past few years from around 91,100 in 2022-2023 to over 104,000 in 2024-2025. But what is causing this worrying trend?

Part of the problem is ‘Corridor Care,’ an increasingly accepted practise where patients must be treated in non-designated clinical areas (like corridors) which are noisy, overcrowded and sometimes even dangerous. While this is a common occurrence in Accident and Emergency departments, it is also widespread across other departments in UK hospitals, usually due to lack of beds or other capacity issues. NHS staff are scapegoats for these shortcomings; made targets for abuse by patients whose anger thresholds have already been lowered by factors like pain or anxiety.

Shadowing district nurses made me realise the risk element that comes from working in healthcare. In this type of nursing, health and care professionals must go to patients' homes, in visits which are usually unsupervised and unpredictable. Although I found most interactions positive, there was more than one instance where I was not permitted to visit a patient as they were deemed ‘inappropriate’ for me to be around. For these more difficult cases, nurses had taken to coupling up to reduce the risk of harm or even going as far as preventing female nurses from visiting a patient (often in relation to male patients making unwanted sexual comments). While shocking to me, they discussed accounts of being shouted at, mistreated, or entering unsafe environments in an offhand manner. It was obvious that abuse from patients had become something tolerated and unavoidable in their daily working life. In addition, the need for extra measures to be taken when dealing with these patients stretches already limited NHS resources. For example, sending two nurses to one patient means that another person has to go longer without care.

But what is being done to stop the abuse of HCPs? The NHS Ten Year Plan hopes to implement a “Zero tolerance” approach against violence towards all NHS workers and making outcomes stricter for abusers. Furthermore, further staff training will be introduced to help prevent and reduce the risk of violence. For example, techniques like de-escalation or recognising behavioural cues that indicate possible violence will be taught.

One particular area I’ve found interesting is the implementation of a three-year trial of body-worn cameras into the ambulance trust. With an average of 55 ambulance workers reporting abuse everyday, it has one of the biggest incidence rates overall. The cameras aim to reduce this figure by deterring possible abusers and giving strong evidence to reinforce reports.

As abuse of NHS workers continue to grow, it raises important questions about the overall wellbeing of our society. What is causing patients to harm the people dedicated to helping them and will the Ten-Year Plan be effective at stopping this?

“Limited Edition Designer Babies” - Fiona Cheng

What are designer babies? Are they the future of humanity or the start of a dystopia?

The term “Designer Babies” are children whose genetic traits have been artificially selected or modified using modern technologies like CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) to remove or change certain things about them. For example, physical characteristics like your eye colour, skin colour, hair colour or even their physical abilities could all be chosen before their even born meaning they may be born without any of their natural features or characteristics, instead it would all be pre-determined for them. While this technology sounds terrible, it does have the potential to prevent serious genetic disorders or illnesses.

On one hand, if we look at it at a medical viewpoint, there's many amazing advantages of this technology. For example, a scenario for this is if two people, both seemingly healthy from birth, create a baby where they have the potential to be born with a genetic disorder, for example cystic fibrosis or Huntington’s disease, both very cruel, harsh diseases. One reason this could happen is because the parents could be carriers which means they won't have any symptoms of it, they would just have a recessive allele for it which means the disorder wouldn't be present in them, but once they have a baby, the recessive alleles could have a chance of presenting in their baby. Going back to technology like CRISPR, parents, once aware of the risk could choose to use this technology to remove or modify the child's faulty gene meaning this faulty gene which could have caused them to be born with a genetic disorder would be gone and shouldn't be present when their born. This could mean, overall, less children are born with these restricting, deadly disorders as these gene editing technologies have already shown lots of promise in correcting these faulty genes. However, during all this, people are worried about how far parents and scientists will go to change children, as not only is it considered unethical it also could be dangerous. And so, a question arises, where should people draw the line between treatment and enhancement, and could this line really be maintained?

On the other hand, if you look at it through an ethical viewpoint, there's an obvious issue that arises. Can humans really “play God” and interfere with natural life? This sort of technology is considered quite recent which means there's questions on if it's really safe, as the long-term effects are still unknown. This could mean as people choose more appealing characteristics, genetic diversity and therefore our gene pool may decrease. Another issue many people are concerned about is the socioeconomic threat, as this technology, the process and the result could create a new form of inequality or social hierarchy where genetically modified or enhanced individuals are seen as superior to others. This concern is linked to past extreme cases, an example being Adolf Hitler, and his obsession over “Pure Aryans” and their physical characteristics of being blue eyed, blonde, tall and athletic. And as everyone knows, through Hitler's obsession over these traits, the line blurred on whether it was ethical or even morally right to want these things, which we know then led to the mass murder of many innocent lives just for not fitting into these characteristics. This shows just how serious this is as it raises hundreds of questions and concerns on the violation of human rights, human dignity and morality of people. Luckily, back then, the technology was not yet advanced enough to modify babies for these characteristics, but if it was, I'm sure you would agree, Hitler would have clearly supported and justified it. So, as you can see, there's always been and always will be concerns and questions regarding the ethics on this topic.

Another important concern to consider is the safety and risks those children could be facing. This is because technology like CRISPR, although advanced, are still prone to making mistakes which could lead to unintended health problems or even new genetic disorders. I believe a good example of the risks is to look at certain breeds of dogs like pugs or bulldogs, dogs that have been selectively bred for certain physical features like short legs or a smaller snout all because we found those features cuter, yet in the end, caused serious health problems like breathing difficulties or a reduced quality of life. This shows how altering genetics for certain desired traits can lead to serious, harmful consequences which causes nothing but pain and suffering for those victims, and ironically enough, the pug, selectively bred for certain features to make them cuter, have now got characteristics that most people dislike and don’t find cute anymore.

This is clearly an example of how genetic editing can create unpredictable mutations or long-term effects that may not be immediately understood or disliked, but when passed onto future generations can pose significant risks to both the victims themselves and society as a whole.

In conclusion, although genetic modification can offer amazing, life changing benefits, the risks and ethical concerns people have for this new method may seem to constantly outweigh the benefits. And although, I do agree with these concerns and don't agree with the topic of “designer babies”, I think genetic editing should continue to be researched for medical purposes only, while things like genetic editing just for certain physical characteristics or to create a designer baby should be heavily restricted and supervised.

“Alzheimer’s rapid development in understanding and experimental treatment . ” - Sophie Foster

My grandfather’s recent Alzheimer’s diagnosis and my interest in neurological science made me curious about the rapid developments in Alzheimer’s research, particularly the shift from simply managing symptoms to actively targeting the underlying disease processes.

Recent studies have given families new reasons for hope. Several next-generation drugs are showing promise in slowing and in some cases potentially reversing aspects of Alzheimer’s disease. Current treatments such as lecanemab and donanemab work primarily by clearing amyloid plaques, the sticky protein clumps associated with memory loss. However, emerging research suggests that Alzheimer’s is far more complex, and scientists are now targeting deeper biological mechanisms.

One breakthrough involves blocking an enzyme called IDOL, which plays a role in cholesterol regulation within the brain. Inhibiting IDOL has been shown to reduce amyloid plaque buildup and protect neurons, potentially offering a safer and more effective therapeutic pathway. Another experimental drug, trontinemab, uses a “brain-shuttle” delivery system that allows it to cross the blood brain barrier more efficiently, enabling faster clearance of harmful proteins. Although long term results are still years away, early data is encouraging.

Researchers in Barcelona have also developed FLAV-27, a compound that reprograms gene activity in brain cells rather than simply removing plaques. This approach aims to restore healthier cellular function in early-stage Alzheimer’s. Meanwhile, a molecule known as P7C3-A20 has demonstrated the ability to repair damaged brain tissue in mice by boosting NAD^+, a molecule essential for cellular energy. More than 130 Alzheimer’s drugs are currently in clinical trials, targeting inflammation, metabolism, immune pathways, and even the gut brain connection. Many experts believe we may be entering a new era in which dementia becomes a more treatable condition rather than an inevitable decline.

My interest deepened further after listening to a podcast titled "Alzheimer's and Its Connection to Metabolic Issues." The discussion highlighted a growing body of research suggesting that Alzheimer's may, in some cases, function like a metabolic disorder leading some scientists to refer to it as "type 3 diabetes." A key focus of the podcast was the APOE4 gene, a well-established genetic risk factor for Alzheimer's. Individuals with no copies of APOE4 have roughly a 9% lifetime risk of developing Alzheimer's, while those with one copy face about a 30% risk. People who inherit two copies one from each parent may have a 50–90% risk, underscoring the strong genetic component of the disease.

The "type 3 diabetes" concept arises from evidence that the brains of people with Alzheimer's often show insulin resistance, similar to what occurs in type 2 diabetes but localized within the brain. Insulin is not only a metabolic hormone; in the brain it plays a crucial role in memory formation, neuron survival, synaptic plasticity, and energy regulation. Neurons rely on insulin signalling to communicate effectively. In Alzheimer's, these insulin receptors become dysfunctional and unable to respond properly, disrupting communication between brain cells. This impairment contributes to cognitive decline, reduced glucose uptake in the brain, increased inflammation, and greater vulnerability to amyloid and tau pathology.

Some researchers argue that this insulin resistance may be one of the earliest triggers of Alzheimer's, preceding noticeable symptoms by years. This has opened new avenues for treatment, including drugs that improve insulin sensitivity, intranasal insulin delivery, and lifestyle interventions targeting metabolic health.

Advances in Alzheimer's research are rapidly reshaping our understanding of the disease. Instead of focusing only on symptom control, new treatments are targeting the biological and metabolic processes that drive neurodegeneration. The growing recognition of Alzheimer's as a possible "type 3 diabetes" highlights the crucial role of insulin signalling in brain health and offers new therapeutic directions. Although many approaches are still experimental, the progress across genetics, metabolism, and drug development provides genuine hope that Alzheimer's may become a far more treatable condition in the years ahead.

“Magnetic Resonance Imaging (MRI)” - -Hamed, A-H. & Arsen, K. & Stanley, O. (H.A.S.)

An MRI scanner is one of the most revolutionary inventions in all of humankind, allowing us to have a deep scan of any part of a person’s body, using only radio waves and magnetic fields, with no ionising radiation. As time goes on, MRI scans are starting to be used for psychiatric diagnosis, instead of only for physical conditions, allowing us to have a better understanding of how they can be treated, as we investigate the biological factors behind certain disorders. Although helpful in understanding the brain, their uses have limitations in psychiatry, as listed further. However, our team at H.A.S. has presented a solution to these problems and to make MRI imaging enhanced.

How: MRI scans work by powerful electromagnets from 1.50 - 3.00 Tesla propelling protons to an axis aligned with the magnetic field. Radio waves are then used (due to their long wavelength and low frequency) to stimulate protons and spin out of average equilibrium position. When the field is turned off, energy is released by protons realigning and produces a radio-frequency magnetic resonance image (RF-MRI) - by the different times taken and amount of energy which varies depending on tissue type - giving a detailed image. Due to radio waves’ low frequency and the equation Photon Energy=Planck’s constant*frequency these have low enough energy to be nonionising than other methods like X-rays and CT scans which make it safer for regular use and especially brain scans. This therefore reduces risks of genetic mutation and uncontrollable cell division.

Limitations: Most MRI scan studies on psychological disorders have shown low sensitivity and even lower specificity, this means they cannot reliably detect or differentiate between illnesses. A wellsupported study combined over 3000 fMRI scans for depressed and non-depressed patients; they found that there was only an exact detection rate of around 60%; barely better than a coin flip on individual cases. A further limitation of MRI is that it only gives a macro view of the brain – as standard MRIs only provide around a $1mm^3$ resolution, in $1mm^3$ of the brain there are 50,000 cells and 130 million neural/synaptic connections.

Therefore, we are unable to have a zoomed in look at the brain- hindering our ability to understand structures. Furthermore, there is also the issue of what MRIs cannot show. For example, a case study following a patient (Susannah Cahalan) who was misdiagnosed with schizophrenia for 2 years. Where she had Autoimmune Encephalitis- a situation where an MRI scan was impractical, illustrating our over-reliance on MRI imaging as the misdiagnosis was due to her condition being molecular and undetectable by MRI imaging.

Improvements: To improve current MRI scanners, researchers have been developing low-field MRI scanners which operate at around 0.10T instead of the standardised 1.50-3.00T machines in hospitals. Although they provide a lower resolution image with more noise caused by low field strength, they are much cheaper and smaller, which allows them to be used in, for example, less developed regions or even in space. However, AI and deep learning algorithms are being used to enhance imaging in low-field MRI machines, which can give them a higher resolution while keeping the same price and weight. Furthermore, as shown by researchers at UC San Francisco, a machine learning code can enhance standard 3.00T MRI scans to around 7.00T scans, which can give access to ultra-high-resolution imaging, without increasing the cost, or forcing people to go to one of the hundred 7.00T MRI scanners to exist in the world.

Further Improvements: In order to compact the MRI further, we can use the equation: Electromagnet strength= Number of coils * Current. We can increase current proportional to the decrease in coils to decrease space and make the MRI more portable without affecting the quality of imaging. We can decrease the work done on each charge carrier per Coulomb to increase charge per second accordingly. In summary, the positives will be increased portability, decreased weight, and the negatives will be the increased heat which can be mitigated using radiators, which can be easily added to the outer shell without interfering with other systems. Additionally, ultralight aerogels can be used instead of foam as insulation, comfort and acoustic dampening. This will be beneficial due to its lower density (0.020g/cm^3) and this decreases weight therefore making our technology more portable. In the future, high temperature superconductors can be used minimising the need for such an effective coolant saving costs in the long term.

Although in aerospace liquid hydrogen is a viable coolant, it is incredibly explosive in terrestrial medicine and so has a limitation in that it may be less viable with its risks.

In conclusion, based on the evidence presented in this paper we can see MRI scans can be a vital tool when identifying psychiatric disorders. However, with imaging bias and the with how inclined physicians are with results from imaging, we can suggest it is not able to replicate and or even replace the clinical judgement from doctors as it lacks specificity and precision. With all this in consideration there is no way that MRI will not be more involved in future practices in the biological psychiatric diagnosis as the future lies in the wake of AI and improved hardware, therefore MRI will be part of this movement.

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“PMDD and the Menstrual cycle.” - Evie Albu

The importance of Recognizing and researching pre-menstrual symptoms.

PMDD (Pre-Menstrual Dysphoric Disorder) is a severe form of PMS where women experience mood, behavioral and physical symptoms that significantly disrupt daily life. According to NICE clinical knowledge summaries from 2024, up to 90% of women of reproductive age experience at least one of the pre-menstrual symptoms that make up PMS (Pre- Menstrual Syndrome), and 5-8% of women (over 100 million) experience PMDD. Symptoms can vary from of suicidal ideation and depressive behaviour, to physical symptoms like severe abdominal cramping and migraines, however. Although many symptoms are thought to be common, studies suggest around 29–53% of women with clinically significant symptoms seek medical help. The lack of research into PMDD aswell as the social stigma around mental health and the menstrual cycle has meant women are often left to deal with this condition on their own, which can often exacerbate feelings of hopelessness and anxiety. Halbreich et al found that on average women is the USA experience around 481 menstrual cycles- if on average women experience 6-7 days of PMDD symptoms this adds up to almost 8 years’ worth of PMDD symptoms. However, by continuing to research possible explanations for PMDD spread awareness about it, we can help to put systems and practices in place that work with women’s menstrual cycles, rather than against them.

Why does PMDD occur

Most recent scientists have suggested that the reproductive patterns of hormones in women with PMDD are normal, but women have a heightened sensitivity to changes in hormone levels throughout the cycle. Some studies have suggested that the decrease in progesterone during the luteal phase cause central nervous system changes eg. Low levels of serotonin or GABA neurotransmitters. Other theories suggest it is an early peak in oestradiol that causes hypersensitivity. However, this fails to explain why some women start to experience symptoms in ovulation whereas others only experience symptoms in their late luteal phase. Furthermore, there are theorised risk factors that can increase a likelihood of developing PMDD including past traumatic events, cigarette smoking and obesity.

How the NHS approached PMDD

The East London NHS foundation Trust approached treating PMDD first through life-style symptom control. This can involve reducing caffeine, regular food intake and exercise, educating family and friends and psychotherapy or counselling. Doctors also often use SSRI's, and other anti-depressant medication to help women deal with emotional symptoms. Hormonal manipulation for PMDD has also been suggested. HRT (Hormone replacement therapy) can reduce hormonal fluctuation, and which can help with cyclical mood and physical symptoms and reduce mood swings, anxiety, irritability, fatigue and improves physical symptoms such as bloating and breast tenderness. Talking therapies (eg. CBT) are also recommended to combat low mood, yet NHS waitlists for talking therapies can be as long as 18 months. Many people have wondered whether systematic changes in occupational and public health would prevent severe PMDD symptoms more effectively that case by case treatment.

A new attitude to PMDD

The Internation association of Premenstrual disorders UK (IAPMD UK) was launched in 2026 and aims to advance evidence led research and education on PMDD and PME (Premenstrual exacerbation) in the United Kingdom. In July 2021 the IAMPD conducted a virtual even in order to create a 'strategic roadmap for advancing patient-centered outcomes in PMDD research and clinical care'. Their research resulted in new recourses for example- A guide to conducting Patient Centred PMDD research. Their publications centre on the idea that it is important 'to bridge the gap between patient stories and the professionals with the tools, funding, and influence to conduct research and drive systemic change'. By directly talking to women with PMDD and collating personal testimonies with clinical research we can create a more diverse and detailed picture of PMDD which can improve research as well as validate patients with PMDD – a condition that has been historically undermined and unresearched.

“The most feared injuries in the sporting world” - Shrey Thakkar

Overview of the knee joint

The knee is a vital part of the human body as it enables the movement of legs in humans, but it can also be easily damaged due to it bearing and supporting the full weight of the human body. The knee is a hinge joint enabling flexion and extension movements. It is also a synovial joint. A distinct quality of synovial joint comprises of synovial fluid and enables free movement between the bones. Synovial joint consists of a variety of different structure that allow it to do this, It contains an articular cartilage that sits on the end of each bone and acts a shock absorber during movements e.g. jumping and landing and reduces friction between the bones by preventing them from rubbing against each other. In addition, it also consists of a synovial membrane that is responsible for the production and secretion of synovial fluid. The synovial fluid is responsible for lubricating the joint, which as a result further minimises friction. Furthermore, there are Bursae, which are fluid-filled sacs around the joint that provide a cushion between the tendons and bones preventing abrasion. Tendons connect muscle to bone and are a type of connective tissue that is predominantly made up of type One collagen; the joint capsule surrounds the synovial joint and stabilises and protects the joint. Finally, there are ligaments, which are a type of connective tissue which is also rich in collagen. They are responsible for the connection of bones to bones. For example, the Anterior cruciate ligament (ACL) connecting the tibia (Shin) to the femur. The ACL is responsible for providing stability to joints particularly in activities involving sudden changes in direction or pivoting movements.

ACL injuries

One of the most feared injuries globally and especially in sport is the tearing of your ACL. The ACL, formally known as the anterior cruciate ligament, tears in the middle or it pulls of the shin bone. There are many different classes of injuries to the ACL depending on the severity of the injury. Grade 1 is the least severe form of injury described as sprain, which occurs when the ligament is mildly stretched, which causes microscopic tears and damage to the collagen fibres in the ligament to the ligament however it provides stability to the knee joint and hence classes as the least severe.

A grade 2 injury which is the initial tearing of the ligament, and this is a significantly more exaggerated injury than a sprain. This involves the ligament only partially tearing of the ligament damaging approximately 20 to 80 percent of the collagen fibres and making it loose, resulting in knee instability. However, grade 2 is relatively uncommon compared to grade 3 injury which is the most serious form incorporates complete rupturing of the ACL. This is where ligament splits into 2 pieces or completely detaching from the bone, resulting in significant knee instability with the knee no longer weight bearing as it usually does, furthermore the “pop” sound that may occur ultimately confirms the rupture.

Treatments for both grade 1 and grade 2 are relatively similar except grade 2 injuries require much longer as part of the ligament has torn, whereas in grade 1 there are only microtears. Rehabilitation is the main method by improving the strength of the quadriceps and the hamstring to compensate for the damaged ligament. It begins by small fine movements of the knee joint to reduce stiffness pain and swelling and gradually building it up to larger movements and strengthening the surrounding muscles. Grade 3 ruptures initially must undergo a surgical approach before anything can begin. This involves firstly the removal of the ruptured/torn ligaments from the knee joint. The torn ligament is replaced by a graft (a piece of tissue that is surgically inserted) which can be an autograft from the patient itself or an allograft which comes from a donor. Common grafts are usually tendons from the surround muscles from either the quadricep or hamstring and sometimes even the patella tendon taken from the knee cap. The tendons are then inserted between the femur and tibia in the original place of the ligament and stabilised by screws, staples etc. Finally, the patient would undergo the rehabilitation process by the 1st and 2nd grade injuries but would be longer and more structured due to them having to learn everything all over again and build the strength in the knee allowing it to be more stabilised and secure (never will be fully as it is a tendon in place).

Meniscus tear

Among the injuries most feared in sport is a meniscus tear, due to its impact on movement and recovery time. The meniscus is a C-shaped band of cartilage responsible for shock absorbing and stabilising the knee during everyday movement.

A meniscus tear is where the articular cartilage that acts as a shock absorber between the femur and the tibia tears. There are three types of meniscus injuries. The class 1 tear is known as an intrasubstance degeneration, and it results in the cartilage suffering small internal tears but does not extend to the surface of the meniscus leaving the upper and lower articular surfaces intact. Considerably worse than a class 1 tear, is a Class 2 meniscus tear, where the partial-thickness tear extends into the fibrocartilage that extends towards the surface of the meniscus doesn’t fully breach the articular surface. In addition, as it doesn’t fully split into two, it signifies that the structural integrity is damaged and its capacity to absorb shock is reduced significantly. Finally, the most common in both sports due to rapid twisting movements and in the elderly due to degeneration is a grade 3 meniscus tear and extremely painful. It involves a complete rupture of the meniscus cartilage, where the tear extends through the complete thickness of the cartilage surface resulting in significant compromise to the structural integrity of the knee. Furthermore, it causes the formation of free moving fragments cartilage; these are small pieces of cartilage that have broken of the joint surface and float around in the synovial fluid, which causes mechanical problems and provides mass discomfort during walking.

Treatments to meniscus

For both the grade 1 and grade 2 meniscus injuries both require physiotherapy that targets the quadriceps and hamstrings in order to stabilize the need and reduce pressure onto the meniscus. Anti-inflammatories work by reducing the production of chemicals in the body, such as prostaglandins, that cause inflammation, pain, and swelling. This helps to decrease discomfort and improve movement in the affected area. However, grade 3 evidently require much more effort with both a surgical and non-surgical approach. The surgical approach initially involves the trimming of unstable fragments of the meniscus to allow the healthy tissue surrounding it to remain intact to prevent pain by the excess cartilage “catching” in the knee. However, if the meniscus tear is much worse, then further surgery may be required to stitch the meniscus together. Similarly, to ACL injuries it is followed by an intense routine of rehabilitation to enable relatively close to normal functioning of the knee due to stiches unable to match the function of the collagen in the meniscus.

Overall, both these injuries are daunting to everyone due to the immense pain they cause but additionally the psychological effects are significantly everlasting and potentially causing trauma to those who underwent this injury. Destroying their confidence ultimately leads to insecurity and perhaps lower quality on route to their recovery. Ultimately, ACL injuries are significantly worse since the consequences of surgery are everlasting and results in time to rediscover the fundamental motor skills.

How Ethical is genetic screening? - By Emma McCulloch

There are many different types of genetic screening, which exist in our technologically advanced world. Some of the common types of screenings, which a pregnant woman can get on their baby, are Chorionic villus sampling (CVS), Amniocentesis and Non-invasive prenatal testing (NIPT). CVS "is a test you may be offered during pregnancy to check if your baby has a genetic or chromosomal condition, such as Down's syndrome, Edwards' syndrome or Patau's syndrome." The aim of this procedure is to get a small sample of placenta which is then examined in a laboratory by inserting a needle with a syringe attached to suction it out. Doctors use an ultrasound scan to direct the needle. As a result of CVS, you can find out "chromosome problems or other genetic diseases in an unborn baby". Amniocentesis is very similar to CVS however "a small sample of the fluid that surrounds the foetus is removed. " instead. NIPT is non-invasive so it does not go near the baby and instead involves the genetic testing of the mother's blood. All three methods can check for Down's syndrome, Edwards' syndrome and Patau's syndrome which are all common examples of trisomy (three copies of a chromosome instead of two).

What does ethical mean? Something is ethical if it is morally correct to do and it affects you and the people around you fairly. In this report I will discuss how ethical these different methods of genetic screening are, and I will present a case study on how China's one child policy affected the views on genetic testing in general, and some primary research of what the public think.

Genetic screening is ethical

Genetic screening is used in England, however it is only offered free of charge to people whose close family have health conditions caused by mutations in chromosomes or to those whose NIPT Test results indicate a high risk. Anyone in England can have a genetic screening test privately, which is charged by which chromosomes you are looking for. On the NHS (a publicly funded health service in England) "antenatal screening is offered for 17 different conditions to approximately 700,000 pregnant women in England every year".

Antenatal screening tests are a variety of investigations, including genetic screening for those at highest risk to detect some birth defects before the baby is born.

Genetic screening is ethical: Doctors can set up health plans for affected babies before birth:

Genetic screening tests tell the parents the likelihood of a baby developing a certain disease such as Cystic Fibrosis. This then allows the doctors to imagine how the infants' life will be.
To assist the baby's life and increase their quality of life, doctors can create support plans which may need to be used immediately after birth if the genetic disorder is potentially fatal or used later in life. This is ethical, because it supports the people around the baby by making them feel less worried and have reassurance that the baby will survive, however most importantly it often improves the life quality of the child hopefully allowing them to take part in more daily activities. For example, the NHS offer staying in hospital for a while after they're born, have further treatment from a specialist doctor and have further tests and checks as they get older depending on their condition and how severe it is. In rare cases there are larger, more detailed plans of which surgeries or medications are needed.

Genetic screening is ethical: Chances of survival, chances that next pregnancy has similar genetic disorders and termination due to expected poor life quality

Unfortunately, some genetic diseases have low chances of survival where life expectancy is short. An example of a severe genetic disorder is Cerebral Demyelinating Adrenoleukodystrophy (ALD). Once symptoms are shown the life expectancy is "within 1 to 10 years". Many Children with genetic disorders such as ALD have a poor quality of life and experience pain. A few symptoms of ALD are;

- Problems with vision, hearing and motor function
- Behaviour problems
- Getting tired easily
- Clumsiness
- Low blood sugar levels
- Eye pain
- Migraines
- Viral infections that keep coming back

These all reduce the quality of life dramatically. Could you imagine having to live with this every day of your life? Some parents believe that it would be better for everyone, including the baby, for the pregnancy to be terminated as the quality of life is so poor. What could affect this decision is the chance of having another baby with the genetic disorder - as they will just have the same problems. Genetic screening can "assess your chances of having a baby" with the condition you are screening for. This is useful as it allows the parents to see how likely the next child will have a genetic disorder and if it is worth trying again. If the baby was born with a genetic disease that limits what activities they can do, causes then emotional stress growing up due to knowing their life is cut short and enduring physical pain, it can make them and the people around them feel upset. In this case genetic screening is ethical.

Genetic screening is not ethical

After doctors share their findings, parents have two main options: Either they terminate the pregnancy or they continue with the pregnancy. This leads to legal dilemmas around the world as abortion is prohibited in 22 countries.

Chromosomes are thin strands of DNA that come in pairs and determine specific traits like eye colour and blood. When doctors analyse the chromosomes, they can detect errors and variations. "The four main types of structural chromosomal aberrations are deletion, duplication, inversion, and translocation. Deletions occur when a portion of the chromosome is deleted, or taken out, which can make that chromosome less functional." This then causes genetic disorders such as ALD or downs syndrome. However, when doctors are looking for a specific disorder, they can also find unexpected variations. Finding incidental variations of the chromosomes can lead to unethical situations. Unfortunately, doctors cannot always explain what different DNA errors mean so this leaves the parents with a whole bunch of questions and questioning a termination of the pregnancy. This dilemma can lead to unethical behaviour. When a variation is found, but the doctor cannot explain the consequences on the quality of life of the baby, the parents may decide to have a termination of the pregnancy. This variation however may not have affected the baby's life and there was no need for the termination.

The process of CVS can lead to a miscarriage, but this is rare. It could be considered unethical to put the baby at risk without other evidence that the baby is at increased risk of a severe genetic disorder as it may cause a miscarriage to a healthy pregnancy. It needs careful consideration, but the knowledge means people can make informed choices, which is important.

Most of the time there are no cures for genetic disorders, but there may be modifying drugs which can have a positive influence on the baby's life.

Between 1980 and 1998 a study found that "following a prenatal diagnosis of Down syndrome 92 per cent" of babies were terminated. These terminations could make other people who have that genetic disease feel unworthy and affect their mental health. It is particularly important that a good mental health is sustained by people, who have a genetic disease as they are more vulnerable.

How did the one child policy in China affect prenatal genetic screening?

The one child policy was implemented nationwide by the Chinese government in 1980. It was a law that forced almost all Chinese families to have only 1 child. This ended in 2016.

They introduced this law to "address the growth rate of the country's population, which the government viewed as being too rapid". When families are restricted to have only one baby, this may influence some of the prenatal decisions made. For example, "Chinese officials recently announced that 336 million abortions" took place during the one child policy.

In the absence of any interventions the "sex ratio at birth is consistent across populations at between 103 and 107 boys born for every 100 girls. Higher early mortality among boys ensures a ratio of close to 100 in the all important reproductive years." However, historically society showed a preference for boys over girls, so girls were often neglected, abandoned or even killed.

A large imbalance in ratio was formed when China's one child policy begun, because since the early 1980s selection for males prenatally with ultrasonographic sex determination and sex selective abortion has been possible. This was socially acceptable in China.

Regular prenatal screening does not tell you as much information as genetic screening.

Genetic testing on embryos has the potential to determine physical traits such as eye and hair colour. Many controversies were highlighted when, prenatal screening was used to discriminate against a sex. Due to people determining the gender of a foetus and then aborting it despite being perfectly healthy, sex ratios were consistently higher than normal across residency type and all age groups except for urban 15-19 year olds. Biological sex ratios peaked in the 1-4 age group; the highest was 126 (95% confidence interval 125 to 126) in rural areas.

This may then also in the future lead to some people thinking that it is socially acceptable to use genetic testing to predict their baby's physical appearance and discriminate against certain undesirable features in their culture. This is extremely unethical as it kills a life without a medical need.

This also raises important questions around IVF (In Vitro Fertilization) and whether it should be allowed to test embryos for their genetically determined physical appearance before they are being implanted into the womb.

In conclusion to this, China's one child policy had a negative effect on the reputation of genetic screening as the policy made sex selective abortion seem acceptable. This may make others think information found with genetic testing not relating to diseases is also acceptable to be used in the decision making whether to keep a pregnancy, when it is not.

Primary research: is genetic screening ethical?

Genetic screening is a controversial topic. I conducted research asking 20 people, who are a range of ages whether they think genetic screening is ethical after telling them a concise summary of how genetic screening works and different forms of it such a CVS and how certain uses can be ethical or not ethical. The results were in favour of it being ethical. 95 % of people said "yes" it is ethical. However, there is a potential risk that there could be some flaws with these results. For example, when answering the question many people also commented that it is important to see the unethical sides of genetic screening and risks that come with it.

Conclusion: how ethical is genetic screening?

In conclusion genetic screening can be performed in many ways, for example CVS. Doctors can then study the DNA and find variations like an extra chromosome. Ethical is whether something is morally correct to do and if it affects you and the people around you fairly.

Genetic screening is ethical because it allows parents to see the chance of another child having the genetic disorder and it allows to see if they will have severe health conditions. My primary research showed that most of the public thought it was ethical, but a few people had concerns about its misuse.

Conducting genetic screening for certain diseases is ethical however it needs careful consideration and laws need to be set in place to avoid unethical use. It does not necessarily mean that a foetus is aborted but it can reduce suffering. It enables us to have early health care plans which prevent irreversible damage. It is important that people can make informed choices. In general, genetic screening has improved patient and parent care.

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