JUNE

MedSoc

NEWSLETTER

In this month's issue...

What's the role of genetics in mental illness development?

BY MANUELA VUTUKURI

There is a lot of debate around the role of genetics in the development of mental illness. Some studies suggest that certain genes may increase the risk of developing conditions like depression or bipolar disorder, while others argue that environmental factors play a larger role. It's likely that both genetics and environment interact in complex ways to influence mental health outcomes. One thing is clear: mental illness is a complex and multifaceted phenomenon that defies easy answers. As we continue to learn more about the genetic and environmental factors that contribute to its development, we may be able to better understand and treat these conditions.

Bipolar disease

According to some estimates, a significant percentage of mental illness cases may be influenced by genetics. Studies have identified specific genetic mutations or variations that may increase the risk of developing bipolar disorder, including genes like CACNA1C, ODZ4, TRANK1 and NCAN. These genetic factors may be inherited from parents or develop during an individual's lifetime.

Schizophrenia

Studies have revealed that there exist certain genetic mutations or variations within specific genes that may heighten the likelihood of an individual developing bipolar disorder or schizophrenia. These genetic factors can either be inherited from previous generations or acquired during an individual's lifetime due to environmental and lifestyle factors.

For example, copy number variants (CNVs) involved in DiGeorge syndrome which includes deletions of around 50 genes including COMT and 17q12 microdeletion syndrome are highly associated with an increased risk of developing schizophrenia.

ASD

ASD (Autism spectrum disorder) is a neurodevelopmental disorder usually present from birth. Many of these genes that have been implicated in ASD are

related to specific ion channels and synapses thus suggesting abnormal synaptic and neural network development.

ASD is characterised by a wide range of genetic mutations, which can vary greatly depending on the specific genes involved and the types of mutations present, leading to a significant degree of clinical and genetic diversity within the disorder.

However, it is also crucial to recognize that mental health disorders are influenced by a variety of environmental and societal factors. Stress, trauma, poverty, discrimination, and inadequate healthcare are all contributing factors. To prevent and treat these issues effectively, it's important to understand the interplay between genetics, environment, and society.

Parkinson's Disease & CEU1

BY SAARAA AZAD

What is Parkinson's?

Parkinson's disease is **progressive disorder** where parts of the brain and nervous system become damaged overtime.

The main symptoms of Parkinsons are **involuntary tremors, slow movement, muscle stiffness** and **impaired balance**. These symptoms can make everyday tasks such as writing and opening items impossible. Therefore people with Parkinsons can suffer from mental health issues surrounding the frustration and lack of independence related to their condition.

Symptoms of Parkinson's disease tend to develop when people are over 50 and it tends to affect men more than women.

Treatment for Parkinsons

There is no cure for Parkinson's so treatment focuses on improving quality of life by reducing the effect of the symptoms mentioned above.

Drugs such as anticholinergics can be used to manage symptoms. Anticholinergics block and inhibit the activity of the neurotransmitter acetylcholine which can help in reducing tremors and tend to be used with younger people that have Parkinson's.

The 3 main types of therapies used to treat Parkinson's are:

- **Physiotherapy**: Helps with muscle strength
- **Speech and language therapy**: Helps with maintaining a good quality of speech as well as working on volume
- **Occupational therapy**: Provides support with everyday life such as maintaining levels of work, self-care etc.

What is CUE1?

The **CEU1** is a device worn on the chest that treats one of the symptoms of Parkinsons which is **freezing of gait**. Freezing of gait refers to when an individual cannot move their feet despite intentionally trying to walk. The device produces vibrations, a particular pattern that is transmitted from the skin to the brain influencing brain activity.

The pulses produced by the device can also act as a stimulus for the individual to focus on when sustaining cycles of body movements such as walking. This is known as cueing.

The aim of the device is to **improve movement** and **reduce falls** to allow people with parkinsons to return back to their homes quicker after being admitted to hospitals. It is non-invasive and discrete so the user can go about their everyday lives as normal. Since this device is relatively new, its use is not widespread but its impact is relatively positive so far.

To strike or not to strike?

JUNIOR DOCTOR STRIKES

BY TAMSIN 12L

Who are junior doctors?

Junior doctor = medical graduates who aren't a consultant or GP, even those not in training but employed under a junior doctor contract

Medical school
(4-7 yrs)

Foundation years
(FY1-FY2,FY3)

Core training
(CT1-CT2)

Specialty training
(ST3-ST8)

Run- through training
(ST1-ST8)

GP training
(3 yrs)

Consultant / GP

Make up ~40% of the doctors in NHS

What has been happening in England?

2022 BMA call to discuss state of NHS and cuts to pay with government

Jan 9th 2023 BMA dissatisfied with government's response so ballot for industrial action opened

98% who voted, said yes

MARCH 72 hour strike

APRIL Government call BMA's call for a 35% pay rise "unrealistic" and "unreasonable" - resulted in 96 hour strike

JUNE May 22nd - government offered 5% pay increase however BMA stated this was "simply not a credible offer" - resulted in 72 hour strike

BMA = the trade union and professional body for doctors in the UK

Why are junior doctors striking?

Full pay restoration

Since 2008/9, doctors' pay hasn't increased in line with inflation. This means that a doctor now is paid ~26% less than a doctor 15 years ago. Doctors' jobs haven't gotten any easier especially throughout the COVID pandemic and in a struggling NHS therefore it has been calculated that a 35% pay rise for junior doctors will bring salaries back to 2008-2009 levels.

Prevent future declines in real pay

The BMA want to agree with the government on a mechanism to prevent decline in pay from happening again in order to improve the NHS's sustainability.

Reform DDRB

DDRB = Doctors' and Dentists' Review Body who advises government on rates of pay for doctors and dentists

79% of junior doctors in BMA Junior Doctor Survey Nov - Dec 2022 said they often think about leaving the NHS. With pre-existing staff shortages, this is evidently a massive issue. Therefore, the 3rd aim of the strikes is to reform the DDRB to help safeguard the recruitment and retention of junior doctors.

BMA survey if you are interested in finding out more shocking stats...
https://www.bma.org.uk/news-and-opinion/damning-survey-results-reveal-scale-of-junior-doctors-hardship

Consultant strikes as well?

Consultants too have received a 35% pay erosion since 2008/9 despite working long, antisocial hours, pushing through the immense pressures of the COVID pandemic and cost of living crisis. As a result, the BMA balloted its consultants resulting in a turnout of 71% of the 86% of consultants that voted saying yes for strike action. This strike will take place on 20 and 21 July if the government fail to come forward with a reasonable pay offer. These strikes have similar motives to the junior doctor strikes: asking for pay not to be cut this year and reformation of DDRB.

Is it ethical for doctors to strike?

Do the impacts of strike unethically compromise patient safety? There's a few things to think about here.

- Doctors, as with most workers, are legally allowed to take part in lawful industrial action. They also have the right to fair pay and conditions in return for their work
- The conditions and pressures doctors are currently working are arguably compromising patients safety and the strikes are a call to fix this
- Stresses due to conditions and pay erosion, difficulty paying student debts, personal finances can risk doctors physical and mental wellbeing which inevitably goes on to affect the workforce's ability to care for patients
- Impacts of not taking strike action will result in the situation worsening where doctors are increasingly moving away from the NHS leaving it in a more pressured state

Are the strikes likely to be successful and make the right change?

https://www.theukcatpeople.co.uk/post/bma-junior-doctors-strikes-uk-medical-interview-hot-topic-questions

https://www.bma.org.uk/advice-and-support/ethics/personal-ethics/the-ethics-of-taking-industrial-action-as-a-doctor

AI In Medicine

By Kanza Saad

What is AI?

Artificial Intelligence (or AI) is "the ability of a computer or other machine to perform actions thought to require intelligence," which essentially means a computer being able to make decisions. A lot of the technology we use today has AI infrastructures within it (a good example is Amazon's Alexa which can recognise words and respond). Now, AI is slowly being integrated into modern medicine and shows a lot of potential.

How is AI currently being used in medicine?

- Medical diagnosis – AI systems have been designed which can make accurate diagnoses from medical imaging scans and microscope slides. This means diseases such as cancer can be detected earlier on which leads to better long-term outcomes for patients.
- Radiotherapy – Normally, generic doses of radiotherapy, which don't consider individual cases, are prescribed, however, an AI framework has been developed to create a specific dose based on a patient's CT and health records.
- Virtual nursing – These are robots which are created to monitor health. An example of this is Current which is a wearable device that tracks a patient's pulse, temperature, respiration and oxygen saturation. It keeps doctors updated on their patients and can be used in a hospital or at home.
- Robotic surgery – Robots can now carry out routine operations and research has found that these can have a five-fold decrease in surgical complications. It also requires less staff and time making robotic surgery a promising prospect for the future. Many NHS hospitals use robots as part of minor surgeries such as hip and knee replacements.

Limitations of AI

- Needs human surveillance – Although AI has advanced fairly rapidly, human intervention is vital in healthcare. For example, in diagnosis, a robot would act logically rather than with empathy and would miss the behavioural traits that a doctor could spot, which could prevent medical complications. Furthermore, AI would not take the social and economic history of a patient into account when determining a healthcare plan (e.g. can a patient afford a certain care centre and will they be comfortable there?).
- May lead to unemployment – Whilst AI reduces the costs of some things in healthcare and takes extra pressure off doctors, it also makes millions of jobs redundant. Repetitive tasks which would have once been completed by humans would be taken over by AI leading to many people losing their jobs; this creates equity and ethical issues with using AI in medicine.

Some would argue that the benefits of integrating AI into the NHS greatly outweighs the limitations so it should be introduced to the healthcare system much more. What do you think? Let me know your thoughts (17saad629@kechg.org.uk).

Is AI the future of medicine?

As medicine is constantly **evolving and changing**, the need for **faster, quicker and more efficient contributions** to healthcare is growing in demand. One such solution is the **intervention of AI.**

However, there are various controversies surrounding the implementation of AI such as the **lack of human attributes and emotions**, which according to the NCBI, restricts the **level of rapport between the patient and the AI**. In particular, specialities such as Obstetrics and Gynaecology require a high level of compassion and care which is simply not feasible with the use of robots. Statistically, "**60% of US adults are uncomfortable with healthcare providers relying on AI**" which shows the **preference** of human medics over AI.

In contrast, the role of technology has helped **support vulnerable age groups** such as the elderly. During the COVID 19 pandemic, virtual/online care became more prevalent than before and many elderly people were able to get the support they needed during this tough time. Reports from the BMJ also reinforce the value of AI as an "**important technology**" needed during this time. One other obvious positive impact is due to the **accurate, precise and rapid diagnoses** made by the AI, it can support the doctor's prediction on the presenting conditions which overall improves the **quality** of the patients experiences.

Using AI has already proven to be effective in identifying **precisely undetected lung cancers** on X-rays. Researchers from the **Seoul National University Hospital** found that AI helped in producing a **higher specificity and more accurate diagnosis**. There are **doubts around whether AI** will be able to consistently provide these results on a wider scale but these experimental results do **look promising** and I feel that upscaling this with a larger sample size will prove effective with more funding from the NHS as this is an investment **worth further researching** into as it will definitely change lives for the better. As the saying goes "Prevention is better than cure" and AI definitely plays a pivotal role in highlighting that. Melanoma is a type of skin cancer and is responsible for over 7000 deaths in the US alone which already signifies the major risk this cancer poses. Statistics show that up to 86% of melanoma cancers can be detected in the early stage and can prevent further rapid progression. As a results, **annotated datasets of skin lesion images** were taken to further improve the quality and accuracy of findings. This tool actually detected the signs of melanoma **much quicker** than human doctors which again reiterates the growing pace of AI.

In my opinion, there is **no future for healthcare without the aid of some technological advancements**. Technology is essential for new drug discoveries, conducting research and so on. The list is endless! We also have to recognise the fact that AI is **not a replacement** for modern medicine but more of a **useful contribution** as it works alongside human doctors in ultimately delivering a **patient centred care of the highest standards**

By Sriya Sreekantam :)

The Insidious Rise of Antibiotic Resistance

BY SAI SHREEYA PUPPALA

Antibiotics are the foundation of modern medicine - from routine surgeries like hip replacements, common illnesses like diarrhoea, and minor injuries like cuts - life without working antibiotics can cause such to become potentially life-threatening. Antibiotic/ Antimicrobial Resistance (ABR/AMR) is when "microbes, such as bacteria, evolve to no longer be susceptible to an antimicrobial agent". The WHO (World Health Organisation) stated it to be "one of the top 10 biggest threats to global health, food security, and development today". There is a dire need for more potent drugs, which often have worse side effects, for previously easy-to-treat illnesses (such as staph infections) that now are becoming prolonged and fatal due to the developing AMR. A 2022 study from The Lancet found that an estimated 1.27 million people die each year from drug resistant infections - threatening global health, as much of the burden falls on low and middle-income countries. Indeed, by 2050, it is predicted that AMR will be responsible for more deaths globally than cancer; so how did it emerge and burgeon to become the immense problem that it is today?

The Creation of Antibiotics and How They Work:

The Age of Antibiotics that we currently live in sprung upon us after A. Fleming's serendipitous discovery of 'Penicillin' - a bread mould that kills bacteria - in 1928. The aim of antibiotics thus has been to target bacteria and leave other human cells unharmed; some destroy bacteria directly (bactericidal) and others prevent them from reproducing (bacteriostatic); some are broad spectrum (can harm many types of bacteria) and others are narrow spectrum (only damage specific bacteria).

Fleming's purified antibiotic - Penicillium Digitatum - for example, interferes with molecules in peptidoglycan cell walls that maintain the shape of a bacterial cell (not present in human or animal cells so they are unaffected) causing them to burst and die. Another class of antibiotics, Quinolones, prevent bacteria upon exposure from being able to copy their own DNA making them unable to replicate once the molecule attaches. Currently, over 100 antibiotics are in use (most derived from soil bacteria, not mould) and the general process to create them is:

- Isolate and purify the specific antibacterial compound the soil bacteria produces.
- Find out dose for the maximum efficacy minimising negative side effects via clinical trials, while taking into account that the liver breaks it down in our body.

How Does Resistance Occur?

As bacteria replicate through binary fission, they may simultaneously develop random genetic mutations in their DNA; this can allow them to survive a specific antibiotic attack, causing them to become resistant to the antibiotic. For example, a bacterium may develop a mutation preventing Quinolone molecules from attaching to the correct site in order to halt DNA replication, allowing the bacterium to still replicate its DNA and reproduce. The AMR gene mutation can then pass onto its offspring making them also resistant and creating a new AMR bacteria population. But this is not the only way AMR can spread:

- (1) Spreading AMR genes by conjugation (two bacteria in a close colony situation where plasmids containing the genes are transmitted via a linking conjugal bridge)
- (2) Spreading AMR genes by transformation (a live bacterium can intake leftover DNA from a dead resistant bacterium nearby to become resistant itself)
- (3) Spreading AMR genes by transduction (a virus infects a resistant bacterium, intakes its DNA, replicates, exits, and deposits its DNA in another bacterium upon infection)

Wherever there are AMR bacteria, there is also a chance for them to spread their resistance to other bacteria - therefore having more antibiotics in the environment can lead to a higher rate of AMR. The overuse of antibiotics when not necessary, especially in the medical and agricultural sector, has led to an exponential rise in AMR leading to the crisis of today.

What can be done to fight AMR?

Primary Care: In England, 86% of antibiotics used are prescribed in primary care (this includes general practice, community pharmacy, dental, and optometry services). Significantly, modelling from the UK Government suggests that at least 20% of antibiotic prescriptions in primary care are inappropriately prescribed. The Hippocratic Oath's command: 'first, do not harm', is essential when considering whether antibiotics are really necessary; as they may pose a risk, both at the individual and the population level. Therefore, antibiotics should only be prescribed when absolutely necessary- with an appropriate antibiotic choice and the correct duration of treatment.

Agricultural Sector: The overuse of antibiotics, specifically in rearing livestock, has led to the intensive factory farming methods contributing to the rise in AMR. High numbers of animals kept in cramped environments can be a breeding ground for disease which has led to antibiotics being given to whole herds or flocks simply to keep illness at bay. Cóilín Nunan, scientific adviser to the Alliance to Save Our Antibiotics emphasised that "the best way to reduce farming's impact is to make large cuts to antibiotic use, and this means keeping animals in healthier conditions so they rarely need medication".

Continual Innovation: Pharmaceutical scientists are working to develop new antibiotics as a 'last line of defence' drugs as well as new drug combinations which will tackle severe infections which cannot be cleared by other treatments. For example, in 2022, the newly developed drugs cefiderocol and ceftazidime with avibactam fight specific AMR bacteria previously difficult to treat. More of these are continually being developed and tested for the future, which will go on to save lives.

What can YOU do?

The WHO (2018) advises to:

- Always seek the advice of a healthcare professional before taking antibiotics
- Only take antibiotics when you have a prescription
- Not to self-medicate
- Wash your hands
- Practise good hygiene at home and in hospitals to prevent bacterial infections in the first place

It is also important to keep your vaccinations up to date; to stay at home when you are sick; and to finish the whole prescription that has been given to you by your doctor.

Conclusion:

No one, no single person or single country, can tackle the AMR crisis alone - yet we can all individually rise up to the challenge and each contribute to a larger cause. By spreading awareness of Antibiotic Resistance, many small, collective changes can go a long way. Antibiotics save our lives - so let's each do our part to save our antibiotics.

Sources:

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https://youtu.be/pkTalaQsRlw
https://youtu.be/jSoOave8hdY

Some fun stuff...

A	S	C	H	I	Z	O	P	H	R	E	N	I	A
B	I	P	O	L	A	R	I	M	T	L	M	A	E
T	C	T	D	D	T	L	B	S	S	S	E	E	H
S	R	N	N	A	G	T	C	R	E	A	E	N	T
N	N	E	H	D	T	E	E	O	E	O	H	L	L
O	A	M	S	I	E	N	N	M	M	R	M	T	A
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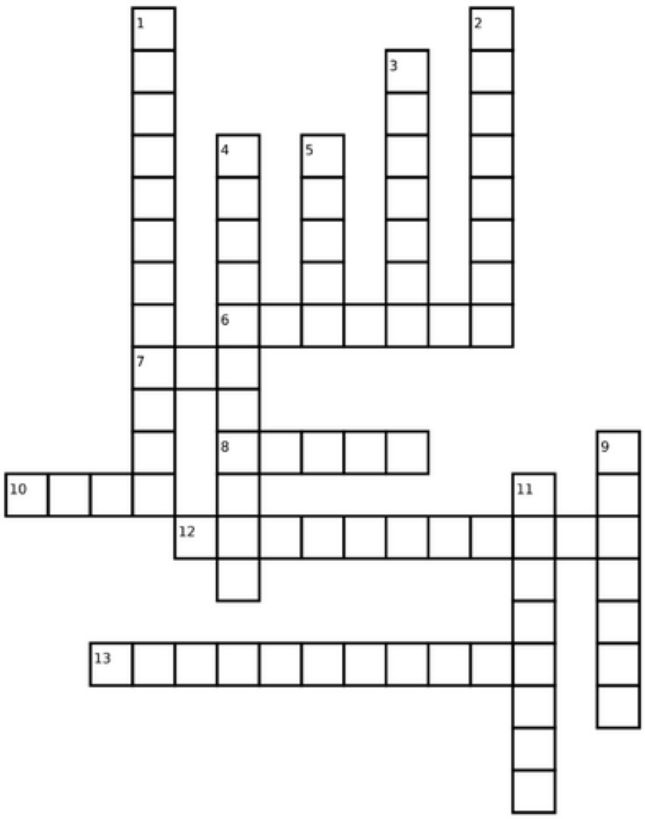
A	D	S	P	R	T	G	I	I	S	E	S	C	N
P	I	S	T	T	E	N	L	E	I	H	N	O	E
A	R	I	A	A	O	N	S	E	N	A	A	I	M

GENETICS
DISORDER
MENTAL HEALTH
TREATMENT
ASD
TREMOR
NHS
BIPOLAR
SCHIZOPHRENIA
PARKINSONS

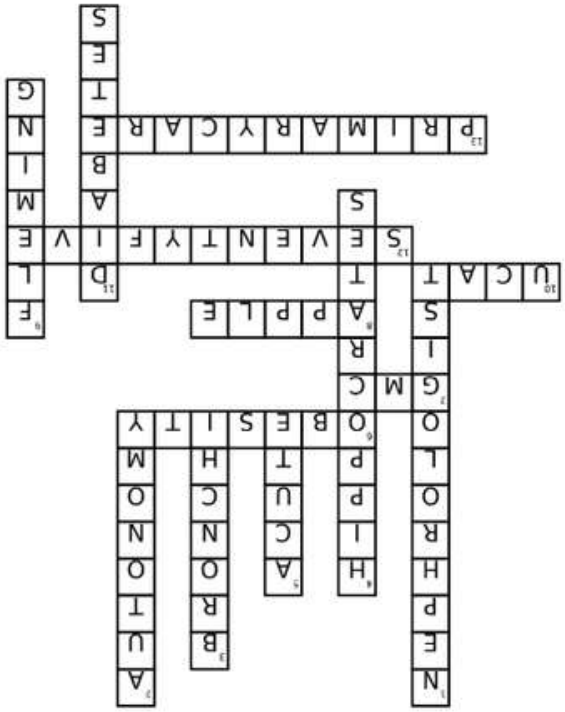


Down:

1. Doctors who specialise in the care of kidneys
2. One of the 4 pillars of medical ethics
3. Part of lungs that becomes inflamed and more sensitive than normal causing asthma
4. Said to be the father of medicine
5. Word to describe illnesses that generally develop suddenly and last a short time
9. Surname of the person who discovered penicillin
11. Lifelong condition that causes a person's blood sugar level to become too high

Across:

6. Abnormal or excessive fat accumulation that presents a risk to health
7. public body that regulates the standards of medical education and practice across the UK
8. "An _____ a day keeps the doctor away"
10. Admissions test used by most medical schools
12. How old will the NHS be this year?
13. Services which provide the first point of contact in the healthcare system, acting as the 'front door' of the NHS



Answers to last edition's crossword

Thank you for reading!!

HAVE AN AMAZING SUMMER!