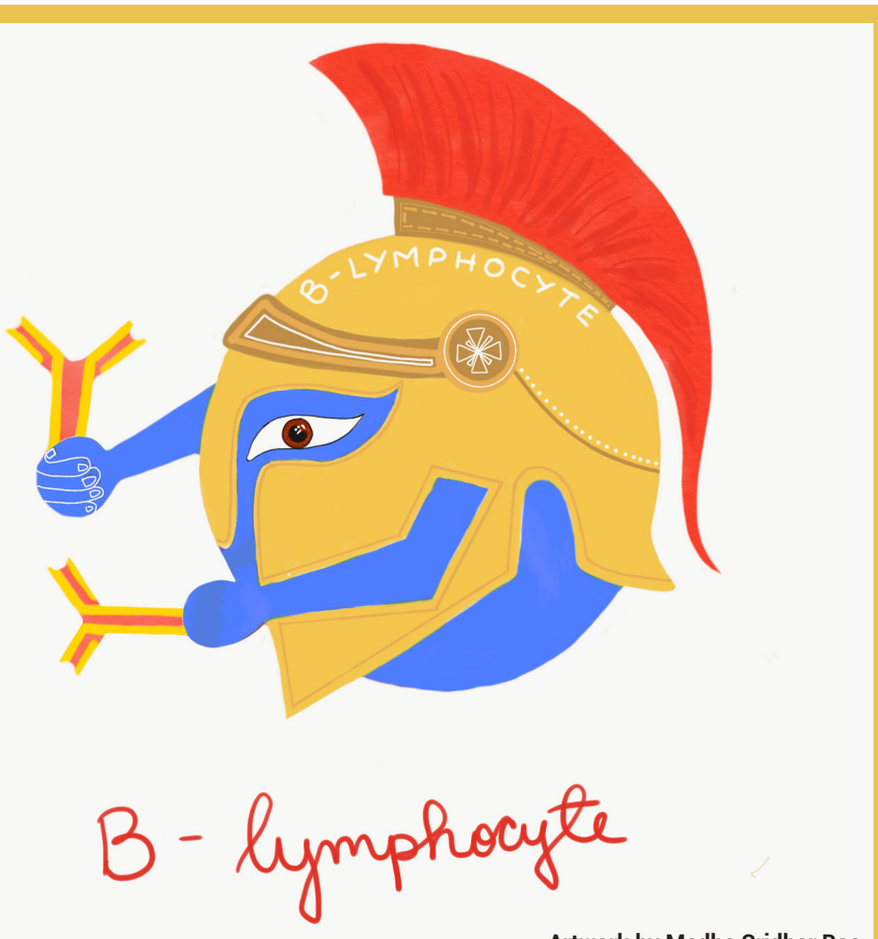
miniMentor.



Artwork by Medha Sridhar Rao

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Issue 01 *September 2020*

Brought To You By MEDIC MENTOR

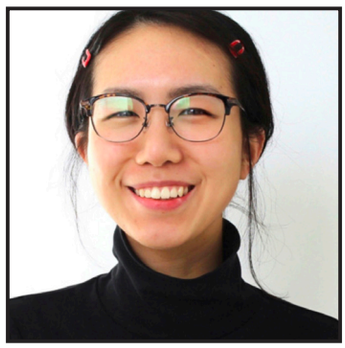
Welcome To miniMentor.

The editorial team of Mentor has been working hard to enhance the content that you receive and we are excited to announce some amazing changes. Mentor will remain a quarterly anthology filled with inspiring and high quality wider reading. From December, it will be written solely by Medic Mentor scholars, Vice Presidents, Chief Mentors and outstanding qualified doctors, veterinarians and dentists.

To provide opportunities for applying students to publishing and give our readers even more wider reading, there will be supplementary releases of miniMentor. The new miniMentor, written by applying healthcare students, is a chance to share experiences, reflections, feelings related to your application process and any inspiration from wider reading. If you would like to contribute to miniMentor, please read the guidelines on the Medic Mentor website or email the editorial team on minimentor@medicmentorfamily.org. Opportunities to publish will be selected on a competitive basis so please think about your proposal carefully before contacting us.

The editorial team has grown from three to seven, demonstrating the Medic Mentor brain power that is delivering this upgraded service to you. Thank you for subscribing to Mentor and we hope you enjoy and value the amazing content we have lined up for you!

Dr Alexander Davies MRCVS >



< Dr Ji-Yun Yeung BDS

Meet The Editors.

Pavandeep Uppal
Editor-in-Chief

I've really enjoyed editing Mentor for the past year alongside Alex and Stephanie, and look forward to working on the new phase of Medic Mentor publications with a great new team! I'm a final year medical student at King's College London and have a BSc in Medical Humanities, Philosophy & Law. The new miniMentor is a fantastic arena to showcase the great work students are doing even before they enter their chosen careers in healthcare.

Tia Bell
miniMentor editor

My name is Tia Bell and I am a second year veterinary student at the University of Surrey and I am originally from South London. I am super excited to be part of the editorial team for miniMentor. I am already amazed by your writing enthusiasm, as well as your hunger to learn and hope this magazine inspires you to achieve your goals. I aspire that miniMentor will support you in your journey into higher education and beyond.

Chris Geddie
miniMentor editor

Hello! I'm a third-year medical student studying at Bristol and I'm about to start my clinical placements. I'm so excited to be co-editing miniMentor this year; it's a chance to collaborate with all the applying students in the Medic Mentor family and it's a wonderful platform for the more creative side of medicine. My hope is that you will enjoy reading the magazine as much as we do putting it together.

Mentor Bulletin.

How to become a Doctor?
'Becoming a Doctor' Podcasts

The Becoming a Doctor series has hit the ground running this academic year with some exciting and informative episodes being dropped over the coming weeks. Get excited for the new careers' series and presidential series along with interview tips, BMAT tips and much much more! Tune in on Spotify, google podcasts, apple podcasts and overcast!

UPDATES Summer School

What an incredible season we've enjoyed! This summer has been our busiest season by far, but for good reason because we are wholly invested into seeing you apply and succeed through every element of your UCAS application journey. Well done to all of our attendees, you are nearly there, and we look forward to preparing you for interviews and seeing you cross that finish line with confidence!

WHAT'S NEW? Book Club.

A new addition to the plethora of opportunities available to you led by Dr Poynton-Smith where each month you will come together with the club to generally discuss what you learned, loved and would recommend to a friend! Wider reading is a non-academic essential, so learn how to apply your wider reading to your application in a way that can enhance your personal statement!

WHAT'S NEW? Virtual Medical Society

A huge welcome to our new committee members! If you are new to the Virtual Medical Society you are in for a very exciting year alongside a 1000 student network of like-minded students covering research, current affairs, medic mentor wide updates, inspiring interviews and so much more!

A 50-Year Career at Age 15

Jay Mittal

Imagine a world where it is mandatory to spend the next 50 years of your life being forced into the same job every day. This is the reality for 85% of full-time workers who find their job 'unengaging' (Jim Clifton, 2017). At 15 years old are we capable of choosing a career that is engaging enough to give us satisfaction and fulfillment for the next 50 years of our lives? Possessing the ability to understand and know how you want to spend the next 50 years of your life is a rare skill, so why has it become a responsibility? Why are teenagers forced to choose? We are not permitted to vote, drink alcohol or drive, yet we are trusted with our futures.

Experience vs Good Grades

Research is key when choosing your career, however there is only so much research you can do until you have narrowed your career choices down to just a few. From then on, more in-depth involvement is required in order to choose your appropriate course. Despite this, there is little to no guidance for some students to find appropriate work experience. Many students only have time to commit to a placement at one place which limits the opportunity for varied career insights. Most students will have already chosen their A-Levels before carrying out any medical, veterinary or dentistry specific experience. If you had not picked science subjects, even with plenty of experience, it may be impossible to get into your dream course. You may be forced to re-do your A-Levels or venture down an entirely different career path. Sacrificing your time to confirm your career choice, by maximising the amount of work experience you attain, may impact the amount of revision you are able to complete. However, it is experience that will give you the best career insight and inform you to confidently and enthusiastically commit to a lifelong and personally fulfilling career.

Are People Satisfied With Their Career?

As stated previously, a global study of one billion full-time workers demonstrated 85% of individuals were not engaged with their job (Jim Clifton, 2017). This astronomical statistic illustrates that a substantial number of people may wish to follow an alternative career path, which they may enjoy more. Alternatively, this unfulfillment may provoke negative mental health in these workers, initiated by boredom and unfulfillment from their job. If these workers had more awareness, time and understanding of potential careers, they may have picked a more engaging course for themselves.

On the contrary, there are many studies online exhibiting that if you possess multiple careers in your lifetime, you achieve greater personal growth and flexibility (Ashmi Pathela, 2017). However, time is lost and stress is generated by finding a new job. Additional qualifications may be required, money 'wasted' and more experience needed. Would it be worth changing from your initial career? It is probably more sustainable and beneficial to make sure you are making the most informed decision at the start of your career.

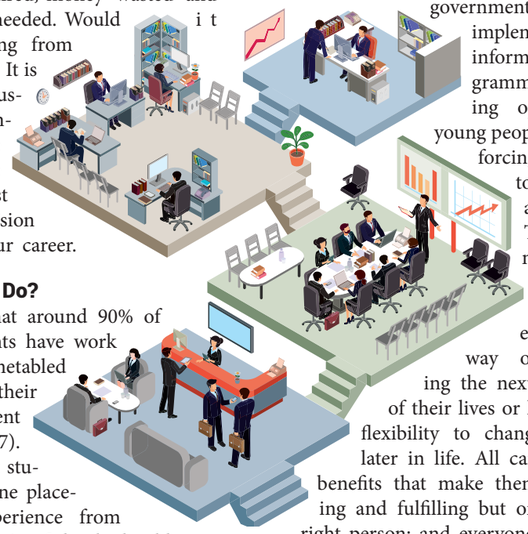
What Should We Do?

It is surprising that around 90% of Year 10-11 students have work experience timetabled into academia by their school (Department for Education, 2017). Despite this, most students have only one placement, hence experience from only one career choice. Schools should support students to organise placements perhaps termly throughout their academic life. If a balance between grades and experience cannot be found, the educational system must be altered to improve eventual work satisfaction.

Finland's upper-secondary education consists of two paths: General and Vocational. With General, coursework is carried out under flexible timings which accumulates to the one standardised test Finland offers (the National Matriculation exam) which is used for college applications. Vocational education is more job-focused and is a mix of apprenticeships and school learning for the future. These two paths can be intertwined to maximise student satisfaction (Kevin Dickinson, 2019). This is just one example of a varied educational system where students are not restricted by their three to four A-Level subjects (or equivalent). Independence is crucial to discover your future, but guidance is essential to aid students on a journey to make a well-rounded decision.

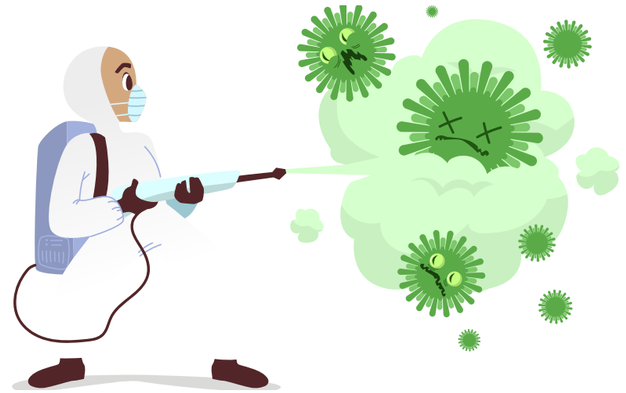
Conclusion

We need to reduce the volume of full-time workers who are dissatisfied. We should not expect every 15-year-old to know exactly what they want to do for the next 50 years of their life with minimal guidance and experience. By pulling ideas from other successful education systems and realising that this 'responsibility' is vital to improve the wellbeing of future generations. I believe that the first step to change is simply recognising this issue. The public needs to be educated. The government needs to implement more informative programmes, giving options to young people and not forcing them to make a choice. Teenagers need time to decide the most engaging way of spending the next 50 years of their lives or have more flexibility to change careers later in life. All careers have benefits that make them rewarding and fulfilling but only to the right person; and everyone is different. We need to make sure the next generation of workers understand the challenges associated with their chosen careers and make informed and logical decisions, based on numerous high-quality experiences.



Medic Mentor's COVID-19 Innovation Conference

Jayashrii Muthaiyan Eliza Hyde
Ashwini Gerneti Kulthoom Javaid
Rittaj Mughal Barnaby Portsmouth

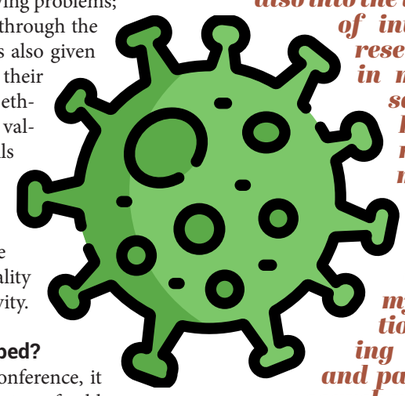


What was the COVID conference?

The COVID-19 Innovation Conference explored various aspects of the recent pandemic and its impacts on society through presentations from healthcare professionals and poster presentations from School Ambassadors. Held over Zoom, the conference allowed us to learn about COVID-19 from the perspective of healthcare staff and to ask questions to deepen our understanding of the direct and indirect consequences. School Ambassadors were teamed up to create poster presentations on topical issues including limited PPE, NHS capacity, testing, treatment, medical and dental education, exit strategies, future peaks and veterinary economics. Each team critically appraised scientific literature and researched their designated COVID-19 theme. Critical appraisal was a valuable skill to refine since it is the method by which healthcare professionals come to reliable conclusions for the benefit of their patients. Based on each team's research, solutions were innovated to tackle the problem at hand. It is clear that in a healthcare setting, teams must adapt quickly and efficiently to identify effective solutions for new and evolving problems; skills that were developed through the conference. Each team was also given the opportunity to debate their topic to learn more about ethical principles, NHS core values and transferable skills such as communication and teamwork. The top six poster presentations were presented at the conference and were judged on the quality of their content and creativity.

What skills were developed?

From the outset of the conference, it was clear that numerous transferable skills relevant for the healthcare application would be developed. Time management was key for the successful completion of the project and was facilitated by each team effectively delegating different roles to different team members to reduce the workload and help them to stay on track! The conference was fundamental in enhancing the attendees' research and critical appraisal skills. The ability to logically and comprehensively evaluate the reliability of wider-reading sources is a vital skill for all healthcare professionals. Eliza Hyde worked in the team investigating the possible exit strategies from lockdown. She was intrigued by how different the UK's actions were compared to those of South Korea, a country that has also experienced and survived the SARS and MERS epidemics so should have invaluable insight. Ethical problem-solving and ethical decision-making were additional skills that Eliza did not expect to use so much in considering the problems that surround exit strategies. In a group debate, Eliza discussed specific COVID-19 restrictions and used the four main medical ethical pillars to support her argument. Each debate highlighted conflicting views on how best to manage COVID-19 but reminded participants that population health and wellbeing is always the utmost priority.



"The conference not only gave me insight into the epidemiology of the current pandemic, but also into the importance of international research within medicine to save lives. It spurred me to look more into research opportunities to enhance my application, by reading articles and papers on research projects and even using templates to challenge how effective they are."
- Kulthoom Javaid

The presentations

Throughout the week, different medical, dental and veterinary specialists delivered interesting insights into how COVID-19 had impacted each speciality. Dr. Aiysha Ashmore, a registrar in obstetrics and gynaecology, said that all elective work had been cancelled, including surgery for cancer patients. These cancellations have emotionally distressed patients and created a massive backlog of patients requiring important surgery. She also discussed that adjustments had been made to increase telemedicine and virtual clinics so doctors can reach patients without overt risks to either. Many specialists-in-training have been halted in their training because they cannot attend clinics or surgeries as a result of cancellations. Dr. Jin Lee, an emergency department Senior House Officer (Core Trainee), stated similar operational changes in his trust. Staff shortages have been matched by a dramatic decline in the number of patients coming into A&E for non-COVID ailments, decreasing the need for medical students. Additionally, streaming pathways and a doctor 'buddy' system have reduced unnecessary delays to treating patients. Dr. Lee reported a worrying pattern of patients avoiding A&E in fear of contracting COVID-19 and so, are suffering at home. Dr. Asha Thomson, a dentist, described that aerosol-generating-procedures put dentists at high risk. Urgent care hubs had been set up to treat patients who have severe dental pain or infections. In primary care settings, dental practices had stopped any routine treatments such as fillings and check-ups. There is a concern that head and neck cancer patients aren't being checked whilst dental practices are closed. Veterinarian, Dr. Rob Campbell, said that he had needed to perform multiple new roles such as laboratory work and calling clients for payments. Vet practices were only open for emergency procedures and all routine vaccinations and surgeries had been cancelled. Veterinary professionals have been protected by conducting consultations over the phone or virtually.

The conference

The COVID-19 closing conference was a one-chance opportunity to experience the creativity, innovation and teamwork that ac

Continue reading on page 8.

What are the treatment options available for patients with COVID-19?

Medic Mentor
Motivating Medical Minds

AUTHORS: REBECCA BROOKS[1], PATRYK MICHLEWSKI[2], FATHIMAH SAQIB[3], EILIDH SIMPSON[4], LYNETTE THOMAS[5], DANIYAL RAJA[6]
AFFILIATIONS: [1]DENMARK ROAD HIGH SCHOOL, GLOUCESTER; [2]GEORGE HERIOT'S HIGH SCHOOL, EDINBURGH; [3]KING EDWARD VI HANDSWORTH GRAMMAR FOR GIRLS, BIRMINGHAM; [4]GREENFAULDS HIGH SCHOOL, CUMBERNAULD; [5]CULTS ACADEMY, ABERDEEN; [6]UNIVERSITY OF EXETER, EXETER

Introduction & Aim

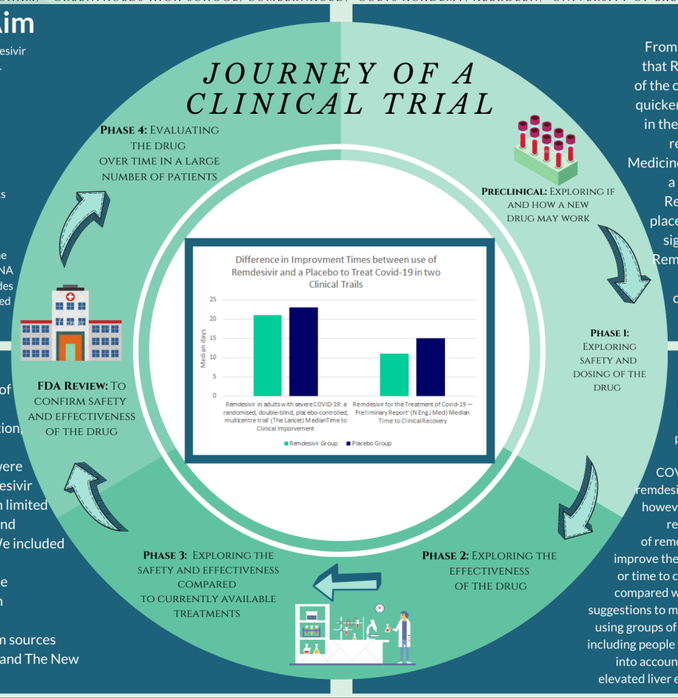
Aim: This article will explore the use of Remdesivir and its effectiveness in treating COVID-19.

The infectious disease COVID-19, caused by the coronavirus/SARS-CoV-2, has rapidly become an unparalleled public health emergency of international concern. Treatments are necessary to save lives and prevent spread however currently there are limited treatments available in the UK. One such treatment is Remdesivir. This drug works by several pharmacological routes to be converted to an active metabolite that interferes with RNA-dependent RNA Polymerase in viruses. This in turn reduces the production of Viral RNA. For SARS-CoV-2, RNA Synthesis is halted after three extra nucleotides are added, therefore, Remdesivir is categorised as a direct-acting antiviral agent.

Methods

We carried out a systematic review of existing literature to review the effectiveness of an antiviral medication, Remdesivir, in the treatment of COVID-19. EMBASE and PubMed were searched using the keywords Remdesivir and COVID-19. The search was then limited further: abstract, English language and publication date of 2020-present. We included two articles (an in-vitro study and compassionate use study), one completed clinical trial in China and one ongoing clinical trial in the United States of America, from sources including Cell Research, The Lancet and The New England Journal of Medicine.

Journey of a Clinical Trial

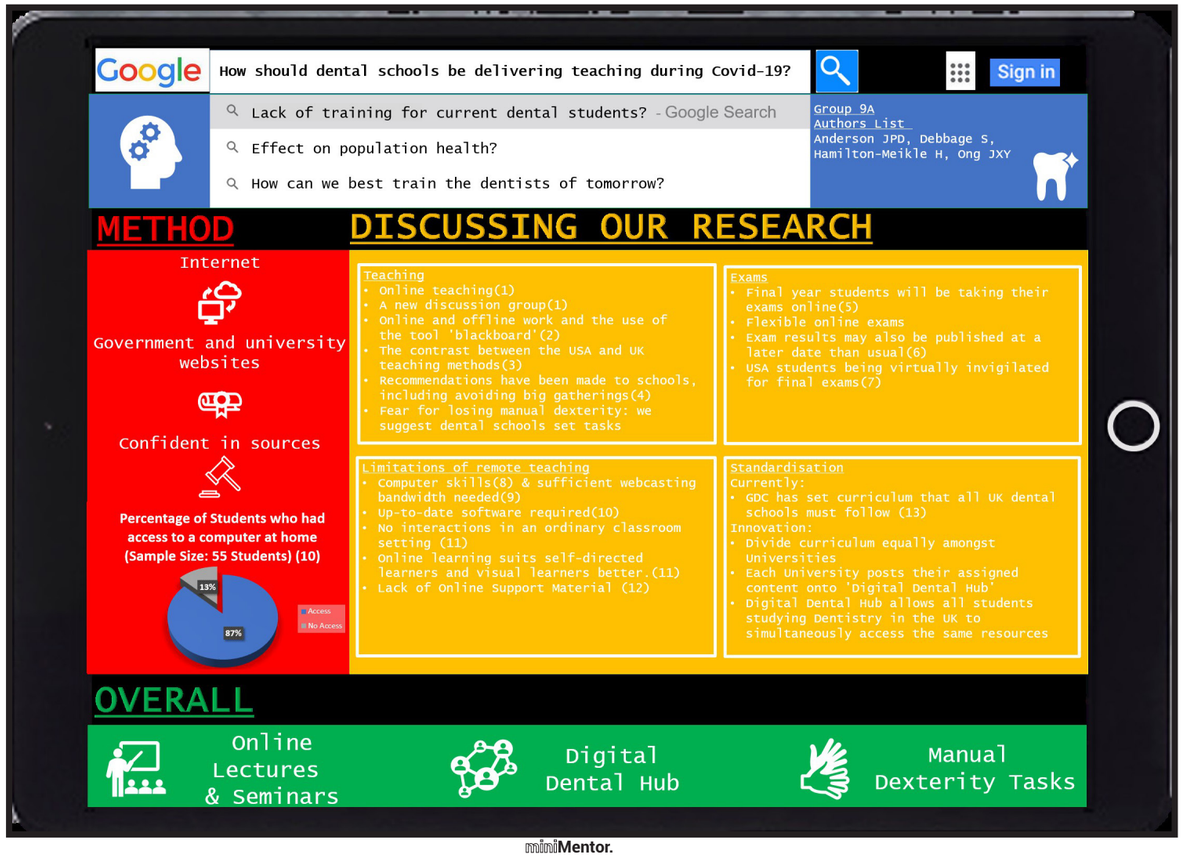


Results

From our four papers , one of them found that Remdesivir is effective in vitro.[1] Two of the clinical trials produced a numerically quicker median recovery time[2,3] (as shown in the graph to the right). The preliminary report of the New England Journal of Medicine article also showed that there was a reduced mortality rate of 7.1% with Remdesivir compared to 11.9% with a placebo, however, this is not statistically significant (p>0.05).[3] In a study where Remdesivir was given compassionately, an improvement in oxygen support class was seen in 68% (36/53) of the patients whose data was analysed.[4]

Conclusion

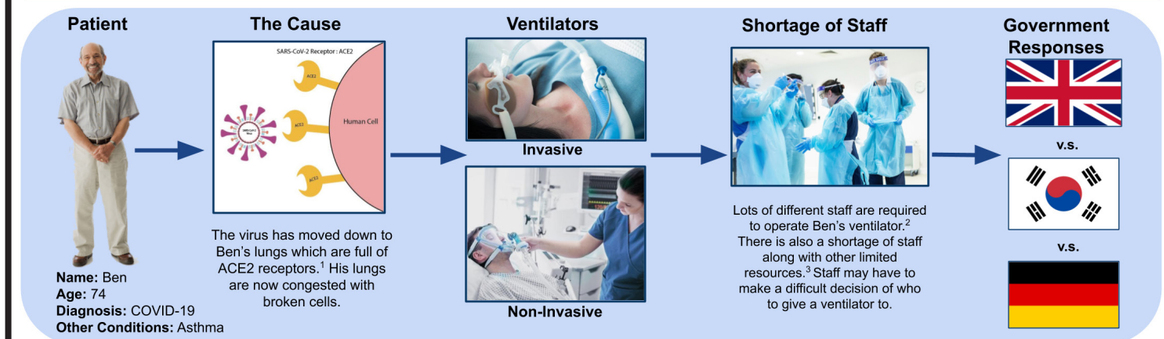
It can be concluded from our study that Remdesivir is more effective than a placebo, but this result is not statistically significant. In patients hospitalized for COVID-19 treated with compassionate-use remdesivir, clinical improvement was observed, however there was no control presented in the report. Therefore the compassionate-use of remdesivir cannot be proven to significantly improve the time to clinical improvement, mortality, or time to clear the virus inpatients with COVID-19 compared with placebo. In light of this, we proposed suggestions to move forward regarding trials: more trials using groups of large sample sizes carried out in the UK, including people with different characteristics and taking into account ethics due to adverse effects, including elevated liver enzymes and infusion-related reactions.[5]



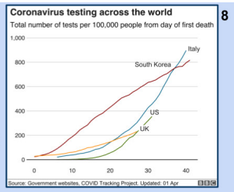
Group 2C - What are the issues surrounding ventilators and COVID-19?

Authors: Al Dandal M, Lim A, Moosan H, Varaksina E, Waseem U
Affiliations: Kensington Aldridge Academy, King Edward VI Camp Hill School for Boys, King Edward VI Fiveways Grammar School, King Edward VI Camp Hill School for Girls, Kelvinside Academy

References included in a separate document



South Korea had the testing and tracing capacity ready so that the virus could be contained.[4]



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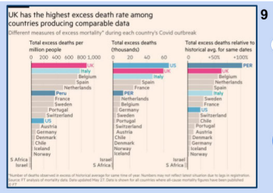

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Carmakers such as Vauxhall and Rolls Royce were called upon to switch their production towards making ventilators.[6,7]

Before patients are put on ventilators, they must be sedated with medications that relax their muscles and alleviate their pain.[5]

Reflection
Critical appraisal
Methods
Ethical pillars

There are many potential lessons to be learned from COVID-19.

What is the impact of the COVID-19 pandemic on service provision by veterinary practices?

By D. Thakral, R. Stevens, L. Colome Baltrons, A. Clark and S. Norman

Part A: RESEARCH - Vets During COVID-19

Owners

- Unwanted breeding.
- Animals have ill health (no vaccinations).
- Financial difficulties.
- Horses can't compete (go overseas etc).[3]
- Puppies can't be taken to events (e.g. puppy parties)[2] - no vaccines.

Farmers

- Food production is affected.
- Required vaccinations and tests are unavailable [4].
- Affects them financially
- Disease more likely to spread -lack of vaccinations.[5]

Impact of delaying treatment

- Affects the animals health and welfare, and the owners, breeders and farmers.
- Increases the chance of them becoming an emergent procedure (prolonged period of time).

Breeders

- Puppies can't have vaccinations; more people buying from poorer breeders.
- Cannot control breeding.
- Risk of abandoned puppies, due to high adoption during COVID-19.

All veterinary guidance is found on a flow chart published by the Royal College of Veterinary Surgeons available at: https://www.rcvs.org.uk/faqs/what-if-we-are-short-staffed-and-cannot-provide-our-normal/

RCVS SETTING VETERINARY STANDARDS

- **Routine procedures** e.g.vaccinations, parasite protection, microchipping, puppy parties, farrier/nail care, routine fertility examination, TB testing & faecal egg counts.
- **Elective procedures** e.g. onychectomy (declawing), cosmetic surgery, tail docking, dew claw removal (not allowed in this country), dental surgery, neutering.
- **Urgent procedures** (anything that is life threatening to the animal) e.g. abdominal distention with vomiting, fractured or broken limbs, collapse or paralysis, intractable pain, significant ongoing blood loss, birthing difficulties (dystocia), increased breathing rate, severe dehydration, vomiting or diarrhoea, repeated isolated convulsions, treatment of colic or bloat, esophageal obstruction.

Part B: ETHICAL DEBATE

"Emergency cases requiring complex or prolonged intervention should be euthanised during the COVID-19 pandemic as treating involves more contact between humans and the virus is more likely to spread"

For	Against
· R0 is approximately 0.9[6]. The client can spread the virus to the vet who can spread the virus to the team. - Staff isolate, so less patients will be seen. - NHS will use more resources. · In an infected household, the pet may be a fomite so more exposure to the virus for the staff. - More staff isolate and so less animals will be seen. · Due to the lack of medicine and PPE, resources for the whole treatment plan cannot be guaranteed. · This risk will create more pressure for the NHS. · For more complex cases, there will be more human contact risking the spread of the virus.	· When euthanising a pet, the vet will be in contact with the owner. The risk of the spread of COVID-19 poses no greater threat than treatment of the pet. · Exchange of the pet can be done without human interaction. - Methods include tying the dog to a pole, changing the leash, use PPE, leave the crate outside. · " I promise and solemnly declare that I will pursue the work of my profession with integrity and accept my responsibilities to the public, my clients, the profession and the Royal College of Veterinary Surgeons, and that, above all, my constant endeavour will be to ensure the health and welfare of animals committed to my care."[1] · It is not ethical to take away the life of an animal just to reduce the risk of people catching the virus.

Part C: SCENARIO DISCUSSION -Prioritisation

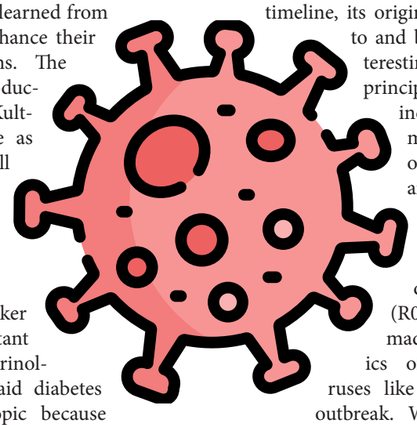
One nurse should take care of the dog with the ripped dew claw.

The second nurse is in charge of the woman who is about to faint. She should take the woman away from the blood and ask her why she came to the surgery.

The vet should take care of the dog involved in the car accident. Once the nurses finish their jobs, they should help the vet.

The dog that was meant to have a spay should stay in the surgery until the dog from the car accident is stable. The vet should tell the owner that the dog might need to stay overnight.

companied the interdisciplinary research of the COVID-19 pandemic. The morning consisted of three surprise guest speakers who were all experts in their respective fields. Each speaker gave insights into the breakthroughs, research trials and logistical and ethical dilemmas that were happening across the globe to combat the pandemic. Inbetween, there were showcases of winning poster presentations created by the School Ambassadors on COVID-19 topical issues. The conference concluded with a session where attendees discussed what they had learned from the programme to enhance their university applications. The ability to reflect productively was a skill that Kulthoom found valuable as it is a transferable skill for a university application and a future career in medicine.



- The first guest speaker was Dr. Kar, a consultant in diabetes and endocrinology. Rittaj Mughal said diabetes was a fascinating topic because her late grandma had suffered from it and she was curious as to how her grandma's treatment would have been affected in these unprecedented circumstances. It was eye-opening to hear that some sufferers of diabetes may be at greater risk from coronavirus. This is especially poignant since 1 in 10 people over age 40 are living with a diagnosis of type 2 diabetes in the UK (approximately 3.8 million people). Certain diabetes-related risk factors for increased coronavirus risk included obesity and hypertension. Dr Kar concluded his presentation by explaining the response taken up by hospitals in light of COVID-19 such as helplines, educational advertisements and patient prioritisation in hospitals where pregnant patients receive healthcare first, then patients with strokes, then patients with stable diabetes.

- Dr. Ali Albar Datoo was the second speaker giving a very engaging talk from his perspective as a Global Health Researcher and Infectious Disease Epidemiologist. He first discussed the epidemiology and chronological events of the COVID-19 pandemic which enabled School Ambassadors and attendees to create a fact file of the virus containing its timeline, its origin, and transmission to and between people. Interesting epidemiological principles were discussed including herd immunity, the impact of future vaccines and the relationship between social distance guidance and the reproduction number (R0). Reflections were made on past epidemics of other coronaviruses like the 2002/3 SARS outbreak. We were reminded that the current pandemic would be another opportunity for healthcare professionals, researchers and policy-makers to learn, in order to act more effectively, if another pandemic were to arise in the future. Dr. Datoo's overriding message inspired us when he hypothesised that the future generation were responsible to 'think globally, act locally'.

- The final speaker was Dr. Wilkinson who detailed the active COVID-19 clinical trials and potential future research focuses. The School Ambassadors and attendees learnt about how a coronavirus infection progresses in human patients and the associated symptoms. He went on to compare the effectiveness of the drugs that could be considered to cure COVID-19 such as hydroxychloroquine and chloroquine. Hydroxychloroquine is less likely to cause heart problems compared to chloroquine. Dr. Wilkinson concluded his presentation by providing an honest reflection on how he has adapted and coped as a doctor during the unprecedented healthcare crisis presented by COVID-19.

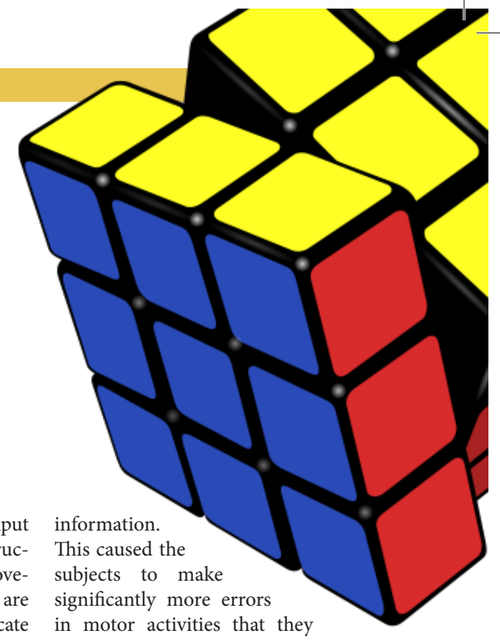
"I found the webinars from the doctors throughout the week incredibly interesting, as they allowed me to understand how different departments of the NHS are coping with the pandemic, such as increasing use of telemedicine. The project challenged me to think in a new, innovative and reflective way, especially when discussing how the response could have been improved. Additionally, working with a group of people who I did not know has improved my communication and confidence greatly."
- Ashwini Garneti

Summary

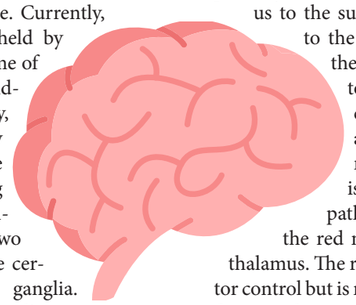
- In summary, the COVID-19 Innovation Conference exceeded the School Ambassador's expectations. They learnt and developed new skills in research, communication and critical appraisal, all of which will prove essential in helping these aspiring students become the doctors, dentists and vets of the future. The attendees would like to thank the team at Medic Mentor and the multiple interdisciplinary guest speakers. The experience was made even more insightful, especially when learning about the optimisation of our health services to better reduce the risk that COVID-19 poses, how the pathogen interacts with the human body and what needs to be done in the future to better tackle pandemics. At the moment the world feels like it is going through a very dark storm, but with education and research facilitated by the COVID -19 Innovation Conference, there is hope and the Medic Mentor School Ambassadors will be the next generation of superb healthcare professionals fighting for health and wellbeing. Thank you to the Medic Mentor team!

The Neurological Double Act Behind Solving the Rubik's Cube

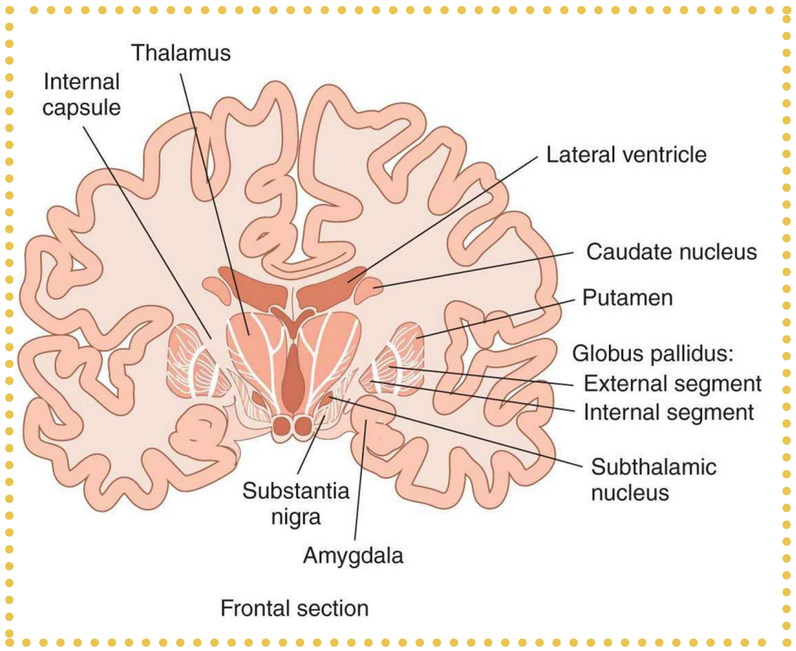
Curtis DeVerinne



The Rubik's Cube is famous for being one of the hardest puzzles to crack, requiring gruelling practice to commit difficult algorithms to memory and develop fast motor movements. In fact, there are now national and global competitions where enthusiasts 'speed solve' in pursuit of the lowest time to solve the Rubik's Cube. Currently, the world record is held by Yusheng Du with a time of 3.47 seconds for a standard 3x3 cube. For many, 3.47 seconds is frankly an unbelievable time so how did Yusheng achieve this? The answer lies partly in two parts of the brain, the cerebellum and basal ganglia. The cerebellum coordinates motor movement whilst maintaining equilibrium in response to sensory information. The cerebellum is located within the posterior fossa of the skull and separated from the surrounding cerebral brain hemispheres by the tentorium cerebelli. The cerebellum is anatomically divided into three lobes: the anterior lobe, posterior lobe and the flocculonodular lobe, separated from each other by two fissures (Figure 1). Most notably in terms of the Rubik's Cube, the paravermis is responsible for receiving proprioceptive information from the fingers to allow players to rapidly spin and twist the game. Meanwhile, the lateral hemispheres of the cerebellum receive information from our cerebral cortex to further improve cognition and ability. Cerebellar stroke patients often display significantly lower motor sequence performance as a result of their disease. However, their ability to improve during training and consolidation has been seen as similar to control groups highlighting the power of cerebellar motor learning even in the face of disease. After maximising the motor component of solving a Rubik's Cube, using sensory and cerebral information, the signals travel to deeper collections of cerebellar nerves known as cerebellar nuclei. One of these collections is called the dentate nucleus. It receives input information and quickly send output instructions like fast, sequential, fine-finger movements. From the dentate nucleus, there are two specialised pathways that communicate with the brain. The first is the dento-thalamic pathway that travels from the dentate nucleus to the superior cerebellar peduncles to the thalamus. The thalamus is the brain relay centre for motor and sensory signals to the cerebrum that decides what action or instruction signal needs to be sent. The second is the dento-rubro-thalamic pathway that travels through the red nucleus before reaching the thalamus. The red nucleus has a role in motor control but is not important in humans for fine muscle movements. One experiment involved primates injected with a sedative-producing compound (GABA-receptor agonist) into their dentate nuclei to stop it relaying information.

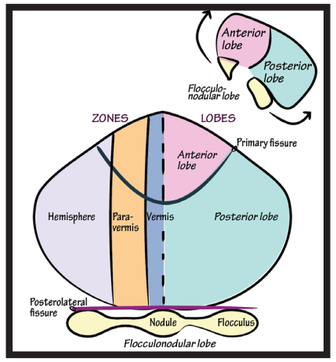


This caused the subjects to make significantly more errors in motor activities that they were usually very good at. So the role of the dentate nucleus is important in executing algorithms for solving a Rubik's Cube. Other parts of the nervous system are also vital in cerebellar learning. Neurons in the inferior olive nucleus (located in the brainstem near the cerebellum) modify motor plans by sending information to the Purkinje cells of the cerebellum to induce sensory and motor learning. Therefore, hours of speed-solving trains the cerebellum to execute precise finger movements because the inferior olive nucleus facilitates faster solving times. The basal ganglia epitomises 'the law of effect' such that responses which produce positive effects become more likely to occur again and vice versa (Figure 2). Therefore, actions asso-



Below: The basal ganglia and surrounding structures.

ciated with a successful feeling are permitted without contest. The function of the basal ganglia however is broad and they play a role in motor movement, procedural learning, eye movement and cognition - all important in successfully solving a Rubik's Cube. Each part of the basal ganglia has its own specific functions connected to specialised nerve pathways. In Shogi, a strategy board game, training has evidently increased recruitment and activation of one structure in the basal ganglia called the caudate nucleus. This training helps players find the next move quickly. Logically, these same skills are vital for recognising patterns and identifying the solution in a Rubik's Cube. The substantia nigra is a basal ganglia structure responsible for motor control, learning, eye movement, reward-seeking and addiction. This structure facilitates the feelings of reward when the Rubik's Cube is successfully solved which reinforces the love of the puzzle on a deep neuro-emotional level to those that can solve the cube. To accelerate sensory-motor learning, the theory of 'chunking' can be exploited. In chess, chunks of different pieces in certain arrangements excite the 'next best move' stored in the long-term memory of players - a stimulus of association. Committing specific arrangements of pieces on the Rubik's Cube to memory and associating them to a movement pattern allows the execution of algorithms in quicker succession. Another example is that reward omission granular cells in cerebellar lobules grew during Pavlovian learning in mice. This suggests that using information without a 'reward' sensation could increase the cerebellum's ability to identify incorrect moves on a Rubik's Cube. This drives the cerebellum to find the correct solution if an incorrect movement is made.



The neuro-anatomy and physiology that underpins a Rubik's Cube is seemingly more complicated than the puzzle itself. Even though 3.47 seconds is an exceptional solve time for the Rubik's Cube, the underlying principle to success is simply "practice makes perfect." The cerebellum and basal ganglia are two vital structures that facilitate more efficient problem solving and one could argue that a doctor can be somewhat defined as a problem solver. Next time you pick up a Rubik's Cube, appreciate that you are exercising and training neurological structures in the same way an athlete trains for a sport. But you are training for lifelong competition in problem solving.

Why I Write

Surya Senthilkumar

Introduction

Writing is a form of art where you can share information and express your opinions on a particular topic; it is a platform for you to communicate and interact with an audience who share your deepest passion for the subject. My experiences with writing have been moulded and fuelled by my enthusiasm. It provides me with the energy to craft quality content regularly. However, recently I have discovered that purpose has made a far greater impression on setting the foundations for my writing work. My goal is to study medicine; a clear-cut goalpost that I can shoot towards. This has led me to write several articles and books relating to medicine, science, and maths. This sense of clarity of vision is ultimately the main driver of writing. Every long term writing goal sparks a set of writing benefits which is the short term reason for you to write. This is the cement of your foundation, helping you to reach your main aim. I will share some of these 'short-term' reasons why I write so that you can see what the composition of my writing foundations are, serving as a blueprint to layout your own.

Allows expansion of knowledge

Before I write, I aim to immerse myself in the subject through research. Research is a valuable source of knowledge; it takes you out of your curriculum and enables you to explore your passions. Research is also a key tool in any science-related career, so it is worth polishing. Reading information is one aspect of expanding the depth of your understanding. Successfully conveying your research in a concise manner helps consolidate your comprehension of the topic. For example, if you are writing an article about how the heart works, your research can be summarised into an annotated diagram. When writing an academic article, I would recommend researching before writing, regardless of your previous knowledge on the topic. This ensures you are up to date on the latest advances in the field. You will also be able to plan your writing better once you are secure in knowledge. In addition to this, keep a list of all the sources you have used; these should be used to cite your information, making it more reliable. .

Allows improvement of writing skills

No matter what your goal in life is, your writing skills will play a major role in helping you achieve them. In medical studies, your writing skills will be put to the test in the BMAT exam. Writing will also be examined by universities and communication in the workplace. Consequently, it is essential to perfect your writing style so that it is concise, professional and informative. Writing for a portfolio will help you to show how your writing methods are developing. In order to see progress, writing regularly is recommended. It helps to improve planning skills and expand your vocabulary range.

Allows portfolio creation

Due to high competition, academic and professional institutions are looking for something unique in a person that propels them above the rest. This might include ex-

tra-curricular activities such as volunteering and sports, but your writing can also form a major piece of your repertoire. As you write, add your work to an e-portfolio website. This has many advantages. It allows you to: share all your completed work to various institutions with one simple link; track how the quality of your writing has improved over time and displays your enthusiasm for a particular subject by showing your contribution to your chosen field. Moreover, it exhibits your long-term commitment and can be described as a record of the time and effort you have dedicated to improving your knowledge and writing. For those who are willing to start a portfolio, I would suggest creating a website and putting any extra-curricular work on there. In addition to this, include school assignments that relate to the topic of your interest; this will provide you with the motivation to produce work that is rich in quality.

Allows expansion to a wider audience

Creating content is one half of the circle; the other is publishing it. Publishing your work can help you reach like-minded individuals who appreciate your writing. Their criticism and praise will allow you to gauge the quality of your writing, allowing you to improve your writing style. Choosing the correct publishing platform is vital so that you can reach your targeted audience. Aim for high impact publications that are appropriate to your level of study. I would recommend writing for scientific magazines that are less insistent on original research but are still nationally distributed, professional printed publications with a lot of weighting on your portfolio (e.g. Mentor Magazine's miniMentor, Young Scientists Journal etc.). Being a regular contributor to a journal or magazine is an amazing way to show your eagerness for a subject. Social media can also be a powerful platform if used responsibly. You can build a following of people who are interested in reading your work. This will ensure that your work is of a high standard and reaches an eager audience. Sharing your work with others will also provide a motive to continue producing great academic content.

Time is precious and hence we must use it effectively. Writing is a very productive activity with many rewarding benefits. It has the power to shape your professional and academic life. Writing is a learned transferable skill. Build your writing foundations today to provide stepping stones for a better tomorrow.

Quizzical!

1. Which of these physicians discovered that contaminated water caused the London cholera epidemic of 1854? This physician is often credited as a father of modern epidemiology and was fundamental in the development of anaesthesia, medical hygiene and public health.

a) Robert Koch **b)** John Snow **c)** Alexander Flemming **d)** Eddard Stark

2. Anagram: **RSTUEOCSBILU**

Clue: I am a bacteria responsible for 1.7 million deaths worldwide in people each year and the slaughter of over 30000 cattle in the UK each year.

3. Use numbers 1-9 to fill in the blanks. Each number can only be used once in the equations in each row and column. Remember that multiplication and division come before addition and subtraction.

	+		+		22
/		X		X	
	-		+		1
X		+		+	
	+		+		12
9		36		44	

If you can't complete this one, email us: minimentor@medicmentorfamily.org

Answers: 1. b / 2. TUBERCULOSIS

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