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Discussion

The need for aviation and space medicine within the United Kingdom undergraduate medical curriculum

DISCUSSION

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ABSTRACT

'Aviation and Space Medicine' (ASM) has recently been introduced as a General Medical Council (GMC) approved specialty in the United Kingdom. This reflects its growing importance in the public, industry and healthcare sectors. Currently, medical school involvement in ASM is minimal at best. An undergraduate medical curriculum devoid of ASM will leave medical students oblivious to both the existence and importance of this discipline. Having introduced ASM as its own distinct speciality, it is now vital to place an emphasis on ensuring current and future medical students are informed, inspired and prepared to pursue careers in this exciting, novel and unique field of medicine.

Why do astronauts grow taller in space? How do we perform CPR in microgravity? Why did the crew aboard Skylab see white lights and beams with closed eyes? Does any of this even matter? Yes. Space medicine is a subspecialty concerned with human physiological and psychological response to the unique, hostile and peculiar environment that is outer space. However, the science falling under the space medicine research 'umbrella' has provided much benefit to life on Earth – and in particular, to human health and welfare. With British astronaut Tim Peake becoming a household name and the parliamentary approval of the new specialty of 'Aviation and Space Medicine' (ASM), (1) it is safe to say that scientific interest in space medicine in the United Kingdom has significantly increased. This represents an ideal time to firmly incorporate space medicine into the UK medical curriculum. In this article, we aim to briefly summarise the growing importance of ASM in healthcare and society, as well as underlining the need to incorporate this discipline into the UK undergraduate medical curriculum.

Although the marriage between space and medicine may initially appear unusual, the study of the multisystem impact of space has significantly contributed to various advancements within multiple medical specialities. The experience of microgravity, intense inertial forces and radiation exposure, coupled with the loss of circadian rhythm in a confined setting, has enhanced our understanding of various disease processes from osteoporosis (2) to vision impairment/intracranial pressure (VIIP) syndrome. (3) VIIP syndrome is a relatively new topic of interest to Space Medicine specialists, introduced after 60% of long-duration crewmembers (aboard the International Space Station or Mir Space Station) reported deterioration in vision. (4) It is hypothesised that microgravity-induced fluid shifts result in intracranial venous congestion, which have produced recognised pathological changes from flattening of the globe to papilledema. (4) The high priority NASA has placed on understanding VIIP syndrome will likely result in novel approaches that can benefit patients on Earth. For example, the design of a reliable non-invasive means of measuring intracranial pressure (ICP) and the development of subsequent countermeasures for astronauts taking part in long-duration flights, will undoubtedly benefit the millions worldwide with conditions such as hydrocephalus and idiopathic intracranial hypertension. Thus, patients will simultaneously benefit from the developments that aim to protect crewmembers from visual impairment in microgravity.

Space Medicine has already resulted in numerous medical spinoffs arising from the space program, which have benefited diverse patient groups. A special foam used to cushion astronauts during lift-off is now used as a means to prevent pressure ulcers in nursing homes – and has in fact become the huge consumer product we popularly know as 'memory foam'. (5) Another example is functional electrical stimulation (FES), which can help regenerate purposeful movement to muscles following prolonged paralysis. (6) This served as a component of Christopher Reeve's own physiotherapy.(6) It is clear that space medicine has much to offer diverse patient groups – and it will likely continue to extend its applicability to the wider public. 'Space tourism' is a concept predicted to become a reality within the next few decades, predominately owing to the work of private companies such as Virgin Galactic. And within current astronaut corps, it is often quoted that approximately 10% are physicians. (7) Thus, it can be confidently said that space and medicine are very much interconnected specialities, collectively offering considerable benefit even for those who would rather keep their feet firmly on the ground.

Increased interest in this distinct discipline is perhaps best demonstrated by the recent introduction of ASM as a new specialty. The Joint Royal Colleges of Physicians Training Board (JRCPTB) has supported its development since 2008, alongside the British Army, Royal Air Force and European Space Agency (ESA). (8) The JRCPTB have now finalised the ASM curriculum. (9) It is fully funded by organisations involved in aerospace and aviation. (1) While the space industry is still growing in the UK, doctors trained in this specialty will have much to offer the British aviation sector in the meantime. In 2014, 238 million air passengers travelled to, or from, the UK. (10) These numbers will rise exponentially in the coming years, which naturally require more doctors distinctly trained in ASM to regulate the suitability of pilots, aircrew and passengers to fly. Even commercial flights present a physiologic stress that must be considered, particularly in the elderly and individuals with chronic cardiovascular and respiratory conditions. Thus, the new ASM specialty programme does not exclusively aim to train doctors for a possible 'Mars One' mission in the next decade, but primarily to manage the increasing demand for the Aviation sector to continue to maintain a high level of flight safety.

The presence of a GMC-approved ASM specialty training programme will serve to inspire further enthusiasm amongst UK medical students. Prior to this, dedicated students who expressed a passion for ASM would find it problematic to convert this into a career – unless they sought opportunities abroad. This meant a financial and intellectual drain for the NHS. Current undergraduate exposure to ASM within the medical curriculum involves limited places in intercalated BScs, which are 1-year courses that allow students to obtain a greater understanding of a particular area of interest within the broad umbrella of medicine. For example, University College London (UCL) offer a '*Space Medicine and Extreme Environment Physiology*' module limited to 50 students exclusively at UCL. (11) It is indeed competitive, reflecting the great interest in ASM amongst undergraduate medical students, yet a simultaneous lack of opportunities to get involved. Other options to gain exposure into ASM lie outside the curriculum itself, in the form of relatively few self-funded conferences, summer schools, out-reach programmes or competitions run by institutions such as the ESA or extremely competitive electives to NASA.

Given that ASM is now a GMC-approved specialty, medical schools should at least endeavour to offer optional modules within their curricula to provide an early exposure to inspire their students. Understandably, however, this may prove difficult given the already saturated medical school syllabus. A good example to illustrate this is dermatology. Approximately 12.4% of General Practice consultations involve dermatological problems. (12) However, a 2009 audit of the dermatological content of UK undergraduate curricula showed that some students have little exposure to dermatology during their time in medical school, and key topics such as the recognition of life-threatening meningococcal septicaemia seem to be omitted from the curricula of 9 medical schools. (13) If medical schools are struggling to cover vital topics within their syllabus, it will inevitably be incredibly difficult to justify ASM as a permanent fixture within their curricula. Furthermore, as ASM is a multi-system speciality, it would only be of real benefit to introduce it in the later stages of medical school – but of course, the focus here is predominantly on Final Examinations and preparing to be a Foundation Year 1 Doctor. Thus, incorporating ASM into medical schools is a challenge, but it should – at the very least – exist as an option for the interested student.

ASM offers a novel perspective for understanding human physiology and health, and its direct multi-speciality clinical relevance has brought about much excitement for many doctors. It truly represents a unique opportunity for academics in all fields of medicine. Fortunately, the UK government has clearly recognised the need for a distinct speciality programme focusing just on ASM, which complements the rapid growth of the aviation and space industry in recent years. It is now time for medical schools to ensure their curriculum reflects this.

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