

ENT UK Undergraduate Essay Prize 2019

Can the whole of ENT survive as a specialty in a cash strapped NHS?

Dominic Gardner

Final Year Medical Student

University of Edinburgh

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In the upcoming decades, rapidly-changing evidence and development of new technologies will lead to shifting paradigms in the NHS and medicine as a whole. These changes will affect the way conditions are managed, health care systems are implemented and, in some cases, the existence of a specialty. In the following essay we seek to explore the future Ear, Nose and Throat surgery (ENT) as a specialty in the NHS.

## The Changing NHS

As population demographics change, the NHS will be confronted by different challenges and demands to those of today. Britain is faced with an ageing population (Figure 1(1, 2)) and increasing health care costs per person within the population (3). This will lead to a rise in the proportion of elderly people and a subsequent strain on public finances (4).

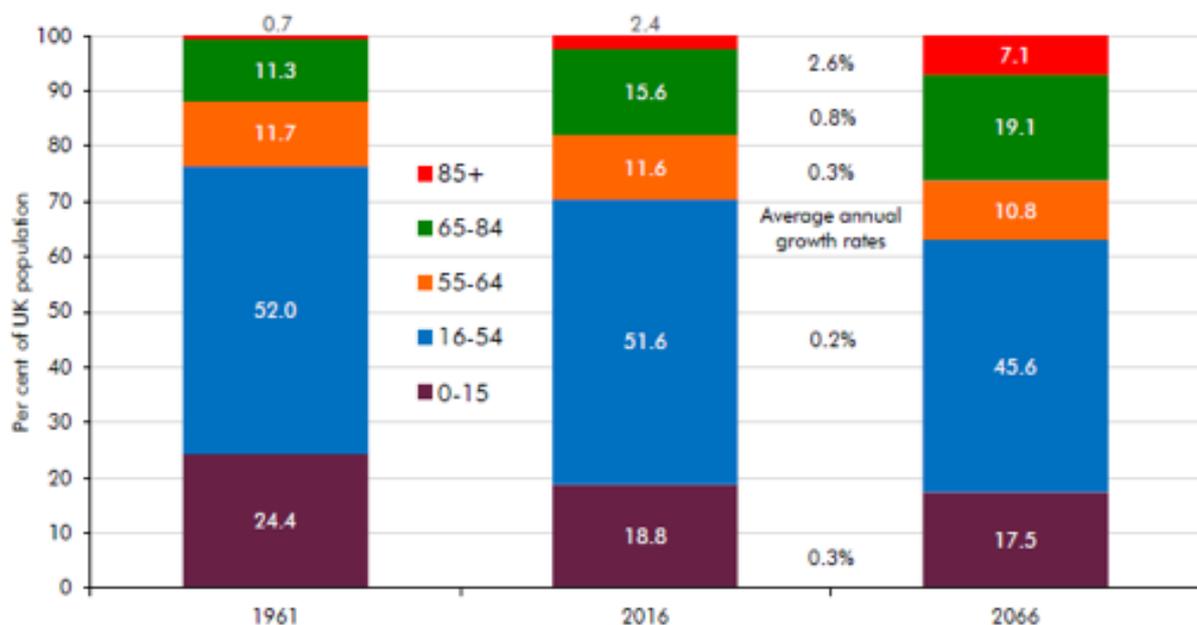


Figure 1: Population Changes Over Time (Taken from ONS(1))

In 2016, the NHS budget was £116 billion, representing 19% of the overall government budget and 6.5% of total GDP (5). Whilst changes in spending tends to reflect the wider economic cycles, recent funding growth has been slower than historical trends despite a period of relative economic affluence (6). The office for budget responsibility predicts that to provide NHS services in their current form, spending will have to increase from the 6.9% of GDP in 2021-2022 to 12.6% of GDP in 2066-67 (7).

Whilst increasing surgical and medical interventions are likely to increase life expectancy and improve population health, an increase in health cost per person seems inevitable. That is unless there is a marked change in the delivery of the care. If drugs, for example, were made cheaper, or if surgeons and general practitioners were able to increase output, perhaps using novel technologies, there might be hope of maintaining services (8). Whether changes to the provision of health in the UK are able to keep up with the rising demand is unclear. What is clear, however, is that the NHS of 50 years time will be vastly different to the NHS of today. Whilst we are subject to constant political promises to maintain health

and education budgets, it seems likely that at some point in the future, the rate of spending growth will be impossible to maintain (9).

Several modifications to the service have been proposed – ranging from increased use of technology to use of the private sector (10, 11). Whilst some may be implemented, increasing taxation or fiscal deficits may also be necessary. It is unlikely that such a politically charged issue will undergo a radical change in a short period of time - more likely a gradual metamorphosis into the NHS of the future.

## ENT as a Specialty

Otolaryngology is a specialty that first began to prosper in the 18<sup>th</sup> century, as biotechnological advances such as the binocular microscope came to fruition and indifferent operations on the ear, nose and sinuses were developed (12, 13).

From that point to today, there have been several existential crises in the ENT. Articles questioning the future of the specialty date back to 1952 (14), often raising issues that seem preposterous to us today. For example, it was thought that the development of antibiotics and chemotherapy would diminish the workload of ENT doctors, with common procedures such as tonsillectomies being taken over by General Surgeons and Paediatricians (12, 14). These concerns were not only unfounded, but the ability to readily control infections in fact enabled otolaryngology to blossom, precipitating the evolution of a plethora of surgical procedures. Needless to say, performing these procedures competently required excellent dexterity and mastery of surgical equipment, which led to further proliferation of the specialty (12).

In recent years, there has been a reduction in several of the operations considered the staples of the ENT surgeon's repertoire (15). Adenoidectomy rates, for example, fell by almost 60% from 1990 to 2008-09, and similar reductions were seen also in tonsillectomies (37%) and grommet insertions (40%) (16). This has further led to questions regarding the demise of the specialty.

It is likely that as increasing strain is placed on the health service, difficult decisions and exclusions will have to be made. This is not something new to ENT, with a McKinsey report in 2009 suggesting that grommet insertion and tonsillectomy are 'ineffective' and should be reduced by 90% in order to cut costs (9). This has been followed in more recent years by certain primary care trusts regarding these operations, alongside sleep apnoea surgery and adenoidectomy as 'Procedures of limited value' or 'Low priority procedures' (17, 18). This leads to exclusion from funding. Whilst there is some evidence of benefit (19-21), it is likely that in the future, those interventions with little clear-cut evidence of help will be excluded further. This has raised questions for the future of ENT surgery (22).

There are many ENT operations which prove useful in the management of disease. This is likely to have contributed to the rising demand in ENT that has been observed (23). In many regions, waiting times are long, with patients waiting up to 35 weeks for a routine referral appointment (24). NHS regularly publishes its main targets and intentions for the near

future. The recent publication highlighted an intention to increase the number of NHS-funded elective operations (4) - cuts to ENT would be antagonistic to that objective.

## The Burden of ENT

In 2017/18, 900,000 referrals to ENT were made by GPs, representing approximately 7% of all referrals within NHS England (25, 26). These must be addressed by around 1,500 currently practicing ENT surgeons (27). If all worked full time, this would represent around 600 referrals per year per doctor; in addition to operating, on-going follow-up, patients and any research and management responsibilities.

Whilst the current body of evidence surrounding the epidemiology of diseases of the Ear, Nose and Throat is decidedly small (28), data shows that ENT problems comprise 20% of all primary care complaints in adults and 50% of those in children (29-31). In Scotland, approximately 1/5<sup>th</sup> of the population have hearing difficulties, 13-18% have had nasal symptoms in the last year and around 31% have had an episode of sore throat or severe tonsillitis (30). This demonstrates the significant burden of diseases of the Ear, Nose and Throat in the UK. The 9 million patients living with hearing loss (25) represent nearly 14% of the population (32). Since incidence is higher in the elderly (30), forthcoming demographic changes are likely to lead to an increasing prevalence of deafness in the population (1, 2).

Whilst many of these symptomatic patients will not require medical attention, and fewer still will require referral to secondary care, it is significant that around 14% of patients with hearing problems are referred to hospital (30). Despite only 6% of the other ENT symptoms culminating in a secondary care referral, this still represents a significant volume of ENT presentations considered beyond the remit of a General Practitioner (30). Simultaneously, it has been demonstrated that the burden of on-call work undertaken by otolaryngologists is increasing. This typically involves draining abscesses, managing epistaxis and post-op complications (33).

It is apparent that the reasons for the existence of the specialty are threefold: for diagnostic certainty in complex or unusual cases, for clarity and expertise in emergencies involving the head and neck, and for providing complex interventions that require specialist skills outwith GPs broad-ranging capabilities. It is true, that practice makes perfect (34). Subsequently, the greatest knowledge of these ENT problems is likely to be accumulated by doctors who research and deal with them on a daily basis.

It is notoriously difficult to predict changes in the workload and demand for surgeons. This is because it comprises many factors, not least the changes in surgical practice but also changes in disease incidence and population demographics. Kim et al aimed to evaluate the future trends in the otolaryngology workforce in the US (35). Taking into account changes in population size and GDP growth, they predicted that there is likely to be an increase in demand over the coming decade. Considering the future GDP (36) and population growth estimates in the UK (37), the same is likely to hold true here. What this study did not consider, was the changing nature of the treatments provided and the re-distribution of the

ENT workload across other specialties. It is apparent, however that ENT advice is often needed. In the remainder of the essay we explore the changes in ENT practice.

## Head and Neck Surgery

Head and neck cancer surgery has long been a battleground between surgeons and medical oncologists. With regard to diagnosis of head and neck cancers, it is likely that further advancements in genotyping and artificial intelligence will reduce the human role in diagnosis. The rapidly developing fields of cytodiagnosics and proteomics hope to provide minimally invasive testing for specific genetic markers of head and neck cancer (38). Circulating cell-free DNA and single circulating tumour cells are being used to diagnose several cancers in the UK and their use in head and neck cancers is currently being evaluated (39-41). Development of artificial intelligence within radiography suggest that soon robots will play a role in interpreting these images too and be utilised in outcome prediction (42, 43). Such molecular advances may in turn reduce the need for follow up by specialists, with blood data able to detect any recurring cancers (44).

Whilst the surgeon plays a prominent role in head and neck cancer management, several novel techniques may reduce that workload. For a start, it is likely that immunotherapies will become more effective and better targeted (45), whilst systemic cancer therapies are constantly developed and trialled (46). The role for these drugs in head and neck cancer is rapidly evolving. When you also consider advances in the accuracy of radiotherapy, the position of surgery as the leading management technique for head and neck cancers is brought into question (47).

Whatever surgery remains is likely to look unrecognisable from that of today. In recent years, surgical robots have been introduced across the country, a practice that will modify the requisite skills and the surgical techniques. Whilst these have been used and applied to a wide-range of settings – from transoral resection to microvascular reconstruction – the outcomes-based evidence for their use is at present limited (48, 49). Whether positive evidence will come to fruition in the near future is uncertain, but as surgeons become better practiced at performing robotic operations and technology continues to develop at a rapid rate (consider Morse's law (50)) is unlikely that this trend will reverse. Does this mean that in the future we will see operating theatres run entirely by robots? In the careers of currently practicing staff, it seems unlikely. The technology is not there at present, and regardless, today's patient seems reluctant to leave such a sensitive time in their hands in the unknowing hands of an intelligent robot (51).

### **Advantages**

1. Enhanced Visualization
2. Elimination of Physiologic Tremors and Scale Motion
3. Multi-articulated Instruments
4. Fatigue Reduction
5. Restore Hand-Eye Co-ordination
6. Telesurgery
7. Training

### **Disadvantages**

1. Absence of Tactile and Haptic Sensation
2. Equipment Size and Weight
3. Cost of the Device
4. New Technology and Unproven Benefit

Figure 2: The Use of Robotic Surgery in Otolaryngology (Taken from (Oliviera et al (49))

## Otology

Otology deals with hearing and balance. The growth of the sub-specialty was relatively stagnant until the 1990s, where the advent of microscopes and microdrills provided impetus for a prolonged phase of growth. Before this, a discharging ear in childhood could be expected to continue into later life (52). Subsequently, the focus of the specialty has shifted from infectious diseases to deafness (53). In particular, demographic changes seen in the UK over the last decade have led to an increasing incidence of sensorineural deafness (54).

In diagnosing disorders of the ear, much of the burden has already been relieved of the otologists. Pure tone audiometry is typically used to detect deafness and can be performed by audiologists. In the case of vestibular

disease, the role of history taking is perhaps more pronounced and as such, the doctor still plays a significant role; however, the rapid improvements in CT and MRI (55) scanning capabilities may supplant some of the role of the clinician. Several diseases show little change on imaging, but a myriad of functional imaging techniques are being developed to improve the evaluation of auditory and vestibular dysfunction (55) and already, there is research to suggest artificial intelligence can help with radiographical diagnosis (56). The use of otoacoustic emission testing in childbirth demonstrates how machinery can replace what was formerly a human role.

In the case of middle ear disease, there has been little advancement in the surgical techniques used several years ago (55). Although the future of OME is likely to be medical, it is the case that at present, therapeutic interventions are limited to either autoinflation, grommet insertion or hearing aids (57). The fact that the first myringotomy was performed in 1649 demonstrates that the rate of change is not always as rapid as we expect (58).

Sensorineural hearing loss in the UK is rising. At present, the recommended treatment for severe to profound deafness is seen as a cochlear implant (59). If this remains the case then it is likely to provide a significant workload for today's otologists, alongside vestibular disease and skull base surgery. This will be a priority for the NHS, as deafness has been seen to contribute to the development of further diseases, such as dementia, and precipitates a significant functional impairment (60). Whilst it is considered that minimal skill and expertise is required to implant such hearing aids, improving hearing technology suggests that the role of a skilled ear surgeon will remain. In the case of skull base surgery, it is likely that the relationship between man and machine will initially create greater scope for surgical intervention. The use of image guided surgery and robotics are likely to further improve access to the skull base and hopefully improve surgical precision – this in turn will

hopefully improve outcomes. In the future it may be considered that autonomous robots could perform this job most capably, creating a somewhat drastic reduction in the ENT surgeons workload (61).

## Rhinology and Facial Plastics

This is also considered a time of rapid evolution in rhinology. It is hoped that in the near future, it will be possible to re-engineer the microbiome of new-borns at risk of allergy, to use immunotherapy in the treatment of both asthma and head and neck cancer and to target chronic rhinosinusitis with local corticosteroids or monoclonal antibodies. As with other head and neck cancer – this treatment is likely to be better targeted when compared with current techniques (62).

In terms of the diagnosis of rhinological problems, the expectation is that primary care clinicians, such as GPs, are able to diagnose most problems, performing examination and basic tests. Despite this, there are various other diagnostic studies within the rhinologist's repertoire that are too uncommonly used to be included in primary care training, but also provide invaluable diagnostic clarity. For example, rhinoscopy.

Modification in rhinological management is likely to follow the same pathway as that of the other specialties, with greater knowledge of molecular pathology and inflammation leading to more specific management of rhinosinusitis. There have been studies to suggest that monoclonal antibodies can be effective in patients with CRSwNP (63). In failing this, it is thought that novel drug eluting devices will be able to deliver high dose corticosteroids to a localised area (62).

The surgical changes in rhinology are likely to mirror those of the other subspecialties, with more abundant use of technology, including the introduction of computer assisted surgery, virtual reality simulation and improved 3D systems (62). Whilst the current robots are generally not suitable, the hope is that the development of smaller, more flexible and stronger systems will provide a new way to access the paranasal sinuses and anterior skull base (64). When these robotic systems are coupled with implant technology, it is hoped that there will be significant progress in facial plastic surgery too (65).

Not all ENT surgeons take an optimistic approach to the future (62), with many developments focussing on new medical treatments for conditions that were previously managed surgically. Whilst technologies such as immunotherapy and gene therapy may replace a proportion of the workload, there are conversely a range of new surgical technologies being developed – this includes drug eluting stents via 3D endoscopes and robotics systems dedicated to endoscopic sinus and skull base surgery (66). There appears to be little chance of redundancy for a surgical specialist in these cases, as clinicians and patients alike are yet to come to terms with AI-based care (51, 67).

## Conclusion

*'If you were to define the future, study the past' – Confucius*

It is impossible to predict with certainty what the future of otolaryngology will hold. In terms of time scale, it seems unlikely that any drastic changes are around the corner. Statistics show that ENT surgeons are still required, both by patients seeking interventions and primary care providers wanting assistance. Looking back, there have been several instances of concern that the specialty is on the verge of decline. None of these have materialised as yet.

The NHS is certain to come under strain over the coming years. It is important to remember that head and neck cancer is still the 8<sup>th</sup> most common cancer in the UK, deafness is on the rise and ENT emergencies still occur (33, 68). In the near term, this should confirm the position of ENT in the NHS. In the longer term, there is a chance that AI will be better at diagnosing than doctors, that targeted systemic therapies will replace some surgery and that autonomous robots will replace surgeons. The likelihood and timescale of this outcome, is unclear. Changes such as this are years away and it is likely we will see a modification in the role of the ENT surgeon, to allow both human and robot providers to exist synergistically.

The speed of change within the specialty over the past 50 years does not suggest that such radical transformations are on the horizon. If they do come to fruition, then the existence not only of ENT, but of all doctors will be brought into question.

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