

HISTORICAL ARTICLE

Nineteenth Century Medical Education for Tomorrow's Doctors

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ABSTRACT

Many of the ideas contained within the GMC's 'Tomorrow's Doctors' could be considered as old ideas reworked for modern medical education. Sir John Struthers, a pioneer in the field of medical education, touched on many of the issues in 'Tomorrow's Doctors' in his writings published over one hundred years ago. The study of the history of medicine, often neglected by members of our profession in the search for new ideas, is not only of interest, but is valuable to current and future medical education. History illustrates the mistakes of the past, but also helps highlight the successes and insights that remain applicable and relevant today.

Introduction

'*Tomorrow's Doctors*', published by the General Medical Council (GMC) in 1993¹, and revised in 2003², heralded a transformation in undergraduate medical education. It sought to establish a consistent framework for curricula between medical schools,³ with a core curriculum that emphasised key knowledge, skills and attitudes for medical graduates, and a style that encouraged student learning through self-direction, problem solving, and critical evaluation of evidence.¹ The perceived information overload of the traditional curriculum was targeted, and traditional 'pre-clinical' teaching significantly reduced in many centres.

Prior to the implementation of '*Tomorrow's Doctors*', the layout of the medical curriculum was largely unchanged from that introduced by the GMC in 1890 in an effort to establish the five-year curriculum and formalise clinical teaching.⁴ Following the changes of 1890, medical students started with a general scientific education then graduated to clinical medicine in later years. Before 1890, a four-year course was standard, with a somewhat variable clinical element.⁴ The chairman of the GMC education committee, archetypal in the development of the five-year course, was Professor John Struthers, Regius Professor of Anatomy at the University of Aberdeen from 1863 to 1889, and President of the Royal College of Surgeons of Edinburgh from 1895 to 1897 (Figure 1)⁵. Foremost a comparative anatomist, Struthers also wrote extensively about his views on medical education,^{4,6,7,8,9} and should

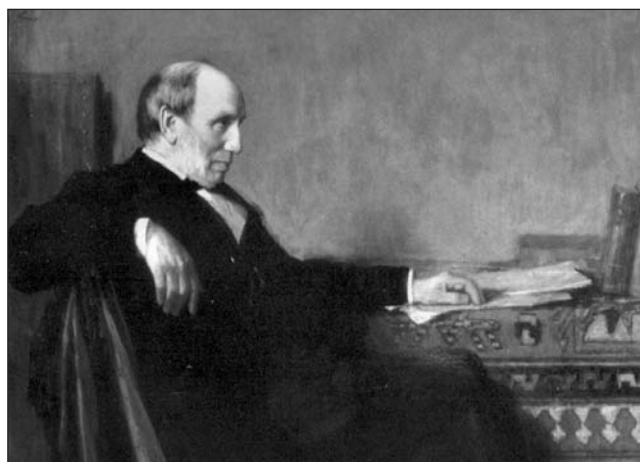


Figure 1 Sir John Struthers. From a painting by Sir George Reid RSA, by permission, University of Aberdeen

be considered a pioneer in this field that is now a rapidly emerging specialty in its own right. Many of the themes found in Struthers' educational work are reflected in the most recent edition of '*Tomorrow's Doctors*'.²

John Struthers had a distinguished career from medical school onwards.¹⁰ After graduation, he became a successful lecturer in the extramural anatomy schools of Edinburgh before moving to Aberdeen as Professor of Anatomy. Struthers was a convinced Darwinian,^{11, 12} and attempted to educate the traditionally sceptical public of north east Scotland about such theories, often to his ridicule.¹¹ (Figure 2)



Figure 2 Professor Struthers the Rag-and-Bone Man. From Bon Accord II, 13 November 1886. Struthers was the object of some derision for his support of Darwinism, and his comparative anatomy collections. By permission, University of Aberdeen

Evolution was also reflected in his teaching and research, with one of his other great passions being the study of the

rudimentary structures of the whales occasionally found washed up along the east coast of Scotland.^{11, 13}

Professor Struthers was involved with the GMC from 1883 until 1891. He retired from his chair at Aberdeen in 1889, but continued his GMC involvement. He was never idle in retirement, and from 1895 to 1897, he was President of the Royal College of Surgeons of Edinburgh. A knighthood was bestowed in 1898, just a year before his death.⁵

Tomorrow's Doctors 2003

In this article, we aim to look at some of the key recommendations of the new edition of 'Tomorrow's Doctors'², and consider what Professor Struthers said about similar subjects over one hundred years before the publication of this benchmark document. The study of the history of medicine, often neglected amongst the medical profession,¹⁴ is not only of interest, but is valuable to those involved in current and future medical education.¹⁵ Historical study may illustrate the mistakes of the past, but also help highlight the successes and insights that remain applicable and relevant today.

Guidance from 'Tomorrow's Doctors' 2003² comes under five general headings and a series of main recommendations. We will review some of these recommendations, and also look at themes from 'Curricular outcomes', 'Curricular content, structure and delivery', and 'Putting the recommendations into practice'.

'Tomorrow's Doctors' - The Main Recommendations

'The core curriculum must be the responsibility of clinicians, basic scientists and medical educationalists working together to integrate their contributions and achieve a common purpose'.

Struthers recognised the importance of integration when teaching medical students. He wrote, about lectures in Anatomy: "*the lecture is rendered doubly interesting and useful when...both scientific and surgical anatomy are combined...so as to render attractive, simple and impressive, what, when otherwise treated, have been, and with sure truth might be called the dry details of Anatomy*".⁹ Current anatomical teaching is very much based on the details of anatomy deemed to be 'clinically relevant'. Courses incorporate not only basic anatomy, but also imaging, practical procedures, and clinical scenarios to illustrate and reinforce the points being made. Many centres have surgeons and other clinicians contributing significantly to the teaching of anatomy.¹⁶

"Factual information must be kept to the essential minimum that students need at this stage of medical education".

Struthers was keen that medical students should not be excessively burdened with subjects irrelevant to them. He wrote: "*Hardly anything could be conceived more likely to give a beginner an aversion to Anatomy than to be wearied with the details of the origins of muscles and the attachments of ligaments. He could not and ought not to try to follow such teaching...it must be on a course specially adapted for him*".⁴ Since the implementation of 'Tomorrows Doctors', many preclinical courses have been extensively revised to ensure that what is taught is largely relevant to future clinicians, and this has no doubt been enhanced by an increasing proportion of practising clinicians teaching the basic science elements of the course.¹⁶

Struthers wrote extensively about teaching and learning. In

"Learning opportunities must help students explore knowledge, and evaluate and integrate (bring together) evidence critically. The curriculum must motivate students and help them develop the skills for self-directed learning".

his 1856 article "Hints to Students on the Prosecution of their Studies",⁷ he said, regarding an introductory course on osteology: "*The student, new to all such study, sees everything, handles everything, acquires the habit of observing for himself, instead of the schoolboy habit of committing to memory the words of the teacher, or of the book. He acquires the critical spirit, the spirit that demands to see and be satisfied of everything, and with such a beginning he is likely to carry these habits into his subsequent studies*". Further, in a clear reference to self-directed learning and critical thinking, he says: "*You must not content yourselves with learning what books or teachers say, but use your own observation; use your own eyes, ears, hands and thoughts; be active, not passive agents in your own education*".⁷

Curricular Outcomes

'Tomorrow's Doctors' - Good clinical care
"Doctors must practice good standards of clinical care, practice within the limits of their competence, and make sure that patients are not put at unnecessary risk".

"Doctors must know about, understand and be able to apply and integrate the clinical, basic, behavioural and social sciences on which medical practice is based".

Struthers advised his students "*not to affect more knowledge than you possess, or qualities which you have not*".⁷ This is clearly a reflection of probity. He encouraged students to learn the principles of a subject first, as "*the true practical man is not the man who despises Anatomy, Physiology... – or who neglects everything which does not concern his patient; but who has the foundation and the principles, and then adds the practical*".⁷

Tomorrow's Doctors' - Maintaining good medical practice

"Doctors must keep up to date with developments in their field and maintain their skills".

"Doctors must be able to gain, assess, apply and integrate new knowledge and have the ability to adapt to changing circumstances throughout their professional life".

"Doctors must be willing to respond constructively to the outcome of appraisal, performance review and assessment".

Struthers told his students that the development of a work ethic as a student, would be of lifelong benefit: *"In the habit of industry [studying], he has gained not only a store of knowledge, but a means of keeping it up and adding to it. The habit of the student lives on in the man"*.⁷ He advocated appraisal and audit of one's practice, writing: *"Let us never be alarmed when our opinions are called into question, but rather invite discussion of them, never afraid of the truth, being assured that it must benefit us either way; either on the one hand by ridding us of error, or on the other giving us greater security to our belief, by assuring us better of the foundation on which it rests"*.⁷

Curricular Content, Structure and Delivery

Struthers tried to encourage the scientific spark in his

'Tomorrow's Doctors' - The scientific basis of practice

"Graduates must have a knowledge and understanding of the clinical and basic sciences. They must also understand relevant parts of the behavioural and social sciences, and be able to integrate and critically evaluate evidence from all these sources to provide a firm foundation for medical practice".

"They must know about and understand normal and abnormal structure and function, including the natural history of human diseases, the body's defence mechanisms, disease presentation and responses to illness. This will include an understanding of the genetic, social and environmental factors that determine disease and the response to treatment".

"Graduates must know about biological variation, and have an understanding of scientific methods, including both the technical and ethical principles used when designing experiments".

'Tomorrow's Doctors' - Treatment

"Graduates must know about and understand the principles of treatment including the following":

- "How to evaluate effectiveness against evidence".

'Tomorrow's Doctors' - General skills

"Graduates must be able to do the following":

"Use research skills to develop greater understanding and to influence their practice".

"Solve problems".

"Analyse and use numerical data".

students from the start, and stressed an experimental ethos in all work: *"the true spirit in which all study and investigation*

should be conducted – the desire for truth and reality prevailing over all others. To be partisans of no teacher or school, to have no blind attachment to any system or theory, to have our minds perfectly free and open to new facts and evidence, to weigh them carefully and importantly, and be ready to acknowledge when we are wrong".⁷

As an anatomist, he obviously had a personal interest in the place of the 'preclinical' sciences in medicine, and was clear at what stage of the curriculum he thought they should be taught: *"Unless you are well informed in the foundation sciences and principles, you may practise your profession, but you will never understand disease and its treatment; your practice will be routine, the unintelligent application of the dogmas and directions of your textbook or teacher"*.⁷

Professor Struthers would almost certainly be dismayed at the effect the implementation of 'Tomorrow's Doctors'^{1,2} is perceived to have had on the teaching and knowledge base of many preclinical disciplines. He stressed the importance of understanding 'foundation sciences' to his students, and discouraged their desire to be exposed to clinical medicine at an earlier stage: *"The young medical man, who has as yet only this knowledge [basic medical science], is in every way more hopefully situated than the other who has neglected it in the endeavour to grasp prematurely at a knowledge of the living phenomena and treatment of disease"*.⁷ Medical students are now often exposed early to patients and families to encourage the development of skills and attitudes necessary for a profession that requires the trust of the public. Professor Struthers would likely have been pleased by attempts to vertically integrate preclinical sciences throughout the medical curriculum. This approach should ensure that students have a sound grasp of basic 'principles' appropriate for their stage of training. However, this has perhaps been harder to implement than anticipated. There is little space later in the curriculum for further 'preclinical' teaching unless at the expense of other subjects.

Struthers was an early advocate of increased clinical and practical teaching, which received sparse attention prior to the changes of 1890. The number of lectures was felt to be excessive, and their content often irrelevant.⁹ In the early years he felt that a student's time was better spent training the eye and the mind in the dissecting room or bone laboratory, followed by a more formal clinical training: *"It requires, I think, no prophet to foretell that ere many years have passed, the clinical element will enter more largely into medical education than it has hitherto done"*.⁷ He strongly encouraged students to spend time involved on the wards:

'Tomorrow's Doctors' - Teaching and learning

"The clinical and basic sciences should be taught in an integrated way throughout the curriculum".

"Students must have different teaching and learning opportunities that combine an appropriate balance of teaching in large groups with small groups, practical classes and opportunities for self-directed learning. Medical schools should explore and, where appropriate, provide opportunities for students to work and learn with other health and social care professionals. This will help students understand the importance of teamwork in providing care".

"Students must be properly prepared for their first day as a pre-registration house officer (PRHO). As well as the induction provided for PRHOs, students should have opportunities to shadow the PRHO in the post that they will take up when they graduate. Such attachments allow students to become familiar with the facilities available, the working environment and to get to know their colleagues. They also provide an opportunity to develop working relationships with the clinical and educational supervisors they will work with in the future".

"Modern educational theory and research must influence teaching and learning. Medical schools should take advantage of new technologies to deliver teaching".

"The student must not merely present himself at the hospital as a clinical observer. He must take a concern in the cases, and get connected with them in some capacity, as a dresser or clerk".⁷

Struthers recognised the concepts of surface and deep learning, as proposed by Marton & Säljö¹⁷ in 1976, and encouraged his students, via a careful process of study and observation, to adopt a deep approach: *"There are two kinds or parts of education; one is from without, put into us by the teacher or book, we commit it to memory and as long as we recollect it, we are able to repeat it as though we knew it. The other is what we work out for ourselves. They are quite distinct in principle".⁷* Medical curricula were at risk of encouraging students to adopt a surface approach to learning, as a result of syllabus overload, and examination styles that often required factual recall only.¹⁸ Syllabus overload is an ongoing problem, but problem-based learning and modern assessment techniques attempt to promote a deep approach and hence understanding rather than just a memory exercise.

Putting the recommendations into practice

'Tomorrow's Doctors' - The responsibilities of students

"Students must accept responsibility for their own learning, including achieving the curricular outcomes in this guidance".

Although Struthers was a strong advocate of clinical and practical teaching, he made sure his students understood the importance of studying outside the classroom: *"You may go about hospitals and dissecting rooms as much as you like, and attend lectures without number, but you will never get on without regular evening study".⁷* He was renowned for quizzing

students in lectures to ensure that they were paying attention, and that they had done their 'homework'.¹¹ He greatly disliked students taking excessive notes in lectures: *"Follow lectures attentively and thoughtfully, with occasional note-taking. Thus when the lecture is finished, the benefit is already secured. The essence of it is assimilated; while the systematic note taker, like the reporter, carries it away only in his pocket, in place of his head; the indifferent student, it may be added, having it in neither".⁷* Students attempting to copy down lectures verbatim was apparently as much of a problem in the mid-nineteenth century as it is today!¹⁹

Discussion

'Tomorrow's Doctors' has certainly revolutionised the undergraduate medical curriculum of today. Major changes in postgraduate medical education are still to be fully implemented under legislation such as the *European Working Time Directive* and *Modernising Medical Careers*. Looking at how the medical curriculum has developed over the years since Professor Struthers wrote his many articles on the subject of medical education, it becomes apparent that many of the 'modern' ideas may not be so new after all. Medical education appears to be like the world of fashion. Styles and ideas come and go, but certain things always 'come around again' – the recent introduction of a four-year medical course being a good example. There may be accusations of 'reinventing the wheel' from some quarters, but perhaps it is more accurate to say that soundly based educational principles remain sound, even if they were first penned over one hundred years ago, and to some extent forgotten, ignored, or simply not emphasised as important in the intervening years.

Professor Struthers may have been somewhat surprised by the effect that the interpretation of some of his theories has had, particularly with regard to the position of basic medical sciences. Remember his statement *"the true practical man is not the man who despises Anatomy, Physiology... – or who neglects everything which does not concern his patient; but who has the foundation and the principles, and then adds the practical".⁷* Since the implementation of "Tomorrow's Doctors", there has been a significant reduction in teaching time for subjects such as anatomy,²⁰ in order to make room for new curricular components and earlier clinical exposure. The likely detrimental nature of this approach has recently been recognised by the current chairman of the GMC.²¹

There are many anecdotal reports, but little objective evidence to suggest that current students and recent graduates are significantly lacking in areas such as anatomical knowledge. This deficiency may in part be due

to a failure of the anticipated vertical integration of such subjects throughout the undergraduate curriculum. However, many senior clinicians now feel that the level of anatomical knowledge is insufficient for safe medical practice.²² Most, if not all of these clinicians will have been educated under the pre-Tomorrow's Doctors system, and may expect that students will have been taught anatomy and physiology to the same level as they were, rather than building on the basics that today's students will have. As new courses become more established and their graduates start to permeate throughout the postgraduate structure, perhaps this will change, but it seems likely that the importance of the basic medical science subjects will have to be re-emphasised.

Communication skills, plus moral and ethical responsibilities are some of the central themes of 'Tomorrow's Doctors'. Perhaps unsurprisingly, this is not an area touched on by Struthers in his writings. However, he did stress the need for openness and honesty in teaching, research, and professional life, and given his desire for increased clinical exposure of students, it seems likely that he may have accepted the need to put doctors more in touch with the people they are treating. He would have almost certainly disapproved if this were at the expense of basic science teaching.

Professor John Struthers was integral in the establishment of the pre-'Tomorrow's Doctors' medical curriculum. From the study of his writings, it seems apparent that he would recognise that many of the educational principles he advocated during the nineteenth century are still central to medical training in the twenty-first century. He would no doubt wish to remind us though that: "*Unless you are well informed in the foundation sciences and principles, you may practise your profession, but you will never understand disease and its treatment*".⁷

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ABSTRACT OF SOCIETIES

Scottish Intensive Care Society

Oral Presentations

References for all articles can be found online at www.smj.org.uk

Teamwork in the Scottish ICU

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Studies of patient safety have indicated the importance of having effective teamwork within the intensive care unit (ICU). In particular, lapses in team communication between ICU nurses and doctors have been found to be an important factor in the occurrence of preventable medical errors.^{1,2} Pronovost et al.³ have also cited the importance of open communication between nurses and doctors, in order to create an environment where it is safe for all individuals to participate and speak up when necessary. This is consistent with many high-risk industries, where teamwork, and the processes of teamwork (e.g. communication), are recognised as being crucial.⁴ Due to the role of communication in medical errors, it would appear important to measure the perceptions of nurses and doctors with regards to factors influencing the quality of communication in the ICU. To date, relatively little research has been done in the UK ICU environment.

The current study reports on the perceptions of ICU nurses and doctors with respect to communication in the ICU. Employing a questionnaire tool used previously within the US, the study examines perceptions of teamwork in a number of Scottish ICUs. The questionnaire has been used across the US, with associations between interdisciplinary communication, patient length of stays, and risk-adjusted mortality rates being found.^{5,6} The questionnaire contains items that measure the quality of communication in the ICU between disciplines (i.e. nurses and doctors), and within disciplines (i.e. senior and junior doctors). Also measured by the questionnaire are perceptions of leadership, satisfaction with communication, understanding patient care goals, and perceived unit effectiveness. The preliminary results show that, overall, staff in ICUs have generally high perceptions of teamwork, similar to the US norm data. However, significant differences in perceptions of interdisciplinary communication openness were found between nurses and doctors. Also, there were significant associations between the leadership and communication scales, and between quality of unit communication and reported understanding of patient care goals.

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Recovery from the Anaemia of Critical Illness is Associated with Resolution of the Inflammatory State Despite a Depressed Erythropoietin Response

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Background: Anaemia is present in 80-90% of all patients at intensive care unit (ICU) discharge and persist for long periods in many patients.¹ In chronic