Anatomists' perceptions of the skills and attributes required of newly-recruited medical students.

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Abstract

Background and purpose: Admission procedures for recruiting students to medical school vary considerably across the world. Notwithstanding such variability, it is important to know what skills and attributes are required of the students by their teachers on entering medical school.

Procedures: Anatomists are often the teachers who first meet the students as they enter medical school and this report analyses, by means of a questionnaire, the putative skills required of their medical students by anatomists from the U.S.A. and Europe.

Findings: The findings from a questionnaire suggest that there are few differences between anatomists in the U.S.A. and Europe, even though medical students are postgraduates in the U.S.A. but undergraduates in Europe. Furthermore, the skill requirements expected of the students differed only slightly according to the gender and age of the anatomists and to whether or not they had clinical qualifications. The most important skills and attributes required of the students were found to be: good study skills and abilities to study independently, understanding of biology (but not chemistry, physics, mathematics, statistics, or understanding of the scientific method), memory/factual retention, communication and teamwork skills, problem-solving abilities, and attributes related to life-long learning, readiness to be challenged, and emotional stability and conscientiousness.

Conclusions: Anatomists within the U.S.A. and Europe essentially agree on the skills and attributes initially required of their medical students, as well as those not deemed initially important. These findings are presented with the view of enhancing admission policies and procedures for admitting students into medical schools.

Introduction

Medical education has historically undergone an evolutionary process that led to a consistent pattern for the medical curriculum across the globe for much of the 20th century. Accordingly, the medical curriculum, in common with many other healthcare curricula, consisted of 5 to 7 years of training, with the early years being devoted to the basic biomedical sciences. After 2 or 3 years of scientific study, the students would begin their clinical training. In the latter part of the 20th century and the early part of the 21st century, this consistency has become tenuous so that healthcare courses nowadays display many different arrangements for the study of clinical and scientific material. It might be argued that this has led to a loss of 'consistency, reliability and transparency' in medical education with the possibility that it has become more difficult to convince society at large that there is quality medical (healthcare) education founded on firm principles. In addition, this process has been 'revolutionised' by largely untried educational methods but, of greater significance in terms of the present debate, is the realisation that we have little knowledge or understanding of the expected skills, attitudes, knowledge base, and learning styles of the students that we recruit to medical school. Indeed, it seems to us that often teachers either do not know the skills that students bring or, thinking that they are dealing with a student as a *tabula rasa*, do not particular believe that knowledge of their skills is needed. This situation is highlighted by the fact that there is great diversity across the world with respect to admission procedures and entry requirements for medical school (e.g. Patterson et al., 2016). One area that has received much attention in guiding changes in the medical curriculum has been the notion that the present generation of students differs attitudinally and behaviourally from previous generations. Strauss and Howe (1991, 2000) have coined the term 'The Millennial generation' or 'Generation Y' for today's young persons and Draves and Coates (2003), authors of *Nine Shift: Work, Life and Education in the 21st Century*, claim that 'Millennials' have distinctly different behaviours, values and attitudes from previous generations as a response to the technological and economic implications of the Internet. However, research into the implications of these views has been, in our opinion, inadequate given the importance to society of the work of the medical profession.

In debates on medical education, there is always the risk of falling into the trap of slinging the epithets of ‘old-fashioned’ or ‘trendy’ into the mix. However, it is not a case of just discussing what is ‘traditional’ or ‘modern’ in terms of the methods of delivering medical education, which is where much of the argument appears so far to have taken place. Consideration should also be given to the attitudes, personal characteristics (including personality) and learning styles of today’s student. In this paper, we outline what anatomists consider should be the core skills, attitudes and other characteristics necessary for newly-recruited medical students to benefit properly from a university-based medical education. That we have studied the beliefs of anatomists comes from the fact that these teachers are often the first to meet and teach newly-recruited medical students and also from recent developments where anatomy courses have changed to include, not just a knowledge base for human structure, but attributes relating to the development of professionalism (e.g. Escobar-Poni and Poni, 2006; Swick, 2006; Swartz, 2006; Moxham and Moxham, 2007; Patel and Moxham, 2008; Wittich et al., 2013).

Our study aims to assess the following four hypotheses:

1. Few skills were required of medical students on entering medical school by anatomists;

2. Marked differences in skill requirements are expected when comparing US versus European anatomists since US medical students enter medical school after graduating from university whereas most medical students enter European medical schools straight from secondary school;

3. Anatomists who have many years of teaching experience require less in the way of skills from the newly-recruited medical students than less experienced (younger) anatomists;

4. Anatomists who are clinically qualified expect more skills from newly-recruited medical students than anatomists who have just scientific backgrounds.

Methods

Figure 1 lists the skills and attributes provided in the questionnaire that were distributed to anatomists. The list was compiled by the authors and included elements to describe personality traits that are derived from the BFI (Big Five Inventory) commonly used by psychologists and educationalists to assess personality (i.e. openness, conscientiousness, extraversion, agreeableness and negative affectivity/neuroticism) (John and Srivastava, 1999; Plaisant et al., 2011, 2014). The respondents were required to judge the importance of each skill/attribute, scoring between 0 and 10, where 0 was deemed to be not needed and 10 was thought to be required at a very high level. This study received ethical approval by the Institutional Review Board at St. George's University, Grenada (SGU IRB Application 14031). The surveys were conducted anonymously, the data remained strictly confidential, no vulnerable groups were included, and participation in the survey was voluntary.

The questionnaire was completed by a total of 108 anatomists, 56 (54%) of whom were clinically qualified. US anatomists numbered 42 (39%) and European anatomists 66 (61%). In terms of gender, 28 (26%) were female anatomists. The number of years of teaching experience ranged from 1 year to 50 years, with 50 (46%) respondents having more than 20 years experience and with a mean of 19 ± 13 (SD) years.

To analyze the data statistically, Microsoft Excel was employed for creating graphs and conducting simple calculations. MINITAB, SPSS, and SAS were used to run statistical tests, including ANOVA and t tests.

Results

Table 1 provides summary data and Figures 2 to 6 provide examples of histograms to show the variety of responses of the anatomists to some of the skills and attributes included within the questionnaire. Since it was recognised that some anatomists were more demanding than others in identifying the requirements of a newly-recruited medical student, the findings were also arranged in terms of the rank order of the skills and personality traits (see Tables 2 and 3).

Statistical analysis using ANOVA indicated that there is no significant difference between responses of US and European anatomists. Furthermore, no significant differences were also discerned between male and female anatomists and between those with, or without, clinical qualifications. However some statistical differences were found when the data was analysed by assessing t tests. Accordingly, those with clinical qualifications gave higher scores for the requirements of memory/factual retention (for the ranking data) ($p<0.01$), for understanding of the scientific method (though paradoxically lower scores for the ranking data) ($p<0.05$), for understanding of moral/ethical considerations (for the ranking data but again paradoxically lower for the non-ranking data) ($p<0.05$), for having practical skills ($p<0.01$), and for being extravert in personality ($p<0.05$). They also gave lower scores for the need to have broad cultural attributes ($p<0.05$). For gender differences, male anatomists tend to higher scores for memory/factual retention (but not for the ranking) ($p<0.01$), for the need to have IT skills ($p<0.05$), and for the rankings for the requirement to have skills needed for life-long learning and to be emotionally stable ($p<0.05$). European anatomists had lower scores than US anatomists for appreciation of the scientific method ($p<0.01$) and for understanding of moral and ethical matters (although paradoxically higher scores for the ranked data) ($p<0.05$) and for the need to have an agreeable personality ($p<0.05$), but higher scores (but only for the ranked data) for problem-solving abilities ($p<0.05$), for appreciation of the scientific method ($p<0.05$), for life-long learning skills ($p<0.05$), and for the appreciation of moral and ethical matters ($p<0.05$). Although correlations between total scores and years of teaching experience were not statistically significant, the more experienced teachers gave higher

scores for the need to have IT skills ($p<0.01$), and for the students to have open and more extravert personalities ($p<0.01$).

Discussion

In order to categorise skills/attributes as required, desirable, or of low priority, decisions were based upon ranking scores, median scores, and the percentage of maximum (10) scores returned by respondents. Accordingly, and as shown in Table 4, of the 27 listed skills in the questionnaire, just 11 are thought by anatomists to be required of a newly-recruited medical student (i.e. study skills, memory/factual retention, conscientiousness, emotional stability, understanding of biology, attributes for developing the skills of life-long learning, attributes associated with independent study, problem-solving abilities, readiness to be challenged, communication skills, and attributes related to teamwork). Therefore, in terms of one of our hypotheses, only a very limited number of skills are required of medical students on entering medical school by anatomists. Of these skills/attributes, it is perhaps not surprising the anatomists would require study skills and factual retention, as well as readiness to be challenged in a subject that will be novel to many new medical students. Additionally, team working is important should there be dissection of human cadavers in the course. However, given that body donation and the care of the donation are important, it is even more surprising that anatomists do not appear to value more the skills/attributes associated with practical skills, awareness of issues related to mortality, and ethical issues. It is possible that the reason for this relates to a belief that these are skills and attributes that can be developed satisfactorily once the students begin their medical education. In addition, although anatomy is a biomedical science concerned particularly with the body in health, it is possible that the introduction of case-studies to provide ‘clinical relevance’ has skewed the anatomists away from the functional-based model for medicine to a disease-based model (for a discussion of clinical anatomy and its relevance to the clinic see Moxham et al., 2011).

Table 4 near here

In terms of academic requirements, the anatomists only suggested that there was a need to have an understanding of biology with some support for chemistry (but not mathematics, basic statistics or physics). We have little doubt that, if the questionnaire was presented to

other biomedical scientists, then differing academic requirements would emerge (e.g. chemistry for the biochemists). Amongst the general skills that apply to a traditional university education, anatomists appear to require their students to have good study skills and abilities to study independently, problem-solving skills, a conscientious approach to their work, and a willingness to be challenged. However, this contrasted with a lesser priority for openness, understanding of the principles of the scientific method, numeracy and literary skills. In the case of the latter skill, this might be explained by the change from essay writing to the predominance of objective tests such as MCQs and EMQs during examinations.

In terms of personality traits, the anatomists required their medical students to be conscientious and emotionally stable. However, openness and agreeableness were not required and extroversion had low priority. These findings can be related to a report where the personalities of a group of French 3rd Year medical students at Paris Descartes (n = 403; mean age 21.3; 65% female) who completed the Big Five Inventory (BFI) were studied (Plaisant et al., 2011). They hypothesized that medical students share a common personality profile, showing relatively high 'agreeableness' (including altruism and affection), 'openness' (including open-mindedness and originality) and 'conscientiousness' (including diligence and control of impulse). It was also believed that they would have moderate to high 'extraversion' (including energy, enthusiasm, as well as sociable, outgoing, friendly and gregarious characteristics) but low 'negative affectivity' (being emotionally stable without neuroticism and nervousness). For comparison, groups of French 3rd Year psychology (n = 241; mean age 22.5; 93% female) and business studies students (n = 281; mean age 21.2; 59% female) at the University of Tours also completed the BFI. The results they reported were not consistent with their hypothesis, there being gender differences and, compared with other student groups studied, the male medical students were found to be relatively low in 'agreeableness' and 'conscientiousness'. In addition, both male and female medical students appeared to be relatively 'open' but the business studies students showed least 'negative affectivity'. In terms of 'extraversion', the findings were similar for medical and psychology students (both male and female) but business students were more 'extravert'. On the basis of these results, it is possible to compare the expectations of the anatomists with the reality of the students' personalities assessed using the BFI by Plaisant et al. (2011). For 'conscientiousness' (that

includes control of impulses as well as diligence), the median score from the anatomists was 8.5 but the equivalent score from the BFI study was only 3.2 for males and 3.5 for females. For ‘emotional stability’, the mean score from the anatomists was 8 but the BFI score was only 2.8 for males and 3.1 for females. Thus, the expectations of the anatomists were not matched by the reality of the students’ personalities. This was also seen for ‘openness’ where the mean score from the anatomists was also 8 but the students’ BFI equivalents were 3.5 for males and 3.4 for females. There was much less expected of the students by the anatomists for ‘agreeableness’ and ‘extraversion’ where the median score were 7 and 6 respectively. However, even for these personality traits the BFI equivalents were respectively just 3.5 for males and 3.7 for females and 3.2 for both males and females. To add to these observations, Plaisant et al. (2011) found that the personality traits of the psychology and business studies students were in many respects more positive than for the medical students. We can conclude that what the anatomists want is not what they get!

Another unexpected finding was that the anatomists only regarded IT skills as being desirable, with only 17% giving the top score of 10 for this attribute. This finding can be related to whether students coming from the ‘Millennial generation’ or ‘Generation Y’ (e.g. Strauss and Howe, 1991, 2000; Draves and Coates, 2003) have distinctly different behaviours, values and attitudes as a response to the technological and economic implications of the Internet. Either these generational differences are not recognised by the anatomists or they regard the issue as being of little importance. The latter explanation is supported by a report that today’s medical students do not value computer-assisted learning or IT-based instruction as the primary means for teaching and learning gross anatomy, preferring instead the more traditional and practical pedagogic methodologies of dissection, demonstration of prosections, and radiological and surface anatomy tuition (Moxham and Moxham, 2007).

For our hypothesis that marked differences in skill requirements are expected between US and European anatomists because their students have different academic backgrounds before entering medical school, few differences were discerned statistically, the findings were paradoxical. For example, European anatomists differed slightly from their US counterparts in

returning lower score values for the appreciation of the scientific method (i.e. in terms of the 0-10 scoring) but ranked this attribute slightly higher than did their US counterparts. Overall, however, our findings are not consistent with our hypothesis and indicate that, whether there is postgraduate or undergraduate entry to medical school, anatomists expect similar requirements of their newly-recruited students. Whether the Europeans are overestimating the skills sets of their students who come straight into medical school from secondary school remains a moot point.

The hypothesis that anatomists who have many years of teaching experience require less in the way of skills from the newly-recruited medical students than less experienced (younger) anatomists was devised because it was felt that the more experienced and elder teachers could become indifferent about the expected skill requirements. Statistically, however, there was little difference detected between older and younger anatomists and those differences were paradoxical. The reasons why the more experienced anatomists provided slightly higher scores for the need to have IT skills and for the students to have open and more extravert personalities is unknown but could relate to the preferred way in which they wished to interact with such students. Nevertheless, our findings are not wholly consist with our hypothesis.

Our hypothesis that anatomists who are clinically qualified expect more skills from newly-recruited medical students than those without clinical qualifications was not supported since few statistical differences between them. Furthermore these could also be seen to be paradoxical. For example, clinically qualified anatomists scored lower for the need to have understanding of moral/ethical considerations but higher when the attribute was ranked. All told, there were consistent responses across the cohort of anatomists surveyed such that there are similar requirements of the skills and attributes of newly-recruited medical students regardless of whether the anatomists were from the USA or Europe, whether male or female, or their level of teaching experience, or had clinical or non-clinical qualifications.

There are some further considerations in terms of what our findings mean for medical/anatomical pedagogy. First, although the anatomists did not seem to require many skills and attributes from their students, perhaps believing that they can be developed rapidly

once they enter medical school, it would be wrong to assume that the skills that scored lowly would not be beneficial to the students. Indeed, given sufficient challenge, we should expect more from the medical students than is taken into consideration by teachers at the early stages of their medical education. Second, too often new (supposedly 'innovative') educational methods are introduced without an understanding of the strengths, weaknesses and attitudes/behaviours of today's medical student. Worse still would be to fain ignorance of the strengths, weaknesses and attitudes/behaviours. New educational methods, in our view, should be based around knowledge of the skills, attributes and attitudes and personalities of the students, otherwise the methods can only be regarded as 'experimental' and not truly 'evidence-based'. Third, there appears to be increasing focus that teaching anatomy should not just be about the dissemination of anatomical knowledge but about developing professional skills and attitudes (e.g. Escobar-Poni and Poni, 2006; Swick, 2006; Swartz, 2006; Moxham and Moxham, 2007; Patel and Moxham, 2008; Wittich et al., 2013). We agree with the need for such developments but, in view of the fact that anatomists seem not to require some of the more professional skills and attributes within our list, we wonder whether this reflects an unreadiness (or uneasiness) to include professional skills within their courses. Perhaps again, the findings may simply reflect a belief that such skills can be successfully introduced once the students have commenced their medical training.

Our findings additionally have implications concerning procedures and policies for recruiting and admitting students to medical school. A comprehensive, and systematic, review of the strengths and weaknesses of a variety of selection methods for recruiting medical students has been published, based upon a literature search of 194 articles published between 1997 and 2015 (Patterson et al., 2016). It was reported that, in terms of effectiveness (validity and reliability), procedural issues and acceptability and cost-effectiveness, academic performance at school, interviews and multi-mini-interviews, and the use of selection centres were preferable to employing traditional interviews and using references and personal statements. In our survey, although high grades in science subjects are often required, anatomists only prioritised biology. This may be related to the requirement for the students to possess the foundations for understanding the morphologically based anatomical sciences. There is evidence to suggest that that students entering medical school with high academic

achievements have low dropout levels (O'Neill et al., 2011; Urlings-Strop et al., 2013), although there is some doubt that academic achievement at school is a good predictor of success in medical school (Al-Rukban et al., 2010; Tektas et al., 2013; Husbands et al., 2014). Since anatomy is not a subject that is often taught prior to medical school and requires good memory and visual learning skills, it may be necessary for a future study to ascertain whether academic achievement prior to entering medical school impacts upon performance in gross anatomy assessments.

It is usual for applicants to medical school to demonstrate evidence of motivation and interest in studying medicine, understanding of the demands of medical training, a caring ethos and sense of social awareness and responsibility, evidence of a balanced approach to life, and interpersonal and communication skills. In this context, communication skills was indeed regarded by anatomists as being a requirement, although the need for literary skills was not so well appreciated. Furthermore, given that students and anatomists believe that gross anatomy is best taught and learned by practical pedagogic methodologies (Moxham and Moxham, 2007, Patel and Moxham, 2008; Kerby et al., 2011), practical skills were ascertained as having low priority. Patterson et al. (2016) assessed the use of personality measures and assessment of emotional intelligence for recruiting medical students, highlighting the findings of Lievens et al. (2002, 2009) that suggested that medical school grades increased predictably over the course of medical education in line with some measures of personality. Patterson et al. (2016) also reported that the BFI personality traits appeared to correlate with aspects of performance at medical school. As mentioned earlier, anatomists held 'conscientiousness' and 'emotional stability' in high esteem but, contrary to our expectations, were less concerned about 'openness' and 'agreeableness', and gave little value to 'extrovert or introvert' personality traits. Whether personality tests should be more generally employed for selecting medical students is a matter of debate, particularly as there may be issues relating to the acceptability of using personality assessments (Lievens et al., 2009; Jerant et al., 2012; Patterson et al., 2016).

Conclusions

Regardless of gender, age, years of teaching experience, or geographical location in the US and Europe, the the most important skills and attributes required by anatomists of newly-recruited medical students were, in order of priority: good study skills and abilities to study independently, understanding of biology (but not chemistry, physics, mathematics, statistics, or understanding of the scientific method), memory/factual retention, communication and teamwork skills, problem-solving abilities, and attributes related to life-long learning, readiness to be challenged, and emotional stability and conscientiousness. We would hope that admission policies and procedures for medical school take full cognisance of our findings. We of course recommend that similar studies be conducted to ascertain the skill requirements of practising medical clinicians but it should be noted that a significant percentage of anatomists in the present survey were clinically qualified and there was little difference between their responses and those anatomists without clinical qualifications.

Contributions and Conflict of Interest

The project and the questionnaire were devised by Bernard Moxham and extensively reviewed by Feisal Brahim. Odile Plaisant provided a French translation of the questionnaire. Bernard Moxham and Odile Plaisant organised the distribution of the questionnaires. Baptiste Lignier analysed the data statistically. All authors were responsible for reviewing the findings, for the discussion, and for the writing of the article. Feisal Brahim gave much assistance in obtaining ethical approval for the project from St. George's University.

There are no conflicts of interest.

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Figure 1 The matrix questionnaire used to assess the views of anatomists regarding the skills, attributes and attitudes expected of a newly-recruited medical student. For each of the 27 skills and attributes in the table below, provide a score between 0 and 10 where 0 indicates that the skill/attribute is not required and 10 where it is necessary at a high level for a newly recruited medical student.

Skills/Attributes	**Teachers' Assessment (0 = not needed; 10 = high requirement)**
Study skills	
Memory/factual retention	
Problem-solving abilities	
Numeracy/mathematical skills	
Basic statistical knowledge	
Understanding of physics,	
Understanding of chemistry	
Understanding of biology	
Understanding of the principles and limitations of the scientific method	
Understanding of moral/ethical frameworks	
Literary skills, including essay writing and reporting	
General knowledge and broad cultural attributes	
Communication skills	
Dress code	
IT skills, including ability to access new information	
Attributes appropriate for independent study	
Attributes appropriate for team working	
Attributes suitable for the development of life-long learning	
Readiness to be challenged	
Awareness of mortality	
Awareness of medicine being health(functionality)-based not just disease-based	
Practical skills (including manual dexterity)	
A detached and objective viewpoint (openness)	
Conscientiousness	
Outgoing (not introspective) personality	
Agreeable personality	
Emotional stability	

Figure 2 Histogram showing the scores from 0 (not required) to 10 (required at a very high level) for study skills (median score = 10)

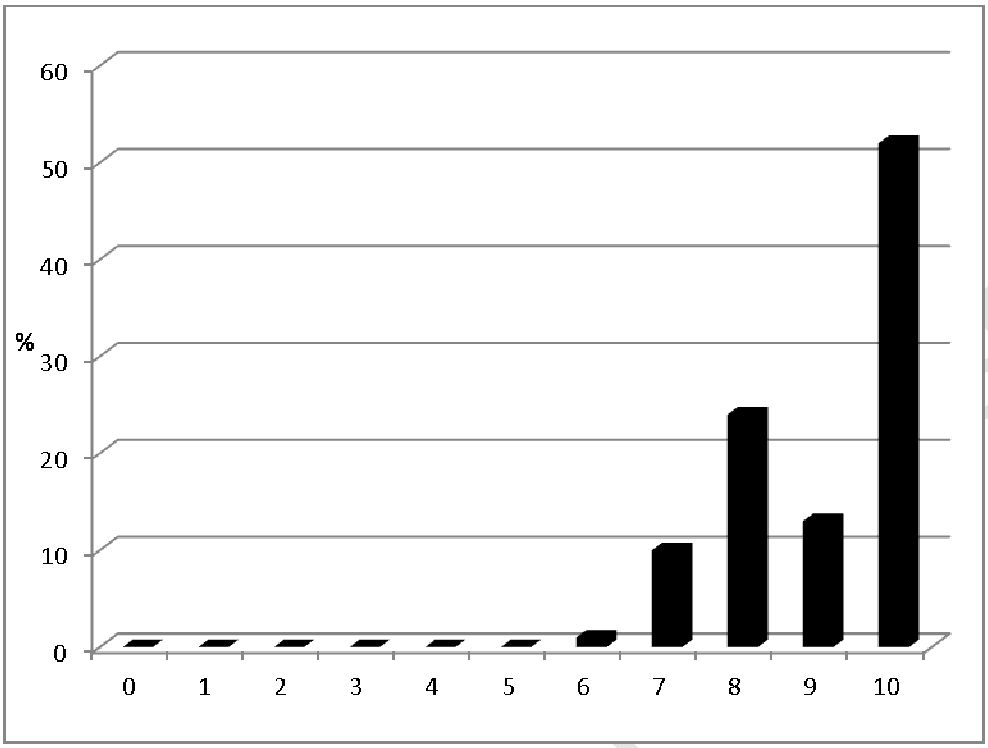

Figure 3 Histogram showing the scores from 0 (not required) to 10 (required at a very high level) for understanding physics (median score = 5)

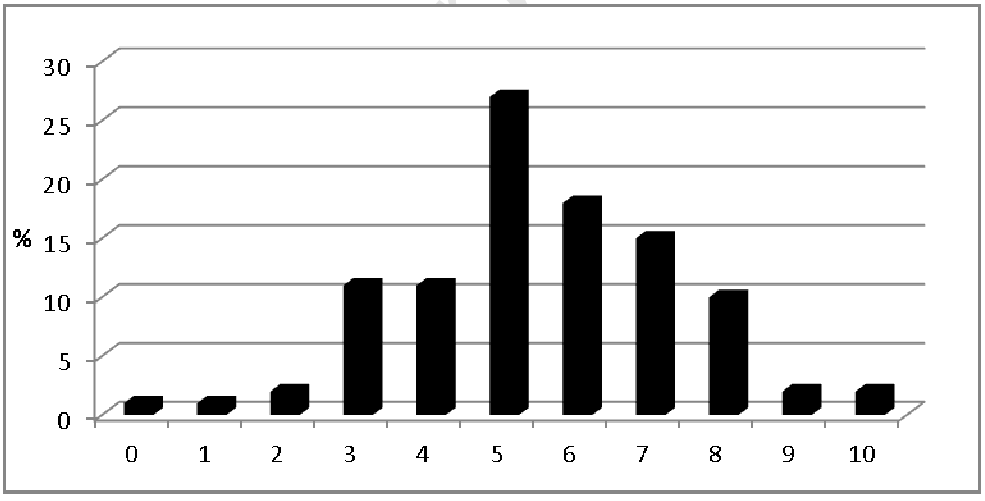

Figure 4 Histogram showing the scores from 0 (not required) to 10 (required at a very high level) for understanding the principles of the scientific method (median score = 7)

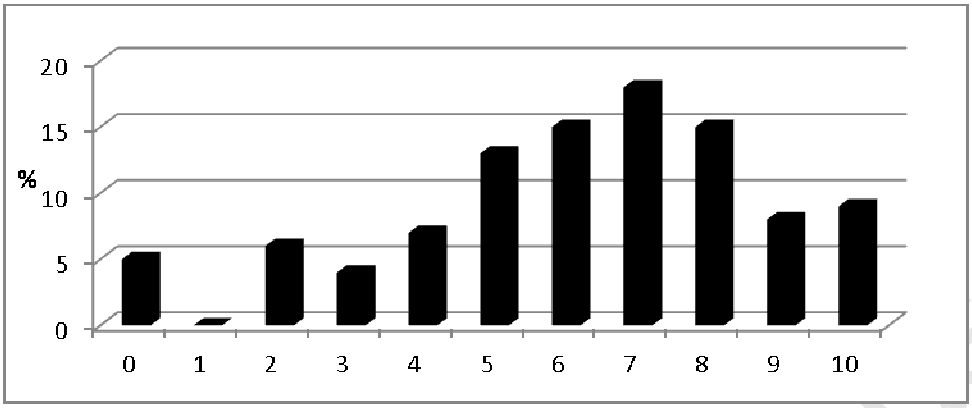

Figure 5 Histogram showing the scores from 0 (not required) to 10 (required at a very high level) for understanding ethical frameworks (median score = 8)

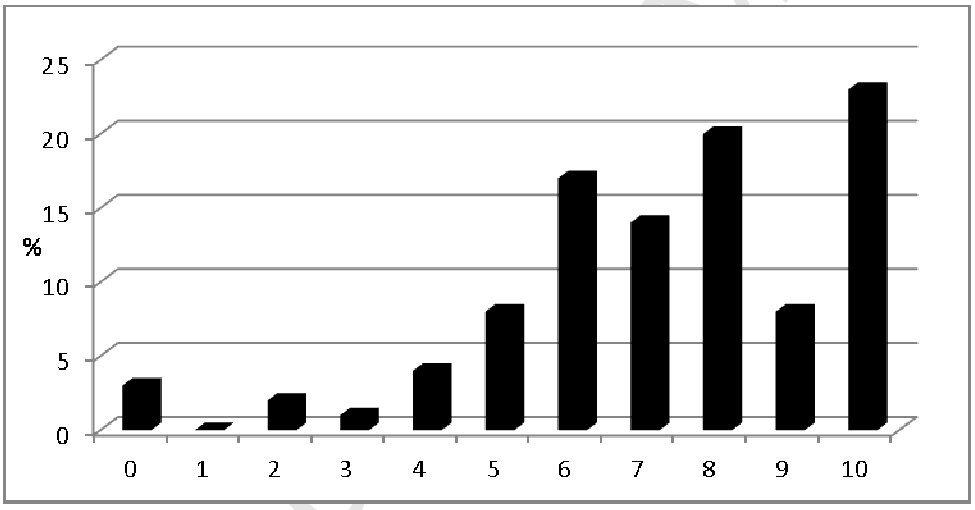

Figure 6 Histogram showing the scores from 0 (not required) to 10 (required at a very high level) for practical skills (median score = 6)

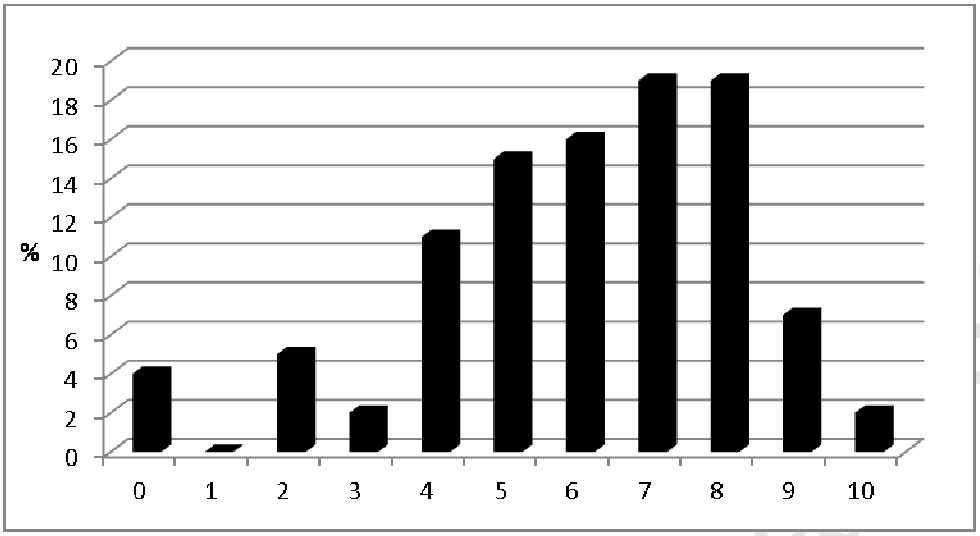

Table 1 Summary of data (non-ranking) where for mean, median and mode the higher the figure the greater the skill is recommended for newly-recruited medical students

SKILL	N	Mean	Median	Mode	Min.	Max.	Variance	S.D.
Study skills	108	9.05	10	10	6	10	1.26	1.12
Memory	108	8.41	8	10	4	10	2.34	1.53
Problem solving	108	8.13	8	10	3	10	2.53	1.59
Mathematics	108	5.69	6	5	0	10	3.07	1.75
Statistics	108	5.47	6	5	0	9	3.73	1.93
Physics	108	5.52	5	5	0	10	3.54	1.88
Chemistry	108	6.48	7	8	1	10	3.37	1.84
Biology	108	8.12	8	10	4	10	2.76	1.66
Scientific method	108	6.28	7	7	0	10	6.45	2.54
Ethics	108	7.30	8	10	0	10	5.39	2.32
Literary skills	108	6.81	7	8	0	10	4.08	2.02
Culture	108	6.49	7	8	0	10	4.38	2.09
Communication	108	7.76	8	8	0	10	3.79	1.95
Dress code	108	5.10	5	5	0	10	7.21	2.69
IT skills	108	7.31	8	8	0	10	3.68	1.92
Independence	108	8.22	8	8	5	10	2.02	1.42
Teamwork	108	7.80	8	8	0	10	3.47	1.86
Life-long learning	108	8.01	8	8	3	10	2.96	1.72
Accept Challenge	108	7.97	8	8	0	10	3.30	1.82
Mortality	108	6.41	6.5	Bimodal	0	10	6.28	2.51
Health/Disease	108	7.01	7.5	8	0	10	5.80	2.41
Practical skills	108	6.03	6	8	0	10	4.81	2.19
Openness	108	7.47	8	8	1	10	3.56	1.89
Conscientiousness	108	8.40	8.5	10	2	10	2.56	1.60
Extroversion	108	5.48	6	5	0	10	4.66	2.16
Agreeableness	108	6.81	7	8	0	10	4.49	2.12
Emotional stability	108	8.29	8	8	2	10	2.37	1.54

Table 2 showing the rankings chosen by anatomists for skills (from the 27 items in the skills/attributes list). For the median ranking scores, the lower the score the higher the ranking.

Skills in Rank Order	Ranking score
Study skills	**1**
Memory/factual retention	**3**
Understanding biology	**4.5**
Attributes for developing life-long learning	**4.5**
Attributes for independent study	**5**
Problem-solving abilities	**5**
Communication skills	**6**
Attributes for team work	**6**
Readiness to be challenged	**6**
Understanding ethical/moral frameworks	**9.5**
IT Skills	**10**
Awareness of medicine for health not just disease	**10.5**
Literary skills	**12**
Understanding chemistry	**13.5**
Understanding the principles of scientific method	**14.5**
Awareness of mortality	**15**
General knowledge and broad cultural attributes	**16**
Practical skills	**l**
Mathematical skills	**18**
Basic statistical skills	**19**
Dress code	**20**
Understanding physics	**20.5**

Table 3 showing the rankings chosen by anatomists for personality traits (from the 27 items in the skills/attributes list). For the median ranking scores, the lower the score the higher the ranking.

Personality Traits in Rank Order	Ranking score
Conscientiousness	**3**
Emotional stability	**4**
Openness	**9**
Agreeableness	**12**
Extroversion/Introversion	**19**

Table 4 Classification of the skills/attributes according to whether they are deemed by the anatomists surveyed to be required, desirable, or of low priority.

	Skills/Attribute	Ranking score	Medians	% of 10 scores
Required	**Study skills**	**1**	**10**	**52**
	Memory/factual retention	**3**	**8**	**35**
	Conscientiousness	**3**	**8.5**	**31**
	Emotional stability	**4**	**8**	**28**
	Understanding biology	**4.5**	**8**	**30**
	Attributes for developing life-long learning	**4.5**	**8**	**28**
	Attributes for independent study	**5**	**8**	**27**
	Problem-solving abilities	**5**	**8**	**25**
	Readiness to be challenged	**6**	**8**	**27**
	Communication skills	**6**	**8**	**21**
	Attributes for team work	**6**	**8**	**22**
Desirable	**Openness**	**9**	**8**	**16**
	Understanding ethical/moral frameworks	**9.5**	**8**	**23**
	IT Skills	**10**	**8**	**17**
	Awareness of medicine for health not just disease	**10.5**	**7.5**	**16**
	Literary skills	**12**	**7**	**11**
	Agreeableness	**12**	**7**	**9**
	Understanding chemistry	**13.5**	**7**	**4**
	Understanding the principles of scientific method	**14.5**	**7**	**9**
	Awareness of mortality	**15**	**6.5**	**15**
Low priority	**General knowledge and broad cultural attributes**	**16**	**7**	**7**
	Practical skills	**17**	**6**	**2**
	Mathematical skills	**18**	**6**	**1**
	Basic statistical skills	**19**	**6**	**0**
	Extroversion/Introversion	**19**	**6**	**2**
	Dress code	**20**	**5**	**4**
	Understanding physics	**20.5**	**5**	**2**