

# The Education of Medical Students in Human Factors – A National Survey

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## Abstract

**Background:** The importance of human factors (HF) has been highlighted recently by the General Medical Council's decision to include it in their processes for evaluating fitness to practice. Medical school is vital for embedding concepts into medical practice, but little is known about the rigor and extent to which HF is taught across United Kingdom (UK) medical schools. **Methods:** Cross-sectional study assessing HF among medical students in the UK. An 8-question survey was designed and disseminated nationally using the Qualtrics platform. Respondents were asked for their existing knowledge and perception of HF, education throughout medical school and relevant demographic factors. **Results:** The survey was completed by 304 medical students from 12 UK medical schools. In total, 45.7% of respondents had never heard of HF as a concept. Furthermore, 96.9% of respondents deemed the concept of HF as very important to medicine and future clinical practice. Moreover, simulated scenarios, one-to-one and small group teaching emerged as the most effective teaching methods, whilst many students agreed this teaching should occur in the early stages of medical education. Lastly, communication and teamwork were perceived to be the most important aspects of HF. **Conclusion:** These findings reveal a lack of awareness regarding HF among UK medical students. New strategies are needed to ensure the doctors of tomorrow are equipped with the necessary tools to implement and deliver safer, more effective patient care.

**Key Words:** Interprofessional Education; Medical Students; Medical Education; Health Communication (Source: MeSH-NLM).

## Introduction

The International Ergonomics Association defines human factors (HF) as "a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance."<sup>1,2</sup> In medicine, HF or soft skills are generally understood to mean all the non-technical skills doctors' needs to perform efficiently in different clinical scenarios ranging from routine practice to high-stress emergency settings, such as trauma and resuscitation.

The importance of HF and the application of its underlying principles within medicine have been recently emphasized by the General Medical Council's (GMC) decision to incorporate HF into their process for evaluating fitness to practice in the United Kingdom (UK).<sup>3</sup> In the light of events such as the case of Dr Bawa-Garba,<sup>4-6</sup> or the failings at the Mid Staffordshire NHS Trust in 2014, the patient safety agenda has been brought to the forefront of both public and professional interest. Much of this work has centered around the number of "avoidable deaths" within the

National Health Service and how this figure can be reduced. This data feeds into a wider exploration of the impact of medical error – defined as the "failure to execute an action as intended" or "use of an inappropriate plan to achieve a stated outcome."<sup>7</sup> Data from the UK suggests that up to 35,000 deaths each year occur due to medical error.<sup>7</sup> The cost of these errors to the UK has been estimated at around £2 billion,<sup>8</sup> with an intangible emotional cost to patients and families.<sup>9</sup> Data from patients admitted to the hospital also suggests that up to 10% may suffer some form of avoidable harm.<sup>10</sup> From an international perspective, the six International Patient Safety Goals from the Joint Commission International include correct patient identification, effective communication, medication safety and safe surgery.<sup>11</sup> HF can have a key impact on these four goals, and knowledge surrounding HF supports healthcare professionals in meeting these goals. The World Health Organization (WHO) produced a Global Patient Safety Action Plan in 2021, highlighting HF as critical in producing a safe healthcare system. Strategy 2.4 of this action plan includes recommendations for ensuring the availability of training programs in HF and that any patient safety accreditation requires training on HF.<sup>12</sup>

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Whilst greater emphasis is placed upon the teaching of HF during post-graduate training, there appear to be wide variations in the rigor and formality of HF teaching in UK medical schools.<sup>13</sup> This research aims to describe the awareness of HF in medical students in the UK and establish their perception of HF teaching and confidence in soft skills.

## Methods

A cross-sectional study based on a survey to identify knowledge and perceptions about HF of UK medical students. Ethical approval was obtained from the Brighton and Sussex Medical School Research and Governance Ethics Committee (RGEC Ethical Approval ER/BSM6909/1).

A draft questionnaire was developed from an initial literature search using PubMed (search terms with and/or used: HF, education, medical, questionnaire, medical student) highlighting existing work and was then tested on a group of medical students (n=10) based at one district general hospital. The use of feedback, including the clarity of the questions, understanding of questions and answer terms used, and perceived relevance of questions from the pilot group, allowed the construction of a final 8-question survey ([Supplementary Material](#)). The survey was accessible online via the Qualtrics platform.

In 2016/2017, the GMC reported 39,185 medical students in the United Kingdom.<sup>14</sup> We aimed to recruit one percent of this cohort to gain data representative of the population. The inclusion criteria were all students currently studying at a UK medical school, including those in intercalation years. No exclusion criteria in terms of demographic were used.

The survey was available online via a web link distributed by contacting medical student societies ("MedSoc") via email. This contact outlined the aims of the study and provided a shareable web link to access the survey. A second phase followed up on the initial email and contacted a selected range of medical school administrative offices where no response was received in phase one. The survey was available online for five months.

Personal data were gathered as part of the questionnaire, including gender, age, and medical school attended. Participants were required to provide informed consent to participate in the survey prior to commencing questions. Students who completed the survey in its entirety could opt-in for a prize draw. Participation in the study was voluntary, and data were treated in accordance with the Data Protection Act and GDPR (2018).<sup>14,15</sup> This work received £800 from Brighton and Sussex Medical School, which funded the prize draw; the medical school had no input in the study design, data analysis, or manuscript production. The data from participants who did not complete the survey in full were removed prior to analysis.

Data were extracted from the Qualtrics software,<sup>17</sup> which allowed for the separation of groups of participants based on responses

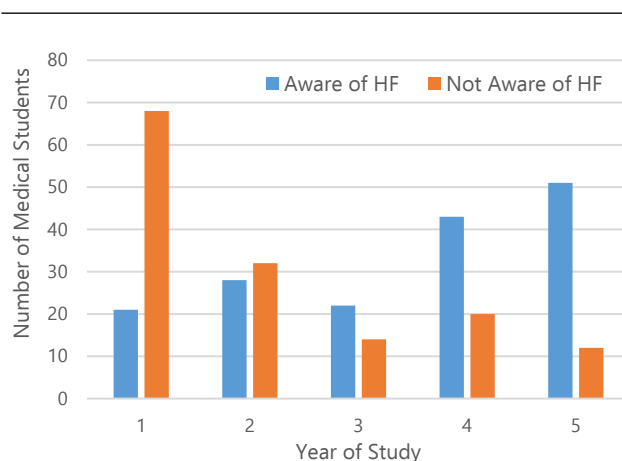
to specific demographic and HF-related questions. Statistical analysis was undertaken on SPSS using Fisher's exact test and chi-squared with a 95% confidence interval.<sup>18</sup> Results were accepted as significant if the p-value was <0.05. Categorical data were collected using a Likert scale with not at all confident, somewhat confident and very confident as options.

## Results

Over the five-month survey period, 304 students from 13 medical schools consented and completed the survey. Respondents were primarily aged between 19 and 24 (92.6%) with a range of 18 to 37 years and a mean of 21 years. The gender of participants was weighted towards females (66.97%), with 32.4% males and 0.61% who prefer not to say. Participants ranged from all years of medical school education. No link was identified between which medical school was attended and awareness of HF ( $p>0.05$ ). Furthermore, there was no significant difference between gender or age and awareness of HF ( $p>0.05$ ).

Of the respondents, 45.7% stated that they were not aware of the term HF from their training so far. Within this group (n=148), only 51.3% of students were familiar with related terms, including "soft skills" and "non-technical skills." Of the 176 students aware of HF, 83.9% had gained experience in the first three years of their degree. A statistically significant difference ( $p<0.001$ ) was found between the year of study and awareness of HF. As participants progressed through medical school training, a higher proportion was aware of HF – only 24.7% of year one students were aware, but 61% of the third year and 80.9% of final-year students had come across the term ([Figure 1](#)).

**Figure 1.** The Number of Respondents in each Year Group who were either Aware or Unaware of Human Factors (HF) as a Concept.



The questionnaire highlighted that a large proportion of students were extremely or somewhat confident in communication and leadership skills, but 50.5% were not at all confident in challenging authority. [Table 1](#) outlines this information for all ten skills related to HF. Chi-squared analysis was conducted comparing the confidence levels of students from different years in each of the ten skill areas, with statistically significant

differences found in confidence in leadership ( $p < 0.001$ ), communication ( $p < 0.05$ ), coping with stress ( $p < 0.05$ ), coping with criticism ( $p < 0.001$ ) and situational awareness ( $P < 0.001$ ), with those in later years of study expressing higher confidence levels. In total, 48.1% of respondents stated they were more confident in soft skills/HF than technical skills (such as venipuncture or cannulation), with 30.9% equally confident in both areas.

**Table 1.** Reported Confidence Levels (%) of Participants in Various Human Factor (HF) related Skills.

Human Factors related Skills	Confidence Levels of Participants (% of responses)		
	Not at all Confident	Somewhat Confident	Extremely Confident
Communication	1.7	47.8	50.5
Leadership	14.2	57.1	28.7
Teamwork	1.0	31.5	67.5
Decision Making	12.5	70.6	16.9
Coping with Stress	10.0	70.2	19.8
Coping with Criticism	20.4	55.7	23.9
Situational Awareness	14.2	55.4	30.4
Task Prioritization	10.4	60.5	29.1
Reporting Errors	17.6	56.1	26.3
Challenging Authority	50.5	40.8	8.7

A range of teaching methodologies for teaching HF were reported. Most frequently were small group based ( $n=252$ ), lecture-based ( $n=219$ ) and simulation ( $n=182$ ) learnings. The opinion of participants on which teaching methodology was most effective was obtained. Simulated scenarios, small groups and one-to-one teaching were perceived as best methods (**Table 2**).

**Table 2.** Participants' Beliefs Regarding which Teaching Methodologies are most Effective for Human Factor (HF) Education and which Teaching Methodologies are Utilized in HF Skills Teaching.

Type of Teaching for HF skills	Receiving this Type of Teaching (%)		Beliefs Regarding Effectiveness (% of responses)		
	Yes	No	Not Effective	Somewhat Effective	Extremely Effective
One to One Teaching	43.8	56.2	4.9	36.1	59.0
Small Group Teaching	87.5	12.5	1.7	24.3	74.0
Lecture	76.0	24.0	40.0	56.9	3.1
Simulated Scenarios	63.2	36.8	0.7	22.2	77.1
E-learning	33.3	66.7	54.5	43.4	2.1

Assessment of which direct skills related to HF were being taught revealed areas where education may be lacking. Participants indicated that coping with criticism (20.8%), challenging authority (32.7%), leadership (34.4%) and task prioritization (33.3%) were the least frequently taught skills. Most participants received education in communication (91.8%) and teamwork (74.4%) skills.

Almost all (96.9%) medical students considered HF teaching in medical schools to be very (24.8%) or extremely (72.1%) important. Moreover, 55.4% believed that "pre-clinical" years (one to three) would be the most appropriate stage of medical school for HF teaching to occur. Nine students selected 'other' and commented that teaching should occur throughout the curriculum. The perceived importance of specific HF skills over others was explored. Students were asked to rank ten HF skills from one (most important) to ten (least important) compared to each other. This question established that communication (90%) and teamwork (47%) were ranked highly as important skills (% who rated this skill rank one or two). The lowest-ranked aspects (% who rated this skill rank nine or ten) were challenging authority (69%), reporting an error (37%) and coping with criticism (36%).

## Discussion

Our results show that HF is forming part of the medical curriculum, with over 80% of final-year students aware of this concept, but it could potentially be featured to a greater extent within undergraduate studies.<sup>19</sup> In recent years, the House of Commons Health Committee produced a patient safety report (2009) highlighting a need to integrate non-technical skills and HF training into the training of undergraduates.<sup>10</sup> Similarly, a multi-professional patient safety curriculum guide from the WHO details the importance of HF in patient safety.<sup>20</sup> Both advocates increased HF training for medical professionals and appear to show progress has been made. However, a significant percentage who were unaware shows that further work is still required both in improving awareness of HF as a term and in providing training earlier in undergraduate training. This is supported by 55.4% of participants responding that the pre-clinical years would be the best time to provide HF education. Studies have shown favorable feedback to curriculum reform with the aim of providing more HF training. In this regard, students report more confidence in communication, overall patient interactions, and breaking bad news.<sup>21</sup> A survey targeted at NHS and military doctors in the UK identified that junior clinicians were much more likely to have had training in HF, with 60% of senior doctors reporting no HF training.<sup>22</sup> Further providing evidence of a movement towards HF educational provision.

Students showed high confidence levels in leadership (96.2%) and communication skills (92.6%). This data is supported by participants specifically stating they received education in these areas of HF skills from their respective institutions. A systematic review of 22 studies providing non-technical skills education found that key featured themes were leadership, communication and teamwork.<sup>23</sup> A 2014 study explored medical students'

attitudes regarding leadership and management training, and again, similar areas were highlighted as necessary.<sup>24</sup> The GMC's guidance regarding expected outcomes for graduates gives a range of HF-related skills as requirements for newly graduated doctors, including awareness of patient safety, communication skills, leadership and team working, and multi-disciplinary work.<sup>25</sup> Considering the significant non-technical requirements for new graduates, limited assessment is undertaken regarding these skills nationally.<sup>26</sup> In light of the requirement to provide this training, it is positive that almost all undergraduate students receive education in these specific areas and have high confidence levels with these skills. Exploring further, we found that 48.1% of students had more confidence in HF-related skills over technical skills, and 30.9% stated equal confidence in both areas. We hypothesize this could be due to a perceived lesser technical skill ability rather than specific confidence in HF-related skills. There may also be an element of more junior students feeling their technical skills are more limited than HF.

Only 48.5% of students stated an element of confidence in challenging authority; this is unsurprising when just 32.7% received any education on this topic, although 69% of students ranked challenging authoring as one of the most important HF skills. The well-known case of Elaine Bromiley, who died of cerebral damage after a prolonged hypoxic episode pre-operatively, highlighted multiple failures in HF within the team, including poor communication and a failure to challenge authority, and valuable lessons were learned from this.<sup>27</sup> Challenging authority in the healthcare setting can be a difficult part of HF. A review of 31 studies discussed that significant barriers were in place to speak out. These included poor inter-professional skills, fear of repercussions and perceived hierarchal gradients amongst professionals.<sup>28</sup> Methods exist to improve communication when challenging authority, including the use of incremental challenges or provocative words (such as expressing concern, discomfort or that an action is unsafe).<sup>29</sup> We suggest the further introduction of education in this area of HF to the medical school curriculum would allow individuals to feel more able to challenge authority if the need arose. Even relatively small interventions can be of significant effect, with four one-hour simulation sessions with subsequent guided debriefs found to improve self-reported confidence in the correction of another healthcare provider.<sup>30</sup>

The methodologies utilized most frequently for HF teaching were small groups, lectures and simulation. The most effective of these were highlighted to be a small group of simulation-based teaching. This is supported by research into the effects of simulation-based training as a tool to develop non-technical skills. 93% of medical students found a mass casualty simulation useful in developing non-technical skills.<sup>31</sup> Hagemann et al. (2017)<sup>32</sup> compared medical students undertaking simulation before and after exposure to either a clinical or HF skills-based seminar. After the seminar, the HF group significantly improved teamwork and situational awareness, decreased stress and

improved error handling. There was no difference in clinical outcome in either group.

Further work shows a correlation between higher non-technical skills scores and clinical performance in simulated scenarios in medical students.<sup>33</sup> This supports simulation with facilitated debrief as a highly effective method for delivering HF training, evidenced by the increasing use of simulation in medical training at all stages.<sup>34</sup>

An understanding of HF can be seen as a threshold concept within medical education.<sup>35</sup> Establishing this understanding allows for a shift in perspective in how individuals view and act in professional interactions. A transformation is required from a clinical-based viewpoint to a non-clinical to facilitate higher quality educational experiences for the student and allow for growth both as a professional individual and as part of a multi-disciplinary team. For HF to be fully utilized in practice, students must undertake higher levels of cognitive processing (evaluation and analysis), as detailed in Bloom's Taxonomy.<sup>36</sup> Higher-level thinking can allow for reflective practice to occur upon learning events and for future practice to be influenced by experiential learning.

We do acknowledge a number of limitations of our study. Respondents were from 12 of the 33 UK medical schools; we feel this number of high enough to be representative overall as curricula are designed to meet the GMC's outcomes for graduates.<sup>25</sup> The methods of content and delivery of teaching may have variations between schools. This is evidenced by Meats et al. (2009),<sup>37</sup> who showed variation in methods and content of medical school curricula but noted that most schools had the same core topics. The limited number of participants from a few medical schools may provide a non-representative sample of the HF teaching at those establishments. However, the overall opinion of these students regarding feelings and beliefs around HF is still valid. The recruitment methodology may lead to participation bias with initial reliance upon medical school societies to share the survey and limited response from administrators of establishments. We feel the data obtained is broad enough in scope to allow for the assessment of medical students' opinions regarding HF and to guide future educational planning.

Further research from this survey could explore the various teaching methodologies in more depth to identify the most effective and guide best educational practice. The survey can be expanded to explore the beliefs of post-graduate medical professionals about HF. The introduction of novel training curricula for postgraduate surgical training focusing on generic professional capabilities highlights a clear need for training in and acknowledgment of HF-related skills in professional practice.<sup>35,36</sup> The increased focus on HF could improve patient safety, patient care, and interdisciplinary work.<sup>40,41</sup>

The research findings highlight several areas where specific development of teaching in aspects of HF can be undertaken. Whilst individual curricular changes would be under the remit of the medical school itself, and we would advocate for improved awareness of HF as a concept at an earlier stage of medical education to allow for the development of higher levels of thinking on the subject. We also note students' significant lack of confidence in challenging authority – which is, when appropriate, the safest course of action in clinical care. Further work on the nature of education and teaching in this specific topic is required and we would advise this to be an area of focus for educators. Students highlighted which teaching methods they perceived to be most effective (simulation, small group and one-on-one teaching), and this should be taken into account when planning educational delivery, although resource and time allocation has to be balanced against meeting course aims and objectives.

Minimal literature exists regarding student perceptions of HF teaching in UK medical schools. This research establishes that there is some awareness of the term HF, but most students believe it to be of significant importance as a part of their training. We have identified a number of areas within HF where teaching is almost universally performed, but some specific aspects of HF were identified as lacking. These areas could be focused on further improving undergraduate education. The most effective methodologies were perceived to be simulation and smaller group-based learning. These results can assist in the further development of undergraduate curricula and impact medical education methodology as a whole. Increasing awareness of HF will allow students to graduate with the skills to improve patient safety and healthcare delivery.

## Summary – Accelerating Translation

The International Ergonomics Association defines Human Factors (HF) as “a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance”. In the field of medicine, human factors or soft skills are generally understood to mean all the non-technical skills needed by doctors to perform efficiently in different clinical scenarios ranging from routine practice to high-stress emergency settings, such as trauma and resuscitation.

This research aims to describe the awareness of HF in medical students in the UK and establish their perception of HF teaching and confidence in soft skills.

A draft questionnaire was developed, and after refinement, the finalized survey was available online via a web link which was distributed through contacting medical student societies (“MedSoc”) via e-mail. This contact outlined the aims of the study and provided a shareable web link to access the survey. A second phase followed up on the initial e-mail contact and contacted a selected range of medical school administrative offices where no

response was received in phase 1. The survey was available online for 5 months. Over the 5-month survey period, 304 students from 13 medical schools consented and completed the survey in full.

Headline results included the fact that 45.7% of participants stated that they were not aware of the term human factors from their training so-far. The questionnaire highlighted that a large proportion of students were extremely or somewhat confident in communication and leadership skills, but 50.5% were not at all confident in challenging authority. A range of teaching methodologies for teaching human factors were reported. Most frequently were small group based (n=252), lecture-based (n=219) and simulation (n=182). The opinion of participants on which teaching methodology was most effective was obtained. Simulated scenarios, small groups and one-to-one teaching were perceived as the best methods.

Students were asked to rank 10 human factors skills from one (most important) to ten (least important) compared to each other. This question established that communication (90%) and teamwork (47%) were ranked highly as important skills (% who rated this skill rank 1 or 2). The lowest-ranked aspects (% who rated this skill rank 9 or 10) were challenging authority (69%), reporting an error (37%) and coping with criticism (36%).

Understanding human factors can be seen as a threshold concept within medical education. Establishing this understanding allows for a shift in perspective in how individuals view and act in professional interactions. A transformation is required from a clinical-based viewpoint to a non-clinical to facilitate higher quality educational experiences for the student and to allow for growth both as a professional individual and as part of a multi-disciplinary team. For human factors to be fully utilized in practice, students are required to undertake higher levels of cognitive processing (evaluation and analysis), as detailed in Bloom's Taxonomy. Higher-level thinking can allow for reflective practice to take place upon learning events and for future practice to be influenced by experiential learning.

This research establishes that there is some awareness of the term human factors, but most students believe it to be of significant importance as a part of their training. We have identified a number of areas within HF where teaching is almost universally performed, but some specific aspects of human factors were identified as lacking. These areas could be focused on further improving undergraduate education. The most effective methodologies were perceived to be simulation and smaller group-based learning. The significance of these results in assisting the development of undergraduate curricula would impact medical education methodology as a whole. Increasing awareness of human factors will allow students to graduate with the skills to improve patient safety and healthcare delivery.



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**Author Contributions**

Conceptualization: JC, GC; Data Curation: JC; Formal Analysis: MC, JC; Funding Acquisition: JC, GC; Investigation: JC; Methodology: JC, GC; Project Administration: MC, JC, GC; Resources: JC, GC; Software: MC, JC, GC; Supervision: GC; Validation: MC; Visualization: JC, GC; Writing – Original Draft Preparation: JC, MDD; Writing – Review & Editing: MC, JC, GC.

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## Supplementary Material

### The Education of Medical Students in Human Factors – Student Survey

This short survey contains eight questions and seeks to establish what medical students are being taught about human factors, and how competent they consider themselves to be in some of the relevant areas.

To thank you for taking part in this survey, we are offering [1x£100 and 7x£50 amazon vouchers] as prizes. The winners of this draw will be chosen by the 7th May 2020. If you would like to be included in the draw to win one of our prizes, please enter your e-mail address on the last page of the survey.

Patient safety is an important aspect of medical education, constituting one of the four domains of a doctor's duties in the General Medical Council's publication Tomorrow's Doctors. The importance of technical skills in maintaining patient safety is well established; alongside this, there is an increasing appreciation of the importance of human factors. The term "human factors" describes an understanding of how human performance is affected by the behaviors of individuals, their relationship with each other, and their interaction with their environment. Within medicine, this includes a focus on the skills of communication, teamwork and leadership, improving systems to mitigate human error, and effective learning from such errors when they do occur. Human factors has been incorporated into training and development across many different industries, and is recognized as a key component of patient safety by bodies such as the World Health Organization and the Royal College of Nursing. The National Quality Board has committed to improving understanding of human factors and including it in its core training for health professionals. Thank you for participating – your input is very valuable to our research.

1. Do you consent to taking part in this survey? This gives us permission to include your anonymized responses as part of this research.

give my consent

do not give my consent

**Basic Demographic Questions.** Before you start the survey, we would appreciate it if you could answer some brief demographic questions. \* Indicates questions that must be answered to progress to the next page of the survey.

2. What is your gender?

Male

Female

prefer not to say

3. What is your age?

4. Which medical school do you attend?

Aberdeen

Anglia Ruskin

Aston

Barts and The London

Birmingham

Brighton and Sussex Medical School

Bristol

Buckingham

Edge Hill

Cambridge

Cardiff

Dundee

Edinburgh

Exeter

Glasgow

Hull York

Imperial College

Keele

Kent and Medway

King's College London

Lancaster

Leeds

Leicester

Liverpool

Manchester

Newcastle

Norwich (UEA)

Nottingham

Oxford

Plymouth University (Peninsula)

Queen's University Belfast

Sheffield

Southampton

St Andrews

St George's

Sunderland

Swansea

UCLAN

University College London

Warwick



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5. Which stage of the medical school course are you currently in? \*

First Year  
 Second Year  
 Third Year  
 Fourth Year  
 Fifth Year  
 Intercalating

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**Awareness of Human Factors.**

6. During your medical education thus far, have you ever come across the term “human factors”?

Yes  
 No

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If yes, at which stage of your medical education did you first come across the term “human factors?”

First Year  
 Second Year  
 Third Year  
 Fourth Year  
 Fifth Year  
 Intercalating

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If no, have you ever come across either or both of the terms “soft skills” or “non-technical skills” during your medical education thus far?

Yes  
 No

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**Self-assessment of ability in non-technical skills.**

7. “Human factors” is broadly understood to include the following set of non-technical skills. How confident do you think you would be at applying these skills in real-life scenarios?

Communication	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Leadership	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Teamwork	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Decision making	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Coping with stress	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Coping with criticism	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Situational awareness	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Task prioritization	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Reporting errors	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident
Challenging authority	<input type="checkbox"/> Not confident at all <input type="checkbox"/> Somewhat confident <input type="checkbox"/> Extremely confident

---

8. How would you rate your ability in these areas (teamwork, leadership, communication, etc.) compared to your ability in technical skills (e.g. venipuncture, cannulation, examining a patient, etc.)?

I am more confident in technical skills  
 I am equally confident in both areas  
 I am more confident in “soft” skills or human factors

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**Teaching of human factors**

9. “Human factors” is broadly understood to include the following set of non-technical skills. Have you ever received dedicated teaching in any of the following skills whilst at medical school? \*

Communication	<input type="checkbox"/> Yes <input type="checkbox"/> No
Leadership	<input type="checkbox"/> Yes <input type="checkbox"/> No
Teamwork	<input type="checkbox"/> Yes <input type="checkbox"/> No
Decision making	<input type="checkbox"/> Yes <input type="checkbox"/> No

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Coping with stress	<input type="checkbox"/> Yes <input type="checkbox"/> No
Coping with criticism	<input type="checkbox"/> Yes <input type="checkbox"/> No
Situational awareness	<input type="checkbox"/> Yes <input type="checkbox"/> No
Task prioritization	<input type="checkbox"/> Yes <input type="checkbox"/> No
Reporting errors	<input type="checkbox"/> Yes <input type="checkbox"/> No
Challenging authority	<input type="checkbox"/> Yes <input type="checkbox"/> No
10. If you have answered yes at least once in question 9, which of the following methods of teaching have been used to teach you in those disciplines? *	<input type="checkbox"/> One-to-one teaching (e.g. shadowing a doctor in a clinical placement) <input type="checkbox"/> Small group teaching <input type="checkbox"/> Lectures <input type="checkbox"/> Simulated scenarios <input type="checkbox"/> E-learning <input type="checkbox"/> None of the above
11. How effective do you think each of the following teaching methods would be for teaching "human factors"?	
One-to-one teaching	<input type="checkbox"/> Not effective at all <input type="checkbox"/> Somewhat effective <input type="checkbox"/> Extremely effective
Small group teaching	<input type="checkbox"/> Not effective at all <input type="checkbox"/> Somewhat effective <input type="checkbox"/> Extremely effective
Lecture	<input type="checkbox"/> Not effective at all <input type="checkbox"/> Somewhat effective <input type="checkbox"/> Extremely effective
Simulated scenarios	<input type="checkbox"/> Not effective at all <input type="checkbox"/> Somewhat effective <input type="checkbox"/> Extremely effective
E-learning	<input type="checkbox"/> Not effective at all <input type="checkbox"/> Somewhat effective <input type="checkbox"/> Extremely effective
12. Which do you think would be the most appropriate stage of medical education for learning about human factors? *	<input type="checkbox"/> Medical School – preclinical (Year 1-3) <input type="checkbox"/> Medical School – clinical (Year 4-6) <input type="checkbox"/> Postgraduate training – foundation program <input type="checkbox"/> Postgraduate training – core/specialty training <input type="checkbox"/> Other – please specify
<b>Importance of human factors</b>	
13. How important do you think it is that medical students are taught about human factors?	<input type="checkbox"/> 1 – not important at all <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 – extremely important
14. Which do you think are the most important human factors? Please rank the following skills. A rating of 1 indicates the skill that you think is most important, whilst 10 indicates the skill that you think is least important.	<input type="checkbox"/> Communication <input type="checkbox"/> Leadership <input type="checkbox"/> Teamwork <input type="checkbox"/> Decision making <input type="checkbox"/> Coping with stress <input type="checkbox"/> Coping with criticism <input type="checkbox"/> Situational awareness <input type="checkbox"/> Task prioritization <input type="checkbox"/> Reporting errors <input type="checkbox"/> Challenging authority
<b>End of survey</b>	