Chapter 15
Selection into Surgical Education and Training

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Overview Recruitment and selection of appropriate medical graduates to join a surgical education and training programme is a complex, expensive and high-stakes process. Although there is general agreement on the goals of selection, debate continues on how this should be undertaken.

A number of selection methods are used which include the curriculum vitae, letters of recommendation and the interview. More recently, the addition of aptitude testing and personality assessment techniques has been proposed in an effort to recruit trainees with the highest aptitude for surgery and to avoid selecting those whose personality may be unsuitable for such a career.

A critical review of the processes, criteria and methods involved in selection has been undertaken. The key to effective selection is the identification of the person specification required through an analysis of the job of a surgeon and to then design selection criteria based on these requirements. Different and complimentary selection methods are used to provide the best measurements of each of these selection criteria in order to score each applicant. There is currently insufficient evidence of the value of aptitude tests and personality assessments for these to be included as a routine part of the selection of surgical trainees or residents.

15.1 Introduction

The education and training of tomorrow's surgeons is facing many challenges. Restricted work hours, demands for improved efficiency in the operating room and elsewhere in the health services and shorter and more streamlined educational

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programmes are impacting on opportunities for teaching and learning. At the same time, the increasing complexity of surgical ailments and procedures, the inclusion of more difficult minimally invasive and other techniques into everyday surgical practice [1, 2] and the increasing demands of the public have placed greater expectations on the competence and performance of surgeons graduating from surgical programmes.

It is therefore more important than ever the right persons are selected and then appropriately educated and trained to cope with a career shown to have the highest levels of stress amongst medical specialists [3].

A common objective is to identify a cohort of professionals who can learn quickly, work effectively within an interdisciplinary and multifunctional healthcare team, make prudent clinical decisions and master the technical and other competencies necessary for safe independent surgical practice [1].

Recruitment and selection of such professionals involves an expensive, complex and high-stakes merit-based process that is subject to medical regulatory considerations and legal requirements, the outcome of which may be challenged by unsuccessful applicants. Traditional selection methods have focused on the applicant's record of academic and other achievements as recorded in their curriculum vitae, comments made in letters of recommendation by those with whom the applicant has worked, the impression given during interview and a combination of opportunity and luck [4]. The rationale for including some of these selection methods is based more on familiarity and ease of quantification than on evidence-based relevance to future surgical performance.

The aims of this chapter are to review the current processes and methods of selection and the more recent developments with a view to providing useful guidelines for best practice.

15.2 Melbourne International Consensus Statement on Selection

In an effort to define a set of principles for use as guidelines for selection, a group of international experts in surgical education from eight countries (Table 15.1) identified ten important principles. These were circulated to delegates from 17 countries who participated in the first International Conference on Surgical Education and Training (ICOSET) in Melbourne [5]. Following repeated discussion, the delegates agreed on a consensus statement on the principles of selection (Table 15.1). Reference will be made to these principles throughout this chapter.

Table 15.1 Melbourne International Consensus Statement on Selection

1. Responsibility for selection must involve trained members of the surgical profession and the agencies (including employers) responsible for the delivery of education and training
2. Selection must aim to identify those doctors with the values, attitudes and aptitude required to become competent surgeons
3. Eligibility criteria (long-listing) for application to specialist surgical education and training should include generic and specialty-specific components
4. Selection methodology must be predetermined and transparent, include a broad range of approaches to maximise validity and reliability, involve multiple raters, contain clear criteria for marking and allocate weighting for each tool which permits ranking of applicants
5. Potential for successful training in a speciality programme is the basis for selection and not the extent of prior knowledge, experience and skills in that specialty
6. Structured curriculum vitae provide important verifiable biographical information on clinical experience and academic and other accomplishments
7. Structured referees' reports can provide credible information from surgeons, colleagues, other healthcare professionals and employers based on their first-hand experience of a doctor's performance in the working and learning environment
8. Structured interviews should use questions which target specific competencies identified through job analysis and yield important information not available from other selection tools
9. Knowledge is an essential base for clinical reasoning and judgement. The extent of a candidate's knowledge at the extremes of performance is a good predictor of their future overall performance
10. Early selection into a surgical education and training programme must be accompanied by clearly established grounds and methodology to ensure struggling or underperforming trainees do not progress unless competency deficiencies are rectified

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15.3 Developing a "Person Specification" for Surgery

Selection aims to identify those doctors with the values, attitudes and aptitude required to become a competent surgeon. The process commences through the collection and analysis of job-related information [6]. For surgery, this involves identifying the common tasks, roles and responsibilities associated with effective performance in the job of a surgeon [7]. Based on this information, a set of competency domains are identified [8]. Although many of these competencies are common to all surgeons, individual specialties may prioritise some or identify others according to the perception of relevance to their specialty. These competency domains provide the knowledge, skills, attitudes and personal qualities or "person specification" required and are used when designing selection criteria. Example behavioural indicators are then developed and mapped to the relevant attributes within each competency domain for use in selection [9].

15.4 The Selection Process

Responsibility for selection must involve members of the surgical profession and representatives of the agencies (including employers) responsible for the delivery of education and training (Table 15.1). Each person taking part must be familiar with the selection process and appropriately trained in the use of the selection methods being used. Selection commences with recruitment through self-selection, followed by the completion of an application form, which is then used to clarify the applicant's eligibility for surgical training.

15.4.1 Recruitment and Career's Information

Cohort studies of graduating UK medical students have shown that around 20% [13–26] list surgery as their long-term career choice [10]. As the process begins through self-selection, career information should include the "person specification" being sought, data on competition ratios, workforce requirements and future employment prospects for each specialty. This may help to avoid the mismatch between expectations and reality which exists in the minds of some applicants and particularly so for oversubscribed specialties [11].

The application form seeks biographical information and relies on the principle of past behaviour being the best predictor of future behaviour [12]. This form must be in a standardised format to enable comparisons to be made between applicants and include generic and specialty-specific questions.

15.4.2 Eligibility Criteria

Eligibility criteria, or long-listing for entry to a surgical programme, are based on national regulatory and legal requirements and on generic and specialty-specific stipulations (Table 15.1), both of which must be educationally and clinically defensible. In addition, criteria may vary depending on whether an applicant is applying for seamless surgical training or to a programme with separate early (core) and advanced training components [13].

It is important that opportunities are widely available for all would-be applicants to obtain the necessary clinical experiences and other attainments listed as eligibility requirements, to avoid the possibility of discrimination. Although criminal records or enhanced disclosure checks may be carried out during the selection process, employers usually include these in their pre-employment checks.

15.5 Selection Methods

15.5.1 Curriculum Vitae

Structured curriculum vitae provide important verifiable biographical information on clinical experience and academic and other accomplishments (Table 15.1).

15.5.2 Clinical Experience

Although specific clinical experiences may be required as eligibility criteria, the hidden curriculum of some specialties may result in applicants being expected to demonstrate extensive surgical experience at the time of application. However, it is the potential for successful training in a specialty programme which should be the basis for selection and not the extent of prior knowledge, experience and skills in that specialty (Table 15.1).

15.6 Academic and Other Achievements

Academic performance in medical school has been a consistently used criterion in the selection for surgical training. There is good evidence that undergraduate academic achievement is a predictor of subsequent academic performance [14] but little to support its use as a predictor of the other elements of future surgical performance.

In the USA, the USMLE Step 1 results are increasingly used in selection. This examination is designed to facilitate decisions about medical licensure rather than later performance on a training programme. Nevertheless, it has been shown that performance in the USMLE Step 1 examination is a good predictor of subsequent performance in the American Board of Surgery qualifying examination [15].

Ranking in a medical school's graduating class is sometimes used as a selection criterion [16]. Class rank, rather than actual examination score, is a fairer index of academic performance, as it negates the impact of different marking thresholds in different medical schools. The use of centile scoring allows the top-performing students to be rewarded, irrespective of which medical school they attended or the actual marks awarded.

Research output is another element of academic performance frequently used in selection. It is relatively easy to assign a value or score to publications and presentations at scientific meetings, simply by counting numbers and factoring in the impact factor of journals or the prestige of national or international meetings. Published research or possessing a PhD is not a strong predictor of surgical performance although it does predict future research performance [17]. Nevertheless, it is important that selection makes provision for recruiting the next generation of academic surgeons.

Extracurricular activities are sometimes rated for selection. Whilst participation in activities outside medicine is clearly desirable for a balanced life, there is no evidence that mere participation predicts better surgical performance. On the other hand, there is good evidence that having an *exceptional* trait (e.g. in sports, the arts or literature) is strongly correlated with surgical performance [18]. This suggests that individuals who excel in one domain have the personal attributes to be high achievers in other domains (e.g. in surgery). However, deciding what level of weighting, if any, should be assigned to exceptional performance in extracurricular activities during the selection of surgical trainees remains controversial.

15.7 Letters of Recommendation and Personal Statements

Letters of recommendation or referees' reports can provide vital and essential information from surgeons, colleagues, other health professionals and employers, based on their first-hand experience of the applicant's performance in the workplace (Table 15.1). Although widely used in selection, potential defects have resulted in their true value being questioned [19].

Applicants inevitably nominate referees whom they believe will provide a supportive report. Free-text letters of recommendation can be highly subjective, often incomplete and contain language which may be evasive and difficult to interpret and evaluate. Reports rarely contain adverse comments, placing those who must score them in what has been termed "fantasy land" [20].

A number of steps have been proposed to improve the validity and reliability of letters of recommendation [21]. The selection panel may choose referees from amongst those nominated by the applicant. Structured pro forma letters completed on a standardised template provide greater objectivity but must avoid promoting a "tick the box" culture. Professional Performance Appraisals (PPAs) are somewhat like referee reports, except members of the selection panel speak directly to the referees in person or by phone and complete a structured form. Although PPAs may enable a more open and frank discussion about applicants, the process is time-consuming, subject to a halo effect and open to legal challenge, particularly if the conversation is not recorded electronically.

Applicants may be invited to submit a personal statement to support their application. The purpose is to evaluate the applicant's personal insight and ability to articulate the reasons why they should be selected. Unfortunately, exaggerated and sometimes false claims are occasionally made which are time-consuming or even impossible to confirm or deny. Furthermore, these statements are often professionally prepared or downloaded from the Internet. There is no evidence that personal statements predict future performance and sufficient evidence of their flawed nature is available for them to be omitted [22].

15.7.1 Aptitude Testing and Personality Assessment as Aids for Selection

Following a symposium on the role of aptitude testing and personality assessment in the selection of surgical trainees [4], great enthusiasm was generated for their addition to the selection process [23]. However, despite the eagerness, this did not eventuate and was largely due to the lack of agreed objective criteria of surgical ability in the different surgical specialties [24].

15.7.2 Aptitude Testing

Renewed interest in aptitude testing as a marker of innate technical skills at the time of selection has recently arisen for mainly two reasons. Because of the reduced opportunities for training and learning, it seems reasonable to try and select those with the optimum innate skills in the expectation they will reach the required level of technical and other competences in a shorter time. Secondly, complex technologies are increasingly involved in twenty-first-century surgical practice. Those who aspire to practice in high-tech areas, such as robotic surgery, catheter-based interventions, advanced endoscopic and minimally invasive surgery, microsurgery and computer- assisted surgery, require high levels of fundamental or innate abilities (e.g. psychomotor skills and visual spatial abilities) that may not be as critical for traditional open surgery [1, 25]. The successful experience with aptitude testing in other occupations, such as the aviation, military and aeronautical industry [26], has further encouraged the providers of surgical training to re-examine its place in selection.

Psychomotor ability refers to hand-eye coordination and fine motor dexterity, attributes which are particularly important in microsurgery, ophthalmic surgery, neurosurgery and vascular surgery. Visual spatial ability is the capability to mentally manipulate objects in three dimensions and is important in laparoscopic surgery, image-guided surgery and robotic surgery. Depth perception is the ability to mentally interpret 2-D images to produce a 3-D image in the observer's brain and is important in laparoscopic surgery, image-guided surgery and microsurgery.

Although a number of validated tests of these abilities are available [27–29], there is little evidence of their value in predicting surgical performance. This may be due to the difficulties in defining and measuring what constitutes good surgical performance. Further research is required before recommending the inclusion of such tests in selection.

15.7.3 Personality and Emotional Intelligence

Doctors with a history of behavioural issues during their medical school course have been shown to more likely to undergo disciplinary action following graduation [30]. In addition, there have been recent reports of "hazardous attitudes" (macho, impulsive, antiauthority, resignation, invulnerable and confident) amongst surgeons [31] and a reported association between these traits and preventable adverse events [32]. These studies have added to a growing recognition that certain individuals may possess personality traits that are long-standing and associated with an increased tendency to behave unprofessionally in the workplace.

Personality is a broad concept in psychology, and its assessment is complicated by the fact that it includes positive traits such as extraversion and openness and dysfunctional traits such as neuroticism and psychoticism. The decision facing surgical programme directors with respect to the assessment of personality is firstly whether they should be used at all, and if they are to be used, should this be to select individuals with the ideal traits or to screen out those with undesirable ones?

The relationship between scores on personality testing and academic and clinical performance is not straightforward, as traits such as conscientiousness may be advantageous for some aspects of medical performance but if combined with other traits such as neuroticism, for example, may be disadvantageous [33]. The current consensus is that the value of personality assessments in high-stakes selection is yet to be proven [34].

Managing one's emotions is a key skill necessary for the development of expertise. Emotional intelligence (EI) concerns the ability to carry out accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thought [35]. Emotional intelligence can be mapped to surgical competencies and predicts scores on tests of interpersonal skills [36]. The concept is relatively new to surgical education, and incorporating the assessment of EI into surgical selection is complicated by the number of different conceptual frameworks available, each with very different associated measures. There are essentially two different forms of measurement, one which relies on self-report and one which is based on the assessment of ability to choose the best options in response to a range of interpersonal scenarios. There is general agreement that measures which rely on self-report are not suitable due to the possibility for faking good and that the ability-based measures may in the future prove to be the more reliable and valid choice [34].

15.7.4 Interviews

Although there is a lack of evidence that the "interview" and in particular the "traditional" unstructured interview have substantial predictive validity of future surgical performance [34, 37], it has been an important and long-standing component of selection for surgical training. Concerns exist regarding its subjectivity and interviewer bias and the costs to training programmes and candidates [2, 38].

Notwithstanding these concerns, the interview is popular with applicants and selection committees and likely to remain an important component of selection. It is therefore important the following steps are taken to improve the reliability and validity of the interview process [39].

1. Shortlisting

It makes sense to restrict invitations for interview to those candidates who have a reasonable probability of being selected. This requires the construction of a shortlist based upon previously agreed minimum criteria or aggregate scores in letters of recommendation and the curriculum vitae.

2. Format

There is evidence that a multi mini-interview (MMI) format has better predictive validity than the traditional single-panel interview [40]. This is especially true if MMIs consist of objective structured interview stations, each addressing clearly defined subject areas. Multiple observers are preferred to a single interviewer. MMIs are however costlier and more resource-intensive than single-panel interviews [41].

3. Content

A clearly articulated definition of the purpose of the interview process must first be established as this will dictate its content, regardless of the format used. A written description of the desired traits being sought must be available to each member of the interview panel and accompanied by related standardised questions to be asked of every applicant. Provision of behaviour-specific anchors for rating scales should be provided for each interviewer and a scoring rubric used to improve interrater and intra-rater scoring.

If MMI stations are used, they should cover a range of both cognitive and non-cognitive areas [42]. Ideally, the MMI should be used to assess attributes that have not been assessed more objectively by other components of the selection process, e.g. personal attributes (motivation and drive, time management, professionalism and interpersonal skills). The inclusion of behavioural-based interviewing as part of the interview process has been suggested as a possible method for improving the likelihood of selecting candidates with the "right cultural fit" and to reduce attrition rates [43] although this has yet to be proven.

Situational judgement tests (SJTs) are useful for assessing professional and ethical skills, analytical and problem-solving skills and clinical reasoning [44]. These SJTs, combined with or incorporated into the MMI process, have shown positive results in terms of predictive validity [34].

4. Interviewer Bias

Interviewer bias is a significant issue in the interview process. It is part of human nature to favour individuals like ourselves [45]. This effect can be magnified if candidates have professional coaching in interview techniques [46]. Interviewers should not be aware of applicant's cognitive data to minimise bias, although this

may be difficult to achieve for those specialties with fewer numbers. Each interviewer should mark each candidate independently and prior to inter-examiner discussion and before reaching a consensus score [47].

5. Interviewer Training

Training of interviewers in interview techniques, marking and scoring and the rules regarding the unacceptability of unethical and "illegal" questions is essential. Interviewers should learn to use the full range of the marking scores available to avoid "clustering" of candidates around the midpoint of the marking range. They must also be conversant with equality, diversity and aspects of employment law [39].

6. Documentation

Documentation of the performance of each applicant during the interview must be clear, concise and professional. These records must be legible or, preferably, be in an electronic format. They should be retained in a secure central place by the educational body as they will be required in the event of an appeal from an unsuccessful applicant.

15.8 Monitoring, Evaluation and Appeals

Agencies responsible for the independent external accreditation of training programmes require educational providers to undertake quality assurance of their selection practices through ongoing monitoring and evaluation. Although no single selection process or method is endorsed by such agencies, standards require those in use to be clearly documented, publicly available, feasible and sustainable in practice. They must also support merit-based selection, able to be consistently applied and prevent discrimination and bias [48]. In addition, selection criteria and the weightings allocated to them must be transparent, rigorous, fair and capable of withstanding external scrutiny.

The education body is required to monitor and evaluate its experience with, and the outcomes from, its selection processes including validity, reliability and feasibility against agreed standards. Feedback from surgical trainees, supervisors, employers and representatives of the community make an important contribution to the development, monitoring and evaluation of selection.

Unsuccessful applicants may choose to appeal the decision of the education body. An appeals process must therefore be in place to provide an impartial review of these decisions. Most appeals can be dealt with, by the organisation's internal appeals process, but some may need to be escalated to the organisation's independent appeal's committee. Elements of a strong and effective appeals process include procedural fairness, timeliness, transparency and clearly documented reasons for decisions [48].

15.9 Discussion

The hallmarks of a first-rate education and training programme include the recruitment and selection of the most appropriate trainees, the development and delivery of high-quality education and training programmes, an access to sufficient accredited training positions and an equipped, motivated and sustainable surgical education faculty.

The goal of selection is to choose a cohort of the best applicants to ensure a diverse workforce and avoid recruiting those who may turn out to be problematic trainees or surgeons. Despite years of discussion and debate, the best method for the selection of surgical trainees remains controversial. Although a number of approaches are in common use, there is a lack of properly conceived long-term studies comparing different methods or combinations of methods in terms of which will provide the most reliable predictive information of success in surgical practice.

In the meantime, selection of trainees must go on, and some might argue that the percentage who fails to succeed or become problematic is small. Nevertheless, the consequences of inappropriate trainee selection are considerable, in terms of the personal and financial costs to the individual, to the surgeon educators, to the health service and to the public. This is particularly relevant as surgeons have been shown to be the specialty most likely to exhibit disruptive behaviour [49]. Although the Melbourne International Consensus Statement was agreed some years ago [5], the principles espoused (Table 15.1) remain a useful guide for those charged with the important task of selecting tomorrow's surgeons.

Whilst it is important the selection process avoids as far as possible choosing those who might prove to be ill suited for a surgical career, multiple appraisals including workplace-based assessments take place throughout training and should ensure that those who exhibit ongoing disruptive behaviour or hazardous traits are identified and advised to seek an alternative career. Even if it was possible to exclude those with undesirable personality or other issues, this alone may be insufficient as trainees may observe and even learn to adopt unacceptable traits and behaviours from the presence of poor surgical role models during their training [50, 51]. Exemplary role modelling by surgeons is therefore necessary during undergraduate medical education and postgraduate surgical training programmes [52]. Recognition and rejection of unacceptable professional behaviour in the workplace is just as important as avoiding the selection of those with undesirable characteristics.

Identifying the person specification required is fundamental to selection and has greatly enhanced confidence in the development of appropriate criteria and methods. Each method has its own individual strengths and weaknesses, and provided selection committees are aware of these and follow the recommendations to achieve greater consistency, reliability and validity; they and the trainees should have confidence with their use. For example, despite the shortcomings of letters of recommendation, comments made by a referee who is recognised as one who takes this task very seriously and completes it well cannot be ignored. Similarly, it is unlikely that any training programme director would accept a trainee without the reassurance of some form of interview. Although behavioural-based interviewing has been suggested by some authors [43], vigilance is required to ensure that this method does not limit the diversity required in the modern workforce.

Consideration of the emotions and feelings of the surgeon, particularly in the face of adversity and human suffering, and their ability to manage these challenges, is important for the well-being of the surgeon and the surgeon-patient relationship. It is said that the "affective regimes typically involving self-control, emotional restraint and the tempering of passions" are connected to a skilful performance [53] and that "in the domain of emotional restraint, it is the surgeon who is said to be the master" [53]. The difficulties in predicting at the time of selection, how an applicant will deal with these emotions, must be compensated for during their training through ongoing workplace-based assessments.

There is little doubt that higher levels of fundamental ability are required for some of the more complex newer surgical technologies, and whilst aptitude testing may one day have a place, it is not yet sufficiently developed, validated and feasible for inclusion. It is much more likely that those selected for these more advanced programmes will be experienced surgeons who have already demonstrated higher levels of innate ability during their preceding specialist training.

15.10 Conclusion

Although no single test or combination of tests has been identified to validly and reliably predict performance in the workplace, educational institutions have extensive experience and confidence with the use of a broad combination of the methods. If the selection criteria and the methods used are based on the person specifications identified through job analysis and the process of selection follows strict guidelines, this confidence is justified. Even the best selection methods will not completely avoid the occasional problematic surgeon and must therefore be supplemented by ongoing workplace-based 360-degree appraisal of trainees. Further longitudinal research is required to identify the most appropriate predictive methods for selection.

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