Selected predictors of junior doctor performance in their first postgraduate year.

What matters most, their demographics, personal attributes, selection scores or academic performance?

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Abstract

This thesis explored the proposition that emotionally intelligent, female medical students, with high scores in UMAT section 2, who have performed well on measures of academic achievement will be better prepared for practice as junior doctors, as measured by the Western Australian Junior Doctor Assessment Tool in the first post graduate year.

This exploration has taken place through a series of publications representing interconnected mixed methods research projects utilising the same sample of medical students from one university as they moved through the last three years of their undergraduate medical course and during the first postgraduate year of practice as a doctor.

The proposition explored is partially supported with emotionally intelligent students who have performed well on measures of academic achievement obtaining higher performance scores as junior doctors when measured by the Junior Doctor Assessment Tool. These findings were further reflected in the participants’ supervisors’ qualitative ratings of performance in the first post graduate year.

This research supports the claim that the tools and processes being used to monitor and assess junior doctor performance need to be better addressed and adds to the growing body of knowledge that suggests assessment of academic performance in medical school is not always aligned with assessing generic graduate outcomes expected of the junior doctor in the workplace. The findings provide support to the value of combining undergraduate assessment scores to assess competence as a whole in predicting future performance as a junior doctor.
Table of Contents

Abstract .................................................................................................................... iii
List of Appendices .................................................................................................... vi
Glossary of Terms ................................................................................................... vii
Acknowledgements ................................................................................................. viii
Statement of Candidate Contribution ....................................................................... viii
Scholarly Outcomes of the Thesis ............................................................................ ix
Publications ................................................................................................................ ix
Presentations ............................................................................................................. ix
Chapter 1: Introduction .............................................................................................. 1
  Selection into medical school ................................................................................... 3
  Academic success in medical school ....................................................................... 5
  Assessment of the junior doctor ............................................................................ 6
  Summary of Methods .............................................................................................. 9
  Research Aims ....................................................................................................... 10
Chapter 2: Results: Emotional Intelligence .............................................................. 19
  Preface .................................................................................................................. 19
  Publication .......................................................................................................... 21
Chapter 3: Results: The Junior Doctor Assessment Tool......................................... 45
  Preface .................................................................................................................. 45
  Publication .......................................................................................................... 49
Chapter 4. Results: Descriptive Analysis of Junior Doctor Assessment ................. 67
  Preface .................................................................................................................. 67
  Publication .......................................................................................................... 69
Chapter 5: Relationship between academic and workplace performance in medical
students and junior doctors ...................................................................................... 97
  Preface .................................................................................................................. 97
  Publication .......................................................................................................... 99
Chapter 6: Predicting junior doctor’s performance on workplace based assessment
.............................................................................................................................. 117
  Preface .................................................................................................................. 117
  Publication .......................................................................................................... 119
Chapter 7. Discussion

Summary of findings

Limitations of the thesis

Implications for further research

Implications for theory

Implications for assessment practice

Biography of the researcher

Appendices
List of Appendices

Appendix 1: Twelve Tips for skills training programmes


Appendix 2: Designing integrated skills programmes

Glossary of Terms

*Tertiary Entrance Examination (TER)* - was a tertiary entrance score used in several Australian states and the Northern Territory as a tool for selection to universities in Australia. As of 2010, it has been replaced by the Australian Tertiary Admission Rank (ATAR) in all states and territories except Queensland.

*Undergraduate Medical Admissions Test (UMAT)* – UMAT is developed by the Australian Council for Educational Research (ACER) on behalf of the UMAT Consortium universities. The test is used specifically to assist with the selection of students into the medicine, dentistry and health science degree programs at undergraduate level. The UMAT consists of three sections (logical reasoning and problem solving, interaction skills or understanding people and non-verbal reasoning)

*Junior Doctor Assessment Tool (JDAT)* – The Western Australian development, 10 item assessment tool used by all three tertiary training sites (hospitals) to assess doctors in their first postgraduate year.

*Australian Junior Doctor Curriculum Framework (ADCF)*- was developed based on existing curricula developed by the Postgraduate Medical Education Councils of NSW, SA and WA, the Committee of Deans of Australian Medical Schools to identify the training objectives for the prevocational years.
Acknowledgements

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I thank colleagues Dr Gabrielle Brand and Dr Susan Miller for their kind and thoughtful comments on the final draft of this thesis. I thank my husband Malcolm for repeatedly finding space for my PhD in our life and to especially thank our children Miranda and Ethan for encouraging me to continue when I wanted to give up. It has been a long journey.

Statement of Candidate Contribution

I certify that this thesis is my own composition and to the best of my knowledge all sources have been acknowledged. It does not contain any material previously published or written by another person except where due reference is made in the text and my contribution is clearly identified in the thesis. The thesis has been substantially completed during the course of my enrolment in this degree at UWA and has not previously been accepted for a degree at this or any other institution. I have developed the research methodology, collected the data and conducted the quantitative and qualitative analysis. I have been the first or sole author for each manuscript submitted and have been the sole presenter for conference presentations cited.
Scholarly Outcomes of the Thesis

Publications

   First author contribution: 100%

   First author contribution: literature review, data collection, analysis and writing the manuscript 90%

   First author contribution: literature review, data collection, analysis and writing the manuscript 80%

   First author contribution: literature review, data collection, analysis and writing the manuscript 90%

   First author contribution: literature review, data collection, analysis and writing the manuscript 85%

Presentations

1. Carr SE*. Emotional Intelligence in Medical Students; Does it correlate with selection measures? AMEE 2008 Prague, oral presentation.


4. Carr SE*. Celenza T and Lake F. The educational impact of junior doctors’ assessments: What the assessors are saying? UWA Faculty of Medicine, Dentistry and Health Sciences Biennial Education Research Symposium 2013 Perth Western Australia: oral presentation.

5. Carr* SE. Evaluation of written feedback given to doctors in the first post graduate year. 14th Ottawa Medical Education Conference, Ottawa Canada April 2014
   *Presenter and author
Chapter 1: Introduction

Understanding the nature of factors which correlate with success of junior doctors in the workplace is important for a number of reasons. Training to be a doctor is expensive, both for an individual and the community, and personally challenging. Secondly, the work requires a range of attributes, some of which are developed in medical school, some of which develop on the job. To ensure success, for the benefit of both the student and the health service, we need to know where support or further training needs to be directed. Understanding what factors are associated with success (or failure) will help understanding what support individuals may require. But, the study of factors influencing success is complex and difficult, because of the multiples of variables and their potential interactions. What distinguishes graduates who succeed in the first postgraduate year from those who struggle are the primary themes of this thesis.

This research was initiated because of my associations with a medical school over a 12 year period. Medical schools are aware that to deal with the complexities of providing quality health care, doctors need, in addition to medical knowledge, generic competencies including effective communication, teamwork and professionalism. In order for Medical schools to impart knowledge, provide opportunities to develop and practice skills, explore attitudes and apply professional behaviours relevant for practicing doctors, many schools refer to tools; such as the Australian Junior Doctor Curriculum Framework and the UK General Medical Council (GMC) Tomorrow’s Doctors. These tools provide valuable guidance in curriculum design aiming to develop attributes a junior doctor needs. Consideration of how junior doctors’ cognitive and personality variables interact, and their relationship to academic success, has long been an important issue for medical schools. (5)
Studies investigating the relationship between scores obtained on different selection processes and personal attributes have frequently been used to predict success in medical school (6-9) but few have looked beyond to success as a junior doctor. Some report positive relationships between various medical student personality characteristics and their performance as junior doctors. (5, 10, 11) However, there is not a universal consensus on the set of personal competencies for entering medical students and consequently it has been difficult to draw generalizable conclusions across studies that have used a wide variety of personality assessment instruments. (12, 13) A clearer understanding of how these cognitive and personality variables interact, and their relationship to academic success and successful performance indicators as a junior doctor is an important issue for both medical schools and medical boards, and provides a clear justification for this study. (2).

Setting the scene

In a local context, the medical course (MBBS) at The University of Western Australia (UWA) has participated in ongoing curriculum reform. In 1999, the selection process was transformed from selecting students with a high cognitive intelligence, as measured through secondary school Tertiary Entrance Examination scores (TER) to using the Undergraduate Medical Admissions Test (UMAT), TER score and performance at an interview. In 2000, a revised MBBS curriculum was introduced which aimed to increase small group, active learning that linked clinical practice to scientific knowledge. In addition, the course introduced and enhanced emphasis on the interaction between the doctor and society and learning outcomes on the development of professional behaviours was introduced into the first year of the course. This pedagogic approach attempted to move toward an outcomes based,
student-centred course that integrated learning outcomes across science and clinical disciplines, both horizontally at each year level and vertically from year 1 through to year 6. Currently, the Faculty of Medicine is in the process of transforming the MBBS to a MD (which commenced in 2014) in which the underlying educational principles remain fundamentally unchanged.

This thesis, reports the outcomes of a descriptive, mixed methods cohort study aimed at exploring the predictive validity of selected personality and cognitive factors on a junior doctors' performance in the workplace setting during the first postgraduate year. The results of this work are presented here as a collection of papers for publication. Before the individual studies that form this thesis are presented, this introduction will address three issues that are relevant to prediction of performance in junior doctors. Firstly, the selection processes being used, including the selected personality attributes for entering medical students. Secondly, the factors or attributes that are reported to predict success in medical school and finally, the attributes required for practice as a junior doctor, including the assessment processes being used in the early postgraduate workplace settings in Australia. This forms the rationale for the design of this research and the Introduction will conclude with an explanation of the study population, outcome and independent variables included in this study. The data collection and analysis procedures for this mixed methods cohort study are fully described in each of the subsequent results chapters that contain the listed publications.

Selection into medical school
Methods of selection of students for entry to medical courses in Australia have changed over the last 10 to 15 years to include wider components other than previous academic achievement. (13) Selection measures used for entry to medical school can be broadly divided into measures of attainment or achievement and
measures of aptitude or ability. (14) Generally, medical schools attempt to admit students who can demonstrate that they possess the intellectual academic success and personal qualities desired in doctors. (15)

While there are many studies reporting entrance scores of academic achievement as the most significant predictor of success in medical school, explaining up to 65% of the variance in performance, there is a generally agreed belief, that many of the attributes required to perform effectively as a doctor are not so easily explained. (8) Selection processes are also about screening out dysfunctional personality characteristics. (16) And selecting potential medical students that possess those attributes required for perseverance, and ultimately successful completion of the medical course. In Australia, and common among the undergraduate medical schools since the late 1990s is the use of the three components in the selection process: academic score, selection interview and the Undergraduate Medicine and Health Sciences Admission Test (UMAT). These three components are used in quite different ways across various universities, with each university developing its own form of interview. (17) In 1998, UWA introduced a new form of admission to its 6-year undergraduate MBBS course that included the three components listed above.

The UMAT consists of three sections (logical reasoning and problem solving, interaction skills or understanding people and non-verbal reasoning) [9]. Section two of the UMAT assesses the ability to know and understand humans. It measures empathy and has three facets that underpin it:

1. identifying emotions and feelings
2. explaining actions and or emotions
3. predicting feelings/response/behaviour [9].

However, despite the introduction of the UMAT into the selection process, what is less understood is the precise relationship between a cognitive measure of

Sandra Carr
interpersonal understanding such as UMAT and measures other of interpersonal
skills.

McManus in 2001 suggested that selection should aim at a small number of
personality characteristics that may be predictive of future and desirable professional
behaviour. (18) Emotional intelligence (EI), the ability to monitor and express one’s
own emotions as well as perceive and discriminate others’ emotions to guide
thinking and actions is one of the documented concepts that has been aligned with
the second section of the UMAT. (19) Emotional Intelligence as a construct emerged
as a subset of intelligence theory that views intelligence as a multi-faceted
phenomenon that includes social and emotional components, (20) and is reported to
be valuable in assisting learning and shaping behaviour and practice. (21) Emotional
Intelligence is commonly referred to within areas of human resources management
and has become a recent focus area in medical education as a potential predictor of
success in medical school (22). Furthermore, research findings suggest that a higher
EI may be linked to competency in interpersonal and communication skills which
may contribute to better patient care and clinical outcomes (23, 24). For these
reasons, in addition to the UMAT and the other selection measures used at the
University of Western Australia (UWA), emotional intelligence has been selected as
a key personal attribute to be considered in the selection process and will be
explored in this research study as a predictor of success not just in the medical
course, but also for performance as a junior doctor.

*Academic success in medical school*

There are interesting new developments in the reported factors or attributes that are
predictive of success in medical school. Historically, demographics of medical
students were among the first variables investigated as predictors of academic
success in medical school. (9) While some studies suggest demographic variables
associated with successful medical students in the preclinical years are increased age at entry; male gender; European or Asian ethnicity; higher parental income and urban origin, other studies report conflicting findings especially related to gender, age at entry and ethnicity. (9, 14, 25, 26)

Over the last couple of decades, research confirms the proposition, that cumulative performance indices of past undergraduate and secondary school performance such as TER in Australia and Medical College Achievement Test (MCAT) scores in America, predicts future performance in medical school. (5, 7, 27-30) However, while past academic performance is a proven predictor of success, recent research has shifted the focus onto personal attributes and personality factors, including the students’ motivation for entering medicine and individual learning styles that may predict performance in clinical assessments and practice during the medical course. (13) As the medical curriculum changes from pre-clinical to a clinical focus over the duration of the course, interpersonal aspects such as extraversion, agreeableness, altruism and assertiveness become more important for success. (31) Leivens et al 2009 discusses how these interpersonal factors may assist students to obtain the clinical experience required to better prepare them for beginning practice as junior doctors. (31) However, there are few studies that have considered the effects these types of curricula and curriculum and selection processes changes have on the medical graduates’ performance as junior doctors. (9, 10)

Assessment of the junior doctor

What makes a good doctor and how we ensure medical schools are graduating doctors prepared for the complexity of beginning practice has become the focus of regulatory bodies such as the Australian Medical Council (AMC), the Postgraduate Medical Council and university driven educational course evaluation. While we know

Sandra Carr
the purpose of medical schools is to educate and train medical students in preparation for the role of junior doctor, the role of the medical student and the role of the junior doctor are substantially different. (32) Medical schools impart knowledge, provide opportunities to develop and practice skills, explore attitudes and apply behaviours relevant for practicing doctors. Many refer to guidelines such as the Australian Junior Doctor Curriculum Framework and the UK General Medical Council (GMC) Tomorrow’s Doctors, for guidance as to what attributes a junior doctor needs. (2, 33) However, medical school curricula across Australia are currently not standardised against such guidelines and neither are the assessment methods used to evaluate medical students and junior doctors performance. (34, 35) These varied and diverse approaches between the measurement of undergraduate academic performance and workplace performance of junior doctors are of concern. Studies of the predictive validity of undergraduate academic performance on workplace performance of junior doctors, in general have shown poor correlation between measures of performance at these two levels. Wilkinson and Frampton, 2004 concluded that aggregated, comprehensive, authentic assessment methods increased their predictive validity in undergraduate medicine. (36)

This poor correlation is supported by literature. For example, the study by Morrow et al (2012) showing junior doctors do not always feel sufficiently prepared with respect to time management, aspects of prescribing and complex practical procedures, but feel most prepared for working with patients and colleagues, history taking and examination. (37) Differences in educational experiences in undergraduate Australian medical courses have been shown to influence how adequately prepared doctors are for their early working life. (38) There is little published work within an Australian context exploring the relationships between performance in assessment in the clinical years of medical school and early work place performance as a junior
doctor. This is in part because of the lack of consistent assessment tools or processes in the workplace environment for junior doctors.

In recent years, postgraduate medical education councils in Australia have developed assessment tools based on the three learning areas: Clinical Management, Communication, and Professionalism aligned with the National Junior Doctor Curriculum Framework (ACF), that sets out the expected standards and outlines the learning outcomes required of junior doctors. (3) By describing these areas of performance the ACF has allowed a national approach to junior doctor assessment aimed at ensuring consistency in experience, quality of supervision and feedback junior doctors receive on their performance. (39) Junior doctor performance of their clinical management, communication and professional skills is assessed during each clinical rotation in the first postgraduate year (PGY1). The primary supervisor of the junior doctor conducts the assessment which is based on direct observation and ideally feedback from multiple sources regarding the junior doctor’s performance over a period of time, usually during an eight to ten week attachment in a particular clinical area.

While a recent study by Bingham and Crompton, evaluating junior doctor assessment in New South Wales found the tool able to discriminate poor performance, there is limited other published data evaluating the reliability, validity or educational impact of this Junior Doctor Assessment Tool (JDAT). (40, 41) In addition, there is no published evaluation of the principal components that make up this assessment tool.

Selection into medical school is competitive and completion of medical school can be stressful. Which personality traits and cognitive abilities correlate with and are predictive of success in workplace based performance merits further investigation,
as there are few studies that have considered the relationship between these variables and the effects they have on graduates’ performance as junior doctors.(42)

**Summary of Methods**

The research methods used in each of the five separate but related research projects that together make up this thesis are more fully described within each chapter. In summary, the target population for this descriptive cohort study was medical students who commenced Year 4 and Year 5 in 2006 at The University of Western Australia (n=303) of whom 46% were male and 64% were female. The outcome variables of interest was the Grade Point Average on graduation from the MBBS and workplace performance as measured by the JDAT during the first postgraduate year of practice as a doctor. The independent variables of interest were varied and included demographic information, selection scores used for entry into medicine, measures of academic performance in the clinical years of medical school and the Mayer Salovey Caruso Emotional Intelligence Test (MSCEIT) score. Data around academic performance was collected from existing university databases, data for EI measures was administered to the study population only and data for the outcome measure JDAT was collected from each the medical administration units at each of the hospitals the study participants were employed at for their first postgraduate year. Quantitative data analysis procedures included descriptive statistics, analysis of variance and linear regression and thematic and summative content analysis was applied to the qualitative data. Written consent was obtained from each participant and the project obtained ethics approval from UWA and the three training hospital sites. Figure 1 presents a summary of the data collection and a timeline for the research process.
The proposition explored in this research is that emotionally intelligent, female medical students, with high scores in UMAT section 2, who have performed well on measures of academic achievement will be better prepared for practice as junior doctors, as measured by the Western Australian Junior Doctor Assessment Tool and reflected in their supervisors qualitative ratings of performance in first post graduate year.

**Research Aims**

Specifically, the research aimed to:

1. Describe the EI scores in year 5 and 6 medical students and identify relationships that may exist between EI scores and scores on selection criteria including Tertiary Entrance Rank (TER), UMAT and interviews at The University of Western Australia (UWA);
2. Explore how junior doctors perform in the first postgraduate year (PGY1) including the identification of how many are not meeting the expected standards of a junior doctor and in what skill areas they perform best and worst;

3. Explore the relationship between academic performance of medical students and workplace performance as junior doctors;

4. Explore the association between assessment methods (written and clinical examinations) and clinical placements (rotation type, and amount of experience) on academic performance of undergraduates and workplace performance on junior doctor performance;

5. Describe how variables of academic achievement in the clinical years correlate with work-based performance in PGY1;

6. Describe how Emotional Intelligence and aspects of the medical training correlate with the workplace performance;

7. Determine if any of the variables studied are predictors of achievement in the undergraduate clinical years and/or as junior doctors in PGY1;

8. Describe any influence of demographic factors such as gender and ethnicity on academic undergraduate and workplace performance.

The following five chapters will respond to the eight aims of this research study. In this first chapter, the nature and context in which this study was set, including the background, significance, purpose and summary of methods applied has been presented. Chapter 2 describes the EI scores in senior medical students and explores relationships between EI scores and scores on selection to medical school. Based on the literature, one would predict emotional intelligence is likely to be an important factor in success as a medical student and doctor, roles which are
demanding cognitively and emotionally. The study described in chapter 2 begins the process of testing this assertion which is continued in chapter 6.

Chapter 3 describes the principal component analysis of the Junior Doctor Assessment Tool (JDAT) so subsequent chapters describing performance of junior doctors and exploring relationships between selection scores, academic success and performance as a junior doctor could occur using a tool that is validated and meaningful.

Chapter 4 presents a mixed methods descriptive analysis of how junior doctors perform in the first postgraduate year, including the identification of how many junior doctors are not meeting the expected standards and in what skill areas they perform best and worst.

Chapter 5 builds on the work in the preceding chapter and contends that there is little recent published evidence exploring the relationship between academic performance in medical school and performance as a junior doctor. It includes exploration of the influence of age, gender, ethnicity, clinical attachment; assessment type and summary score measures (GPA) that are identified in the research aims for this thesis.

Chapter 6 focuses on determining if any of the variables studied are predictors of achievement in the undergraduate years and/or as junior doctors in PGY1. The findings provide clarity to the value of combining undergraduate assessment scores to assess competence as a whole in predicting future performance as a junior doctor.

At the beginning of each results chapter, a brief “preface” is presented that explains how the separate studies connect expanding the rationale for the structure of the subsequent chapter and prepares the reader for the manuscript. Each manuscript
includes a review of the relevant literature. The results chapters are followed by the discussion section contained in Chapter 7 which synthesises the results of all the studies in this thesis, and weighs up the strengths and weaknesses. Discussion on the implications for assessment in medical school and the early postgraduate setting are also provided.
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Chapter 2: Results: Emotional Intelligence

Preface

As described in the introduction, EI is an important factor in the success of medical students and junior doctors, roles which are both demanding cognitively and emotionally. This premise is based on recent medical education literature from 2007 that assert the potential influence a medical student’s EI may have on their leadership skill development and interactions with both patients and other members of the health professions team in the clinical setting. Chapter 1 has reviewed the literature and introduced the rationale for the study and identified the research aims.

Research on EI as key internal variable in success of medical students and junior doctors is laid out in following results chapters of the thesis, with each chapter focussing on one or more of the research aims.

As a first step in analysing EI, Chapter 2 explores the relationship between EI, measured near graduation and selection measures for medical students. The chapter contains the work as published in Medical Education (2009), a leading educational journal for the health professions. The paper describes the EI scores in senior medical students, which has not previously been reported, which allowed comparisons with other health professional students to be explored. Although there was a significant correlation between different components of the selection methods (interview and TER), in one cohort, this was not present in the second cohort. Importantly, there was no significant relationship between EI scores and scores on selection criteria including Tertiary Entrance Rank (TER), UMAT and interviews at The University of Western Australia (UWA). The study concluded that further research exploring possible relationships between EI measured at entry and UMAT scores, also measured at entry to medical school, should be undertaken.
This paper added valuable knowledge to our understanding of the EI scores of medical students and encouraged other scholars to also consider how EI may influence levels of interpersonal aptitude. On March 24th 2014, this paper had been cited by 40 subsequent papers exploring EI in medical and/or health professions education (accessed from PubMed).
Publication

Emotional Intelligence in Medical Students; Does it correlate with selection measures?

Authors: Sandra E Carr


Abstract

Context: Much attention and emphasis is placed on the selection of medical students. While there is literature validating selection measures it is not yet known whether high scores at selection are indicative of high levels of interpersonal aptitude. Emotional Intelligence (EI) is reported to be a predictor of the interpersonal and communications skills medical schools are looking for in applicants.

Purpose: This study describes EI scores in medical students and explores correlations between EI and selection scores at the University of Western Australia.

Methods: Senior medical students from a six year undergraduate curriculum completed the online MSCIEIT ® survey. EI scores were described and correlations between EI and selection scores of Undergraduate Medicine and Health Sciences Admission Test (UMAT), Interview and Tertiary Entrance Rank (TER) scores were analysed.

Results: The respondents 177 (58%) reflected the normal distribution (m =98, SD=15). Males had higher EI than females and Asian students demonstrated higher EI total and branch scores than Caucasian students. Highest EI scores were obtained for understanding emotion (m =110, SD=19.0) and lowest EI scores for perceiving emotion (m = 94, SD= 15.6). No significant correlations were found between EI total or EI branch scores with any of the selection scores (UMAT, TER and Interview).
**Discussion:** This study offers information that can be used to compare EI scores of medical students with other health professionals. There was no relationship identified between cognition (measured by UMAT) and skill (measured by MSCEIT) in the interpersonal domain and emotional intelligence. Further studies are required to explore whether UMAT section 2 is measuring EI, if there are associations between EI and academic performance and if EI can be used to predict performance of junior doctors.

This study has ethics approval from the University of Western Australia Human Ethics committee.

**What is already known on this subject?**
Emotional intelligence is one of the documented concepts aligned with the second section of the UMAT. EI is reported to be valuable in assisting learning, shaping behaviour and practice, and has become a recent focus area in medical education as a potential predictor of success. Some are suggesting that a higher EI may be linked to competency in interpersonal and communication skills which may contribute to better patient care and clinician outcomes.

**What this study adds?**
This study offers information that can be used by others to compare EI scores of medical students with other students in the health professions.

**Suggestions for further research?**
Further studies are required to explore whether EI can be used to predict performance of medical students and junior doctors and the impact of EI on the experiences and outcomes of patients care.
Introduction

There has been much discussion and debate about the selection of medical students and the importance of a range of intrinsic or internal factors of the student that may be predictive of their success in medicine. Some say that the key to success in medicine is related to cognitive intelligence. (1) Others have argued that qualities such as empathy, effective communication, and interpersonal skills are equally important. (2) McManus in 2001 suggested that selection should aim at a small number of personality characteristics that may be predictive of future professional behaviour. (3) Over the last ten years medical boards of registration have sought to license practitioners who have passed assessments in professionalism, communication and interpersonal skills which in turn have placed pressure on medical schools to ensure that entering students bring humanistic qualities with them. (4-7) However, it is recognized that because of the competitive nature of the selection process in medicine, these qualitative attributes have to be objectified. (5)

Additional pressures have also been placed on doctors by the managed care model of health care delivery (4) where doctors are expected to see patients quickly while upholding the humanistic values of the profession. Some have suggested that students were more likely to complete the medical course when they had both higher tertiary entrance scores and a capacity to be ‘thick skinned’ when compared with students with lower entrance scores who were more shy or timid. (8)

Currently, evidence to validate the model and tools used for selection of medical students in Australia is being gathered and synthesized by the Undergraduate Medicine and Health Sciences Admission Test (UMAT) Consortium. (9) Studies to date have highlighted the need for rigorous evaluation of Australian medical school admissions tests. (10, 11)
The UMAT is the tool used by 13 institutions in Australia and New Zealand to assist selection of students into undergraduate medicine, dentistry and health science courses. It consists of three sections (logical reasoning and problem solving, interaction skills or understanding people and non-verbal reasoning). (9) Section two of the UMAT assesses the ability to understand and think about people. It measures empathy as a broad cognitive ability and has three facets that underpin it:

1. identifying emotions and feelings
2. explaining actions and or emotions
3. predicting feelings/response/behaviour. (9)

But we do not yet know the precise relationship between a cognitive measure of interpersonal understanding (UMAT) and measures of interpersonal skills. (9)

Emotional intelligence (EI), the ability to monitor and express one’s own emotions as well as perceive and discriminate others’ emotions to guide thinking and actions (12, 13), is one of the documented concepts that has been aligned with the second section of the UMAT. EI as a construct arose from the evolution of intelligence theory. It emerged as a subset of the theory that views intelligence as a multi-faceted phenomenon that includes social and emotional components. (14) It is reported to be valuable in assisting learning and shaping behaviour and practice. (15) It is commonly referred to within areas of human resources management and has become a recent focus area in medical education as a potential predictor of success. (6, 16) Some are suggesting that a higher EI may be linked to competency in interpersonal and communication skills which may contribute to better patient care and clinician outcomes. (17)

Although self-report measures of EI are commonly used, research demonstrates that self-assessments of EI most likely reflect perceptions of emotional abilities rather
than measures of the abilities themselves. (18) For this study the MSCEIT® has been used. (19) The MSCEIT is a performance based test of emotional intelligence. It provides an estimate of the participants EI ability by having them solve problems. Its validity and reliability has been evaluated extensively. It has been found to be reliable with a high internal consistency (alpha, 0.91) and test-retest reliability of 0.86 with an N of 62. (19: p.35) Face validity also appears adequate with an inter-rater reliability of 0.83. There are also studies exploring the predictive validity of MSCEIT linking high EI scores with leadership and occupational choices and job performance. (19: p.41)

Similar to other tests of EI, studies using the MSCEIT in health care settings are few. However, a study involving nurses showed positive correlations between clinical performance level and EI scores. Staff nurses on the professional clinical track (i.e., those pursuing advanced training and skills) demonstrated higher EI scores than staff nurses not on the clinical track [20]. It would appear EI has the potential to deepen our understanding about a set of factors that are related to clinical performance and leadership. These include effective interpersonal and communication skills [21, 22]. That is, skills that rely on the ability to perceive, use, understand, and manage emotions in self and others. How EI may correlate with current selection processes needs to be explored.

**Purpose**

This study describes Emotional Intelligence scores in senior medical students and explores correlation between EI and selection scores of TEE, UMAT and Interview Scores at the University of Western Australia (UWA).
Methods

Emotional Intelligence as measured by the MSCEIT® is a performance based assessment of overall emotional intelligence for those aged 17 years or older is the outcome variable of interest. It offers measures of each of the four branches of emotional intelligence.

Table 1. Overview of the Four Branch Model of Emotional Intelligence (Mayer & Salovey 1997 as cited in Mayer et al, 2002: [19] p. 7)

<table>
<thead>
<tr>
<th>Branch Name</th>
<th>Brief description of skills involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceiving Emotions</td>
<td>The ability to perceive emotions in oneself and others, as well as in objects, art, stories, music and other stimuli</td>
</tr>
<tr>
<td>Facilitating Thought (using emotions)</td>
<td>The ability to generate, use and feel emotion as necessary to communicate feelings, or empty them in other cognitive processes</td>
</tr>
<tr>
<td>Understanding Emotions</td>
<td>The ability to understand emotional information, how emotions combine and progress through relationship transitions, and to appreciate such emotional meanings</td>
</tr>
<tr>
<td>Managing Emotions</td>
<td>The ability to be open to feelings, and to modulate them in oneself and others so as to promote personal understanding and growth</td>
</tr>
</tbody>
</table>
There were three independent variables related to selection chosen for inclusion in the study. These were:

a. *Tertiary Entrance Ranking (TER)*

Entrance to medical school is highly competitive. For every one place in the medical course at UWA, sixteen prospective students will apply. (24) Selection of medical students is a complex process. Each medical school varies its selection process. For the UWA the tools used to aid selection are the TER score, UMAT score and structured interview.

The TER is used by some Australian universities as a measure of academic ability. The TER is calculated using the sum of the four highest Courses of Study scores obtained at the end of high school. Scores range from zero to 99.5 with 96 being the minimum cut off score for applicants to medicine. Researchers have suggested that the TER is the strongest predictor of success whilst at university in general and the early years of medicine (24, 25), although it is not recognized as the strongest predictor of work based performance or professionalism in medicine. (7)

b. *Undergraduate Medical and Health Sciences Admissions Test (UMAT)*

The UMAT is the second of the three criterions used to inform selection of students into undergraduate medicine. It is the tool used by 13 universities in Australia and New Zealand. It is a measure of logical reasoning, problem solving, understanding people and non-verbal reasoning. Many medical schools have implemented such tests of aptitude with limited evidence about the value they add. (26) Research looking at the content and construct validity of UMAT is in process in Western Australia. (9) Section two of the UMAT (understanding people) is reported to assess aspects of applicant’s emotional intelligence. (9) This study will examine the correlations between UMAT scores at the beginning of the medical course and
emotional intelligence scores toward the end of the course. However, EI scores are not meant to change substantially over time. (15) This study explores the relationship between cognition (measured by UMAT) and skills (measured by MSCEIT) in the interpersonal domain.

c. Interview Score

Interviews are the third criteria used to assist and inform selection. Interviews are part of the admission process in nine Australian and New Zealand (9) medical schools and many medical schools in the UK and US. (27) While it is commonly reported as a means of evaluating some of the non-academic qualities seen to be desirable in medical practitioners such as compassion, respect and integrity (27, 28) there is no standardized approach used. Each institution designs its own process. At UWA this process includes a structured interview lasting 25 to 35 minutes with two interviewers (one community member, one faculty member). The purpose is to assess a range of skills and attributes including ability to assist others, ability to manage and examine oneself, appreciation of health and social diversity, capacity to appreciate others perspectives and willingness to work with others. (29) There has been no published evaluation of the interview process at UWA. In the literature the reliability of interviews is still open to debate with limited research data as yet published. (30) Despite this the interview remains a feature of many models of admission to medical school. It is reported to help establish the humanistic paradigm in the admission process in the difficult area of ensuring diversity among medical students. (5)

The independent demographic variables that have been included are gender and ethnicity. Some studies have found no significant (25) differences between the academic performance of male and female students while other studies report more
favourable academic performance results for either female or male students. It has been suggested these results may be more related to the way in which the different medical courses are structured (31) and the learning styles of males and females. The two largest groups within the study cohort are Caucasian and South East Asian.

Data Collection
Two groups of senior medical students from Year 5 and Year 6 of a six year undergraduate curriculum (n= 304) were asked to consent to participate. The study was explained to the group in large face to face sessions and written consent obtained. Participants were given 45 minutes to complete the online MSCEIT ® survey during an allocated class time in a computer laboratory or emailed the survey if they failed to attend the allocated class time.

Analysis
Completed MSCEIT® surveys were returned to the provider, Multi- Health Systems (MHS), to calculate the EI total and branch scores against normative data which is based on data collected from over 5000 respondents. (19) The EI scores are reported as traditional intelligence scales so that the average score is 100 and the standard deviation is 15. If a person obtains a score of around 100, then they are in the average range of emotional intelligence. If they obtain a score less than 85, they should consider the impact of their EI on behaviour and if around 115, they have possibly a high level of performance.

Descriptive statistics were calculated for each cohort and for both cohorts combined. Normal distribution was checked for each variable and upheld for EI and UMAT. TER and Interview scores have been treated as ordinal data. Differences in the descriptive statistics have been explored for each cohort, between genders, ethnicity
and for selection scores (TER, UMAT, Interview) using T-tests and Mann Whitney U Tests. Correlation between EI and selection criteria was calculated using Pearson's and Spearman’s Correlations. A post hoc correction was applied to the significance level to allow for the multiple comparisons. SPSS 17.0 was used for the statistical analysis.

**Results**

Of the 303 students 237 agreed to participate in the study (78%) and of these 177 completed the MSCEIT online (58%). 104 were from the Year 5 cohort and 73 were from the Year 6 cohort. The mean age of participants was 23 years (SD: 2.3, range 20-37 years). There were 105 (59%) females and 72 (41%) males who completed the MSCEIT. This appears representative of the total sample (n=303) where 169 (56%) were female and 133 (44%) were male.

Figure 1 depicts the distribution of EI scores for all participants with a mean of 97.9 (SD =15). Of the 177, 32 students had total EI scores that may require development (score equal to or less than 85) and 16 students had scores demonstrating high performance or skill in this area (scores above 115). Therefore, 73% of students have an MSCEIT which indicates competence in EI ability. The mean scores for each branch of the EI and total score were around 97 except for the Understanding Branch of EI with a mean of 110 (SD=19).
When the two cohorts of students were compared using T-Tests and Mann Whitney U tests there was no significant (p< 0.05) difference in mean scores for participants Total EI, TER, Interview or Total UMAT scores. However, there were significant (p <0.05) differences for the mean scores for UMAT2 between cohorts with the mean being higher for cohort 2 (p= 0.006). As UMAT 2 is the variable reported to assess cognition in the interpersonal domain and most aligned with EI the correlation data for both cohorts have been reported separately.

There were notable differences with EI scores between genders with males (mean =100) having a higher mean score than females (mean 95, p = .039). While this difference is statistically significant, both genders have mean scores in the
“competent” zone. When the branch scores are examined the scores for males in this study are higher than the scores for females in each branch area.

Of the respondents 103 have self-reported their ethnicity as Caucasian and 60 as Asian (Chinese, Malay and Vietnamese). The remaining 14 either did not report their ethnicity or were represented in such a small number they were not included in this section of the analysis. Asian students scored a higher total EI score (p < .001) and in all branches except the “perceiving branch” where the mean scores were similar (Caucasian: m = 93 and Asian: m= 96; p = .242).

Figure 2. Box plot of total EI by gender and ethnicity

Figure 2. Box plot of total EI by gender and ethnicity
Correlation Results

Tables 2 and 3 present the correlation data for both cohorts. For cohort 1 (n= 73, year 6 students) there was a significant negative correlation found TER and Interview score (r=-.281, p= 0.007). There was no correlation between EI total or any of the sub branches with the selection scores for cohort 1.

For cohort 2 (104 year 5 students) the UMAT total correlated positively with the "using" branch score of EI (r=.232, p=.030) and EI total score (r=.231, p=.027). As the level of significance for this analysis has been set at p< 0.01 because of the multiple comparisons of variables only the findings for cohort 1 are significant. There was no correlation between UMAT2 and Emotional Intelligence scores for either cohort.
Table 2. Correlation between MSCEIT Scores and Independent variables for both cohorts

<table>
<thead>
<tr>
<th></th>
<th>Cohort 1 (Year 6 n=73)</th>
<th>Cohort 2 (Year 5 n=104)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EI Total</td>
<td>Interview</td>
</tr>
<tr>
<td>El Total</td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>N=73</td>
</tr>
<tr>
<td>Interview</td>
<td>Pearson Correlation</td>
<td>-.114</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>N=71</td>
</tr>
<tr>
<td>TER</td>
<td>Pearson Correlation</td>
<td>.133</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>N=73</td>
</tr>
<tr>
<td>UMAT Total</td>
<td>Pearson Correlation</td>
<td>.084</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>N=71</td>
</tr>
</tbody>
</table>

** Significance at the level of 0.01 allows for post hoc correction of multiple comparisons
Table 3. Correlations between MSCEIT scores and subsections of UMAT

<table>
<thead>
<tr>
<th>Cohort 1 (Year 6 n=73)</th>
<th>Perceive</th>
<th>Using</th>
<th>Understand</th>
<th>Managing</th>
<th>EI Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMAT 1</td>
<td>Pearson Correlation</td>
<td>.009</td>
<td>-.087</td>
<td>.168</td>
<td>-.113</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.945</td>
<td>.467</td>
<td>.178</td>
<td>.367</td>
</tr>
<tr>
<td>UMAT 2</td>
<td>Pearson Correlation</td>
<td>.132</td>
<td>-.014</td>
<td>-.120</td>
<td>.080</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.292</td>
<td>.912</td>
<td>.338</td>
<td>.526</td>
</tr>
<tr>
<td>UMAT 3</td>
<td>Pearson Correlation</td>
<td>.093</td>
<td>.135</td>
<td>.048</td>
<td>.154</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.457</td>
<td>.279</td>
<td>.705</td>
<td>.217</td>
</tr>
<tr>
<td>UMAT Total</td>
<td>Pearson Correlation</td>
<td>.144</td>
<td>.020</td>
<td>.053</td>
<td>-.80</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.250</td>
<td>.873</td>
<td>.670</td>
<td>.809</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cohort 2 (Year 5 n=104)</th>
<th>Perceive</th>
<th>Using</th>
<th>Understand</th>
<th>Managing</th>
<th>EI Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMAT 1</td>
<td>Pearson Correlation</td>
<td>.041</td>
<td>-.063</td>
<td>.196</td>
<td>.137</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.700</td>
<td>.557</td>
<td>.062</td>
<td>.192</td>
</tr>
<tr>
<td>UMAT 2</td>
<td>Pearson Correlation</td>
<td>.117</td>
<td>.190</td>
<td>-.166</td>
<td>-.007</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.287</td>
<td>.089</td>
<td>.144</td>
<td>.949</td>
</tr>
<tr>
<td>UMAT 3</td>
<td>Pearson Correlation</td>
<td>.129</td>
<td>.167</td>
<td>.069</td>
<td>.113</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.220</td>
<td>.111</td>
<td>.512</td>
<td>.283</td>
</tr>
<tr>
<td>UMAT Total</td>
<td>Pearson Correlation</td>
<td>.199</td>
<td>.232</td>
<td>.001</td>
<td>.129</td>
</tr>
<tr>
<td></td>
<td>Sign (2 tailed)</td>
<td>.058</td>
<td>.026</td>
<td>.989</td>
<td>.222</td>
</tr>
</tbody>
</table>

** Significance at the level of 0.01 to allow for post hoc correction of multiple comparisons

Discussion

This study has described the EI ability as measured by the MSCEIT ® of 177 senior medical students and has looked for the presence of a statistical relationship between EI and the selection scores commonly used in Australia and New Zealand of UMAT, TER, and Interview.

The distribution of EI scores for the study participants reflected the normal distribution of the general population with a mean of 97.8 and a SD of 15. Males in this study had higher EI than females. While this difference is statistically significant both genders have mean scores in the “competent” zone. Studies exploring the standardisation of the MSCEIT report slightly higher EI scores for females when compared with males. However, even the largest difference, observed in the
managing emotions branch, accounted for only 5.3% of the variance in scores. (19) A larger study would be required to explore potential differences between genders further.

The participants demonstrated highest branch scores for understanding emotion with a mean score higher than the general population (m =110). This could mean that the medical students in this study have an increased ability to understand emotional information, label emotions and recognize that there are groups of related emotions. This may be beneficial in the clinical setting, as understanding how emotions change and combine over time is reported to be important when dealing with other people and understanding emotions in themselves. (19) The study participants demonstrated the lowest branch scores for perceiving emotion with a mean of 94 indicating possibly lower cohort ability to identify emotions. However, this is not significantly lower than the population mean.

There is limited published data from other health professionals but one small study (n=27) looking at EI in clinical nurses demonstrated highest branch scores related to the skills of managing emotions and lowest branch scores in perceiving emotions. (20) Another study of Year 4 American medical students (n =84) reported similar findings to this study with mean EI scores of 97.0 (SD 12.2). Highest scores were obtained for understanding emotion (mean 101.1, SD 9.5) and lowest scores were for perceiving emotion (mean 93.8, SD 14.4), they found no significant difference based on gender. (32)

In this study, Asian students scored higher in total EI score (p = .000) and in all branches except the “perceiving branch” where the mean score was similar with Caucasian students (Caucasian: 93 and Asian: 96 p = .242). Caucasian members of
the Normative Studies by Mayer and Salovey obtained higher MSCEIT scores as do participants whose first language is English. (19). However, the differences were relatively modest with only 6% of the variance explained by ethnicity. The authors of the MSCEIT caution making claims of significant differences in EI between ethnic groups. (19) As this study did not ask participants if English was their first language, it is possible the observed differences were due to language ability rather than ethnicity.

Some of the findings may be explained by the limitations of this study. Unexpectedly there was a significant negative correlation found between TER and Interview score \( r = -0.281, p = 0.007 \) for cohort 1, with no correlation found for cohort 2. As the response rate was 58%, the respondents may not be a truly representative sample of the population. If the sample had been more complete, differences between cohorts may not have been observed. The participants were enrolled in the study as senior medical students and completed the MSCEIT 5 years after completing the selection measures. This time delay may have influenced the results. Mayer, Salovey and Caruso discuss several analyses that have been conducted to investigate age differences with EI scores. (15) The observations indicate younger adults (17-24 years) score slightly lower than older age groups. The mean age for this study was 23 years (SD: 2.3, range 20-37 years). Therefore participants EI scores may have been slightly lower at the time of selection, however it is unlikely students with high EI scores would have lost this ability over time or that the change due to age would have been significant for the intervening period.

Significant differences were found between the cohorts UMAT mean scores. Therefore relationships between UMAT and EI were examined separately for each
cohort. This inconsistency in the UMAT scores over the 2 year period, another limitation of the study, was most likely due to changes being made to the UMAT process locally at that time. The nature of these changes was to enhance the capacity of Section 2 of UMAT to assess the candidates’ abilities to understand interpersonal situations. Whilst it is recognised that section 2 is a valid component of a selection test such as UMAT it is not yet known whether high scores on Section 2 of UMAT indicate high levels of interpersonal aptitude, particularly good skills in dealing with people. (9) Emotional Intelligence is meant to be related to interpersonal aptitude. If that is correct it would appear that the UMAT Section 2 was not measuring EI at the point of time these medical students were selected.

No research has as yet addressed the degree to which emotional intelligence is inherited. It is possible that some of the capacity is biologically based and some is a consequence of learning. Attention needs to be paid to the students with low EI. Mayer and Salovey speculate that EI is relatively stable, whereas emotional knowledge- the kind of information that EI operates on- is relatively easy to acquire and teach (15, p 209). EI scores may be able to be used as the groundwork for change. Assuming a person has an average EI, it is possible to learn about emotions and improve their performance in emotional reasoning. (19) There are some reports of medical schools implementing programmes to enhance EI of medical students but evaluation of the effects of these programmes on student EI abilities are as yet unpublished. (33, 34)

This study has added to understanding the EI scores of medical students. How EI scores of medical students from different medical schools compare needs further exploration. Whether EI can be used to predict performance of medical students and junior doctors is yet to be explored. One study looking at empathy and EI suggests
limited associations between EI and academic performance but asserted EI scores affected team function in a Problem Based Learning environment. (35)

This research has not answered whether candidates who obtain high scores on UMAT Section 2 have higher levels of interpersonal aptitude and those who obtain low scores have lower levels of interpersonal aptitude. Further research exploring possible relationships between EI and UMAT scores are required. This should be undertaken at the point of entry into medicine and ideally include all candidates undertaking UMAT and not just those who are successful in obtaining entry into a medical course.
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Chapter 3: Results: The Junior Doctor Assessment Tool

Preface

Measures of performance of the UWA MBBS cohorts in their first postgraduate year took 18 months to complete, as the two cohorts moved through PGY1 sequentially. During this time, other aspects of medical student behaviour, which may have been linked to future success as a doctor, were studied. It was felt that the amount of procedural skill practice gained as a student, and the overall amount of experience obtained in the clinical setting, factors which may be impacted by both the learner (motivation) and the learning environment (opportunity) might identify students more likely to be successful as doctors. Although the work resulted in important information (two papers published from this work are included as appendices), it describes the actual rather than anticipated experience gained as a student, the data sources available were not reliable enough to allow these measures to be used to predict future performance outcomes.

In this chapter, the Junior Doctor Assessment Tool (JDAT) is used as a measure of success as a doctor. The tool is used by the employer (Health Services) to measure competence and subsequently used to determine full registration with the Medical Board at the end of the PGY1 year. It is also hoped the use of the JDAT ensures junior doctors receive regular and consistent feedback. Each study participants file was viewed on site in the medical administration department of the training hospital in which the junior doctor worked, the data from the JDAT was extracted, entered into the coded excel spreadsheet and any other records of relevance in the Junior Doctors file noted. For example, if there was feedback on performance from a source other than the tool in the file, a note was made as to its contents.
During the initial phases of the analysis, the researcher made an assumption about the data, which was subsequently demonstrated to be incorrect. It was assumed that the tools stated constructs (Clinical Management, Communication, and Professionalism) had been validated. Therefore, summary scores for each of these constructs were calculated and used in the analysis to explore correlations with academic performance as a medical student. The findings from this analysis were disappointing with few areas of correlation identified between student academic and junior doctor workplace performance data. When this work was presented at the Association for Medical Education in Europe (AMEE) in 2011 and at the conference for the Australian and New Zealand Association for Health Professions Educators (ANZAHPE) in 2012, feedback from the audience prompted questions of these initial assumptions. While the qualitative data was valuable, the quantitative data was questionable. Subsequent discussion with Professor’s Richard and Sylvia Cruess from the Center of Medical Education, at McGill University in California provoked further questions including how or whether the tool was measuring professionalism or professional behaviour, and whether it was measuring the constructs it claimed to be measuring?

Further review of the literature showed there were no publications validating the specific Junior Doctor Assessment Tool (JDAT) used in Western Australia, although similar tools used elsewhere had been validated. It was determined that a principal component analysis on the JDAT used with our cohort, was required before any further analysis or comparisons could be undertaken. Chapter 4 reproduces the paper studying the validity of the JDAT.

Of importance, the findings from this paper showed only two principal components of junior doctor performance are being assessed rather than the commonly reported
three. If the item “Doctor’s role in Society” is removed, a Cronbach Alpha of .832 is calculated. These findings are very important in terms of the use of the JDAT and in particular, the educational impact of this assessment when used to monitor junior doctor development and progression.

On 24th March 2014, this paper had been accessed 917 times since publication on September 21st 2013. Information sourced from BMC Medical Education Online access statistics.
Abstract

Context: In recent years, Australia has developed a National Junior Doctor Curriculum Framework and a national approach to junior doctor assessment. Given the significance of the judgments made, in terms of patient safety, development of junior doctors, and preventing progression of junior doctors moving to the next stage of training, it is essential to develop and validate assessment tools as rigorously as possible.

Methods: This paper reports on a validation study of the Junior Doctor Assessment Tool.

822 assessments from 200 junior doctors were collated over a two year period. The psychometric properties of the tool were explored and the principal components identified with an ANOVA and regression analysis to quantify the potential influences of the length of experience on assessment scores.

Results: The highest mean scores were for interpersonal skills, teamwork and written communication skills and the lowest were for procedures. Most junior doctors were assessed three or more times and scores were not different in the first rotation compared to subsequent rotations. There appeared to be no influence on scores obtained by the number of times they were assessed. A Cronbach Alpha of .832 is calculated for the tool without the item Doctor’s role in society and component.
analysis identified two principal components of junior doctor performance are being assessed rather than the commonly reported three.

Discussion: Now that the components of the tool have been accurately identified it will be more meaningful and potentially more influential to consider these factors and the potential educational impact of this assessment process for monitoring junior doctor development and progression.
Introduction

The need to assess junior doctors’ performance in the workplace is well recognised. It is important for safe patient care that the small minority of junior doctors, whose performance is giving cause for concern, are identified and addressed. Moreover, formal assessment could ensure all junior doctors receive feedback about their performance in the workplace early in their career, essential for professional development.

A range of approaches are available to assess competence in medical practice. (1,2) Most assessments of competence include direct observation of practice in the clinical setting enabling the assessment of the interrelated domains of competence, namely: medical knowledge, scientific enquiry, clinical skills and patient care, professionalism, communication and interpersonal skills, knowledge of the health system and learning through reflective practice. (3) Multisource feedback is increasingly used in postgraduate medicine to contribute to the assessment of performance. (4) Multi-source feedback is useful in identification of high, intermediate, and low-performing junior doctors and been useful for providing specific formative feedback. (5) It is vital that reliable, valid, feasible and effective measures of performance are used in the assessment and feedback process. (6) Given the significance of the judgments made, in terms of patient safety, development of junior doctors, and preventing progression of junior doctors moving to the next stage of training, it is essential to develop and validate assessment tools as rigorously as possible. Optimising any assessment tool or programme requires consideration of how reliability and validity balance with the other measures of utility such as feasibility and acceptability. Although there is growing evidence to support the reliability and validity of different assessment tools used in postgraduate medical education, including multisource feedback tools (7), it is important individual tools are analysed.
in local settings to guide where efforts should be made in terms of optimising implementation.

In recent years, Australia has developed a National Junior Doctor Curriculum Framework (ACF) that sets out the expected standards and outlines the learning outcomes required of junior doctors. (8) The ACF is built around three learning areas: Clinical Management, Communication, and Professionalism. These areas are further subdivided into learning topics which have been identified as being critical to both safe prevocational practice and a basis for future training. Through this description of these areas of performance the ACF has allowed a national approach to junior doctor assessment to develop. (8) This National approach is aimed at ensuring consistency in experience received, and the quality of the supervision of Junior Doctors and the feedback they receive on their performance. Junior doctor performance of their clinical management, communication and professional skills is assessed during each clinical rotation in the first postgraduate year (PGY1). The primary supervisor of the junior doctor conducts the assessment which is based on direct observation and hopefully feedback from multiple sources about the junior doctor’s performance over a period of time, usually during an eight to ten week attachment working in a particular clinical area.

The assessment tool has been developed by postgraduate medical councils across Australia and aligns with similar such assessments in the UK. (9) The areas for assessment are related to the Australian Junior Doctor Curriculum Framework, rather than the GMC categories. Being based on the UK form means it is likely to have high face validity. Based on the widespread take up of the assessment it also appears to be feasible and acceptable. While some research has been conducted on the ability of the tool to discriminate poor performance (10), there are few published data evaluating the reliability, validity or educational impact of this Junior Doctor Assessment tool. Neither is there any published evaluation of the principal
components making up the assessment tool. Therefore questions exist about the tool’s reliability, and validity to assess performance in the cited components of clinical management, professional and communication skills. These questions need to be answered before the scores obtained from this assessment can be used to accurately assess junior doctor performance and before the tool can be used to explore correlations between undergraduate performance in medical school and workplace performance of Australian junior doctors. This paper reports on a validation study of the Junior Doctor Assessment Tool as used for PGY1 doctors.

**Methods**

**Context**

The assessment tool was developed by the Postgraduate Medical Council of Western Australia (11) to assess performance in three areas, Clinical Management, Communication and Professionalism, through 10 unique items. The tool has been used at the three tertiary public hospitals, Sir Charles Gairdner Hospital, Fremantle Hospital and Royal Perth Hospital since 2008. This validation study of the Australian developed Junior Doctor Assessment Tool as it was used in three public and other associated hospitals in Western Australia for PGY1 across a two year period addressed two core aims, namely: (1) to evaluate the psychometric properties of the instrument; (2) to explore the effect of length of experience as a PGY1 on assessment scores.

**Study population**

Two groups of senior medical students from Years 5 and 6 of the same six year undergraduate curriculum (n = 302) were asked to participate in a longitudinal study following the students until the end of PGY1. The mean age was 23 years at the beginning of the study with 169 (56%) female and 133 (44%) male. Human Research Ethics Committee approval was obtained from the University of Western...
Australia and the individual public hospitals the graduands would be working in for their first postgraduate year. The study was explained to the group in large face-to-face sessions and individual written consent was obtained.

**Tool description**

**Outcome measure**

In Western Australia, the Junior Doctor Assessment Tool is completed by the supervising clinician at the end of each 10 week rotation or attachment. As depicted in Table 1 the junior doctor is assessed using a five-point Likert type scale where 0 = not observed, 1 = below expected level, 2 = borderline, requires assistance, 3 = at expected level and 4 = better than expected. Each item was assigned a score of between 1 and 4 with no value being given to ‘not observed’ for each of the 10 items and summed to give a score out of 40 for each assessment. If a junior doctor is identified as performing at level 1 or 2, the assessor is asked to provide comments to support their rating.

In addition to the ratings of the three performance areas (clinical management, communication and professionalism) the assessor rates the junior doctors overall performance during the attachment in the form of a global rating using a four point Likert scale where 1 = below expected level, 2 = borderline- requires development, 3 = at expected level, 4 = above expected level.

Assessors are also asked to document the junior doctor’s strengths, areas for improvement including specific information supporting ratings of borderline or below expected performance. Additionally, assessors are asked to comment on whether they have made this assessment based on close personal observation, their general impression of the junior doctor and whether colleagues and other health professional staff have informed the assessment made. This validation study has only included
quantitative data pertaining to the three components of Clinical Management, Communication and Professionalism in the analysis.

**Independent variables**

The independent demographic variables included in this study were timing of the assessment (first, second, third, fourth or fifth rotation) and the number of assessments completed over the 12 month period.

**Table 1. Replica of a Junior Doctor Assessment Form**

<table>
<thead>
<tr>
<th>Not observed</th>
<th>Below expected level. Requires substantial assistance</th>
<th>Borderline. Requires assistance</th>
<th>At expected level</th>
<th>Better than expected</th>
</tr>
</thead>
</table>

**CLINICAL MANAGEMENT**

1. Clinical Assessment and Patient Management
2. Procedural Skills
3. Emergency Management
4. Adverse event identification and risk minimisation

**COMMUNICATION**

5. Interpersonal skills with Patients
6. Team work/Interpersonal skills with others in the health care team.
7. Written communication/Record keeping

**PROFESSIONALISM**

8. Professional Behaviour (responsive / reflective / ethical)
9. Scholarly Practice (learning / critical thinking)
10. Doctor’s Role in Society (manager / role model)

Data collection

The data of junior doctor performance were collected directly from the medical administration departments in the public hospitals where the junior doctors were
employed in the first postgraduate year by the researcher over a two year period and
imported to SPSS V20 for statistical analysis procedures.

Data analysis
Assessments were removed from the analysis if a rating for each of the 10 items was
not recorded. This resulted in 822 individual assessments with complete ratings for
the 10 items recorded. A qualitative review of assessments suggested assessors
applied the ‘not observed’ category for different reasons. Sometimes the assessors
checked ‘not observed’ when the junior doctors had not obtained experience in that
skill area but in other instances it was used to indicate their lack of engagement in
the clinical workplace. (12) In most instances the assessor included a comment to
support their use of the ‘not observed’ category. However, no instructions appear to
have been given to assessors on when or how to use the “not observed” category so
how to complete the form was left open to interpretation. Therefore, the analysis was
conducted excluding ratings of “not observed” such that 134 of the 822 assessments
were not considered reliable for inclusion leaving 688 assessments in the analysis.
To address the first objective of this study, that is, to investigate the psychometric
properties of the Junior Doctor Assessment instrument, Cronbach’s Alpha reliability
coefficient with an item-total scale correlation (to check if any item in the set was
inconsistent and therefore could be discarded), and interscale correlation analyses
were completed. (13). For item reduction and exploring the factor structure of the
instruments, a principal components analysis was conducted with an extraction
criterion of Eigenvalue > 1 and with varimax rotation (orthogonal). Items were
grouped under the factor where they displayed the highest factor loading.
Subsequently, the factor structure was subjected to reliability analysis using
Cronbach’s alpha. A Cronbach’s alpha of at least 0.70 was pre-determined to offer
an indication of satisfactory internal consistency reliability of each factor. An item-
total correlation coefficient of 0.3 or more was considered as adequate evidence of homogeneity and hence reliability. (14)

To address the second objective of the study, to quantify the potential influences of the independent variables, descriptive statistics were used to summarise performance for each of the 10 assessment items, plus the overall combined score. This was followed by an ANOVA to test the null hypothesis for the variables of ‘number of assessments’ and ‘length of experience’ (whether it was the first or last rotation in the year).

**Results**

**Respondents**

Of the 302 medical students, 237 consented to participate in the study (78%). Of these 237, data were available for collection from 200 junior doctors over the two year period (84% of the consented participants). The mean age of participants was 23 years (SD 2.3, range 20–37 years). The total number of assessments completed of the 200 junior doctors included in this analysis was 822 individual assessments. The proportion of females in the respondent group was 54%, representative of the population of graduands. There was no significant difference identified in descriptive scores for the two cohorts of respondents for the 10 items, therefore the findings of both cohorts are reported together.

**Descriptive findings and effect of timing of rotation**

As illustrated in Table 2 the lowest mean scores were obtained for the items pertaining to the ability to perform procedures, Emergency Management and the Doctor’s role in Society. The highest mean scores were observed for the items pertaining to abilities around professional behaviour, interpersonal skills, teamwork and written communication skills.
Table 2. Descriptive statistics of each item

<table>
<thead>
<tr>
<th>Items ranked in order of highest to lowest mean score</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork in the health care team</td>
<td>3.67 (0.48)</td>
</tr>
<tr>
<td>Interpersonal skills with patients</td>
<td>3.60 (0.49)</td>
</tr>
<tr>
<td>Professional behaviour</td>
<td>3.58 (0.50)</td>
</tr>
<tr>
<td>Clinical assessment and patient management</td>
<td>3.50 (0.51)</td>
</tr>
<tr>
<td>Written communication</td>
<td>3.48 (0.50)</td>
</tr>
<tr>
<td>Scholarly practice</td>
<td>3.35 (0.48)</td>
</tr>
<tr>
<td>Adverse event identification</td>
<td>3.34 (0.49)</td>
</tr>
<tr>
<td>Doctor’s role in society</td>
<td>3.31 (0.47)</td>
</tr>
<tr>
<td>Emergency management</td>
<td>3.27 (0.45)</td>
</tr>
<tr>
<td>Procedural skills</td>
<td>3.21 (0.42)</td>
</tr>
</tbody>
</table>

Most of the junior doctors were assessed three or more times (92%) in the first postgraduate year with only 1% assessed once and 7% assessed twice. As illustrated in Table 3, there was a small significant difference in the overall mean score obtained with the increasing number of times they were assessed ($F = 2.020$, $p = 0.014$). However, there were no observed effects of the amount of experience obtained ($F = 1.170$, $p = 0.294$). That is, the observed overall mean score obtained was not significantly different in the first rotation of the year compared with any of the other subsequent rotations of the year.

Table 3. Influence of number of assessments and rotation (experience) on overall combined score

<table>
<thead>
<tr>
<th>Category (count)</th>
<th>Overall combined score Mean (SD)/40</th>
<th>F (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of assessments (n = 688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once (8)</td>
<td>33.9 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Twice (48)</td>
<td>34.0 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Three times (136)</td>
<td>34.1 (3.3)</td>
<td>2.020 (.014*)</td>
</tr>
<tr>
<td>Four times (194)</td>
<td>34.3 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Five times (302)</td>
<td>34.6 (3.4)</td>
<td></td>
</tr>
<tr>
<td>First (160)</td>
<td>34.2 (3.3)</td>
<td></td>
</tr>
<tr>
<td>Second (167)</td>
<td>34.2 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Rotation (n = 688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third (146)</td>
<td>34.8 (3.3)</td>
<td>1.170 (.294)</td>
</tr>
<tr>
<td>Fourth (130)</td>
<td>34.5 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Fifth (102)</td>
<td>34.5 (3.2)</td>
<td></td>
</tr>
</tbody>
</table>

*p <0.05.
Dimension structure and reliability of the dimensions

A Cronbach Alpha of 0.883 was obtained for the 10 item scale with an Alpha of 0.786 for the items within the pre-existing Communication subscale, 0.776 for the Clinical Skills subscale and 0.759 for the subscale for Professionalism.

The 10 items were subjected to a principal components analysis (PCA) using SPSS Version 20 as summarised in Table 4. Prior to performing PCA, the suitability of the data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Oklin value was 0.912, exceeding the recommended value of 0.6 (14) and Bartletts Test of Sphericity reached significance, supporting the factorability of the correlation matrix.

(14) Principal component analysis yielded 2 factors with an Eigen value greater than 1, in total explaining 49.7% and 10.7% of the variance respectively. An inspection of the screeplot revealed a clear break after the second component. The factors (all with factor loadings of > 0.4) comprised six items that have been labelled “Clinical Management subscale” which explained 49.7% of the variance and four items labelled “Communications subscale” that explained 10.7% of the variance. There was a positive correlation between the two factors (r = 0.702).

<table>
<thead>
<tr>
<th>Item</th>
<th>Rotated Component 1</th>
<th>Rotated Component 2</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency management</td>
<td>0.795</td>
<td>0.659</td>
<td></td>
</tr>
<tr>
<td>Adverse event identification</td>
<td>0.709</td>
<td>0.326</td>
<td>0.609</td>
</tr>
<tr>
<td>Procedural skills</td>
<td>0.695</td>
<td>0.498</td>
<td></td>
</tr>
<tr>
<td>Doctor’s role in society</td>
<td>0.666</td>
<td>0.331</td>
<td>0.553</td>
</tr>
<tr>
<td>Scholarly practice</td>
<td>0.638</td>
<td>0.366</td>
<td>0.541</td>
</tr>
<tr>
<td>Clinical assessment and patient management</td>
<td>0.529</td>
<td>0.492</td>
<td>0.521</td>
</tr>
<tr>
<td>Teamwork in the health care team</td>
<td>0.821</td>
<td>0.712</td>
<td></td>
</tr>
<tr>
<td>Interpersonal skills with patients</td>
<td>0.819</td>
<td>0.707</td>
<td></td>
</tr>
<tr>
<td>Professional behaviour</td>
<td>0.303</td>
<td>0.760</td>
<td>0.670</td>
</tr>
<tr>
<td>Written communication</td>
<td>0.366</td>
<td>0.662</td>
<td>0.573</td>
</tr>
<tr>
<td>Cronbach Alpha for components</td>
<td>0.829</td>
<td>0.834</td>
<td></td>
</tr>
</tbody>
</table>

Note: major loadings for each item are bolded.
Cronbach Alphas for the 10 item scale was 0.883 and was 0.829 for the 6 item ‘Clinical Management subscale’ and 0.834 for the 4 item ‘Communication subscale’, indicating good internal consistency and reliability of the questionnaire in its entirety and for both subscales.

Discussion

This paper reports a validation study of the Junior Doctor Assessment Tool as used for PGY1 doctors in Australia, as used on Western Australia. Interestingly, the lowest mean scores were obtained for the items pertaining to the ability to perform procedures and emergency management and the highest mean scores were around professional behaviours, interpersonal skills, teamwork and written communication skills. While these findings may reflect the type of clinical work in each attachment and the relationship or type of interaction between the supervisor and junior doctor, they do fit with those reported in the literature on the areas where graduates feel most and least prepared when commencing the first post graduate year. (15,16) While there was a small statistically significant increase in the overall mean score obtained with an increasing number of assessments, this increase is unlikely to be practically applicable. Moreover, the observed overall mean score obtained was not significantly different in the first rotation of the year compared with any of the other subsequent rotations of the year. Therefore it appears that each piece of assessment is independent for that junior doctor in that particular rotation. It is possible the assessors adjust the standard by which they are assessing the junior doctor according to how much experience they have obtained (starting off or nearing the end of their first year), in particular as the descriptor for the performance level where “Most doctors will be in this category” (Category 3), is “At expected level”. It is also possible that the tool is just not sensitive enough to pick up these changes. However, if performance is being assessed in this way then it limits the ability of the
assessment process to monitor for the expected development and progression of junior doctor performance over the whole year.

A high level of internal consistency was identified for the items in the assessment tool. This internal consistency is highest when considering the scale in its entirety (0.883), but the Clinical Management subscale with 6 items and the 4 item Communication subscale both have Cronbach Alphas above 0.82.

Together the findings discussed here, point to a tension between the reliability and validity of the tool and echoes similar findings from elsewhere. (9, 17) The analysis demonstrated two principal components – rather than the three factors commonly reported, which reflect the way the assessment form is structured, with the questions falling into the three areas of clinical management, communication skills and professionalism. Robust factor structures with good internal consistency were found for two subscales that have been labelled “Clinical Management” and “Communication”. It would appear that the Clinical Management subscale is assessing a combination of knowledge and skills in the area of clinical management while the Communication subscale is measuring interpersonal and written communication skills alongside some aspects of professional behaviour. However, exactly how assessors are interpreting some items remains unclear, therefore it may be more valid and reliable to use the 10 items of the scale or individually to comment on the junior doctors’ performance in a particular area. Assessors need to consider which of the 10 items are most important for monitoring development of the junior doctor and whether this differs for different clinical attachments. One recent study suggested that underperformance of junior doctors was more likely to be detected in emergency medicine rotations. (18)

Limitations to this study include the loss to follow up of 30 of the original 237 study participants, incomplete data and the difficulties of interpreting the category of ‘not observed’ and of summarising the junior doctor assessment data by combining the
scores for the individual assessment items. Despite these limitations, the findings of this study do seem to be validated by the literature. It would increase the generalizability of these findings if other states in Australia replicated this work so as to confirm the component analysis of the tool that has been widely adopted for use. It is understood factors such as training of assessors, whether assessors ensure multi-source feedback is used, the qualitative aspects of the feedback given to the junior doctors or the gender of the learner can have an effect on the assessment scores obtained or the sensitivity of the assessment to identify the junior doctor with performance difficulties. All these factors need to be optimised so underperforming or incompetent trainees are identified accurately.

Conclusions
The important finding in this work has shown taking a commonly used tool (WBA from UK and many other countries) and contextualising it to an Australian setting by covering the main components of the Junior Doctor Curriculum Framework, resulted in distorting the way these measures are used to determine learner competence. The components of the tool have been analysed and only two rather than three areas are being used. It will be more meaningful and potentially more influential to consider these factors and the potential resultant educational impact of this assessment process for monitoring junior doctor development and progression through a qualitative analysis. From there we will be able to answer how we utilise this junior doctor performance scores to evaluate relationships between academic and work place based performance.
References


8. CPMEC: **Australian Curriculcum Framework for Junior Doctors.** In *Australia Confederation of Postgraduate Medical Education Council.* ; 2009. Available from:


Preface

Once the validation of the JDAT was completed, it was timely to describe the assessment process for junior doctors in a meaningful way and explore the possible impact the process has on junior doctors’ experience of learning in the first postgraduate year. There is some tension between the formative processes of this assessment, to support learning in junior doctors and the summative aspects of the process, to determine those junior doctors who will be registered at the end of the first postgraduate year and those who will not.

While there are some recent published Australian studies describing how assessors have completed the tool, a review of the literature demonstrated little research around identifying the strengths and weaknesses of specific skill areas for junior doctors; including how performance differs across clinical disciplines and assessment that identifies junior doctors in difficulty. The findings of this mixed methods study offers insights into the value of the JDAT and the missed opportunities to ensure the development of junior doctors through a lack of detailed written feedback being provided.

The participants obtained lower mean JDAT assessment scores for abilities to perform procedures, manage emergencies and adverse event identification, and obtained highest mean assessment scores in abilities around their interpersonal skills, teamwork and professional behaviour. The findings indicate there was no association with experience, but there was a significant apparent effect of the discipline in which the rotation occurred with Emergency Medicine having significantly lower mean scores and Medicine having significantly higher mean
scores. This reinforces the author’s previous finding that marks obtained by students in the Emergency Medicine attachment were predictive of junior doctors’ performance.

The JDAT appears to identify struggling junior doctors, as five junior doctors (female 2, male 3) were identified as having an overall workplace performance that was borderline or less than expected and these figures are in line with previously published figures of 1 to 3%.
Descriptive Analysis of Junior Doctor Assessment in the first postgraduate year


Authors: Sandra E Carr, Antonio Celenza and Fiona Lake

Abstract

Introduction: Preparing graduates for the role of the junior doctor is the aim of all medical schools. There has been limited published description of junior doctor performance in the workplace within Australia.

Methods: This cohort study describes junior doctors’ performance in the first postgraduate year, the influence of gender, rotation type, and amount of experience and explores the feedback process used for junior doctors across a two year period.

Results: Participants obtained lower scores for performing procedures, managing emergencies and adverse event identification and highest scores for interpersonal skills, teamwork, written communication and professional behaviour. There were no observed effects of the amount of experience but, were effects of the discipline in which the rotation occurred. Five juniors doctors, two female and three male, were classified as having overall borderline performance, 2.5% of the respondents. These findings were supported by content analysis of the written feedback. While feedback was documented in 94% of occasions, this was not given to the junior doctor 25% of the time.

Conclusions: The findings in this study support the claim that the tools and processes being used to monitor and assess junior doctor performance could be better. The Australian medical board appears to be looking for an assessment
process that will both discriminate the poorly performing doctor and provide educational guidance for the training organisation. These two intents of the assessment may be in opposition to each other.

**Keywords:** junior doctor assessment; feedback;

**Practice Points**

1. Junior doctors may need more training and opportunities to practice skills and less instruction around their interpersonal skills and professional behaviour.

2. Borderline performers need to be monitored more closely throughout the first postgraduate year.

3. The first postgraduate year should be seen as a year-long clinical placement.

4. Written feedback needs to be specific enough to guide a struggling junior doctor.

5. There appear to be two potentially conflicting intents of junior doctor assessment.
Introduction

Recently, Australia along with many other parts of the world has seen rapid changes in the education and training of junior doctors. These changes include better definition of outcomes, such as through the Australian Junior Doctor Curriculum Framework (JDCF), an educational program running alongside clinical duties, an emphasis on feedback and support and changes to assessment. Additionally medical schools have changed their programs with the aim of better preparing students for their role as junior doctors. Surveys suggest most graduates feel well prepared, and only 15 per cent felt forced to cope with clinical problems beyond their competence. (1) Medical graduates from the UK reported feeling most prepared for aspects of working with patients and colleagues, history taking and examination and least prepared for some aspects of prescribing, performing complex practical procedures and for applying knowledge of specific therapies. (2,3)

Assessment during the first training year has moved away from the traditional one-off type of assessment towards multi source feedback, looking at a broad range of skills, and at a doctor’s longer-term performance. (4,5,6,) In addition to clinical skills, teamwork, working with colleagues and patients, integrity and communication skills, is being assessed. For junior doctors the assessment can be a significant barrier as they must demonstrate satisfactory performance to qualify for general medical registration at the end of that first year. In Australia, registration is now through a national scheme overseen by the new Medical Board of Australia. (7) The MBA has endorsed the intern-assessment processes of each state, which are very similar, but is moving to a nationally uniform system. In recent work we showed the 3 categories on the assessment tool used in Western Australia, of Clinical Management, Communication and Professionalism, which were based on the areas
in the JDCF, were only being assessed as two core areas, namely Clinical Management and Communication. We felt this may be due to supervisors not being comfortable with what some of the areas under Professionalism, such as Doctor in Society, meant or how they could be assessed. As such, the tool may only be capturing part of what a junior doctor does and needs to develop.

The Australian medical board appears to be looking for an assessment process that will both discriminate the poorly performing doctor and therefore provide a barrier to registration, and provide educational guidance for the development of the junior doctor. Epstein noted in developing an assessment, it is important to consider the intent (8), and for junior doctors these are 1. protecting patient safety by identifying underperformance issues; 2. guiding the trainee’s professional development by providing feedback to the trainee on how to improve performance; 3. documenting satisfactory performance so that the trainee can progress to higher training (summative assessment); and 4. identifying strengths and weaknesses of the education and training process. (9)

In terms of picking the failing trainee, the vast majority of junior doctors perform well if measured by the results of assessment. In Australia, a recent review from NSW concluded 99% of first post graduate year (PGY1), trainees were assessed by their supervisors as performing at or above the expected level on all assessment items, although their data would suggest that not all areas are clearly assessed. (9) How well the process acts to support and inform training is less clear, however a review of the process of feedback, both written and verbal, should provide insights.
In the educational literature, clear standards for best practice with regard to feedback are available. Australia has a well-supported health service, with undergraduate through to postgraduate training programs at the sites where junior doctors are working, with senior staff in general aware of and supportive of supervision and teaching, and staff development through written, on-line and face to face programs available. Whether this translates into best practice is not clear however and such knowledge would help direct where resources should go.

In the study by Bingham from Australia (NSW), the written comments made by supervisors, although encouraging, were found to be generally short and lacking in specificity that trainees might use to guide improvements. This finding is in line with other reports from elsewhere. (3, 10) Our study aims to contribute to the understanding of how the Australian developed junior doctor assessment tool is implemented and review where staff development could be usefully aimed to ensure the assessment tool meets more of the outcomes desired from its implementation. Specifically, our study allows review of both assessment results and how the tool is implemented across clinical areas, where, because of the nature of clinical services, differences exist in terms of how close supervision is the range of clinical activities carried out and the continuity of supervision. With such information, we can better match tools, staff development and expectations.
Methods

Context
This paper reports on a descriptive cohort study of the Junior Doctor Assessment tool (JDAT) as used for PGY1 doctors over a two year period. Specifically this paper addresses four core research questions, namely;

1) how did this sample of junior doctors perform on the JDAT in PGY1 including how many are not meeting the expected standards and in what skill areas do they perform best and worst;

2) what is the influence of demographic factors including gender, rotation type, and amount of experience on this sample of junior doctors’ performance;

3) who is providing the assessment feedback? - the supervising clinician, other doctors, other health professionals or patients;

4) what written feedback do the assessors give to junior doctors and how does this align with assessment performance scores and external criteria as to what represents useful feedback.

Study population

Two groups of senior medical students from Years 5 and 6 of a six-year undergraduate curriculum (n = 303) were recruited as part of a larger prospective study. The study was explained to the group in large face-to-face sessions and written consent was obtained. Ethics approval was sought from the University of Western Australia and tertiary hospital settings the graduands would be working in for their first postgraduate year in 2008 and 2009.
**Tool Description**

The assessment tool was developed by the Postgraduate Medical Council of Western Australia (PMCWA, 2012) to assess performance in three areas, Clinical Management, Communication and Professionalism through 10 discrete items. The items were based on the roles and outcomes outlined in the Australian Junior Doctor Curriculum Framework. (12) The tool has been used at the three tertiary public hospitals in Western Australia since 2008. As depicted in Figure 1 each item is assigned one of five categories: not observed, below expected level, borderline, requires assistance, at expected level and better than expected. If a junior doctor is identified as performing at level 1 or 2, the assessor is asked to provide comments to support their rating. Each junior doctor is meant to be assessed five times in PGY1. The JDAT is completed by the supervising clinician at the end of each 10 week rotation or attachment.

In addition to the ratings of these 10 items the assessor rates the junior doctors overall performance during the attachment in the form of a global rating using a four point Likert scale where 1= below expected level, 2= borderline- requires development, 3= at expected level, 4= above expected level.

Assessors are also asked to document the junior doctor's strengths, areas for improvement including specific information supporting ratings of borderline or below expected performance. Additionally, assessors are asked to comment on whether they have made this assessment based on close personal observation, general impression and whether other health professional staff have informed the judgement.
Dependent Variables

The outcome variables of interest are the performance on the 10 items, the combined total score (out of 40) for each rotation and the assessor’s global rating of performance (out of 4).

Independent Variables

The independent variables included in this study were gender, clinical attachment specialty area (medicine, surgery, psychiatry, emergency medicine, timing of the assessment (first, second, third, fourth or final rotation), the inclusion of feedback by the assessor sought from multiple sources, and the number of assessments completed over the 12 month period. If the specialty rotation was not clear to the researcher or absent from the assessment form it was labelled as “other specialty”.

Data collection methods

The data of junior doctor performance was collected directly from the medical administration departments in the public hospitals where the junior doctors were employed in the first postgraduate year. Data were entered, coded and de-identified into SPSS V20 for statistical procedures over a two year period between 2008 and 2009.
### Figure 1. Junior Doctor Assessment Form (JDAT)

<table>
<thead>
<tr>
<th>Not observed</th>
<th>Below expected level. Requires substantial assistance</th>
<th>Borderline. Requires assistance</th>
<th>At expected level</th>
<th>Better than expected</th>
</tr>
</thead>
</table>

#### CLINICAL MANAGEMENT
5. Clinical Assessment and Patient Management
6. Procedural Skills
7. Emergency Management
8. Adverse event identification and risk minimisation

#### COMMUNICATION
11. Interpersonal skills with Patients
12. Team work/Interpersonal skills with others in the health care team.
13. Written communication/Record keeping

#### PROFESSIONALISM
14. Professional Behaviour (responsive / reflective / ethical)
15. Scholarly Practice (learning / critical thinking)
16. Doctor’s Role in Society (manager / role model)

Please support these ratings with comments overleaf.

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**Data Analysis**

Mixed methods of analysis procedures have been applied to the data to increase the reliability and validity, through triangulation, of the interpretation of the findings. (13)

The junior doctor assessments data were presented as a numerical value out of 4 for the 10 assessment items where 1= below expected level, 2= borderline, requires assistance, 3= at expected level and 4= better than expected. Each item was assigned a score of between 1 and 4 with no value being given to ‘not observed’ for each of the 10 items and summed to give a score out of 40 for each assessment.
The data was treated as parametric with descriptive statistics applied to assessment scores for each of the ten items including measures of central tendency and spread.

The influence of the independent variables on the dependent variable of interest was explored through an analysis of variance. Assessments with missing data were excluded from this aspect of the analysis. The independent variables of interest were gender, rotation type (medicine, surgery, psychiatry and emergency medicine), amount of experience (first, second or last term) and the number of times a junior doctor is assessed over the 12 month period.

A summative content analysis (14) was undertaken of the open ended comments made by assessors of junior doctors using TEXTSTAT (15). In a summative content analysis key words or content in the text (manifest content analysis) are identified and quantified. (16) Furthermore, a thematic analysis was applied to explore patterns and themes recurring in the text. (17) The global rating of performance and the inclusion of feedback from multiple sources by assessors was considered in conjunction with the open ended comments about the strengths and weakness of the junior doctor’s performance. Frequency statistics were applied to the ordinal data collected on the sources of feedback sought by the assessor and frequency with which feedback was given to the junior doctor.

Results

Respondents

Of the 302 medical students, 237 consented to participate in the study with data available for collection from 200 junior doctors over the two year period (84% of the consented participants). The mean age of participants at the commencement of the study was 23 years (SD 2.3, range 20–37 years). The proportion of females in the respondent group was 54%, which is representative of the population of graduands.
The total number of assessments completed of the 200 junior doctors was 822 individual assessments. There was no significant differences identified in descriptive scores for the two cohorts of respondents for the 10 items, therefore the findings of both cohorts are reported together.

Descriptive findings

Overall the mean scores for each item were high with only a small number of junior doctors falling below acceptable performance level. As illustrated in Table 1 the lowest mean scores were obtained for the items pertaining to the ability to perform procedures, emergency management, procedures, adverse event identification and the doctor’s role in society. The highest mean scores were observed for the items pertaining to abilities around teamwork, professional behaviour and interpersonal skills.

The items with the highest number of junior doctors identified as being a poorer performer (scores of 1 = below expected level, or 2 = borderline) were related to clinical assessment and patient management (n=5, 0.6%), teamwork (n=5, 0.6%), written communication (n=4, 0.5%) and adverse event identification (n=4, 0.5%). The items where the fewest junior doctors were identified as poor performers were interpersonal skills, professional behaviour and scholarly practice. The mean (SD) for Overall Combined Score, out of 40 for the 10 assessment items was 34.41 (3.38).
Table 1. Mean (SD) for the 10 items and Count (%) for junior doctors identified as performing below expected level or ‘borderline’ for items on the junior doctor assessment tool (n=822)

<table>
<thead>
<tr>
<th>Items ranked in order of highest to lowest mean score</th>
<th>Mean (SD)</th>
<th>Score &lt;expected or borderline</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork in the health care team (n= 821)</td>
<td>3.67 (0.48)</td>
<td>5 (0.6)</td>
<td></td>
</tr>
<tr>
<td>Interpersonal skills with patients (n= 820)</td>
<td>3.60 (0.49)</td>
<td>1 (0.1)</td>
<td></td>
</tr>
<tr>
<td>Professional Behaviour</td>
<td>3.58 (0.50)</td>
<td>2 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Clinical Assessment and patient management (n=821)</td>
<td>3.50 (0.51)</td>
<td>5 (0.6)</td>
<td></td>
</tr>
<tr>
<td>Written Communication (n= 819)</td>
<td>3.48 (0.50)</td>
<td>4 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Scholarly Practice (n= 815)</td>
<td>3.35 (0.48)</td>
<td>1 (0.1)</td>
<td></td>
</tr>
<tr>
<td>Adverse event identification (n= 809)</td>
<td>3.34 (0.49)</td>
<td>4 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Doctor’s role in society (n= 798)</td>
<td>3.31 (0.47)</td>
<td>3 (0.4)</td>
<td></td>
</tr>
<tr>
<td>Emergency Management (n= 782)</td>
<td>3.27 (0.45)</td>
<td>2 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Procedural Skills (n= 729)</td>
<td>3.21 (0.42)</td>
<td>1 (0.1)</td>
<td></td>
</tr>
<tr>
<td>Overall Score (/40)</td>
<td>34.41 (3.33)</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Influence of Demographic factors: gender, specialty, rotation and number of assessments overall combined junior performance

There were no observed effects of the amount of experience obtained, as expressed by the number of rotations completed, on the overall combined score or the individual score for any of the 10 items. Most of the junior doctors were assessed three or more times (93%) in the first postgraduate year with only 1% assessed once and 7% assessed twice. As illustrated in Table 2, there was no difference in the
overall mean score obtained if the junior doctor was assessed once, twice, three
times, four times or five times.

In contrast, there were apparent effects of the discipline in which the rotation
occurred on the mean scores (F=17.76, p<0.000). Emergency Medicine had
significantly lower mean scores while junior doctors in Medicine and Surgery
rotations had the highest observed mean scores. In addition, females obtained
higher mean scores than males (F= 4.84, p= 0.028).

Table 2. Influence of Gender, Specialty, Number of Assessments and Rotation
(experience) on Overall Combined Score

<table>
<thead>
<tr>
<th>Category (count)</th>
<th>Overall Combined Score Mean (SD)</th>
<th>F (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong> (n=688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (315)</td>
<td>34.10 (3.3)</td>
<td>4.84 (.028*)</td>
</tr>
<tr>
<td>Female (373)</td>
<td>34.67 (3.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Term Type/Specialty</strong> (n=688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine (174)</td>
<td>35.20 (3.3)</td>
<td>17.76 (.000**)</td>
</tr>
<tr>
<td>Surgery (176)</td>
<td>35.05 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Em Medicine (157)</td>
<td>32.42 (2.6)</td>
<td></td>
</tr>
<tr>
<td>Psychiatry (40)</td>
<td>35.52 (3.7)</td>
<td></td>
</tr>
<tr>
<td>Other specialty (121)</td>
<td>34.77 (3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Assessments</strong> (n= 688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once (8)</td>
<td>33.87 (3.4)</td>
<td>0.91 (.456)</td>
</tr>
<tr>
<td>Twice (48)</td>
<td>33.97 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Three times (136)</td>
<td>34.15 (3.3)</td>
<td></td>
</tr>
<tr>
<td>Four times (194)</td>
<td>34.32 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Five times (302)</td>
<td>34.66 (3.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Rotation</strong> (n=688)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First (160)</td>
<td>34.17 (3.3)</td>
<td>0.09 (.470)</td>
</tr>
<tr>
<td>Second (167)</td>
<td>34.17 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Third (146)</td>
<td>34.76 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Fourth (130)</td>
<td>34.49 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Fifth (85)</td>
<td>34.57 (3.2)</td>
<td></td>
</tr>
</tbody>
</table>

*p <0.05 ** p<0.01

Content Analysis and Analysis of feedback processes

Table 3 presents a summary of how the Junior Doctor Assessment form was
completed through the use of a tally of the number of assessments, who completed
the assessments and the sources of feedback or assessment obtained. The majority of assessment forms included written feedback about performance with only 6.3% of the completed forms having no comments recorded. Ninety one per cent of the forms included comments on strengths and 56% on areas for improvement with junior doctor performance. The majority of assessments (88%) were based on close personal observation, 37% on the assessor’s general impression, 46% were based on observations made by others and 21% based on all three. On 80% of occasions the assessor consulted with others, including other consultants (52%), registrars (54%), nursing staff (29%) and other members of staff (5%) with three or more sources of feedback sought in 19%. Feedback about the assessment was given to the junior doctor 75% of the time, although it is not clear if this included a face to face meeting, leaving 25% of junior doctors not given feedback even in the form of a copy of the assessment result.
Table 3. Summary of how Junior Doctor Assessment Forms were completed by Assessors

<table>
<thead>
<tr>
<th>Number of Assessments completed =822</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No comments recorded by assessor</td>
<td>52</td>
<td>6.3</td>
</tr>
<tr>
<td>Comments on strengths of junior doc</td>
<td>745</td>
<td>90.7</td>
</tr>
<tr>
<td>Comments on weaknesses of junior doc</td>
<td>461</td>
<td>56.1</td>
</tr>
<tr>
<td>Assessment based on personal observation (assessment only based on personal observation by assessor)</td>
<td>729(319)</td>
<td>88.7(38.8)</td>
</tr>
<tr>
<td>General impression (Only based on general impression)</td>
<td>303(31)</td>
<td>36.9(3.78)</td>
</tr>
<tr>
<td>Observations made by others (based only on assessment by others)</td>
<td>381(14)</td>
<td>46.4(1.64)</td>
</tr>
<tr>
<td>Assessment based on all three sources</td>
<td>176</td>
<td>21.4</td>
</tr>
<tr>
<td>Other staff consulted by the assessor</td>
<td>657</td>
<td>79.9</td>
</tr>
<tr>
<td>Assessor consulted with Consultants</td>
<td>431</td>
<td>52.5</td>
</tr>
<tr>
<td>Assessor consulted with Registrars</td>
<td>448</td>
<td>54.5</td>
</tr>
<tr>
<td>Assessor consulted with Nursing staff</td>
<td>235</td>
<td>28.6</td>
</tr>
<tr>
<td>Assessor consulted with other members of staff</td>
<td>42</td>
<td>5.05</td>
</tr>
<tr>
<td>All boxes checked, 3 or more sources of feedback sought by the assessor</td>
<td>153</td>
<td>18.68</td>
</tr>
<tr>
<td>Feedback given to junior doctor Yes/No(missing data )</td>
<td>613/152(57)</td>
<td>74.6/18.5(6.9)</td>
</tr>
</tbody>
</table>

**Overall Global Performance**

In addition to rating performance against each of the ten items described above, assessors were asked to provide an overall global rating of the junior doctors performance, 1= below expected level (requiring substantial assistance); 2= borderline (requires development); 3= at expected level and 4= better than expected.
When assessors were asked to provide a “Global Rating”, of the junior doctor, 82% did so. Of these 671 ratings, the assessor identified the junior doctor as being borderline or below the expected level of performance overall in only seven instances (1.0%) with 2 assessments identifying the junior doctor as being below expected level and 5 identifying the junior doctor as being borderline, requiring development.

Conventional Content Analysis

A summative content analysis was undertaken, which resulted in three concepts identified by assessors as key areas of strength for the junior doctor (team member, communication, and knowledge) and three main areas for improvement (knowledge, time management and practical/procedural skills).

More comments made were pertaining to strengths of the junior doctor rather than identifying areas for improvement. The length of the comments ranged from 3 to 15 words with most typically 8 to 10 words. Most assessors identified two or more areas of strength with typically only two areas of weakness. When identifying areas of strength, assessors most often used excellent (72 times), reliable (81 times); enthusiastic, dedicated, hardworking (81 times) and competent (21 times). When documenting areas for improvement assessors did not commonly apply the opposite of the adjectives identified above, but indicated junior doctors needed more experience or exposure and opportunities to develop (65 times), needed to improve their knowledge base (27 times) or practical skills (25 times). Assessors used the terms “poor” or “weak” to describe a junior doctor’s performance twice and no junior doctors were identified as being unreliable or incompetent.
Table 4. Summary of content analysis

<table>
<thead>
<tr>
<th>Category Identified</th>
<th>Sample comments (positive in italics negative in bold)</th>
<th>Count positive</th>
<th>Count negative</th>
</tr>
</thead>
</table>
| Team Member         | “works well in a team professional attitudes, good manners”  
|                     | “*needs to communicate more effectively with team- she is aware of this and is making effort*” | 96             | 5              |
| Written and verbal Communication skills | “Excellent communicator, mature attitude, friendly to patients”  
|                     | “Good record keeping and communication skills patient interaction and liaising”  
|                     | “*Needs to develop skills in appreciating impact of communication on patients and staff*” | 155            | 3              |
| Knowledgeable       | “emergency mx theoretical knowledge about various psychiatric disorders”  
|                     | “*will need to strengthen anatomy knowledge in pursuit of surgery as a vocation*” | 34             | 27             |
| Time management     | “Excellent time management skills good communicator”  
|                     | *work on time management- will develop with time* | 10             | 9              |
| Professional        | “Highly developed professional skills and strong work ethic”  
|                     | “*...discharge letters, time mx, professionalism- blaming others, not taking responsibility...*” | 15             | 3              |
| Practical Skills    | “ask appropriate questions, motivated with procedural skills including Hickmans line removals”  
|                     | “*not had enough opportunity to develop procedural skills experience*”  
|                     | “*...try to gain more procedural skills...Lacks confidence*” | 3              | 25             |
When the assessment forms for the junior doctors with low global scores were reviewed, five junior doctors were identified as having overall performance that was borderline or less than expected with two of them being female and three, male. This equates to 2.5% of the 200 junior doctors included in this study. In two instances, the assessment occurred in the first term, one junior doctor was assessed as borderline in both the first and second term and in one instance the junior doctor was assessed as borderline in the fourth term.

Six of the seven assessors giving the low score were Consultant level clinicians with one being a Senior Registrar. In four instances, the junior doctor was in a medicine attachment, two were completing an Emergency Medicine attachment and one was from a surgical attachment. In all instances, multiple sources of feedback had been sought by the assessor. This feedback had been discussed with the junior doctor and specific written comments were documented. These comments and subsequent assessment outcomes are summarised in Table 5 below for the five junior doctors identified.

Table 5. Summary of Assessment for Borderline Performers (n=5)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1. | The junior doctor was described as thoughtful, and able to develop a good patient rapport. Specific comments related to their borderline performance were:  
“Assessments require more focus and management plans need some detail. Documentation needs more detail, concentrating on impression/diagnosis and plan. Improve speed of assessments and organising referrals. Differential diagnosis/synthesis of problems needs work.”

This junior doctor was assessed four more times in the year, obtaining global performance ratings of 3 and 4. |
| 2. | This junior doctor was described as working hard, being diligent and passionate. Specific comments related to their borderline performance were:  
“Assertiveness, record keeping, organisation, and prioritisation based on clinical importance, initiative. Has improved significantly since mid-term assessment and will make an excellent doctor with encouragement and ongoing supervision and clear instructions.” |
In the second term no comments around strengths were recorded. Specific comments around areas for improvements were:

“Performance improved throughout the latter half of the term to an acceptable standard”.

No specific areas for improvement were noted on the form, however several letters were included in the junior doctors file indicating that multiple sources of feedback had been sought around their communication and interpersonal skills- no other assessments were recorded in the junior doctors records at the end of the data collection phase.

3. The identified strengths of this junior doctor included their ability to work hard, time management, organisation of work tasks, clinical information and problem formulation. Specific comments around areas for improvements were:

“Email complaint by nursing staff regarding YYY’s manner and professional behaviour- this was followed up.”

This junior doctor obtained scores of 3 in two subsequent assessments, comments around communication skills and professional behaviour demonstrated an improvement over the course of year with no further complaints.

4. This junior doctor was described as being at the expected knowledge level and inquisitive. Specific comments around areas for improvements were:

“Needs to perform thorough history, examination and follow up of patients, needs to fully apply themselves even when working in a specialty which may not be of their long term choice. These concerns were raised midterm- but they did not present for end of term review.”

This junior doctor obtained a global score of 4 in assessment during the first clinical term, there was no further evidence of assessment in the junior doctors file in subsequent rotations.

5. This junior doctor was described as having an overall reasonable attitude to the job- non- judgmental and interacting very well within the team with a willingness to assist others with their workload. Has made significant improvements throughout the term. Specific comments around areas for improvements were

“Knowledge base in area needs improving (independent study). Improvement in history taking and clinical assessment. The impression from multiple doctors within the unit was that XXXX required substantial support and close supervision. There have been issues regarding discussing of XXXX and interpretation of results for these tests.”

Similar comments were made in a previous term, and the junior doctor had refused to sign the assessment as they did not agree with the statements. A subsequent and final assessment report was very positive with a global rating of 4.
Discussion

The findings of this mixed methods study contributes to the understanding of how graduates of one Western Australian university performed on the JDAT in PGY1 over a two year period and offers insights into the value of the tool, through analysis of how the assessment tool was completed. It is likely these findings are representative of many other centres and the insights will be of value to other training institutions and Australian states. The junior doctors in this study obtained lower mean assessment scores for abilities to perform procedures, manage emergencies and adverse event identification and obtained highest mean assessment scores in abilities around their interpersonal skills, teamwork and professional behaviour. These descriptive findings were supported by content analysis of the written comments in this study and are in line with assessments, identification of perceived need for competence and self-rated preparedness scores reported elsewhere. (3, 18)

The analysis of the measures of central tendency and spread of the distribution identified that there are a range of scores being allocated. Similar findings have been recently reported in a Queensland study. (19) There were no observed effects of the amount of experience obtained, as expressed by the number of rotations completed (assessed in the first or final rotation) or if the junior doctor was assessed once, twice, three, four or five times. There was no effect of experience, and we believe it is likely the assessors are adjusting their mark to the expected standard of performance at that stage of training rather than expected performance for a newly registered doctor, thus treating each rotations assessment as independent rather than part of continuous assessment over the course of the first postgraduate year. This raises some concern as to the reliability of the tool to make decisions about
progression from PGY1. If the final assessment is the only one truly assessing the junior doctor’s performance against the standard expected for a registered doctor, then the reliability of that will be limited. (20) In addition, valuable areas for improvement may not be clearly articulated to the junior doctor throughout the year.

To increase the specificity of the tools ability to correctly identify poorly performing junior doctors, and enhance attention for all trainees on areas to improve, it is recommended that the standard expected for the learning outcomes being assessed should be for the end of PGY1 and that this information is made transparent for assessors and junior doctors. This would result in multiple assessments of the same standard of learning outcome and thereby increase the reliability of the identification of the poorer performer. (21)

In contrast, there were apparent effects of the discipline in which the rotation occurred with Emergency Medicine having significantly lower mean scores and Medicine having significantly higher mean scores. We have previously reported the marks obtained by students in the Emergency Medicine attachment, but not any other attachments, were predictive of junior doctors performance. The findings in this paper may reflect the emphasis placed on practical skills, emergency management and adverse event identification in the discipline of Emergency Medicine and teamwork, interpersonal and communication skills in Medicine however this finding cannot be confirmed by our study and warrants further qualitative investigation. Gender also demonstrated a statistically significant effect on the combined overall mean score obtained with females obtaining higher mean scores than males. While this effect may not be practically significant it is worth
noting and comparing with other studies—particularly as there were specific skill areas that females performed better in. This could affect the training approaches or supervision offered to junior doctors on the basis of gender into the future.

Five junior doctors (female 2, male 3) were identified as having overall performance that was borderline or less than expected. This equates to 2.5% of the 200 junior doctors included in this study and aligns with findings published previously that report between 1 and 3% of junior doctors performing below the expected level. (6, 9, 10) It is not clear, however whether identification of these poorer performers at the PGY1 level translates into the application of the Improving Performance Action Plan as described by CPMEC (12), whether these assessments had an impact on the ability of the junior doctor to become registered with the Australian Medical Board or how the identified poorer performers were followed beyond PGY1, but the lack of clear action in the trainees records raises concern.

With respect to the role of the assessment in “guiding the trainee’s professional development by providing feedback to the trainee on how to improve performance”, the tool worked well in that the majority of trainees received multiple assessments and received feedback in a face to face meeting with their consultants. This is important and suggests an opportunity that can be built on, in particular with the quality of the feedback. Several adjectives were used by the assessor to describe areas of strength of junior doctor performance, most often excellent, reliable; enthusiastic, dedicated, hardworking and competent and when documenting comments around areas for improvement assessors most commonly said that the junior doctors needed more experience or exposure and opportunities to develop. In
only two instances did an assessor use the terms “poor” or “weak” to describe a junior doctor’s performance. While 94% of assessments included some written feedback, this feedback was not specific enough to enhance performance and was not returned to the junior doctor 25% of the time. These seem to be missed opportunities to ensure that the assessment is being used to develop the junior doctors’ performance, and suggests staff development could shift from emphasising the “positive critique”, which many consultants seem to interpret as providing positive feedback, to focus on the quality of feedback. Alternately, a form which makes the supervisor state one or more areas, but only for improvement, may shift the balance of the critique.

While presenting or summarising the junior doctor assessment data by combining the scores for the 10 assessment items may be a limitation as is incomplete data for qualitative comments on PGY1 performance and the loss to follow up for a small number of the original 237 study participants mainly due to not completing internship in Western Australia or taking leave during the medical course, the findings of this study do seem to align with previous studies be validated by the literature.

Many assumptions about the benefits of clinical rotations, their optimal timing and structure, and on how transitions between clinical rotations should occur exist. (22) Our study suggests that staff development should focus on ensuring the first postgraduate year is seen by supervisors and trainees, as a year-long clinical placement rather than a series of short placements, and mechanisms be put in place to ensure communication occurs to bring forward issues from one rotation to the next. The Junior Doctor Assessment Tool appears more likely to identify the poorer
performer, when the performance in the separate items, global rating and written feedback are all considered together, but, the usefulness of this tool to provide specific feedback has not been realised and it’s use for monitoring and developing all junior doctors, not just the poor performers, could be bettered by describing the benchmark of performance in any terms as that expected for the end of PGY1. (23) Additionally, training of assessors, in particular on using the benchmark and increasing the quality and specificity of verbal and written feedback, and implementation of action plans for those few poorly performing junior doctors, will build on what we believe is the evident commitment of supervisors to engage in the process. Rather than throw out the tool because of limitations in the tool or the assessors, we believe with further training, it can meet the Australian medical board’s needs, for an assessment process that will not only discriminate the poorly performing doctor, but provide educational guidance for the training organisation to support the development of all junior doctors. These two intents of the assessment could work in opposition to each other, but with recognition of the potential tension in purpose and the needs of the individual trainee, and a focus on quality and specificity in feedback, both vital needs from the tool can be met.
References


Chapter 5: Relationship between academic and workplace performance in medical students and junior doctors

Preface

Now that the process and experiences of using the junior doctor assessment tool have been described, it is important to consider if any relationships between performance of medical students as undergraduates and workplace performance as junior doctors in the first postgraduate year exist.

At the time of commencing this research, there was very limited Australian data exploring possible statistical relationships between undergraduate academic and workplace performance. This was in contrast to other publications describing recent graduates’ perceptions’ of preparedness for beginning practice as a junior doctor that were being used to evaluate the appropriateness of medical courses. Research on assessment in medical education was focusing on individual measurement instruments and their psychometric quality.

With the local introduction of the JDAT across WA hospitals, an exploration of the studies being published in the UK and US was undertaken to explore associations between undergraduate assessment and workplace performance of doctors, and compare the local results with global research findings. However, as medical schools often teach and assess knowledge and skills in discrete areas such as anatomy or pathology or obstetrics or surgery, it is inherently difficult to decide which aspects of undergraduate education are most likely to correlate with generic skills and behaviours required of junior doctors in the workplace.

It was thought that the undergraduate OSCE examinations in Years 4 and 5 of the medical course and student performance during the clinical attachments in the last
year (Year 6) of the course may be the most likely to demonstrate a relationship with workplace performance in the first post graduate year.

While there are limitations of the JDAT, including the narrow inter-quartile range of scores, this was the only tool being used to assess workplace performance at the time of the study and it is still in use across Western Australia. While these limitations may affect the ability to generalise the findings prospectively to student groups and to other similar settings, at the time of publication the JDAT or a variation of the WA version remains the key assessment tool around Australia. Secondly, there are no similar studies being undertaken within Western Australia, so the findings are significant in understanding current practice and planning for the future.

At the time of submission of this thesis for examination the publication had been submitted for peer review to BMC Medical Education online on March 27th 2014. Subsequently, the paper was accepted and published on July 30th 2014. The electronic version of the article can be found at http://www.biomedcentral.com/1472-6920/14/157
**Publication**

**Relationships between academic performance of medical students and their workplace performance as junior doctors**

Authors: Sandra E Carr, Antonio Celenza, Ian Puddey and Fiona Lake


**Abstract**

**Context:** Little recent published evidence explores the relationship between academic performance in medical school and performance as a junior doctor. Although many forms of assessment are used to demonstrate a medical student’s knowledge or competence, these measures may not reliably predict performance in clinical practice following graduation.

**Methods:** This descriptive cohort study explores the relationship between academic performance of medical students and workplace performance as junior doctors, including the influence of age, gender, ethnicity, clinical attachment, assessment type and summary score measures (grade point average) on performance in the workplace as measured by the Junior Doctor Assessment Tool.

**Results:** There were two hundred participants. There were significant correlations between performance as a Junior Doctor (combined overall score) and the grade point average (r = 0.229, P = 0.002), the score from the Year 6 Emergency Medicine attachment (r = 0.361, P < 0.001) and the Written Examination in Year 6 (r = 0.178, P = 0.014). There was no significant effect of any individual method of assessment in medical school, gender or ethnicity on the overall combined score of performance of the junior doctor.

**Conclusion:** Performance on integrated assessments from medical school is correlated to performance as a practicing physician as measured by the Junior
Doctor Assessment Tool. These findings support the value of combining undergraduate assessment scores to assess competence and predict future performance.

**Keywords**: Workplace based assessment; Junior doctors; Undergraduate medicine
Introduction

While we know a purpose of medical schools is to educate and train medical students in preparation for the role of junior doctor, the role of the medical student and the role of the junior doctor are different (1). If assessment is matched to role, it may be difficult therefore, to assess medical students’ readiness to begin practice as a junior doctor, and to ensure that students who do not have the appropriate knowledge and skills do not progress. (2). In addition, there is a significant diversity in approach. Medical schools impart knowledge, provide opportunities to develop and practice skills, explore attitudes and apply behaviours relevant for practicing doctors. Many refer to such tools as the Australian Junior Doctor Curriculum Framework (3, 4) and the UK General Medical Council (GMC) Tomorrow’s Doctors (5), for guidance as to what attributes a junior doctor needs. In addition, much effort is taken to reliably assess medical students on their knowledge and performance related to these outcomes, in attempts to ensure competence. However, medical school curricula are not standardised against such guidelines and neither are the assessment methods used. (6) Such a diversity of approaches is likely to add to a mismatch between measurement of undergraduate academic performance and workplace performance of junior doctors. (7) Studies of the predictive validity of undergraduate academic performance on workplace performance of junior doctors, in general have shown poor correlation between measures of performance at these two levels. (8)

This poor correlation is supported by literature showing junior doctors do not always feel sufficiently prepared with respect to time management, aspects of prescribing and complex practical procedures, but feel most prepared for working with patients and colleagues, history taking and examination. (9) One large study of UK medical
schools found the proportion who agreed they had been well prepared for practice (after one year) ranged from 30 to 82% (10). They concluded that the vast knowledge base of clinical practice makes full preparation impossible. Many forms of assessment can be used to study a medical student’s knowledge or competence, however, if full preparation is not possible, undergraduate competence may not reliably predict performance in clinical practice. (11) Additionally, we know that the reliability and validity of assessments is context specific and there are reports in suggesting the final examination is not related to a student's clinical experiences, hence calling into question the validity of final examinations. (12) Differences in educational experiences in undergraduate Australian medical courses have been shown to influence how adequately prepared doctors are for their early working life. (13) Since these earlier studies, there have been changes in Australia and elsewhere in terms of both outcomes and assessment at both undergraduate and postgraduate levels. In addition, a shift to identifying poor performers rather than just determining a minimal standard (50%) suggests a broader view of how we identify who needs support and any action that should be taken. The purpose of this paper therefore is to explore the relationship between academic performance of medical students and workplace performance as junior doctors using a range of knowledge based, clinically based and combined measures, to see if they can be used to predict which students may need additional support.

**Methods**

**Context**

This descriptive cohort study, explores the relationships between assessment of academic performance of medical students and workplace performance of these medical students as junior doctors in the first postgraduate year (PGY1). Specifically,
it explores whether students with lower scores in medical school also have lower scores as junior doctors and whether performance in medical school predicts performance in assessment as a junior doctor.

Sample

Two groups of students from the 5th and 6th year of a 6-year undergraduate medical curriculum (n = 302) at a single University were asked to consent to the collection of data about their undergraduate and early postgraduate assessment performance. The small number of students, who failed, requiring them to repeat a year, could not be included as longitudinal data could not be obtained. Graduands seek employment, through application and interview, at a tertiary hospital of their choice to commence their first postgraduate year of work and training as a junior doctor.

During this first year, the junior doctors rotate through five different, 10 week clinical terms. Ethics approval was obtained from the University of Western Australia as well as the three tertiary hospital settings in which the graduands worked for their first postgraduate year.

Tool description

The Junior Doctor Assessment Tool (JDAT) has been developed to assess performance in clinical management, communication skills and professional behaviour throughout the first two postgraduate years. The tool consists of 10 discrete items that align to the areas of competency described in the Australian Junior Doctor Curriculum Framework. Each junior doctor is intended to be assessed summatively five times in during their first postgraduate year (PGY1) (14), with the JDAT being completed by the supervising clinician at the end of each 10 week rotation or attachment.
In a validation study of the JDAT, we identified a Cronbach Alpha of 0.883 for the 10 item scale and identified that two principal components of junior doctor performance are being assessed rather than the commonly reported three. (15) Cronbach Alphas were 0.829 for the 6 item ‘Clinical Management subscale’ and 0.834 for the 4 item ‘Communication subscale’, indicating good internal consistency and reliability of the instrument in its entirety and for both subscales. It was asserted that professionalism was not assessed as a discrete entity; instead, professional behaviours were being assessed alongside or at the same time as assessing each of the items in the scale. For this reason, only the combined score, along with the scores of the two validated subscales have been used in this analysis.

**Dependent Variables**

The outcome variable of interest is the junior doctor performance in PGY1 measured using the JDAT, with the mean combined overall score (out of 40), the mean score for the Clinical Management subscale (out of 30) and the mean score for Communication skills subscale (out of 10).

**Independent Variables**

The undergraduate academic performance measures used were written examination scores in Year 5 (Science and Practice of Medicine - comprising 5 Modified Essay Questions and 5 Short Answer Questions and Year 6 (Science and Practice of Medicine comprising 100 extended matching questions and 10 short answer questions); objective structured clinical examination (OSCE) scores for Year 4 and Year 5; and scores from clinical attachments in Year 6 that would replicate their clinical activities as junior doctors in PGY1 (medicine, surgery, psychiatry, and emergency medicine). Additionally, a combined score, the Grade Point Average (GPA), was included as an independent predictor variable.
The Grade Point Average (GPA) is a simple numerical index summarising academic performance in a course. At UWA the GPA is calculated by:

\[
\text{GPA} = \frac{\text{sum(unit points} \times \text{grade GPA})}{\text{sum(unit points)}}
\]

with a range of GPA from 0 to 7 units.

Demographic variables of interest included age, gender and self-identified ethnicity (coded into Asian and Caucasian). Aboriginal students were not coded in this study as there was concern that anonymity of the student may not be maintained due to the small number of indigenous students in the cohort.

Data collection methods

The data of participant performance as medical students were collected directly from the student administration repository of assessment scores. Junior doctor performance data were collected directly from the medical administration departments in the public hospitals where they were employed in the first postgraduate year. This data had not previously been collected and collated for analysis by the University of training hospitals prior to this study. Data were entered, coded and de-identified into SPSS V20 for statistical procedures over a two year period between 2008 and 2009.

Analysis

Quantitative analysis procedures have been applied to the data with descriptive statistics performed for each of the assessment measures as medical students and junior doctors. The mean with standard deviation (SD) and median with interquartile range (IQR) were calculated to report the dispersion of results and the number of students with a result that was lower than the 25\textsuperscript{th} percentile of GPA were recorded.
The influence of the independent variables on the dependent variable of interest was explored through Pearson’s Correlation, ANOVA and linear regression analysis. The predictor variables of interest were age group (less or equal to 23 years or greater than 23 years) gender, ethnicity, the mark from year 6 clinical attachments (medicine, surgery, psychiatry and emergency medicine), GPA and assessment method (OSCE, written examination).

Results

Respondents

Of the 302 eligible medical students, 237 consented to participate in the study (78%). Of these, data were available for collection from 200 junior doctors over the two year period (84% of the consented participants). The mean age of participants at the commencement of the study was 23 years (SD 2.3, range 20–37 years). The demographics of the respondents were representative of the population of the graduands with 54% of them being females, 104 (52%) self-identifying as Caucasian, 66 (33%) as Asian and 15% did not identify an ethnic background. There were no significant differences identified in the descriptive scores of academic performance for the two cohorts of respondents, or for the workplace performance scores for the three tertiary hospital training settings therefore the findings of both cohorts and all hospitals are reported together.

Descriptive findings

As documented in Table 1, for the assessment of Year 6 clinical attachments, Psychiatry had the lowest mean scores and the largest standard deviation and Medicine demonstrated the highest mean score with the smallest standard deviation. Emergency Medicine had the fewest students with scores below the 25th percentile.
For examinations, the Year 4 OSCE had the greatest number of students performing below the 25 percentile and the Year 6 Written exam had the least. The proportion of participants with scores below the 25th percentile as medical students (GPA) were similar in PGY1 (Combined score on JDAT).

Table 1: Measures of Central Tendency and Dispersion for Assessment Measures

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Mean (SD)</th>
<th>Median (IQR)</th>
<th>&lt;25 percentile (count)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=200)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment of Medicine</td>
<td>73.7 (5.1)</td>
<td>74 (71,77)</td>
<td>50</td>
</tr>
<tr>
<td>Surgery</td>
<td>72.1 (7.4)</td>
<td>73 (69,76)</td>
<td>52</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>73.3 (5.6)</td>
<td>71 (65,78)</td>
<td>23</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>71.6 (8.6)</td>
<td>72 (65,78)</td>
<td>42</td>
</tr>
<tr>
<td>Examinations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4 OSCE</td>
<td>68.7 (8.2)</td>
<td>70 (65,74)</td>
<td>62</td>
</tr>
<tr>
<td>Year 5 OSCE</td>
<td>66.3 (7.3)</td>
<td>67 (63,71)</td>
<td>46</td>
</tr>
<tr>
<td>Year 5 Written</td>
<td>68.3 (8.3)</td>
<td>69 (63,73)</td>
<td>48</td>
</tr>
<tr>
<td>Year 6 Written</td>
<td>71.1 (4.5)</td>
<td>71 (68,74)</td>
<td>38</td>
</tr>
<tr>
<td>Summary Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA</td>
<td>5.6 (.47)</td>
<td>5.6 (5.32, 5.93)</td>
<td>48</td>
</tr>
<tr>
<td>Assessment as a Junior Doctor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Management subscale (/24)</td>
<td>19.9 (1.37)</td>
<td>19.75 (19, 21)</td>
<td>40</td>
</tr>
<tr>
<td>Communication skills subscale (/16)</td>
<td>14.4 (1.4)</td>
<td>14.3 (13.8, 15)</td>
<td>50</td>
</tr>
<tr>
<td>Combined Overall Score (/40)</td>
<td>34.4 (2.23)</td>
<td>34.25 (33,36)</td>
<td>42</td>
</tr>
</tbody>
</table>

**Effect of Demographics**

Females obtained higher mean scores than males for the Year 5 written examination (P=0.001) and Emergency Medicine (P=0.034) and Asian students obtained higher scores in the Year 6 Emergency Medicine (P=0.030). In students older than 23 years there was a non-significant trend for higher mean scores on the Clinical Management subscale of the JDAT (P=0.06) and significantly higher scores in the Year 5 OSCE examination (P=0.045) There was no other significant effects of age, gender or ethnicity on measures of undergraduate performance or workplace performance.

**Relationships between academic and workplace assessment**
As summarised in Table 2, there were significant correlations between performance as a Junior Doctor (combined overall score) and the GPA ($r=0.229$, $P=0.002$), the score from the Emergency Medicine attachment ($r=0.361$, $P=0.000$) and the Written Examination in Year 6 ($r=0.178$, $P=0.014$). These correlations persisted when the Clinical Management subscale and the Communication skills subscales were used suggesting that junior doctor performance in all assessed areas were related to these measures of undergraduate academic performance. Additionally, a significant correlation was observed between both the JDAT combined overall score and the score obtained on the Clinical Management subscale of the JDAT with both the Year 4 and Year 5 OSCE scores. There were significant correlations between the written assessment in Year 6 and workplace performance as measured by both the Clinical Management subscale ($r=0.136$, $P=0.027$) and the Combined Overall score on the JDAT ($r=0.178$, $P=0.014$).

**Table 2. Correlations between academic measures and PGY1 performance**

<table>
<thead>
<tr>
<th>Academic Performance Measures N=200</th>
<th>Junior Doctor Performance Measures</th>
<th>Clinical Management Subscale</th>
<th>Communication Subscale</th>
<th>Combined Overall score</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA</td>
<td>$r$ 0.280</td>
<td>$P&lt;0.001^{**}$</td>
<td>0.288</td>
<td>0.257</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td>0.257</td>
<td></td>
</tr>
<tr>
<td>Year 4 OSCE</td>
<td>$r$ 0.197</td>
<td>$P&lt;0.001^{**}$</td>
<td>0.225</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td>0.001</td>
<td>0.027</td>
</tr>
<tr>
<td>Year 5 OSCE</td>
<td>$r$ 0.172</td>
<td>$P&lt;0.001^{**}$</td>
<td>0.244</td>
<td>0.161</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td>0.001</td>
<td>0.022</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>$r$ 0.229</td>
<td>$P&lt;0.001^{**}$</td>
<td>0.137</td>
<td>0.361</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychiatry</td>
<td>$r$ 0.075</td>
<td>$P=0.011^{*}$</td>
<td>0.161</td>
<td>0.094</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>$r$ 0.194</td>
<td>$P=0.011^{*}$</td>
<td>0.157</td>
<td>0.162</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>$r$ 0.26</td>
<td>$P=0.100$</td>
<td>0.091</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yr 5 Written Exam</td>
<td>$r$ 0.153</td>
<td>$P=0.076$</td>
<td>0.067</td>
<td>0.076</td>
</tr>
<tr>
<td></td>
<td>$P=0.017^{*}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yr 6 Written Exam</td>
<td>$r$ 0.136</td>
<td>$P=0.148$</td>
<td>0.088</td>
<td>0.178</td>
</tr>
<tr>
<td></td>
<td>$P=0.027^{*}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$r$= Pearson correlation coefficient, $P$=2 tailed probability where * is significant at $p<0.05$ and ** is significant at $p<0.01$. 

Sandra Carr
**Effect of Independent variables**

In the final linear regression models there was no evidence of multicollinearity (the independent variables are not related), with tolerance statistics for all independent variables greater than 0.7 and the VIF values between 1.1 and 1.4. In regression analysis there was no significant effect for the demographic variables of age, gender or ethnicity. There was a significant effect of the method of assessment in medical school on the overall combined score of the junior doctor ($F = 3.003, P = 0.042$) but there were no significant Beta coefficients for any individual assessment method. As illustrated in Table 3, scores in Emergency Medicine attachments in medical school demonstrated a significant influence on overall combined scores on the JDAT ($P < 0.001$), however while this significant influence of Year 6 Clinical Attachments did persist for the Clinical Management subscale ($F = 3.605, P = 0.007$) it did not persist for the Communication subscale ($F = 2.826, P = 0.26$). As depicted in Table 3, when measures of academic performance in medical school were summarised using GPA, a significant effect on the overall combined score of the junior doctor was observed ($F = 14.080, P = 0.001$) which persisted for both the Clinical Management subscale ($F = 16.879, P < 0.000$) and Communication subscale ($F = 18.060, p < 0.000$) indicating that performance in Emergency Medicine attachments or overall GPA both predicted performance in the junior doctor assessments used in PGY1.
Table 3. Multivariate linear regression and ANOVA of Combined Overall JDAT Score (workplace performance) with undergraduate clinical attachment scores, GPA or examination methods as the predictor variables

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Category (n=200)</th>
<th>Standardized Coefficient Beta (P value)</th>
<th>ANOVA F (P value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 6 Clinical Attachments</td>
<td>Medicine</td>
<td>0.104 (0.162)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surgery</td>
<td>0.077 (0.283)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergency Medicine</td>
<td>0.355 (&lt;0.001)</td>
<td>2.846 (0.025)</td>
</tr>
<tr>
<td></td>
<td>Psychiatry</td>
<td>0.033 (0.633)</td>
<td></td>
</tr>
<tr>
<td>Method of Assessments</td>
<td>Year 5 Written</td>
<td>0.041 (0.859)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Year 6 Written</td>
<td>0.105 (0.163)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Year 4 OSCE</td>
<td>0.060 (0.161)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Year 5 OSCE</td>
<td>0.123 (0.141)</td>
<td></td>
</tr>
<tr>
<td>Summary of Academic Performance</td>
<td>GPA</td>
<td>0.251 (0.001)</td>
<td>14.08 (&lt;0.001)</td>
</tr>
</tbody>
</table>

Discussion

Medical students in this study, all of whom formally passed, demonstrated a range of scores in both examination and performance in clinical placements as undergraduates. Emergency Medicine attachments in medical school demonstrated a significant association with overall combined scores on the JDAT which persisted for the Clinical Management subscale but not the Communication subscale. The most significant effect of measures of academic performance on the overall combined score of the junior doctor was observed for the GPA and this persisted for both the Clinical Management subscale and Communication subscale. Others have found similar results (8), supporting the combination of assessments to produce the strongest predictive validity. It is well recognised that clinical practice as such requires competence in a range of attributes; therefore no single method of assessment is likely to provide enough data to make a valid and reliable judgement of this integrated competence. (16)

Surprisingly there was only a small significant effect of the method of assessment in medical school (P = 0.042) on the overall combined score of the junior doctor. This effect was not explained by any individual assessment. There was a significant
correlation between junior doctor performance and the Year 4 and 5 OSCE’s, which was amplified between the OSCE score and the Communication subscale suggesting the OSCE may have played some part in prediction of performance in workplace based assessment. In an OSCE, a student must demonstrate behaviours and knowledge but a ward assessment by a supervising consultant may inform the highest predictor of clinical competence - the combined implementation of medical knowledge, procedural skills, communication and professional behaviour. Most medical schools have an OSCE as part of their final barrier examination and (6) others have reported its ability to predict future performance in clinical and psychomotor skills. (17,18) However, many of these studies have not looked at junior doctor performance. Rather they have studied performance in pre-clinical examinations to predict clinical performance later in medical school. Results are mixed with other studies finding OSCE’s are not predictive of future performance post-graduation unless part of a comprehensive assessment process.(8) These findings again re-enforce the differences between the narrowed expected performance of medical students and broader integrated expectations of medical graduates and as such warrant further large scale, multi-centre research.

Why the emergency medicine attachment was the only clinical attachment predictive of performance as a junior doctor is interesting. The tools used in all clinical attachments in Year 6 are similar to those used in PGY1. Although the assessors in the emergency medicine attachment have not received additional training in assessment techniques, there are unique differences in the learning opportunities and the organisation of the clinical team compared to other ward and outpatient based clinical attachments. With a high turnover of patients presenting diagnostic and acute management problems, there are many opportunities for consolidating
clinical and procedural skills. In addition, such skills need to be integrated in the immediate assessment and care of patients, which may be more closely aligned to those assessed in PGY1. Emergency medicine consultants who perform the assessments on medical students and junior doctors, spend much of their time on duty supervising in the clinical environment, as opposed to medicine or surgery where work on the wards (such as during ward rounds or emergency reviews) is intermittent. In addition, close working relations between Emergency Medicine team members may foster good communication about poor performance by students or junior doctors. This in turn may lead to a more accurate assessment of a person’s ability, with greater observation by more people. Such an approach may also provide more of a participatory learning environment, (19) enabling students and junior doctors opportunity, under close supervision, to engage and implement medical knowledge, thereby developing competence. Supporting our findings, one recent study has also identified emergency medicine as the clinical attachment in the early postgraduate years most likely to detect underperformance in junior doctors. (20)

Limitations of the study are that there was a small loss to follow up for the cohort, only students who have passed were included and it is not known whether students had repeated any year in their course. The narrow inter-quartile range of scores for some items on the JDAT may limit the ability to interpret the findings. However, this was the only tool being used to assess workplace performance at the time of the study and it is still in use. While these limitations may affect the ability to generalise the findings prospectively to student groups and to other similar settings, at the time of publication there are no similar studies being undertaken within Western Australia.
Conclusion

Research on assessment in medical education has been described as focusing on individual measurement instruments and their psychometric quality.(21) Despite its importance, predictive validity is a characteristic of assessment that is often neglected because of difficulties in the accurate determination of outcome. The findings of this current research support the value of combining undergraduate assessment scores to assess competence as a whole in predicting future performance. This is in line with support in recent years to develop programmatic approaches to assessment where a purposeful arrangement of methods is applied to measure competence comprehensively. (21,22)

Adding to this is the knowledge that assessment of academic performance in medical school is not always aligned with assessing the generic graduate outcomes expected of the junior doctor in the workplace. If we adopt an approach to help students most likely to struggle, rather than narrowly using assessment to determine the failures, we can consider how the lower performers can be tracked, monitored, supported and remediated during the final year of medical school and through the first post graduate year of medical practice. How this more constructive approach can be best achieved needs to be explored and developed in collaboration between the higher education and postgraduate training providers.
References


18. Martin I, Jolly B. Predictive validity and estimated cut score of an objective structured clinical examination (OSCE) used as an assessment of clinical skills at the end of the first clinical year. Medical Education. 2001;36:418-25.


**Chapter 6: Predicting junior doctor's performance on workplace based assessment**

**Preface**

The main theme woven throughout this thesis is the added value of combining undergraduate assessment scores to assessing competence as a whole in predicting future performance.

Adding to this is the knowledge that assessment of academic performance in medical school is not always aligned with assessing the generic graduate outcomes expected of the junior doctor in the workplace.

In this final paper, the theories and questions that were the driving force behind the research have been revisited. Earlier studies have attempted to identify academic variables which correlate with success in medical school environments, but very few studies have extended the exploration of correlation into the early postgraduate workplace setting. The purpose of this research is to begin to identify the characteristics common to medical graduates who are successful in the workplace as junior practitioners. In view of the knowledge that a number of characteristics will affect graduate performance, it was important to investigate selected socio-demographic factors, abilities or aptitudes and personality factors that play an important part when considering the analysis of performance.

The findings described in this paper illustrate the areas of overlap between the attributes that are being measured in the selection process and in medical school and overlaps in the attributes or application of these attributes being observed in medical school and early postgraduate training period. There are similarities, but they are not the same.
The differences in the assessment methods used for selection, in medical school and for junior doctors are further discussed in order to offer an explanation of the key finding that GPA as a composite measure of ability and performance in medical school can be predicted by selection scores and predictive of junior doctor assessment. This research may serve to assist graduates, universities and health institutions employing junior doctors, to be aware of and promptly address issues surrounding medical students transitioning from university to the workplace.
Publication

*Predicting junior doctor’s performance on workplace based assessment*

Authors: Sandra E Carr, Annette Mercer, Antonio Celenza, Fiona Lake, Ian B Puddey

Submitted for publication on April 2nd 2014

Abstract

**Introduction:** Understanding the nature of variables which correlate with success in the workplace in junior doctors, and how they potentially interact, is difficult. This study explored the effect of demographic variables, selection scores for entry into a medical course, a measure of emotional intelligence and undergraduate academic performance to determine intellectual abilities and other factors as predictors of workplace based performance in junior doctors during the first postgraduate year.

**Methods:** Two cohorts of medical graduates from one university (n= 200) in Western Australia participated in the study. Summary statistics were compared, Pearson correlation coefficients calculated and multivariate analyses utilised linear regression to assess the relationships of the Junior Doctor Assessment Tool (JDAT) and each of its sub-components with potential predictor variables.

**Results:** Increased age was found to be a predictor for junior doctor performance on the Clinical management subscale and understanding emotion was found to be a predictor for the JDAT Communication subscale with Grade Point Average (GPA) at the completion of undergraduate studies found to predict performance on the overall JDAT and each subscale. Tertiary Entry Rank on entry to medical school score predicted GPA.
**Discussion:** The GPA as a composite measure of ability and performance in medical school can be predicted by selection scores and predictive of junior doctor assessment. This study supports the movement towards programmatic assessment for medical education. The challenge for implementing this approach is to determine how performance on assessments can be aggregated for higher stakes, pass/fail and remediation decisions.

**Keywords:** Junior doctors, predictors, work place based assessment
Introduction

Understanding the nature of factors which correlate with success in the workplace in junior doctors is important, but because of multiple variables and their potential interactions it can be complex and difficult. What is it that distinguishes graduates who succeed in the first postgraduate year from those who struggle? Do they inherently possess or have they developed different personality characteristics than their less successful counterparts? Are there socio-demographic factors that will affect their workplace performance? Some graduates will have a higher cognitive skill baseline but is that important?

By the time an Australian medical graduate becomes a junior doctor, a range of measurements have been gathered throughout their secondary schooling, the selection process for entry into medicine, and during medical school, which can be linked to the more recently gathered measurements of performance into the early years of postgraduate practice.

The purpose of this research is to begin to identify characteristics common to medical graduates who are successful in the workplace as junior practitioners. Such research may serve to assist graduates, universities and the health institutions employing junior doctors as they address issues surrounding transition from university to the workplace.

Over the years, a number of researchers have attempted to identify academic variables which correlate with success in medical school environments. In particular, the relationship between selection scores and cumulative undergraduate grade point average has been frequently used and shows secondary school academic achievement is the strongest predictor of successful completion of medical school.
but only accounts for 65% of the variance meaning other factors are important. (1-3)

In addition to performance, other studies have considered the impact of science or humanistic backgrounds on academic achievement and cautioned against setting biomedical science pre-requisites. (4) Moreover, for many years selection committees have been supplementing academic achievement data with non-academic information deemed to be of particular importance to supporting entry of minority or disadvantaged applicants. (5, 6) Many of these factors have been studied in relationship to success in medicine.

There are fewer studies however, identifying which of these variables correlate with the success of junior doctors in workplace environments, and very little published research in the Australian context. Some published work supports the value of combining undergraduate assessment scores to assess competence as a whole in predicting future performance (7-9). However, we know that assessment of academic performance in medical school is not always aligned with assessment of the performance of the junior doctor in the workplace.(10) Various characteristics will affect graduate performance during the transition to practice as a junior doctor including coping skills and resilience. In view of this, the effect of other socio-demographic factors, abilities or aptitudes and personality factors may be important, and therefore need consideration in the analysis of performance.

Further studies have considered variables that cluster around different intelligences factors such as emotional intelligence or selection process scores and motivation with some citing age, gender, socio-economic factors and performance on selection scores as predictor variables in medical school. (5, 11-17) Meanwhile, some are suggesting that higher scores or abilities such as emotional intelligence may be linked to competency in interpersonal and communication skills which may contribute to better patient care and clinician outcomes (15, 16).
Purpose

This study explores selected demographic variables, socio-economic status as students, emotional intelligence as a personality factor, differing components of selection scores for entry into a medical course and undergraduate academic performance to determine which of intellectual abilities, personality measures and demographic or other factors might predict workplace based performance in junior doctors.

Methods

Sample

Two groups of students from the 5th and 6th year of a 6-year undergraduate medical curriculum (n = 302) at a single university were asked to participate. The study was explained to the groups in large face-to-face sessions and written consent was obtained. Ethics approval was obtained from the University of Western Australia as well as the three tertiary hospital settings in which the graduands worked for their first postgraduate year.

Tool description

The Junior Doctor Assessment Tool (JDAT) has been developed for use in Western Australian tertiary training institutions to assess performance in clinical management, communication skills and professional behaviour of junior doctors. The 10 discrete items are aligned to the Australian Junior Doctor Curriculum Framework. (18)

In a validation study of the JDAT, we identified a Cronbach’s Alpha of 0.883 for the 10 item scale and identified that two principal components of junior doctor performance are being assessed rather than the commonly reported three. (11) Cronbach’s Alphas were 0.829 for the 6 item ‘Clinical Management subscale’ and 0.834 for the 4 item ‘Communication subscale’, indicating good internal consistency.
and reliability of the instrument in its entirety and for both subscales. The aim is for each junior doctor to be assessed summatively five times during their first postgraduate year (PGY1) with the JDAT being completed by the supervising clinician at the end of each 10 week attachment. (19)

**Dependent Variables**

The outcome variable of interest is junior doctor performance in PGY1 measured using the JDAT, comprising a mean combined overall score (out of 40), a mean score for the Clinical Management subscale (out of 24) and a mean score for Communication skills subscale (out of 16).

**Independent Variables**

Demographic data included were age on entry to the study, gender, socio-economic background, language spoken at home and type of high school attended. Aboriginality of participants was not coded in this study as there was concern that anonymity of the student may not be maintained due to the small number of indigenous students in the cohort.

Language spoken at home was classified according to the Australian Standard Classification of Languages (ASCL). (20) For multivariate analysis this was collapsed into two groups – English and all other languages. Type of school was classified into one of two groups – government (publicly funded) and independent (fee paying).

Socio-economic status was attributed to each candidate’s correspondence postcode at entry to the medical course using the deciles generated from the Index of Relative Socioeconomic Advantage and Disadvantage Score (IRSAD Score). The IRSAD summarises information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures. It does not include age or self-identification as of Aboriginal or Torres
Strait Islander origin. The score is standardised against a mean of 1000 with a standard deviation of 100 with two thirds of SEIFA scores falling between 900 and 1100. A low score indicates relatively greater disadvantage and a lack of advantage in general. A high score indicates less disadvantage and greater advantage in general. For example, an area may have a high score if there are (among other things): - many households with high income or many people in skilled occupations AND- few households with low incomes, or few people in unskilled occupations.

Other independent predictor variables of interest included in the analysis were medical school selection scores and Emotional Intelligence. The selection tools used at the UWA are the Tertiary Entrance Rank (TER), The Undergraduate Medical Admission Test (UMAT) and score from a Structured Interview. The TER is calculated using the sum of the four highest Courses of Study scores obtained at the end of high school. These scores are ranked and the TER ranges from zero to 99.5, with a rank of 96 being the minimum cut off score for applicants to medicine. Researchers have suggested that the TER is the strongest predictor of success whilst at university in general and the early years of medicine (21) although it is not the strongest predictor of work based performance or professionalism in medicine (6).

The UMAT is the second of the three selection criteria used. It comprises 3 sections - UMAT-1, - logical reasoning and problem solving, UMAT-2, - understanding people and UMAT-3, - non-verbal reasoning. UMAT-2 (understanding people) assesses aspects of applicant’s empathy and emotional intelligence. (22)

Performance at interview is the third criterion used to assist and inform medical student selection. At UWA this comprises a structured interview lasting 25 to 35
minutes with two interviewers (one community member, one faculty member). The purpose is to assess a range of skills and attributes including willingness to assist others, ability to manage and examine oneself, appreciation of health and social diversity, capacity to appreciate others perspectives and ability to work with others. (23) Evaluation of the interview process at UWA supports combining prior academic achievement with the assessment of communication skills in a structured interview as an indicator of academic success during the undergraduate course. (24)

Medical schools combine selection scores in a range of ways to determine a ranked list of applicants. While the effect of individual selection scores have been included in studies of prediction of performance in medical school, few have analysed the effect of a combined selection scores (TER, UMAT, Interview) on subsequent performance in the workplace. For this study, the z scores for tertiary entrance rank, total UMAT score and interview (with equal weighting) have been summed to provide a Combined Selection Score for inclusion in the analysis.

Emotional Intelligence as measured by the MSCEIT® is a performance based assessment of overall emotional intelligence for those aged 17 years or older and offers measures of each of the four branches of emotional intelligence (perceiving, using, understanding and managing). (25) The EI scores are reported as traditional intelligence scales so that the average score is 100 and the standard deviation is 15. If a person obtains a score of around 100, then they are in the average range of emotional intelligence. If they obtain a score less than 85, they should consider the impact of their EI on behaviour and if around 115, they have possibly a high level of performance. Participants in the study completed the MSCEIT at the beginning of year 5 of the six year course.
The undergraduate Academic Performance measure used was a simple numerical index summarising academic performance throughout the six year medical course, the Grade Point Average score (GPA). At UWA the GPA is calculated by:

\[
GPA = \frac{\text{sum (unit points} \times \text{grade GPA)}}{\text{sum (unit points)}}
\]

with a range of GPA from 0 to 7 units.

Data collection methods

The data of participant scores from the admission process and performance as medical students were collected directly from the Faculty administration repository. Junior doctor performance data were collected directly from the medical administration departments in the public hospitals where they were employed in the first postgraduate year. Data were entered, coded and de-identified over a two year period between 2008 and 2009.

Data analysis procedures

Summary statistics were compared using one-way ANOVA (with Bonferroni correction) for continuous variables or chi-squared statistic for categorical variables. Pearson correlation coefficients were calculated for the JDAT scores (total scale and communication and clinical subscales) with each of the predictor variables listed above. Multivariate analyses utilised linear regression to assess the independent relationships of total JDAT, Clinical Management subscale, and Communication subscale with age, gender, type of secondary school, language spoken at home, IRSAD decile, UMAT (total UMAT score as well as score for UMAT-1, UMAT-2 and UMAT-3, respectively), TER, Interview Score, MSCEIT score, Combined Selection Score and GPA. All analyses were carried out utilising IBM SPSS Statistics Version 20.0.
Results

Participant demographics and summary statistics

Of the 302 eligible medical students, 237 consented to participate in the study (78%). Of these, data were available for collection from 200 junior doctors over the two year period (84% of the consented participants). The mean age of participants at the commencement of the study was 23 years (SD 2.3, range 20–37 years) with 29% older than 23 years and 71% 23 years or younger. The demographics of the respondents were representative of the population of the graduands with 54% females, 104 (52%) self-identifying as Caucasian, 66 (33%) as Asian and 15% not identifying an ethnic background. Eighty three percent of respondents identified English as the language they spoke at home and 17% identified another language spoken at home. There was no significant relationship of gender on Chi-square analysis with GPA or scores on the JDAT or the Clinical Management or Communication subscales.

Predominantly, the participants had attended independent metropolitan secondary schools (59.5%) with a further 25.6% from metropolitan public secondary schools and 8.8% from public rural secondary schools and the remaining 6% from independent rural secondary schools. The majority were from areas of particular social advantage with 69.5% in IRSAD band 9/10 with a further 14% from IRSAD band 7/8 and 10.8% in IRSAD band 5/6. Only 3.4 percent of participants were in IRSAD bands 1 to 4.

Summary data for the three variables included in the selection score were calculated. The mean TER (SD) for the study participants was 98.70 (1.29), the mean UMAT score was 179.0 (18.1) and for Interview the mean was 19.45 (3.33).
The mean total Emotional Intelligence score was 97 with a standard deviation of 15.5 and a range of 64-166. Mean (SD) for undergraduate academic performance at the end of the medical course as represented by the GPA was 5.6 (0.46) with a range of 3.90 to 6.65.

For the outcome variable of junior doctor performance in PGY1, measured using the JDAT, the mean (SD) for the combined overall score was 34.42 (2.23), for the Clinical Management subscale was 19.91 (1.38) and for the Communication skills subscale was 14.36 (1.06).

There was no significant difference in the demographic scores for participants from the two cohorts or from the three different training centres (tertiary hospitals); therefore the analysis has been conducted with both cohorts combined.

**Correlation Coefficients**

Pearson correlation coefficients of the predictor variables against the JDAT, Combined Overall score, the Clinical Management subscale and the Communication skills subscale are presented in Table 1. This table shows that respondent scores on the Overall Combined JDAT correlated significantly with GPA ($r= 0.257$, $P<0.001$). The Clinical management subscale correlated with increasing age ($r= -0.178$, $P=0.046$) and GPA ($r= 0.280$, $P< 0.001$), while the Communication subscale correlated significantly with Understanding Emotion ($r=0.207$, $P=0.019$) and with GPA ($r= 0.288$, $P<0.001$). Socio-economic advantage as depicted by the IRSAD scores did not correlate with the outcome measures for this study.
<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Overall JDAT score</th>
<th>Clinical management subscale</th>
<th>Communication subscale</th>
</tr>
</thead>
<tbody>
<tr>
<td>N= 200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (at entry)</td>
<td>Pearson Correlation -0.055</td>
<td>-0.178</td>
<td>0.026</td>
</tr>
<tr>
<td>(&gt;23yrs/&lt;24yrs)</td>
<td>Sig. (2-tailed) 0.538</td>
<td>0.046*</td>
<td>0.776</td>
</tr>
<tr>
<td>Language</td>
<td>Pearson Correlation 0.094</td>
<td>0.029</td>
<td>0.101</td>
</tr>
<tr>
<td>(English/Other)</td>
<td>Sig. (2-tailed) 0.182</td>
<td>0.685</td>
<td>0.154</td>
</tr>
<tr>
<td>Type of Secondary Schooling</td>
<td>Pearson Correlation -0.124</td>
<td>-0.087</td>
<td>-0.096</td>
</tr>
<tr>
<td>(public/independent)</td>
<td>Sig. (2-tailed) 0.123</td>
<td>0.280</td>
<td>0.231</td>
</tr>
<tr>
<td>IRSAD_Decile_1_2</td>
<td>Pearson Correlation 0.040</td>
<td>0.082</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.575</td>
<td>0.249</td>
<td>0.0924</td>
</tr>
<tr>
<td>IRSAD_Decile_3_4</td>
<td>Pearson Correlation 0.085</td>
<td>0.112</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.230</td>
<td>0.113</td>
<td>0.509</td>
</tr>
<tr>
<td>IRSAD_Decile_5_6</td>
<td>Pearson Correlation 0.037</td>
<td>0.067</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.599</td>
<td>0.342</td>
<td>0.736</td>
</tr>
<tr>
<td>IRSAD_Decile_7_8</td>
<td>Pearson Correlation 0.057</td>
<td>0.087</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.419</td>
<td>0.217</td>
<td>0.592</td>
</tr>
<tr>
<td>IRSAD_Decile_9_1 0</td>
<td>Pearson Correlation 0.090</td>
<td>0.086</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.203</td>
<td>0.226</td>
<td>0.376</td>
</tr>
<tr>
<td>Z_interview</td>
<td>Pearson Correlation 0.015</td>
<td>0.062</td>
<td>0.026</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.848</td>
<td>0.416</td>
<td>0.731</td>
</tr>
<tr>
<td>Z_TER</td>
<td>Pearson Correlation 0.028</td>
<td>-0.016</td>
<td>0.070</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.696</td>
<td>0.825</td>
<td>0.32</td>
</tr>
<tr>
<td>Z_Umat Total</td>
<td>Pearson Correlation -0.050</td>
<td>-0.041</td>
<td>-0.083</td>
</tr>
<tr>
<td></td>
<td>Sig. (2 tailed) 0.480</td>
<td>0.560</td>
<td>0.244</td>
</tr>
<tr>
<td>Combined selection score</td>
<td>Pearson Correlation 0.11</td>
<td>0.006</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>Sig. (2 tailed) 0.892</td>
<td>0.945</td>
<td>0.647</td>
</tr>
<tr>
<td>Perceive EI</td>
<td>Pearson Correlation -0.032</td>
<td>0.047</td>
<td>-0.034</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) 0.721</td>
<td>0.601</td>
<td>0.706</td>
</tr>
<tr>
<td>Using EI</td>
<td>Pearson Correlation -0.120</td>
<td>-0.100</td>
<td>-0.069</td>
</tr>
</tbody>
</table>
In the final linear regression models there was no evidence of multicollinearity, with tolerance statistics for all independent variables greater than 0.7 and VIF values between 1.1 and 1.4. The independent variables that demonstrated a correlation greater than 0.100 with the outcome variables were selected for inclusion in the regression analysis.

There was no significant predictive value for the demographic variables of socio-economic advantage, gender, school type attended or language spoken at home for performance in the JDAT see Tables 2, 3 and 4). As depicted in Table 3 increased age (>24 years) was a significant predictor for performance on the Clinical Management subscale (P=0.032). Furthermore, there was no significant effect of any of the selection scores (UMAT, TER, Interview or Combined Selection Score) for performance on the JDAT. However as depicted in Table 4 Understanding emotion for performance on the Communication subscale was an independent predictor (P=0.026). Finally, there was a significant association between academic performance as depicted by GPA for overall performance on the JDAT (P=0.006), the Clinical Management subscale (P=0.002) and the Communication subscale.
(P=0.003). Given these findings, further exploration of the predictor, GPA, was undertaken to determine whether selection scores, while not predictive of JDAT may be predictive of GPA. Table 5 summarises these findings demonstrating UMAT-3 (P=0.016) as a significant negative predictor and TER (P<0.001) as significant positive predictor of GPA in this study.

Table 2. Multivariate linear regression for predictor variables with total JDAT score

<table>
<thead>
<tr>
<th>Predictor variable (reference group)</th>
<th>B Coefficient</th>
<th>95% CI for B</th>
<th>Beta</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age grp (&gt;23)</td>
<td>-0.097</td>
<td>-1.408, -0.456</td>
<td>-0.476</td>
<td>0.314</td>
</tr>
<tr>
<td>IRSAD Deciles 3 and 4</td>
<td>0.092</td>
<td>-0.160, 0.492</td>
<td>0.166</td>
<td>0.315</td>
</tr>
<tr>
<td>Emotional Intelligence Using EI</td>
<td>-0.169</td>
<td>-0.052, 0.003</td>
<td>-0.024</td>
<td>0.081</td>
</tr>
<tr>
<td>Understanding EI</td>
<td>0.177</td>
<td>-0.003, 0.045</td>
<td>0.021</td>
<td>0.092</td>
</tr>
<tr>
<td>Combined z-selection score</td>
<td>-0.069</td>
<td>-0.324, 0.158</td>
<td>0.098</td>
<td>0.449</td>
</tr>
<tr>
<td>GPA</td>
<td>0.255</td>
<td>0.348, 2.080</td>
<td>1.214</td>
<td>0.006**</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.01

Table 3. Multivariate linear regression for predictor variables with Clinical Management subscale score

<table>
<thead>
<tr>
<th>Predictor variable (reference group)</th>
<th>B Coefficient</th>
<th>95% CI for B</th>
<th>Beta</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age grp (&gt;23 years)</td>
<td>-0.205</td>
<td>-0.310, 1.30</td>
<td>-0.621</td>
<td>0.032*</td>
</tr>
<tr>
<td>IRSAD Deciles 3 and 4</td>
<td>0.092</td>
<td>-0.160, 0.492</td>
<td>0.140</td>
<td>0.162</td>
</tr>
<tr>
<td>Using EI</td>
<td>-0.133</td>
<td>-0.029, 0.005</td>
<td>-0.012</td>
<td>0.161</td>
</tr>
<tr>
<td>Understanding EI</td>
<td>0.136</td>
<td>-0.005, 0.025</td>
<td>0.010</td>
<td>0.186</td>
</tr>
<tr>
<td>Combined z-selection score</td>
<td>-0.091</td>
<td>-0.235, 0.075</td>
<td>-0.080</td>
<td>0.309</td>
</tr>
<tr>
<td>GPA</td>
<td>0.284</td>
<td>0.310, 1.361</td>
<td>0.836</td>
<td>0.002*</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.001

Table 4. Multivariate linear regression for predictor variables with Communication subscale score

<table>
<thead>
<tr>
<th>Predictor variable (reference group)</th>
<th>B Coefficient</th>
<th>95% CI for B</th>
<th>Beta</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age grp (&gt;23)</td>
<td>-0.028</td>
<td>-0.503, 0.375</td>
<td>-0.064</td>
<td>0.772</td>
</tr>
<tr>
<td>IRSAD Deciles 3 and 4</td>
<td>0.061</td>
<td>-0.101, 0.206</td>
<td>0.052</td>
<td>0.500</td>
</tr>
<tr>
<td>Using EI</td>
<td>-0.137</td>
<td>-0.022, 0.004</td>
<td>-0.009</td>
<td>0.151</td>
</tr>
<tr>
<td>Understanding EI</td>
<td>0.232</td>
<td>0.002, 0.024</td>
<td>-0.013</td>
<td>0.026*</td>
</tr>
<tr>
<td>Combined z-selection score</td>
<td>-0.044</td>
<td>-0.150, 0.091</td>
<td>-0.030</td>
<td>0.627</td>
</tr>
<tr>
<td>GPA</td>
<td>0.277</td>
<td>0.220, 1.035</td>
<td>0.628</td>
<td>0.003**</td>
</tr>
</tbody>
</table>

*P <0.05, **P<0.01
Table 5. Multivariate linear regression for selection scores as predictor variables with Grade Point Average

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B Coefficient</th>
<th>95% CI for B</th>
<th>Beta</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>z-score Interview</td>
<td>0.073</td>
<td>-0.023, 0.092</td>
<td>0.034</td>
<td>0.242</td>
</tr>
<tr>
<td>z-score UMAT 1</td>
<td>0.021</td>
<td>-0.510, 0.072</td>
<td>0.011</td>
<td>0.732</td>
</tr>
<tr>
<td>z-score UMAT 2</td>
<td>-0.060</td>
<td>-0.086, 0.29</td>
<td>-0.029</td>
<td>0.332</td>
</tr>
<tr>
<td>z-score UMAT 3</td>
<td>-0.150</td>
<td>-0.132, 0.014</td>
<td>-0.073</td>
<td><strong>0.016</strong>*</td>
</tr>
<tr>
<td>z-score TER</td>
<td>0.276</td>
<td>0.080, 0.209</td>
<td>0.145</td>
<td>&lt;0.001**</td>
</tr>
</tbody>
</table>

*P <0.05, **P<0.01

Discussion

This study explored selected demographic variables, selection scores for entry into a medical course and undergraduate academic performance to distinguish which factors might predict workplace based performance in junior doctors during the first postgraduate year. The 200 junior doctors who participated in the study were predominantly under the age of 24, English speaking, from independent schools and with backgrounds of relative social advantage. Around half were female; their emotional intelligence scores reflected normal population means and their academic performance in medical school reflected a cohort who overall are performing at the higher end academically.

None of the demographic variables of socio-economic advantage, gender, school type attended, language spoken at home or any of the selection scores (UMAT and its component scores, TER, interview or combined selection score) were found to be predictors of performance of junior doctors. Previously, demographic factors including gender and socio-economic status have been reported to predict academic performance in undergraduate medicine. (2, 13) They did not predict junior doctor performance in this study which may be linked to the specific instrument used to assess performance or to unique characteristics in this particular cohort of junior doctors. It may be that potential influences of gender and socio-economic background reduce during the medical course in response to new external influences such as a change of environment. The only demographic variable that had predictive
value was increased age (>23 years) which was significantly associated with performance on the clinical management subscale.

Understanding emotion as measured using the MSCEIT was predictive of performance on the Communication subscale of the JDAT. This finding is in keeping with the literature. (16, 26, 27) Understanding emotion is one aspect of communication that may assist individuals to be able to manage their interactions with others. (26) However, the score in UMAT-2 (Understanding people), which in part also acts as a measure of both emotional intelligence and empathy, showed no relationship.

Given the various aspects of the medical practitioners role required in the first postgraduate year that differ from those required of applicants to medical school, it is not surprising that UMAT, TER and interview did not correlate with performance on the JDAT. (28-30) Range restriction in each of these selection factors, with subjects selected into the medical course in a narrow band of high performing students, would also mitigate against finding significant associations in what was a relatively small sample.

However, as others have found, TER was predictive of the GPA at the end of the medical course. (1, 24) GPA was also predictive of overall performance, clinical management score and communication skills score as a junior doctor. In contrast UMAT-3 (Non-verbal reasoning) was negatively linked to GPA in this cohort. We have previously reported performance in UMAT-3 as a negative predictor of performance in the Foundations of Clinical Practice unit during the first 3 years of our course as well as overall academic performance at level 5 of the 6 year course.(24). Edwards et al also found negative associations between UMAT-3 and GPA in 2 of
the 3 institutions involved in their recent predictive validity study. (31) We have also previously reported weaker performance in UMAT-3 in females, in those of rural origin and in those of European and Other language backgrounds but a higher score in males and those of Asian language background. (5) The extent to which socio-demographic dictates of UMAT-3 performance might have influenced the relationships seen in the present study needs further evaluation.

This is the first study to extend evaluation of the predictive validity of the UMAT into the post-graduate domain. Nearly all previous predictive validity studies of the UMAT have focused on undergraduate academic performance and the results to date have been mixed. (3, 24, 31, 32) We have reported generally weak positive associations of UMAT-1 with marks achieved in some individual ‘knowledge’-based and ‘clinically’ based units during our MBBS course. Others have also reported relatively poor predictive value of the UMAT score or its separate components in comparison to admission academic performance as assessed by mean GPA. (3, 32) Again in this study no predictive validity for the UMAT or its individual components was apparent during 12 months of assessment as a junior doctor.

The potential limitations for generalisation of these findings include the relatively small size of the study population and that it relates to two cohorts of graduates, all of whom studied at the one university and successfully completing the medical course. Furthermore, they all completed their first postgraduate year of training at three training sites from within Western Australia. The JDAT, while offering a rating of performance, is predominantly a judgement based assessment while the measures of assessment for selection and throughout the medical course are measurement based assessments. However, there was no significant change in the selection processes, no difference in the scores obtained for participants between
cohorts on any independent variable, or between training institutions and while there are different measurement approaches taken for the three stages of assessment (selection, student, junior doctor) the findings reflect actual practice. Therefore the findings are likely to be reflective of others experiences within Australia where variations of the JDAT is commonly used.

So what are the attributes being assessed for selection, as a medical student and as a junior doctor? Hays et al describe three aspects of performance as being included in the assessment of doctors. These are, being managers of their patients care, managers of their environment and managers of themselves. (29) The abilities assessed during selection are cognitive ability, communication and interaction ability, reasoning and problem solving ability and motivation for medicine. (1, 22) During medical school, assessment focuses on the development of knowledge and skills, more specifically medical and scientific knowledge, communication skills, management of patients and how students manage themselves, that is their professional skill development. (33)

There are overlaps between the attributes that are being measured in the selection process and in medical school and overlaps in the attributes or application of these attributes being observed in medical school and the early postgraduate training period. There are also differences in the assessment methods used for selection, in medical school and for junior doctors. Assessment for selection and medical school are focused towards measurement of knowledge and ability while assessment of junior doctor performance is focused on judgements of performance to assess capability. (34) That may be why the GPA as a composite measure of ability and performance in medical school can be predicted by selection scores and predictive of junior doctor assessment. Figure 1 illustrates these different assessed attributes
and how they interact at points around knowledge or cognition, communication and self-management or professional behaviour.

Figure 1. Attributes assessed to progress through selection and medical school to become a Junior Doctor.*adapted from Hays et al. 2002.

This study supports the movement in recent years towards programmatic assessment- one that aggregates information in a structured and meaningful way rather than being reliant on individual measurement instruments and the associated risks for decisions around progression. (35) The challenge for implementing this approach is to determine how performance on assessments can be aggregated for higher stakes, pass/fail and remediation decisions. (30, 36) The logical application is to determine and apply a performance standard for each element of assessment by an independent, authoritative group of assessors- a committee of examiners that can consider the numerical aggregation of information and interpret the qualitative judgements.

In the past there has been little communication between universities and prevocational training program but to ensure good transition AND that people get the
support they need. Handover/communication (with trainees knowledge) prior to
transition may make sure necessary support and an appropriate initial placement is
established. As medical schools increasingly move towards programmatic
assessment the final challenge to consider is how to align such approaches in
medical school to the approach taken in training and assessment in the early
postgraduate years.
References


19. CPMEC. Guidelines for Junior Doctors using the National Assessment Tools Australia: Confederation of Postgraduate Medical Education Councils; 2012 [cited
2013 February 17th. Available from:


Chapter 7. Discussion

Summary of findings

This thesis explored the predictive validity of selected personality and cognitive factors on a junior doctor’s performance in the workplace setting during the first postgraduate year. This exploration has taken place through a series of interconnected research projects utilising the same sample of medical students from one university as they moved through the last three years of their undergraduate medical course and during the first postgraduate year of practice as a doctor.

The proposition explored is partially supported. Emotionally intelligent students who have performed well on measures of academic achievement will be better prepared for practice as junior doctors, as measured by the Western Australian Junior Doctor Assessment Tool and this finding was reflected in their supervisors qualitative ratings of performance in the first postgraduate year.

This chapter provides a summary in response to each of the eight specific aims of the thesis and discusses the limitations of the research ending by offering reflections of the implications of the results for further research and practice of assessment.

Emotional Intelligence

Research aim:

1. Describe the EI scores in year 5 and 6 medical students and identify relationships that may exist between EI scores and scores on selection criteria including Tertiary Entrance Rank (TER), UMAT and interviews at the University of Western Australia (UWA).
As described in Chapter 2, the distribution of EI scores for the study participants reflected the normal distribution of the general population, however, males in this study had higher EI than females which differs from others findings. (1) The participants demonstrated highest branch scores for “understanding” emotion with a mean score higher than the general population, which would be a desired characteristic of doctors who need to provide empathic patient focussed care, integrating clinical knowledge, and excellent communication with understanding patient’s desires. The study described in Chapter 6 identified “understanding” emotion as predictive of performance on the communication subscale of the JDAT. Understanding emotion is one aspect of communication that may assist individuals to be able to manage their interactions with others. (2, 5) This work has added to our knowledge of EI scores in medical students and how EI may be useful to predict performance of junior doctors’ communication and added to the small but growing literature related to EI in medical education. (2-4) No significant relationships were found between EI and any selection scores in this study. Importantly, the score in UMAT-2 (understanding people), which in part also acts as a measure of both emotional intelligence and empathy, also showed no relationship to the EI score for the study population. If this is correct, it would appear that the UMAT Section 2 was not measuring EI as defined by the MSCEIT, at the time these medical students were selected and may be measuring something related in terms of emotions but slightly different.

Influence of assessment methods

Research aim:

4. Explore the influence of assessment methods (written and clinical examinations) and clinical placements (rotation type, and amount of experience) on academic performance of undergraduates and workplace performance on junior doctor performance;
Before the association of different measures of assessment with overall performance could be analysed, the validity and construct of the tool being utilised needed to be understood. The validation of the JDAT in Chapter 2, identified two principal components with good internal consistency that have been labelled “Clinical Management” and “Procedures,” not the three factors (clinical management, communication skills and professionalism) commonly identified in the tool.

The analysis of the measures of central tendency and spread of the distribution identified that there are a range of scores being allocated. As described in Chapter 3, the junior doctors in this study obtained lower mean assessment scores for abilities to perform procedures, manage emergencies and adverse event identification, and obtained highest mean assessment scores in abilities around their interpersonal skills, teamwork and professional behaviour. These descriptive findings were supported by content analysis of the written comments in this study and are in line with assessments, identification of perceived need for competence and self-rated preparedness scores reported elsewhere. (5, 6)

Little of the variance in performance was explained by the number of times the junior doctor was assessed or the amount of experience obtained. The finding there was no effect of experience, indicated the assessors are adjusting their mark to the expected standard of performance at that stage of training rather than expected performance for the end of PGY1, thus treating each rotations assessment as independent rather than part of continuous assessment.

If the assessment scores do not increase over the course of the first postgraduate year as depicted in Chapter 5, then this raises some concern as to the reliability of the tool to make decisions about progression from PGY1. If the final assessment is the only one truly assessing the junior doctors performance against the standard expected for a registered doctor, then the reliability of that assessment will be
limited. (7) In addition, valuable areas for improvement may not be clearly articulated to the junior doctor throughout the year suggesting wasted opportunities for valuable feedback.

There were apparent effects of the discipline in which the rotation occurred, with Emergency Medicine having significantly lower mean scores and Medicine having significantly higher mean scores. As reported in Chapters 4 and 5, the marks obtained by students in the Emergency Medicine attachment, but not any other attachments, were predictive of junior doctors' performance. These findings may reflect the emphasis placed on practical skills, emergency management and adverse event identification in the discipline of Emergency Medicine and teamwork, interpersonal and communication skills in Medicine however this finding cannot be confirmed by this study and warrants further qualitative investigation.

Gender also demonstrated a statistically significant effect on the combined overall mean score obtained, with females obtaining higher mean scores than males. While this effect may not be practically significant it is worth noting and comparing with other studies—particularly as there were specific skill areas in which females performed better. This could affect the training approaches or supervision offered to junior doctors on the basis of gender into the future. Similar findings have recently been reported in a Queensland study. (8)

Surprisingly, there was only a small significant effect of the method of assessment in medical school on the overall combined score of the junior doctor. There was a significant correlation between junior doctor performance and the Year 4 and 5 OSCE’s, which was amplified between the OSCE score and the communication subscale suggesting success in the tasks set in the OSCE plays some part in prediction of successful performance in workplace based assessment. This finding however, was not statistically significant.
Most medical schools have an OSCE as part of their final barrier examination and others have reported its ability to predict future performance in clinical and psychomotor skills. (9,10, 11) However, many of these studies have not looked at junior doctor performance. Rather, they have studied performance in pre-clinical examinations to predict clinical performance later in medical school. Results are mixed, with other studies finding OSCEs are not predictive of future performance post-graduation unless part of a comprehensive assessment process. (12) These findings again re-enforce the differences between the narrowed expected performance of medical students and broader integrated expectations of medical graduates and that assessment tools subtly emphasise different aspects of performance.

Performance in the first postgraduate year as a doctor

Research aim:

2. Explore how junior doctors perform in the first postgraduate year (PGY1) including how many are not meeting the expected standards and in what skill areas they perform best and worst;

The study described in Chapter 4 identified five junior doctors (female 2, male 3) as having overall performance that was borderline or less than expected. This equates to 2.5% of the 200 junior doctors included in this study and aligns with findings published previously that report between 1 and 3% of junior doctors performing below the expected level. (5,13,14) It is not clear however, whether identification of these poorer performers at the PGY1 level had any impact on the ability of the junior doctor to become registered with the Australian Medical Board or how the identified poorer performers were followed beyond PGY1, but the lack of clear action documented in the trainees records raises concern.

Effect of Demographics on performance
Research aim:

8. Describe any influence of demographic factors such as gender and ethnicity on academic undergraduate and workplace performance.

The 200 participants in this study were predominantly under the age of 24, English speaking, from independent schools and with backgrounds of relative social advantage. Around half were female; their emotional intelligence scores reflected normal population means and their academic performance in medical school reflected a cohort who overall is performing at the higher end academically. None of the studied demographic variables studied; socio-economic advantage, gender, school type attended, language spoken at home or any of the selection scores (UMAT and its component scores, TER, interview or combined selection score) were found to be predictors of performance of junior doctors.

The only demographic variable that had predictive value was increased age (>23 years) which was significantly associated with performance on the clinical management subscale. Previously, demographic factors including gender and socio-economic status have been reported to predict academic performance in undergraduate medicine. (15, 16) They did not predict junior doctor performance in this study which may be linked to the specific instrument used to assess performance or to unique characteristics in this particular cohort of junior doctors. It may be that the potential influences of gender and socio-economic background decrease during the medical course in response to new external influences such as a change of environment.
Predictors of achievement

Research aim:

3. Explore the relationship between academic performance of medical students and workplace performance as junior doctors;

5. Describe how variables of academic achievement in the clinical years correlate with work-based performance in PGY1;

6. Describe how Emotional Intelligence and aspects of the medical training correlate with the workplace performance;

7. Determine if any of the variables studied are predictors of achievement in the undergraduate clinical years and/or as junior doctors in PGY1;

‘Understanding emotion’ as measured using the MSCEIT was predictive of performance on the Communication subscale of the JDAT. This finding is in keeping with literature reported elsewhere. (2-4) Understanding emotion is one aspect of communication that may assist individuals to be able to manage their interactions with others. (2) However, the score in UMAT-2 (understanding people), which in part also acts as a measure of both emotional intelligence and empathy, showed no relationship.

The marks obtained by students in the Emergency Medicine attachment, but not any other attachments, were predictive of junior doctor’s performance. Chapter 6 confirmed the most significant effect of measures of academic performance on the overall combined score of the junior doctor was for the GPA and this persisted for both the clinical management subscale and communication subscale. Other researchers have found similar results supporting the combination of assessments to produce the strongest predictive validity. (17, 18) It is well recognised that clinical practice as such requires competence in a range of attributes, therefore no single
method of assessment is likely to provide enough data to make a valid and reliable judgement of this integrated competence. (19)

However, as previous studies have found, TER was predictive of the GPA at the end of the medical course. (20, 21) Grade Point Average was also predictive of overall performance, clinical management score and communication skills score as a junior doctor. In contrast UMAT-3 (non-verbal reasoning) was negatively linked to GPA in this cohort. Performance in UMAT-3 as a negative predictor of performance in the Foundations of Clinical Practice unit during the first 3 years of the medical course as well as overall academic performance at level 5 of the 6 year course, has previously been reported. (21) Edwards et al also found negative associations between UMAT-3 and GPA in two of the three institutions involved in their recent predictive validity study. (22) It has also previously been reported that weaker performance in UMAT-3 in females, in those of rural origin and in those of European and Other language backgrounds but a higher score in males and those of Asian language background. (23) The extent to which socio-demographic dictates of UMAT-3 performance might have influenced the relationships seen in the present study needs further evaluation.

Limitations of the thesis

Some of the findings may be explained by the limitations of this study. Unexpectedly there was a significant negative correlation found between TER and interview score for cohort 1, with no correlation found for cohort 2. As the response rate was 58%, the respondents may not be a truly representative sample of the population. If the sample had been more complete, differences between cohorts may not have been observed.

In studying the 200 participants who had completed longitudinal data, those who were unsuccessful in medical school, needing to repeat a year or being excluded, could not be included, thereby narrowing the range of marks in any assessment and
making any association between selection criteria, undergraduate performance and postgraduate performance more difficult to find. Similarly, we could not study those who were not selected for medical school, or left in the early years of the course, before recruitment. This narrows the applicability of our findings to the group who successfully reach their PGY1 year. This group is still important however, with a small but significant group who struggle, and a larger group who lack confidence in a range of areas or are stressed.

The narrow inter-quartile range of scores for some items on the JDAT may also limit the ability to interpret the findings. However, this was the only tool being used to assess workplace performance at the time of the study and it is still in use. While these limitations may affect the ability to generalise the findings prospectively to student groups and to other similar settings, at the time of publication there are no similar studies being undertaken within Western Australia.

The potential limitations for generalisation of these findings include the relatively small size of the study population and that it relates to two cohorts of graduates, all of whom studied at the one university and successfully completed the medical course. Furthermore, they all completed their first postgraduate year of training at three training sites within Western Australia. The JDAT, while offering a rating of performance, is predominantly a judgement-based assessment, while the measures of assessment for selection and throughout the medical course are measurement-based assessments. However, there was no significant change in the selection processes, no difference in the scores obtained for participants between cohorts on the outcome, or between training institutions and while there are different measurement approaches taken for the three stages of assessment (selection, student, junior doctor), the findings reflect actual practice. Therefore, the findings are
likely to be reflective of others experiences within Australia where variations of the JDAT is commonly used.

Implications for further research

The findings of this mixed methods study contributes to the understanding of how graduates of one Western Australian university performed on the JDAT in PGY1 over a two year period and offers insights into the value of the tool, through analysis of how the assessment tool was completed. While there has been some previous research undertaken to observe the complexities of the clinical learning situation and how it is influenced by the learning content, the setting and the participants actions and interactions there is limited empirical research in this area. This thesis has helped in the understanding of these complexities.

This study has added to our knowledge of EI scores in medical students and how EI may be useful to predict performance of junior doctors’ communication. This research has not answered whether candidates who obtain high scores on UMAT Section 2 have higher levels of interpersonal aptitude and those who obtain low scores have lower levels of interpersonal aptitude. Further research exploring possible relationships between EI and UMAT scores are required. It is recommended this research is undertaken at the point of entry into medicine and ideally include all candidates undertaking UMAT and not just those who are successful in obtaining entry into a medical course. Similarly, attention needs to be paid to the students with low EI. Mayer and Salovey speculate that EI is relatively stable, whereas emotional knowledge- the kind of information that EI operates on- is relatively easy to acquire and teach.

This is the first study to extend evaluation of the predictive validity of the UMAT into the post-graduate domain. This thesis reports generally weak positive associations.
of UMAT-1 with marks achieved in some individual ‘knowledge’-based and ‘clinically’ based units during the MBBS course. Others have also reported relatively poor predictive value of the UMAT score or its separate components in comparison to admission academic performance as assessed by mean GPA. (12, 27) Again in the current study no predictive validity for the UMAT or its individual components was apparent during 12 months of assessment as a junior doctor. We know that the skills and abilities required of the junior doctor in the first postgraduate year differ innumerably from those required on application to medical school. Therefore, it is not surprising that UMAT, TER and interview did not correlate with performance on the JDAT. (28-30) It may be more appropriate to focus future predictive studies for junior doctor performance on measures of performance in medical school.

Many assumptions exist about the benefits of clinical rotations, their optimal timing and structure, and on how transitions between clinical rotations should occur. (31) The findings of this thesis identifies missed opportunities to ensure that the assessment is being used to develop the junior doctors performance, and suggests staff development could shift from emphasising the “positive critique”, which many consultants seem to interpret as providing positive feedback, to focus on the quality of feedback and provision of balanced feedback (what is done well and areas to improve). The focus of the first postgraduate year must be seen by supervisors and trainees, as a year- long clinical placement rather than a series of short placements, and mechanisms should be put in place to ensure communication occurs to bring forward issues from one rotation to the next. It is further recommended that the standard expected for the learning outcomes being assessed should be for the end of PGY1, and that this information is made transparent for assessors and junior doctors. These improvements may act to increase the specificity of the tools ability to
correctly identify poorly performing junior doctors, and enhance attention for all trainees on areas to improve. (32, 33)

Why the emergency medicine attachment was the only clinical attachment predictive of performance as a junior doctor is interesting. The tools used in all clinical attachments in Year 6 are similar to those used in PGY1. Although the assessors in the emergency medicine attachment have not received additional training in assessment techniques, there are unique differences in the learning opportunities and the organisation of the clinical team compared to other ward and outpatient-based clinical attachments. Emergency medicine consultants who perform the assessments on medical students and junior doctors, spend much of their time on duty supervising in the clinical environment, as opposed to medicine or surgery where work on the wards (such as during ward rounds or emergency reviews) is intermittent. In addition, close working relations between Emergency Medicine team members may foster better communication about poor performance by students or junior doctors. This in turn may lead to a more accurate assessment of a person’s ability, with greater observation by more people. Such an approach may also provide more of a participatory learning environment, (7) enabling students and junior doctors opportunity, under close supervision to engage and implement medical knowledge, thereby developing competence. Supporting our findings, one recent study has also identified emergency medicine as the clinical attachment in the early postgraduate years most likely to detect underperformance in junior doctors, but more qualitative research in this area could provide further explanation as to what in the structure or organisation of the term leads to such detection. (8)

Research on assessment in medical education has been described as focusing on individual measurement instruments and their psychometric quality. (19) Despite its importance, predictive validity is a characteristic of assessment that is often
neglected because of difficulties in the accurate determination of outcome. The findings of the current research support the value of combining undergraduate assessment scores to assess competence as a whole in predicting future performance. This is in line with support in recent years to develop programmatic approaches to assessment where a purposeful arrangement of methods is applied to measure competence comprehensively. (19, 34)

Adding to this is the knowledge that assessment of academic performance in medical school is not always aligned with assessing the generic graduate outcomes expected of the junior doctor in the workplace. If we adopt an approach to help students most likely to struggle, rather than narrowly using assessment to determine only the failures, we can consider how the lower performers can be tracked, monitored, supported and remediated during the final year of medical school and through the first postgraduate year of medical practice. How this more constructive approach can be best achieved needs to be explored and developed in collaboration between the higher education and postgraduate training providers.

Implications for theory

Further insight of the findings in this thesis is offered by considering Kolb’s experiential reflective learning cycle and utilisation of learning styles where individuals preferred learning style can be categorized as Diverging, Assimilating, Converging, or Accommodating. (35) Recognition of these different learning styles within individuals and educational systems can improve the efficiency of learning. (36) As a medical student moves towards practicing independently as a junior doctor, the learning of medical school becomes more focused on and connected to the real life situations of the workplace as a junior doctor. During the transition to becoming a junior doctor the task demands and pressures of the new job and the move from being a student to a doctor shape a person’s adaptive orientation and
influence their learning style and thereby potentially their performance on assessments. (37) In one recent study the predominant learning style of medical students was found to be “assimilating” and this was significantly different from the “converging” learning style reportedly found in the doctors and faculty. (36)

**Implications for assessment practice**

So what are the attributes being assessed for selection, as a medical student and as a junior doctor? Hays et al describe three aspects of performance as being included in the assessment of doctors. These are, being managers of their patients care, managers of their environment and managers of themselves. (28) The abilities assessed during selection are cognitive ability, communication and interaction ability, reasoning and problem solving ability and motivation for medicine. (20, 38) During medical school, assessment focuses on the development of knowledge and skills, more specifically medical and scientific knowledge, communication skills, management of patients and how students manage themselves, that is their professional skill development. (39)

There are overlaps between the attributes that are being measured in the selection process and in medical school and overlaps in the attributes or application of these attributes being observed in medical school and the early postgraduate training period. There are also differences in the assessment methods used for selection, in medical school and for junior doctors. Assessment for selection and medical school are focused towards measurement of knowledge and ability while assessment of junior doctor performance is focused on judgements of performance to assess capability. (40) McManus, 2013 drew similar conclusions when reporting on attainment at different educational stages from high school to postgraduate training of medical graduates. (41) That it is the structure of knowledge that enables people
to perform at a particular level in assessment. That may be why the GPA as a composite measure of ability and performance in medical school can be predicted by selection scores and predictive of junior doctor assessment. Figure 1 illustrates these different assessed attributes and how they interact at points around knowledge or cognition, communication and self-management or professional behaviour.

Figure 1. Attributes assessed to progress through selection and medical school to become a Junior Doctor. *adapted from Hays et al. 2002.

This thesis supports the movement in recent years towards programmatic assessment- one that aggregates information in a structured and meaningful way rather than being reliant on individual measurement instruments and the associated risks for decisions around progression. (34) The challenge for implementing this approach is to determine how performance on assessments can be aggregated for higher stakes, pass/fail and remediation decisions. (19, 30) The logical application is to determine and apply a performance standard for each element of assessment by an independent, authoritative group of assessors- a committee of examiners that can consider the numerical aggregation of information and interpret the qualitative
judgements. This will however mean that opportunities to identify and help those at the lower end of passing will be missed.

In the past, there has been little communication between universities and prevocational training programs to ensure good transition AND that people get the support they need. Handover/communication (with trainees knowledge) prior to transition may make sure necessary support and an appropriate initial placement is established. As medical schools increasingly move towards programmatic assessment, the final challenge to consider is how to align such approaches in medical school to the approach taken in training and assessment in the early postgraduate years.

It is likely these findings are representative of many other centres and the insights will be of value to other training institutions and Australian states. Therefore, it would be valuable for other states in Australia to replicate this work so as to confirm the component analysis of the JDAT that has been widely adopted for use and move towards an assessment process that will not only discriminate the poorly performing doctor, but provide more detailed educational guidance for the training organisation to support the development of all junior doctors.
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Biography of the researcher

Since joining the University of Western Australia in 1998 as a Senior Lecturer I have worked as a teacher, unit coordinator, curriculum designer and educational researcher. As Deputy Head of the Faculty of Medicine and Dentistry Education Centre since 2002 I have been able to assist the achievement of its mission to promote quality teaching and learning through a variety of mechanisms including leading the development and implementation of Procedural Skills Training in the undergraduate Medicine course, the adoption of Outcomes Based Education across the Faculty of Medicine, Dentistry and Health Sciences; developing and implementing postgraduate courses in Health Professions Education; constructing Curriculum Framework for Interprofessional Learning and introducing an structured approach to Peer Assisted Learning.

As Associate Dean of Teaching and Learning since 2010, I take an active role in the establishment and maintenance of Faculty academic policy and standards such as the Faculty Evaluation Framework, Professional Behaviour for students and Assessment policies. I Chair the Faculty Teaching and Learning Committee and participate in several other curriculum and teaching and learning committees within the Faculty and University and at a National level.

My research activities have been focused to align with the educational developments occurring in the Faculty. Together with colleagues from the Education Centre and various schools in the Faculty of Medicine and Dentistry, I have been working toward considered, evidence based evaluation of teaching and learning practice and curriculum developments or change across a broad cross section of topics as evidenced by my past publications.
Appendices

1. Twelve Tips: Establishing an integrated multi-professional skills training programme.
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Abstract

Opportunities to learn and practice skills are becoming less with changes in the health care environment. Responses to this have included curriculum change and the development of skills programmes. Although the skills programmes, often taught in simulated settings in skills Centres have been frequently described, such a model may not be appropriate for all Universities or have the best outcomes. Firstly access to a centre may not be available and secondly, the training may not alter students’ behaviour in the workplace in terms of applying and practicing these skills. The programme outlined here used a multi-disciplinary, multi-professional group to design and run a skills programme which was clearly linked back to clinical attachments, emphasising ongoing practice with feedback. The twelve tips highlight the importance of broad ownership of the programme, separate funding and good evaluation and which are essential if the programme is to continue in the absence of a specific Centre or School to run it.

Introduction

Instruction in a simulated setting followed by practice integrated with students’ clinical placements is a valuable way to learn procedural skills. However there are challenges in achieving what appears to be a sensible approach to learning (1) and attention to all steps in establishing a skills programme are required for success.
With changes in health services, it has become increasingly difficult for students to gain sufficient meaningful interactions with patients (2, 3) with diminishing opportunities for practicing clinical skills. In some sites, only 75% of the intended skills based curriculum is being learned (4). It is essential new doctors are prepared to carry out skills independently when they start work, both to minimise stress for the doctor and for patient comfort and safety. It is important students have reached a basic level of competency before they practice in the clinical setting, again for patient safety and comfort but also to ensure they are ready to make best use of opportunities when they arise. Internationally, focused curricular change has been used (5) to address the deficiencies in training.

Locally, we had demonstrated problems with graduates’ competence in performing skills. Despite a curriculum redevelopment introduced in 2000, evaluations demonstrated graduates did not feel adequately prepared in performing procedural skills. This participatory evaluation led to the development of a curriculum skills map, detailing essential and desirable skills to be obtained, where they were currently being taught, the methods of teaching used, assessment strategies (if at all) and whether practice in the clinical setting was encouraged and achieved. In collaboration with the postgraduate trainers in the State, we agreed on the core skills that students and prevocational trainees needed to be competent in and at what level that competence was expected. At an undergraduate level, a strategy to address deficiencies and ensure consistency in teaching uses workshops and simulation (6) and clinical experience. A Skills Working Party (SWP) with representatives from key disciplines that offer clinical attachments (medicine, surgery, paediatrics, emergency medicine, women’s health), developed the centrally coordinated skills training programme to standardise teaching of the essential skills. Simulation was chosen because student opinion of this teaching method is positive.
(7, 8) and it increases consistency of teaching in comparison with opportunistic learning in the clinical arena. Simulation also allows the integration of communication and technical skills (9) and allows for more intense formative assessment and practice. However what is learnt must be applied back into the real world and unless this link is reinforced, learning may not be carried over (10). Therefore the SWP also ensure the programme is linked back to the clinical setting by facilitating opportunities and encouraging practice in individual clinical attachments. This paper outlines the implementation of this programme and offers tips for developing a centrally coordinated, integrated, multidisciplinary skills training programme.

**Table 1. The Learning Outcomes**

*At the end of the programme the students are expected to:*

1. Discuss issues of confidentiality and legal requirements when obtaining consent to perform a procedure.

2. Describe and demonstrate principles of asepsis through hand washing, and preparation and maintenance of a sterile field when performing the above skills.

3. Describe and demonstrate ability to correctly perform the following procedural skills with supervision:
   a. Phlebotomy
   b. Injections (subcutaneous (SC), intravenous (IV) and intramuscular (IM)).
   c. Intravenous (IV) cannulation
   d. Urinary catheter insertion

4. Cardiopulmonary resuscitation (CPR) - Describe and demonstrate the basic life support algorithms, use of airways and bag-mask ventilation and shock advisory defibrillation.

5. Discuss with clinical insight when these procedural skills would be required.

**Programme Outline**

During the first 2 weeks of Year 4 of a 6 year course (the first predominately clinically based year), students participate in standardised simulation workshops (2-4 hours in groups of 6 to 8 students) followed by facilitated opportunities to practice in clinical settings through ward placements, nursing attachments, phlebotomy services, and continence nurses. The outcomes are shown in Table 1. All students receive
formative assessment through written and verbal feedback at the end of each simulation workshop, covering all components of performing the skill. The skills workshops are taught by a range of health professionals (nurses, phlebotomists, physiotherapists, continence advisors, infection control personnel and doctors) from Schools within the Faculty and from external service providers. During the remainder of the academic year, students are encouraged to perform skills and record their experiences, with supervising practitioners (doctors, nurses, phlebotomists) encouraged to provide feedback on observed performance using criterion referenced assessment detailed in a logbook. The logbook is submitted at the end of the academic year. All of these procedural skills are assessable in the end of year OSCE.

Programme Evaluation

Each year the processes of the training and effect of the programme on clinical experience students obtain is evaluated using a participatory approach (11, 12). Data is collected from the participants immediately before and at the beginning of each subsequent (Year 5 and 6) academic year. Through a five-point Likert scale students evaluate the effect of training on their preparedness to complete each of the procedures and document the amount of experience they have obtained performing procedures during the preceding 12 month period. The amount of experience is confirmed through collected logbooks. At the end of each simulation workshop, students are assessed formatively to ensure they are able to perform the procedure correctly in a simulated setting.

When compared with the preceding cohort who did not receive the skills training, self-rated preparedness was significantly higher for four of the skills: injections, inserting intravenous cannula, phlebotomy and performing cardio-pulmonary
resuscitation at the beginning of the subsequent year. In the workshops, the majority of students met the required standard in the formative assessment on their first attempt and all students met the criteria satisfactorily on their subsequent attempt. Evaluation determined that the processes surrounding the skills training programme were positive. There was a high level of agreement that the workshops achieved their intended outcomes and that the students were able to perform the procedures to an acceptable standard at the end of the training when assessed formatively. Additionally, a longer term impact of the workshops was demonstrated, with significantly greater clinical experience in some procedures being gained during clinical attachments, when compared with a previous cohort who did not receive a formal training programme.

The other benefit of this multidisciplinary programme has been increased dialogue across clinical sites and between different professions, for example between nurses and doctors responsible for infection control and procedures, and between undergraduate and prevocational trainers, with better agreement on what should be taught when and how. Bringing together different disciplines, clinical departments and Schools so that a sense of ownership of skills training has remained within the clinical areas, giving the students the best opportunities for ongoing experience, and allowing them to learn from those that will be their clinical colleagues when they begin work as junior doctors has been a considerable achievement.

Skills training programmes are typically hampered by logistical issues including uncertain ongoing funding, concerns about time students spend away from the clinical areas, the need for a training coordinator, and the requirement for ongoing enthusiasm from both students and ward preceptors to continue practising skills in the manner and standard to which they were originally taught. This paper outlines
tips for establishing and maintaining successful multidisciplinary skills training programmes.

**Tips for establishing and maintaining a multidisciplinary skills training programmes**

1. **Base the development of the programme on local evidence.**
   Faculty members have to be convinced of the need to change the way learning is occurring and to commit funds for training. Despite the literature, our staff needed to be shown that locally, graduates were not well prepared. Consulting widely with local clinicians, sharing results openly and building arguments for a change to the course is helpful but takes time, in our case, six months. Work with postgraduate training groups to ensure you have a vertically integrated programme, agreeing at what level each skills should be learned and assessed. This encourages support for implementation in all phases of the programme from Schools, University, hospital and community based organisations.

2. **Form a working party with representatives from a range of disciplinary areas.**
   Choose working party representatives wisely so that you have an ally in many of the Schools or disciplines you are working with. Ensure all disciplines where the skills will be practiced are involved and include a range of health professions in your working party. Find out who is already using simulation training in their Schools and include them in the working party. Identify staff ready for change. This interdisciplinary participation will encourage broad ownership, increase respect about
the skills each professional brings and in turn impact on students’ experience in performing procedures.

3. **Employ a coordinator to lead the programme and a multi-professional team of trainers**

If an individual, with the support of all disciplines, takes responsibility for coordinating the development of workshops, recruiting and training the trainers and liaising between the medical school and external health care providers where students will be placed, the programme is more likely to be successful. This person needs to be collaborative and be able to work with a range of health professionals. Form authentic partnerships with these health professions, working with clinical staff from the hospital or ambulatory settings when designing the training to ensure the protocols taught mirror practice. You do not want the teachers saying—well that is not the way we do it on the wards! Recognise and acknowledge openly that they are the better people to teach many of the procedural skills medical graduates require. By forming partnerships with health professionals that work in hospitals (eg continence advisors) and will work with the students in clinical settings you are enhancing the culture of the clinical learning environment. Expand the pool of staff involved in the training- so each year there a more and more spreading the good word. Use casual staff for trainers- but offer them something- a positive working environment- taking them for lunch, providing educational support, asking and valuing their opinion, and providing them with evaluation results and thank you letters.

4. **Develop the programme using ‘central funding’**

Assured funding that is centrally controlled is important so that no one discipline or School is disadvantaged or favoured. Ensure that there is an ongoing source of
funding, rather than relying on grant based funding for delivery of the training programme. Grants can be useful to buy equipment and we established an “Equipment Library”. Any member of Faculty can borrow the part task trainers purchased with the funding and use them for no cost, minimising the number of part task trainers “hidden in cupboards” in different schools. Invest time to deliver cost efficient training. Consider a range of ways to reduce the costs and make it clear the lengths you have gone to reduce the financial burden for the Medical School. Disposable equipment can be accessed from a range of sources for free with expired disposable equipment from pharmacy, theatre, labour ward and so forth, keeping training costs to a minimum.

5. **Discuss research and development opportunities with trainers and working party members**

Simulation is widespread in medical education. Quality research of the outcomes and effectiveness of simulation is limited, including its impact on the application in the work setting. Issenberg et al, 2005 (13) as part of a systematic review of research of high fidelity simulation discuss the need for better quality research. It is important to involve all stakeholders in the future development and possible research initiatives. Research design should be included when developing the skills training programme and have a champion who is part of the programme to ensure it is carried out rigorously.

6. **Enhance the teaching skills of your trainers.**

Trainers may be excellent in the procedure they are teaching but may not understand the principles of simulation training or have limited knowledge best practice for teaching, learning and giving feedback which you wish to use. By offering professional development, they will obtain personal benefit from participating
in the training program. We choose to employ trainers that are current with their clinical practice and working in the clinical settings where students will be placed. Our evaluation indicates this assists students to prepare for clinical learning as trainers are able to place the simulation event in a more authentic context for the learner and they link up with the students later in the hospital. This helps students to feel as though someone knows them and that they belong in the clinical setting, boosting their confidence to ask for experience and for feedback on their performance.

7. Ensure the developed training and trainers are standardised

All students must have a similar simulated learning experience. The training that is offered should be standardised by using established hospital policies and protocols and where available, best evidence, when designing the workshops. The trainers should meet regularly as a group to discuss how the workshops will run and have group demonstrations to ensure the same approach to the procedure is used by all.

8. Ensure all students have a basic level of competence after the workshops

Students should all be individually assessed on the skills taught in the workshop and receive formative feedback about their performance. Anyone who is not competent should be made to repeat training and/or assessment till they reach an acceptable level. In addition, by making them perform a self assessment, they can compare their result with that from an independent expert, helping to benchmark themselves for future learning in unsupervised settings.

9. Provide opportunities for students to obtain clinical experience and feedback
Continuous or repeated practice with explicit feedback, sometimes called ‘deliberate practice’ assists in the development of expertise (14, 15). Strategies to increase student experience and feedback should focus on firstly, engaging as many health professionals as possible in the learning process for medical students and secondly, using assessment to drive learning. If staff in the clinical setting, are aware of the training and assessment expectations of medical students, they may be more likely to assist them in obtaining experience. Develop a logbook, which contains criteria for assessment to aid staff and so students can record and reflect on each clinical experience they have. Link this with assessment protocols. While the literature debates the success of log books, locally we have found it valuable in driving learning (16), where students are expected to document a certain amount of experience and reflection on that experience. The logbook is reviewed during formative feedback sessions which are given at the end of each clinical exposure. It can also form an important part of evaluating the success of the skills training programme overall. Organised reflective discussions can assist students to explore alternative means of obtaining clinical experience. These may be conducted by any member of the multi-professional team.

10. Develop strategies for assessment of learned skills

Assessment opportunities, both formative and summative, using direct observation of the procedural skill (DOPS), completed log books, written case reports, oral presentations or objective structured clinical examinations (OSCEs) using a range of simulation strategies are all possible. These assessments need to be robust, fair and defensible (17), and should be developed at the same time the training programme is developed. Knowing procedures can be assessed at the end of academic year OSCEs is a strong driver for students.
11. Collect and act on feedback

Develop transparent evaluation and gather it broadly from students, trainers and staff within the clinical setting. Respond to criticism by developing plans for improvement. In addition, encourage the trainers interest and improve expertise through Peer Observation of teaching (POT), which can be used both formatively and summatively to evaluate teacher effectiveness. The peer review model may be the most applicable in this setting, judiciously using resources, where teachers observe each other, often in a reciprocal process and rather than judge by externally set criteria, they based it around a set of mutually agreed issues (18). The three stages of pre-observation, observation and post-observation takes 45 to 60 minutes each (19).

12. Close the loop – keep stakeholders informed and involved.

Curriculum drift, disgruntlement in times of limited funding and narrow disciplinary views can threaten a programme which lies outside the normal curriculum structure or funding model. Demonstrating the effectiveness of the programme through robust evaluation and peer reviewed publication, addressing deficiencies through rational planning with a willingness to continually improve the programme, ensuring feedback is provided to all key stakeholders and continuing to ensure it is a multidisciplinary programme are important in keeping all on side. The students can be a powerful force so involving them in planning, research activities and evaluation is important.

Conclusion

The twelve tips outlined were at the core as a new skills training programme was established at our University. Apart from an increase in self assessed preparedness
and experience amongst students, there was increased dialogue across clinical
sites, across different disciplines and health professional groups, for example
between nurses and doctors, and between undergraduate and prevocational
trainers, with better agreement on what should be taught when and how.

One of the strengths of our approach has been to bring together these different
groups so that a sense of ownership of skills training remained based within the
clinical areas, giving the students the best opportunities for ongoing experience, and
allowing them to learn from those who will be their clinical colleagues when they
study and work with patients. The twelve tips for establishing and maintaining a
multi-professional skills training programme cover all phases of the programme.

**Preparation**

1. Base the development of the programme on local evidence.
2. Form a working party with representatives from a range of discipline areas.
3. Employ a Coordinator to lead the programme and a multi-professional team
   of trainers
4. Develop the programme using ‘central funding’
5. Discuss research and development opportunities with trainers and working
   party members

**Delivery**

6. Enhance the teaching skills of your trainers.
7. Ensure the developed training and trainers are standardised
8. Ensure all students have a basic level of competence after the workshops
9. Provide opportunities for students to obtain clinical experience and feedback
10. Develop strategies for assessment of learned skills

**Evaluation**

11. Collect and act on evaluation
12. Close the loop – keep stakeholders informed and involved.

Notes on Contributors:

- Sandra Carr is the Director of Postgraduate courses in Health Professional Education, Deputy Director of the Clinical Training and Education Centre at UWA and coordinates the skills training programme.
- Antonio Celenza is an emergency physician with a Masters in Education who is an A/Prof in Emergency Medicine and involved in teaching skills, particularly resuscitation, to students.
- Fiona Lake is a respiratory physician, A/Professor in Medicine and Head of School of Medicine and Pharmacology.


Funding: No external funding

Ethical Approval: The UWA Human Ethics committee did not require an ethics application as the study involved standard curriculum evaluation and the trainees were not identifiable in the project.
**References**


2. Designing and implementing a skills program using a clinically integrated, multi-professional approach: Using evaluation to drive curriculum change

Sandra E. Carr, Antonio Celenza, Fiona Lake

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Abstract

The essential procedural skills that newly graduated doctors require are rarely defined, do not take into account prevocational employer expectations, and differ between Universities. This paper describes how one Faculty used local evaluation data to drive curriculum change and implement a clinically integrated, multi-professional skills program. A curriculum restructure included a review of all undergraduate procedural skills training by academic staff and clinical departments resulting in a curriculum skills map. Undergraduate training was then linked with postgraduate expectations using the Delphi process to identify the skills requiring structured, standardised training. Without a dedicated simulation centre the skills program was designed and implemented.

This paper shows the benefits of an alternate model where clinical integration of training and multi-professional collaboration encouraged broad ownership of a program and in turn impacted on clinical experience obtained.
Introduction

Undergraduate medical curricula should train graduates to perform essential procedural skills, since many of these skills will be performed unsupervised upon commencement of work \(^1\). In many jurisdictions, medical councils have described the expected competencies of junior doctors, examples being the “The Australian Curriculum Framework for Junior Doctors” developed by the Confederation of Postgraduate Medical Education Councils in Australia and “The New Doctor 2007” from the General Medical Council in the United Kingdom (UK) \(^2,3\). These guidelines describe what should be learned during the early postgraduate years, but not what should have been learned during undergraduate training, which remains the domain of universities.

It is recognised ensuring preparedness to practice as a doctor at graduation is difficult \(^4-6\) and students often feel unprepared in the performance of procedural skills \(^7\). The essential procedural skills that newly graduated doctors should perform competently are rarely defined\(^8\), do not take into account prevocational employer expectations, and differ between Universities. In some sites, only 75% of the intended skills based curriculum is being learned \(^9\). Even if they have been formally taught many students often have not had adequate practice\(^10,11\). Ethical and medico-legal changes, patient safety concerns and increasing patient medical knowledge and expectations make it difficult for students to learn and practice procedures on patients \(^12-14\). Increasing student numbers, decreasing clinical teaching resources and fewer clinical opportunities are also resulting in less experience for students \(^15-18\). Some medical schools have addressed these concerns by focused curricular change, introducing simulation centers which ensure adequate teaching of skills, logbook or portfolios to record adequate practice and skills based assessments to ensure competence \(^14,19-22\).
In our experience, the multiple disciplines that contribute to an undergraduate medical curriculum, and the hospitals that employ graduates, have diverse expectations regarding procedural skills that are deemed essential for graduates, resulting in disagreement on what should be taught, variation or duplication in teaching, inefficiencies and confusion which affects students learning experiences and opportunities. Despite a medical curriculum redevelopment at the University of Western Australia (UWA), evaluations continued to demonstrate graduates’ limited preparedness in performing procedural skills. Curriculum review showed a poorly coordinated approach to teaching procedural skills. This paper describes how curriculum change occurred resulting in the implementation of a clinically integrated, skills program at UWA, and discusses how this model of training may impact on graduates’ preparedness to practice.

The plan was to involve all relevant groups (across disciplines, professions and levels of training) in the planning and implementation of a program that would teach core skills in a standardised fashion, encourage practice in the clinical setting and integrate with prevocational training. The program had to be sustainable and run within the usual running budget for clinical teaching.

**Processes and Results**

**Setting**

The medical course at UWA is a 6-year undergraduate course with approximately 120-150 students per year. Most postgraduate year 1 (PGY1) doctors in the teaching hospitals of Western Australia are graduates from UWA. The medical school curriculum redesign commenced in 1998 with graded implementation from 2000.
Review of curriculum

During the period of curriculum restructure, one of the themes reviewed was resuscitation training. Initially, a small working party representing surgery, anaesthesia, intensive care, emergency medicine and students convened to identify needs and plan coordination of resuscitation teaching. This led to a review of all procedural skills teaching and a documented, “Core Curriculum in Clinical Practice”, describing the skills, clinical presentations and conditions new graduates should have learned and practiced. A broad list of skills from the Core Curriculum in Clinical Practice was defined and further reviewed by a modified Delphi approach by academic staff of the departments of paediatrics, medicine (including anaesthetics), surgery (including emergency medicine and other surgical specialties), women’s health and general practice to form a “list of proposed skills”.

Table 1. Initial List of Procedural Skills derived from the Core Curriculum in Clinical Practice.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Venepuncture</td>
</tr>
<tr>
<td>2.</td>
<td>ECG</td>
</tr>
<tr>
<td>3.</td>
<td>PEFR, Spirometry</td>
</tr>
<tr>
<td>4.</td>
<td>MSU, Urinalysis, Pregnancy test</td>
</tr>
<tr>
<td>5.</td>
<td>Finger prick glucose</td>
</tr>
<tr>
<td>6.</td>
<td>Collection of swabs and slide smear</td>
</tr>
<tr>
<td>7.</td>
<td>Use of standard precautions</td>
</tr>
<tr>
<td>8.</td>
<td>Vaginal pH testing</td>
</tr>
<tr>
<td>9.</td>
<td>Gown and gloving</td>
</tr>
<tr>
<td>10.</td>
<td>Drug administration by sc, im, iv routes</td>
</tr>
<tr>
<td>11.</td>
<td>Local anesthetic infiltration</td>
</tr>
<tr>
<td>12.</td>
<td>Wound closure, Removal of sutures</td>
</tr>
<tr>
<td>13.</td>
<td>Aseptic dressing change</td>
</tr>
<tr>
<td>14.</td>
<td>Urinary catheter insertion (male and female)</td>
</tr>
<tr>
<td>15.</td>
<td>Bandaging and splinting of limbs</td>
</tr>
<tr>
<td>16.</td>
<td>Limb back slab plaster</td>
</tr>
<tr>
<td>17.</td>
<td>Removal of plaster</td>
</tr>
<tr>
<td>18.</td>
<td>Basic life support (airway positioning, management of choking, 1 &amp; 2 person CPR, positioning of unconscious patient)</td>
</tr>
<tr>
<td>19.</td>
<td>Defibrillation/ advanced life support</td>
</tr>
<tr>
<td>20.</td>
<td>Spinal immobilization</td>
</tr>
<tr>
<td>21.</td>
<td>Use of airway adjuncts and suctioning</td>
</tr>
<tr>
<td>22.</td>
<td>Manual ventilation with bag-mask-valve</td>
</tr>
<tr>
<td>23.</td>
<td>Endotracheal intubation</td>
</tr>
</tbody>
</table>
The next step was to link the expectations at the undergraduate level with postgraduate expectations. Through a structured questionnaire, members of the postgraduate medical education committees of hospitals that provided employment to graduates from UWA, along with members of the prevocational training committee of the local medical board were asked to select ten skills they thought were essential for doctors they thought were essential for doctors to have at graduation from the proposed skills list (Table 1). For each of the ten selected skills respondents were asked to indicate:

- When, where and to what levels commencing postgraduate Year 1 (PGY1) doctors should be trained
- Current teaching and whether this was considered adequate
- Deficiencies in teaching staff or training resources
- Optimal teaching and resources
- The need for formal assessment and reaccreditation.

Twenty of the 50 questionnaires distributed were returned (response fraction = 40%). Of the skills on the list, 21 were considered to be essential by at least one respondent. The most highly rated skills were identified as essential by between 50 and 95% of respondents. The other skills were identified as essential by 35% or less of respondents. Two additional skills (inter-costal catheter and lumbar puncture)
were suggested. This resulted in a final short-list of skills in which the postgraduate clinicians felt doctors should be competent in on the first day of work (Table 2).

Table 2: Essential skills identified by clinicians responsible for postgraduate training.
When training should occur, current and optimal teaching and whether assessment is required is shown.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Start of PGY1 (%) agree</th>
<th>End of PGY1 (%) agree</th>
<th>Independent Practice (%)</th>
<th>Current Teaching (ad hoc / structured)</th>
<th>Optimal Teaching (ad hoc / structured)</th>
<th>Formal Assessment (yes / no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG – performing and basic interpretation</td>
<td>53%</td>
<td>42%</td>
<td>(47%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>No</td>
</tr>
<tr>
<td>Intravenous therapy including intravenous cannula insertion, setting up iv infusions, administration of iv drugs, fluid therapy and fluid charts</td>
<td>79%</td>
<td>21%</td>
<td>(68%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>Undecided</td>
</tr>
<tr>
<td>Senior First Aid including recognition of danger, airway positioning, choking, 1 &amp; 2 person CPR, positioning of unconscious patient</td>
<td>94%</td>
<td>0%</td>
<td>(78%)</td>
<td>Structured</td>
<td>Structured</td>
<td>Yes</td>
</tr>
<tr>
<td>Airway management including use of adjuncts and manual ventilation</td>
<td>65%</td>
<td>29%</td>
<td>(71%)</td>
<td>Structured</td>
<td>Structured</td>
<td>Yes</td>
</tr>
<tr>
<td>Monitoring and interpreting BP, P and R in a sick patient</td>
<td>69%</td>
<td>25%</td>
<td>(56%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>No</td>
</tr>
<tr>
<td>Oxygen therapy including nebuliser therapy, use of pulse oximetry</td>
<td>80%</td>
<td>7%</td>
<td>(73%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>No</td>
</tr>
<tr>
<td>Urinary catheter insertion (male and female)</td>
<td>50%</td>
<td>43%</td>
<td>(64%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>Yes</td>
</tr>
<tr>
<td>Defibrillation</td>
<td>58%</td>
<td>42%</td>
<td>(83%)</td>
<td>Structured</td>
<td>Structured</td>
<td>Yes</td>
</tr>
<tr>
<td>Arterial puncture and performing and interpreting arterial blood gas sampling</td>
<td>9%</td>
<td>91%</td>
<td>(82%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>No</td>
</tr>
<tr>
<td>Wound management, including simple wound closure and removal of sutures</td>
<td>50%</td>
<td>40%</td>
<td>(50%)</td>
<td>Ad hoc</td>
<td>Structured</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The top skills as depicted in Table 2 included the ability to resuscitate and practice emergency interventions, insert and manage intravenous therapy; monitor and
interpret vital signs in a sick patient; manage oxygen therapy; insert a urinary catheter; interpret arterial blood gas results; and suture a simple wound. It was felt these skills should be assessed but only life support skills required reaccreditation. Ninety percent of respondents expected the PGY1 doctor to be able to practice these skills unsupervised on day one of working.

After discussion some essential skills (i.e. interpretation of arterial blood gases and the arterial puncture) were thought to require theoretical knowledge and understanding of application at an undergraduate level, but the need to apply the practical skill would not be required until completion of the PGY1 so they were not put forward for inclusion in the training program. Similarly, even though not rated by the clinicians, patient handling skills (moving patients safely) were deemed essential by the skills working party and therefore included in the training program.

Implementation

A curriculum skills map was created, describing the essential and desirable skills and current learning experiences, including methods of teaching used, level of skill expected, assessment strategies and whether practise in the clinical setting was encouraged or available.

A Skills Working Party (SWP) with representatives from several disciplines (medicine, surgery, pediatrics, emergency medicine, women’s health), used the short-list and the curriculum skills map to develop a centrally coordinated skills training program to ensure all students were taught the basic required skills in a standardised fashion, and using assessment as a driver, make use of clinical opportunities when they arose. Members of the working party came from a range of health professions as well as representing different disciplines. Once the program
had been developed, further input was sought from a broader range of different health professionals who were asked to comment on the learning outcomes, methods and proposed assessment strategies and tools. These health professionals were then approached to deliver the training. For example, nurses specifically trained to manage continence were asked to teach the urinary catheterisation workshops, phlebotomists from all of the local teaching hospitals agreed to provide the venepuncture training and physiotherapists conducted the manual handling (moving patients safely) sessions.

Implementation commenced across all clinical years in 2004 and included:

- **Pre-requisite for course entry:** A Senior First Aid certificate was required to be obtained by students prior to the end of 1st year.
- **Year 4:** During the first 2 weeks of Year 4 (the first entirely clinically based year), students participate in standardised simulation workshops (2-4 hours in groups of 6 to 8 students) followed by facilitated opportunities to practice in clinical settings through ward placements, nursing attachments, phlebotomy services, and continence nurses. The learning outcomes are summarised in Table 3 and an example of a specific skill outcome is shown in Table 4. All students received formative assessment with written and verbal feedback at the end of each simulation workshop, covering all components of performing the skill. The skills workshops were taught by a range of health professionals (nurses, phlebotomists, physiotherapists, continence advisors, infection control personnel and doctors) from disciplines within the Faculty and external service providers. A suturing workshop was conducted during the clinical attachment in Surgery. During the remainder of the academic year, students recorded their experiences performing these procedural skills, with supervising practitioners (doctors, nurses, phlebotomists) encouraged to provide feedback on observed
performance using criterion referenced assessment detailed in a logbook. The logbook is submitted at the end of the academic year. All of these procedural skills are assessable in the end of year OSCE.

- **Year 5:** Neonatal resuscitation and paediatric resuscitation skills, together with a refresher of adult resuscitation are taught in small groups using low-fidelity simulation.

- **Year 6:** Workshops are conducted to train basic airway management (Rural General Practice), suturing (Surgery), limb splinting and plastering (Emergency Medicine), and students need to attend and be assessed as competent in an Immediate Life Support Course, accredited by the Australian and UK Resuscitation Councils.

**Table 3. The Learning Outcomes for Year 4 Skills Training Program**

At the end of the program the students are expected to:

6. Discuss issues of confidentiality and legal requirements when obtaining consent to perform a procedure.

7. Describe and demonstrate principles of asepsis through hand washing, and preparation and maintenance of a sterile field when performing the stated skills.

8. Describe and demonstrate ability to correctly perform the following skills with supervision:
   a. Phlebotomy
   b. Injections (subcutaneous (SC), intravenous (IV) and intramuscular (IM)).
   c. Intravenous (IV) cannulation
   d. Urinary catheter insertion
   e. Principles of Manual Handling

9. Cardiopulmonary resuscitation (CPR) - Describe and demonstrate the basic life support algorithms, use of airways and bag-mask ventilation and shock advisory defibrillation.

10. Discuss with clinical insight when these procedural skills would be required.
Table 4. Outcomes to be achieved in the urinary catheterisation workshop (Yr 4).

<table>
<thead>
<tr>
<th>Urinary Catheterisation</th>
<th>Workshop Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcomes</td>
<td>In groups of 12, students attend a one-hour group discussion with two Continence advisors. They discuss the anatomy, clinical decision making and practice related to urinary catheterisation and observe a demonstration of the procedure. Then over two hours, in groups of 6 students with 1 instructor, students prepare for and perform urinary catheterisation on both male and female mannequins under direct observation.</td>
</tr>
<tr>
<td>1. State reasons for urinary catheterisation</td>
<td></td>
</tr>
<tr>
<td>2. Correctly insert urinary catheter for male and female</td>
<td></td>
</tr>
<tr>
<td>- Explain procedure/obtain consent/maintain privacy</td>
<td></td>
</tr>
<tr>
<td>- Prepare equipment/select the correct catheter size/type</td>
<td></td>
</tr>
<tr>
<td>3. Maintain asepsis</td>
<td></td>
</tr>
<tr>
<td>- Don sterile gloves correctly</td>
<td></td>
</tr>
<tr>
<td>- Avoid contamination of sterile field</td>
<td></td>
</tr>
<tr>
<td>- Take appropriate action if sterile field is contaminated</td>
<td></td>
</tr>
<tr>
<td>4. Insert catheter correctly (male and female)</td>
<td></td>
</tr>
<tr>
<td>- Avoid inflating catheter balloon whilst still in urethra</td>
<td></td>
</tr>
<tr>
<td>- Recognise situations which require expert help</td>
<td></td>
</tr>
<tr>
<td>- Recognise allergic reaction to lignocaine gel</td>
<td></td>
</tr>
<tr>
<td>- Collect specimen if required</td>
<td></td>
</tr>
<tr>
<td>5. Connect drainage bag</td>
<td></td>
</tr>
<tr>
<td>6. Dispose of equipment correctly</td>
<td></td>
</tr>
<tr>
<td>7. Record Patient Clinical Status - document urinary output</td>
<td></td>
</tr>
</tbody>
</table>

Funding was diverted from all disciplines that taught in the clinical years to pay a coordinator and part time teaching staff. Funding from a competitive grant paid for physical teaching resources, such as manikins, which were used in the workshops and were also made available for loan to all disciplines throughout the year.

Evaluation of the Program

To evaluate the skills training processes and effect of the Year 4 program on clinical experience, a participatory approach of evaluation was used. A survey of self assessed ability performing the skills was collected from the participants immediately before and at the beginning of each subsequent (Year 5 and 6) academic year (2004...
to 2006). A Wilcoxon sign rank test was used to evaluate for shifts in this self rated ability.

In addition, a survey focusing on the key skills in the Year 4 workshops was run before and 4 weeks after the training workshops. Through a five-point Likert scale (5= Very Well, 4= Well, 3= Average, 2= Poorly, 1= Very poorly) students evaluated their preparedness to complete each of the procedures and on the annual survey and students also documented the amount of experience they had obtained performing procedures during the preceding 12 months. The amount of experience was confirmed through collected logbooks. Results from students receiving the formal skills program were compared the previous cohort (2003) who had not received structured skills training but had the same clinical attachments. A one way analysis of variance with a post hoc multiple comparisons correction (Bonferroni) was used to test for significant differences between the intervention and comparison group. Additionally, at the end of each skills training workshop, students were assessed formatively to ensure they were able to perform the procedure correctly in a simulated setting, could discuss with clinical insight when the procedures would be performed and were asked for their formative evaluation of the workshop. Students were not assessed on their ability to obtain consent from patients, although informed consent is covered explicitly on other areas of the course. The multi-professional group of trainers engaged in a dialogue to review the evaluation results as a group so as to refine the delivery of training for the subsequent year.

When looking at the impact of the Year 4 workshops, the majority of students met the required standard in the formative assessment on their first attempt and all students met the criteria on their subsequent attempt. There was a significant improvement in self rated ability in all skills, 4 weeks after the workshops (p<0.01) (Table 5). Evaluation of the processes surrounding the skills workshops was positive
with a high level of agreement they achieved their intended outcomes. When compared with the preceding cohort who did not receive the skills training, self-rated preparedness (at the commencement of Year 5) to perform skills was significantly higher for four of the skills; injections, inserting intravenous cannula, phlebotomy and performing cardio-pulmonary resuscitation (Table 6).

Table 5. Student self rated ability before and 4 weeks after skills training. Likert Scale from 1 (strongly disagree) to 5 (strongly agree).
NB. 85 of the original 119 (71.4%) students completed the follow up survey 4 weeks after training.

Table 6. Impact of skills training program on student self rated ability to perform skills measured after skills training and 12 months clinical experience compared to 12 months clinical experience alone.

<table>
<thead>
<tr>
<th>Skill</th>
<th>N</th>
<th>% well prepared</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Aseptic technique</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training (2003)</td>
<td>89</td>
<td>26</td>
<td>0.303</td>
</tr>
<tr>
<td>Trained (2004)</td>
<td>112</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Phlebotomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training</td>
<td>89</td>
<td>52</td>
<td>0.001*</td>
</tr>
<tr>
<td>Trained</td>
<td>112</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>IM, IV and SC Injections</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training</td>
<td>89</td>
<td>37</td>
<td>0.001*</td>
</tr>
<tr>
<td>Trained</td>
<td>112</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>IV cannula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training</td>
<td>89</td>
<td>35</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Trained</td>
<td>112</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Urinary Catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training</td>
<td>89</td>
<td>10</td>
<td>0.425</td>
</tr>
<tr>
<td>Trained</td>
<td>108</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Demonstrate CPR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Training</td>
<td>89</td>
<td>21</td>
<td>0.002*</td>
</tr>
<tr>
<td>Trained</td>
<td>109</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

* Mann Whitney U test, significant at p<0.05

It appears the workshops and logbook may have had an impact on practice during clinical attachments, with significantly greater experience in some procedures being gained, when compared with a previous cohort who did not receive a formal training program (Table 7). The impact of the skills training on students' confidence and clinical experience was also shown over the longer term through the larger survey of self-rated preparedness in clinical and procedural skills.
Table 7. Impact of skills training compared with no skills training on the number of procedures performed over 12 months, determined from a logbook.

<table>
<thead>
<tr>
<th>Skill</th>
<th>No Training</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n* (124)</td>
<td>Mean # of procedures (95% CI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean # of procedures (95% CI)</td>
</tr>
<tr>
<td>Use Aseptic technique</td>
<td>73</td>
<td>2.9 (2.5,3.4)</td>
</tr>
<tr>
<td>Phlebotomy</td>
<td>73</td>
<td>4.4 (4.1,4.7)</td>
</tr>
<tr>
<td>IV cannula</td>
<td>72</td>
<td>3.3 (2.84, 3.7)</td>
</tr>
<tr>
<td>Urinary Catheter-male</td>
<td>73</td>
<td>1.1(0.8,1.4)</td>
</tr>
<tr>
<td>Urinary Catheter-female</td>
<td>73</td>
<td>0.56(0.3,0.8)</td>
</tr>
</tbody>
</table>

Table 7. Impact of skills training compared with no skills training on the number of procedures performed over 12 months, determined from a logbook.

* n - number who completed the logbook
† significant with Bonferroni correction at 0.01.

Discussion

Undergraduate medical curricula must train graduates to perform essential procedural so they are ready to commence practice. This paper has described how one Faculty used local evaluation information to demonstrate the lack of preparedness of graduates to perform essential skills and convince staff of the need for structured, standardised skills training and link undergraduate training with postgraduate needs. The results of program evaluation indicate that the workshops processes and format have been valued by students, have enhanced student ability and preparedness to perform several of the procedural skills and increased the
amount of clinical experience they obtain. While self rated preparedness, as a key evaluation measure, may be a limitation, others have shown a link between poor perceived preparedness and limited exposure to clinical experience. Additionally, while students are supervised when performing procedures, introducing structured summative assessment has proved difficult thus limiting outcome evaluation of the program. Longer term, summative evaluation is also being conducted related to retention of resuscitation skills into internship but the results of this study are not as yet available.

Much of the literature related to skills training evaluates a single procedure or the utility of skills centres and simulation. This paper shows the benefits of another model, where the skills training is offered adjacent and linked to clinical attachments, by the health professionals’ students work with and alongside. Interdisciplinary participation encouraged broad ownership and in turn impacted on clinical experience, with a wider group of professionals than just doctors supporting students’ learning. This multidisciplinary program has increased dialogue across clinical sites, for example between nurses and doctors responsible for infection control and procedures, and between undergraduate and prevocational trainers, with better agreement on what should be taught, when, and how.

During this three year process, several key factors have been highlighted for implementing a successful and sustainable skills training program. Consulting widely with local clinicians and sharing the results of consultation openly is important but takes time. We required over six months consulting and establishing arguments for implementing the training program. In the planning and implementation phase, choosing working party representatives with care (those already using simulation or
staff ready for change) was important to ensure a willing partner within relevant disciplines.

Outside of the undergraduate course, we felt it was important to engage postgraduate educators, so they agreed on skills covered at an undergraduate level and better understood what training and assessment had occurred. There is often duplication in teaching, to the annoyance of students or graduates or teachers which occurs too late. Vertical integration is now occurring, as many skills, both clinical and procedural, require ongoing development.

With significant movement of students across Australian states, and now with most states having more than one medical school, some general agreement about what should be taught, when and how, in particular with procedural skills is useful. The idea of a national exit examination has been raised, and this would drive such a development.

Within the medical school, the use of ‘central funding’ so no one group is disadvantaged or favoured was important as was ensuring an ongoing source of funding that was not grant based. This program had to be established and run without a substantial injection of funds and without the luxury of a dedicated skills centre. We obtained a one off grant to buy equipment and decided to establish an “Equipment Library”. Any member of Faculty can borrow the part task trainers purchased with the funding and use them for no cost all year round. This minimises the number of part task trainers that are gathering dust in cupboards in different schools. We also accessed disposable equipment from a range of sources, such as
free or expired disposable equipment from pharmacy, theatre, labour ward etc which has meant costs of training have been kept to a minimum.

As the program was across disciplines, we wanted to keep it out of the usual School structure so an individual, able to work with different health professionals took responsibility for coordinating the development of the training workshops, recruiting and training the trainers and liaising between the Faculty, Schools within the Faculty and the health care providers where students are placed clinically. In addition, they worked with clinical staff from the hospitals so teaching was based on current practice and so trainers were more comfortable supervising and giving feedback to students in the clinical setting.

We felt it important teaching was encouraged to carry over into clinical attachments. Even though at the end of a workshop, students are expected to be able to perform the procedure correctly and safely, they need practise to perform the skills consistently when not observed, and in a real context. In addition, what was learnt in workshops required the students self direction to apply the skills elsewhere, something which does not automatically happen if not structured into the program.

Both the logbook, which was an assessment requirement, and knowing that the material could be included in the end of year clinical examination appeared to have an impact. Most skills were performed more often and a smaller number reported never performing a skill when compared with those who had not received training or encouragement to practice, mainly through opportunities that arose as part of routine clinical work. However, even after training, a substantial number had still never performed male or female catheterisation, a procedure which would be performed in hospitals relatively often. This procedure is performed mainly by nurses and doctors are often not called unless there is a problem, a challenge if there has been limited
prior experience. Making a certain number mandatory and offering particular attachments (surgery, spinal units) where procedures are performed often may address this deficit.

One of the strengths of our approach has been to bring together different health professions, clinical departments and prevocational organisations so that a sense of ownership of skills training remains based within the clinical areas, giving the students the best opportunities for ongoing experience, and allowing them to learn from those who will be their clinical colleagues when they begin work as junior doctors.

References


26. Koczvara B. Tattersall, MHN. Barton, MB et al. Achieving equal standards in medical student education: is a national exit examination the answer?
