Research

Medical students' clerkship experiences and self-perceived competence in clinical skills

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Introduction. In a traditional curriculum, medical students are expected to acquire clinical competence through the apprenticeship model using the Halstedian 'see one, do one, and teach one' approach. The School of Medicine, University of Zambia, Lusaka, Zambia, used a traditional curriculum model from 1966 until 2011, when a competence-based curriculum was implemented.

Objective. To explore medical students' clerkship experiences and self-perceived competence in clinical skills.

Methods. A cross-sectional survey was conducted among 5th-, 6th-, and 7th-year medical students at the School of Medicine, University of Zambia, two months before the final examinations. Students were asked to rate their clerkship experiences with regard to specific skills on a scale of 1 - 4 and their level of self-perceived competence on a scale of 1 - 3. Skills evaluated were in four main domains: history-taking and communication, physical examination and procedural skills, professionalism, teamwork and medical decision-making. Using the Statistical Package for the Social Sciences (SPSS), correlations were performed between experiences and self-perceived competence of specific skills, within domains and overall.

Results. Of clinical students (*N*=197), 138 (70%) participated in the survey. The results showed a significant increase in the proportion of students performing different skills and reporting feeling very competent with each additional clinical year. Overall correlations between experience and self-perceived competence were moderate (0.55). For individual skills, the highest correlation between experience and self-perceived competence was observed mainly with regard to medical- and surgical-related procedural skills, with the highest at 0.82 for nasogastric tube insertion and 0.76 for endotracheal intubation.

Conclusion. Despite the general improvement in skills and self-perceived competence some deficiencies were noted, as significant numbers of final-year students had never attempted important common procedures, especially those performed in emergency situations. Deficiencies in certain skills may call for the incorporation of teaching/learning methods that broaden students' exposure to such skills.

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Introduction

The ultimate goal of medical education is to prepare students to become clinically competent doctors.[1,2] Clinical competence has been defined as 'habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of individuals and community being served'.[3] In a traditional curriculum, medical students are expected to acquire clinical competence through the apprenticeship model using the Halstedian 'see one, do one, teach one' approach[4] as they rotate through clinical clerkships of medical and surgical disciplines. In a competence-based curriculum, essential competencies are identified and learning activities and strategies developed to facilitate attainment of these competencies.[5]

From 1966 to 2011, the School of Medicine, University of Zambia (SOM-UNZA), Lusaka, Zambia, used a traditional curriculum model. In 2011 the School implemented a competence-based curriculum. Its implementation followed the School's self-evaluation against the World Federation of Medical Education International Basic Medical Education Standards (WFME-IBMES).[6] This shift from the traditional medical education model to competence-based education also reflects a global paradigm shift towards competence-based education.[3,7] Despite this shift, it was not known how undergraduate medical students at UNZA progressed in clinical skills acquisition through the different clinical years as the matter had not been investigated.

In the literature, it is contentious whether or not students are competent in essential skills at graduation as discrepancies have been observed in skills they are expected to learn in a particular clerkship compared with what they actually learn.[8] For example, Colberly and Goldenhar[8] indicated that out of six recommended basic procedures (arterial puncture, insertion of nasogastric tube, phlebotomy, intravenous (IV) catheter insertion, lumbar puncture and Foley catheter insertion), the majority of 4th-year students reported not performing four procedures (phlebotomy, IV catheter insertion, lumbar puncture and Foley catheter insertion) during their acting intern rotation at Cincinnati University, USA. These

discrepancies between what students are expected to learn and what they learn have resulted in a lack of competency in certain clinical skills, with a resultant negative impact on patients, medical students, junior doctors and the medical profession.[7, 9] In this regard, Lai *et al.*[7] have suggested that it is important for medical schools to examine the progress in medical students' clinical competence towards the end of their course as this provides a good indication of their ability as housemen and of the effectiveness of the curriculum. In addition, exploring the relationship between students' exposure to and confidence regarding a range of practical skills might review specific strengths and deficiencies in their acquisition of these skills, and identifying the relationship could help to improve the effectiveness of the curriculum.[7] The objective of this survey was to explore students' clerkship experiences and self-perceived competence in clinical skills prior to the implementation of the competence-based curriculum and the introduction of simulation methodology into the curriculum at SOM-UNZA.

Methods

Population description

The duration of UNZA's medical programme is seven years, resulting in a Bachelor's degree in Medicine and a Bachelor's degree in General Surgery (MB ChB). The first two years are pre-medical, followed by two years of basic biomedical sciences and three years of clinical medicine. In the 5th year – the first clinical year – students have their first set of clerkships in Internal Medicine, General Surgery, Obstetrics and Gynaecology and Paediatrics and Child Health. In the second clinical year, clerkships are in Psychiatry, Ophthalmology, Community Medicine, Dermatology, Orthopaedics, Ear, Nose and Throat, Maxillofacial Surgery, and Radiology. In the 7th (final) year, students have their final set of clerkships to consolidate their skills in Internal Medicine, General Surgery, Obstetrics and Gynaecology, and Paediatrics and Child Health.

Design and sampling procedures

The data stem from a medical student-based survey conducted in February 2012. A survey questionnaire was distributed to students two months prior to completion of their 5th, 6th and 7th years (the clinical years of the undergraduate medical education programme at SOM-UNZA). Using a sampling frame that consisted of 5th (*n*=73), 6th (*n*=64), and 7th (*n*=60)-year medical students, a convenient sample of all consenting clinical medical students completed the survey.

Instrument

A questionnaire was administered to all eligible and willing clinical medical students. It obtained information on sociodemographic data, students' year of study and completed clinical clerkships. Students were also asked to rate their clerkship experiences with regard to specific clinical and procedural skills on a scale of 1 - 4 as follows: (*i*) never taught and never performed; (*ii*) taught, but never performed; (*iii*) performed once; (*iv*) performed two or more times.

Furthermore, the students were asked to rate their level of (self-perceived) confidence in performing the skills using the Likert Scale, where 1 = not confident, 2 = fairly confident, and 3 = very confident. The skills evaluated were in the following domains: history-taking and communication skills, physical examination, procedural skills in Internal Medicine, General Surgery, Obstetrics and Gynaecology, Paediatrics and Child Health, and Psychiatry. Other areas evaluated included professionalism, teamwork, decision-making, and decision on appropriate drug/other therapies. The major clinical skills and procedures of focus were based on a study conducted in 2004 at the University Teaching Hospital, Lusaka, which identified and listed a number of commonly encountered procedures.[10] The top 10 were intravenous cannula insertion, urethral catheterisation, examination of the placenta, nasogastric intubation/lavage, abdominal/ascetic tap, lumbar puncture, and vaginal examination. Others were ear,

Table 1. Medical students' clerkship experience (number of times a clinical skill was performed) and self-perceived competence of physical examination skills at the School of Medicine, University of Zambia (2012)

	(A) Percentage reporting performing a skill ≥2				(B) Percentage reporting feeling very confident			
Physical skills examination	5th year, *n*=51	6th year, *n*=34	7th year, *n*=53	*p*-value	5th year, *n*=51	6th year, *n*=34	7th year, *n*=53	*p*-value
Cardiovascular examination, and identifying/detecting								
S1, S2	51 (100)	32 (94.1)	53 (100)	0.059 (F)	36 (70.6)	19 (55.9)	44 (83.0)	0.023
S3, S4	25 (49.0)	18 (52.9)	39 (73.6)	0.026	4 (7.8)	4 (11.8)	15 (28.3)	0.013
Diastolic murmur	23 (45.1)	18 (52.9)	37 (69.8)	0.035	8 (15.6)	2 (5.9)	14 (26.4)	0.044
Systolic murmurs	43 (84.3)	27 (79.4)	49 (92.5)	0.200	22 (43.1)	10 (29.4)	38 (71.7)	<0.001
Pericardial rub	13 (25.5)	15 (44.1)	32 (60.4)	0.002	8 (15.7)	7 (20.6)	20 (27.7)	0.027
Respiratory examination and performing								
Tactile fremitus	48 (94.1)	31 (91.2)	48 (90.6)	0.782	36 (70.6)	21 (61.8)	44 (83.0)	0.080
Auscultation to detect crackles, rhonchi, consolidation	50 (98.0)	31 (91.2)	53 (100)	0.062 (F)	34 (66.7)	22 (64.7)	46 (86.8)	0.024
General abdominal examination	51 (100)	33 (97.1)	53 (100)	0.246 (F)	47 (92.2)	25 (73.5)	51 (96.2)	0.003
Breast examination to detect nodules	40 (78.4)	29 (85.3)	51 (96.2)	0.025	27 (52.3)	18 (52.9)	46 (86.8)	<0.001

Unless identified with a letter (F), *p*-values are based on the χ^2 test of (A) association between year of training and performing a skill ≥2, and (B) association between year of training and feeling very confident. (F) indicates that Fisher's exact test was used to calculate the *p*-value.

Table 2. Medical students' clerkship experience (number of times a procedure was performed) and self-perceived competence of 12 common clinical practical procedures at the School of Medicine, University of Zambia (2012)

	(A) Percentage reporting performing a skill ≥2				(B) Percentage reporting feeling very confident			
Clinical practical procedure	5th year, *n*=51	6th year, *n*=34	7th year, *n*=53	*p*-value	5th year, *n*=51	6th year, *n*=34	7th year, *n*=53	*p*-value
Vaginal delivery	45 (88.2)	34 (100)	53 (100)	0.005	33 (64.7)	25 (73.5)	52 (98.1)	<0.001
Venepuncture and cannulation	51 (100)	32 (94.1)	51 (96.2)	0.236 (F)	47 (92.2)	24 (70.6)	48 (90.6)	0.009
Bladder catheterisation	23 (45.1)	18 (52.9)	48 (90.6)	<0.001	21 (41.2)	12 (35.3)	43 (81.1)	<0.001
Examining the newborn	33 (64.7)	33 (97.1)	48 (90.6)	<0.001	21 (41.2)	18 (52.9)	32 (60.4)	0.144
Abdominal paracentesis	12 (23.7)	12 (35.3)	40 (75.5)	<0.001	11 (21.6)	11 (32.4)	34 (64.2)	<0.001
Nasogastric tube insertion	6 (11.8)	1 (2.9)	29 (54.7)	<0.001	3 (5.9)	1 (2.9)	23 (43.4)	<0.001
Lumbar puncture	2 (3.9)	7 (20.6)	28 (52.8)	<0.001	2 (3.9)	7 (20.6)	21 (39.6)	<0.001
Suturing	3 (5.9)	6 (17.6)	24 (45.3)	<0.001	2 (3.9)	4 (11.8)	15 (28.3)	0.002
CPR	7 (13.7)	5 (14.7)	18 (34.0)	0.023	2 (3.9)	5 (14.7)	11 (20.8)	0.037
Endotracheal intubation	0 (0)	2 (5.9)	12 (22.6)	<0.001	1 (2.0)	3 (8.8)	8 (15.1)	0.059
ACLS	1 (2.0)	0 (0.0)	7 (13.2)	0.012	0 (0)	0 (0)	5 (9.4)	0.027 (F)
Use of a defibrillator	0 (0)	0 (0)	1 (1.9)	1.0 (F)	0 (0)	0 (0)	0 (0)	-

Unless identified with a letter (F), *p*-values are based on the χ^2 test of (A) association between year of training and performing a procedure ≥2, and (B) association between year of training and feeling very confident with the procedure. (F) indicates that Fisher's exact test was used to calculate the *p*-value.
CPR = cardiopulmonary resuscitation; ACLS = Advanced Cardiac Life Support.

nose and throat examination, rectal examination and venous cut-down. It is expected that by the end of the undergraduate training, every student should have attempted these commonly performed procedures.

Prior to the administration of the survey questionnaire, four clinical experts representing the Departments of Internal Medicine, General Surgery, Paediatrics and Child Health, and Obstetrics and Gynaecology reviewed the list of clinical skills. The clinical experts are academic staff of the university and are involved in the clinical teaching of medical students. They identified other practical procedural and clinical skills in addition to those described by Banda.[10] Therefore, the final list was based on consensus among the four experts. Validity of the survey questionnaire was determined by the four clinical experts who considered and adjusted both the content and structure as indicated above. To test for internal consistence, a reliability analysis test was performed for all test items using the Statistical Package for the Social Sciences for Windows version 11.0 (SPSS Inc. Chicago, Illinois, USA) (SPSS), and Cronbach's alpha was 0.956.

Analysis

Data were analysed using SPSS. Descriptive statistics and multivariate analysis were done and complex sample design was used to take into consideration the design effect (year of study taken as the primary cluster). Percentages were calculated for clerkship experiences and level of confidence for each skill across different clinical years. For Tables 1 and 2, Likert scales were collapsed to create dichotomous variables as follows: (A) performed a skill more than once versus never or only once; and (B) very confident versus all other responses. Chi-square or Fisher's exact tests were applied to determine significance of associations between: (*i*) clerkship experience (number of times a skill was performed) and year of training (Tables 1A and 2A); and (*ii*) level of confidence and year of training (Tables 1B and 2B). These *p*-values tested for significant differences across the three grade years, but did not compare any two years directly. Unless identified with a letter (F), *p*-values are based on χ^2.

For Table 3, 'Never taught, never performed' and 'Taught, never performed' were collapsed into one exposure category – 'Never performed'. Correlation coefficients and Spearman's test were used to correlate level of exposure (3-point Likert scale) versus confidence (3-point Likert scale) for all final-year students on a selected number of procedural skills (Table 3). The level of significance was set at 0.05 for all items; therefore, all associations for which $p<0.05$ were considered significant.

The overall correlation between experience and confidence using Spearman's Rho was computed for all skills, and within each domain. Furthermore, correlations between experience and level of confidence/self-perceived competence were computed for selected procedural skills for final-year students. Using previous literature, we determined that self-reported competence will be high if ≥70% of students reported being very competent in that skill, moderate if 50 - 69%, and low if <50%.[11] Similarly, exposure to a skill is high if ≥70% of students reported having practised it two or more times, moderate and low for 50 - 69% and <50%, respectively. Correlations between experience and confidence were assessed using Spearman's Rho correlation coefficient.

Results

Participation and distribution

Out of 197 clinical students, 138 participated in the survey, giving a response rate of 70%. The highest response rate was among final-year students, where 53 out of 60 participated, giving a rate of 88%. This high response rate can possibly be attributed to the fact that final-year students are more interested in evaluating their experiences and confidence in clinical skills compared with the more junior students. The lowest response rate was among the 6th-year students; 34 of 64 participated, giving a response rate of 53%. For 5th-year students, 53 out of 73 participated, giving a response rate of 70%.

Regarding clerkship placement, all 5th-year students had their first set of clerkships in Internal Medicine, General Surgery, Obstetrics and

Table 3. Correlation of number of times performing selected procedures and level of confidence among final (7th)-year students at the School of Medicine, University of Zambia

Practical skill	Confidence level	Never performed	Performed once	Performed ≥2	Correlation (Rho)	*p*-value
Nasogastric tube insertion, *n*=51	Not confident	8 (100)	2 (14.3)	0	0.818	<0.001*
	Fairly confident	0	11 (78.6)	7 (24.1)		
	Very confident	0	1 (7.1)	22 (75.9)		
Endotracheal intubation, *n*=49	Not confident	15 (79.0)	2 (11.1)	0	0.757	<0.001*
	Fairly confident	4 (21.0)	14 (77.8)	6 (50.0)		
	Very confident	0	2 (11.1)	6 (50.0)		
Suturing, *n*=51	Not confident	8 (80.0)	4 (23.5)	0 (0)	0.742	<0.001*
	Fairly confident	2 (20.0)	12 (70.6)	10 (41.7)		
	Very confident	0	1 (5.9)	14 (58.3)		
Bladder catheterisation, *n*=52	Not confident	1 (100)	1 (25.0)	1 (2.1)	0.721	<0.001*
	Fairly confident	0	3 (75.0)	3 (6.4)		
	Very confident	0	0	43 (91.5)		
Lumbar puncture, *n*=49	Not confident	2 (40.0)	5 (29.4)	0	0.637	<0.001*
	Fairly confident	2 (40.0)	11 (64.7)	8 (29.6)		
	Very confident	1 (20.0)	1 (5.9)	19 (70.4)		
Cardiopulmonary resuscitation, *n*=51	Not confident	5 (45.5)	5 (22.7)	0	0.578	<0.001*
	Fairly confident	6 (54.5)	15 (68.2)	9 (50.0)		
	Very confident	0	2 (9.1)	9 (50.0)		
Advanced cardiac life support, *n*=48	Not confident	23 (63.9)	1 (20.0)	1 (14.3)	0.542	<0.001*
	Fairly confident	13 (36.1)	4 (80.0)	1 (14.3)		
	Very confident	0	0	5 (71.4)		
Examining the newborn, *n*=53	Not confident	0	1 (20.0)	1 (2.1)	0.421	0.002*
	Fairly confident	0	4 (80.0)	15 (31.3)		
	Very confident	0	0	32 (66.7)		
Abdominal paracentesis, *n*=52	Not confident	2 (66.7)	0	1 (2.6)	0.357	0.009*
	Fairly confident	0	6 (60.0)	9 (23.1)		
	Very confident	1 (33.3)	4 (40.0)	29 (74.4)		
Use of a defibrillator, *n*=49	Not confident	39 (84.8)	1 (50.0)	1 (100.0)	0.113	0.440
	Fairly confident	7 (15.2)	1 (50.0)	0		
	Very confident	0	0	0		
Venepuncture and cannulation, *n*=52	Not confident	0	0	0	0.058	0.684
	Fairly confident	0	0	4 (8.0)		
	Very confident	0	2 (100)	46 (92.0)		

Correlation coefficients and *p*-values are based on Spearman's test of correlation for level of exposure (3-point Likert scale) v. confidence (3-point Likert scale).
*Indicates column percentage for particular skill.

Gynaecology and Paediatrics and Child Health as defined by the curriculum. In addition to the first set of clerkships, all final-year students reported having had their third and final clerkships in Internal Medicine and General Surgery and second and final clerkships in Obstetrics and Gynaecology and Paediatrics and Child Health. Students' self-reported experience and confidence with selected physical examination skills are shown in Table 1.

For basic examination skills, such as cardiac auscultation for S1 and S2, respiratory auscultation, and abdominal examination, there were high levels of exposure across all years of training, with 90 - 100% performing the skill at least twice. The proportion of students who had identified S3 and S4, diastolic murmurs, pericardial rub and breast nodules more than twice, increased with each additional year of training. As expected, for all skills

the proportion of students feeling very confident with the various skills was highest among 7th-year students.

It is however worth noting that for a number of skills – identifying S1 and S2, systolic murmurs, tactile fremitus, and general abdominal examination – 6th-year students demonstrated less confidence than 5th-year students. More than 80% of 7th-year students nearing graduation reported feeling very confident with auscultation of S1 and S2, tactile fremitus, pulmonary auscultation, abdominal examination, and breast examination to detect nodules. However, <30% reported feeling very confident with auscultation for S3 and S4, diastolic murmurs, or pericardial friction rubs.

Among the 12 listed procedural skills, venepuncture and cannulation had the highest proportion of exposure (>90% performed these at least twice), followed by vaginal delivery, which had been performed by >85% at least twice (Table 2). For most procedural skills, there was an increase in experience with each additional clinical year and a corresponding increase in the proportion reporting feeling very confident. Between the 6th and 7th years, increasing proportions of students had performed the following procedures often: bladder catheterisation (52.9 - 90.6%), abdominal paracentesis (35.3 - 75.5%), nasogastric intubation (2.9 - 54.7%), and suturing (17.6 - 45.3%), with very similar increases in confidence levels. Other skills, such as vaginal delivery, lumbar puncture, and cardiopulmonary resuscitation, showed a gradual progression of experience from 5th to 6th to 7th year.

The highest level of confidence was in conducting vaginal deliveries, where 98.1% of 7th-year students felt very confident. However, less than one-third of final-year students were very confident in five of the 12 listed common procedural skills, the lowest being in the use of a defibrillator (0%), followed by advanced cardiac life support (9.4%), endotracheal intubation (15.1%), cardiopulmonary resuscitation (20.8%), and suturing (28.3%).

Table 3 shows the detailed breakdown of exposure to different procedural skills for final-year students: never taught, taught but never performed, performed once or performed two or more times. In addition, Table 3 shows the correlations between the number of times different procedural skills were performed and the level of self-perceived competence. The lowest correlation was with venepuncture and cannulation (0.058), and the highest with nasogastric tube insertion (0.82).

For the correlations presented in Table 3, overall correlation between experience and confidence for all skills across the different clinical years was 0.55. Within domains, the correlation ranged from 0.15 for professionalism, teamwork and medical decision-making to 0.53 for medical- and surgical -related procedural skills. Correlations in other domains were as follows: mental state examination – 0.21, history and communication skills – 0.34, physical examination skills – 0.47, and obstetrics and gynaecology-related skills – 0.52. Additional data revealed a general improvement in self-confidence in professionalism, teamwork and medical decision-making with each additional clinical year. However, only 42.3% of final-year students reported to be very confident in making decisions regarding appropriate drugs/other therapies.

A significant proportion of final-year students had never performed a number of common procedural skills, including suturing (20%), cardiopulmonary resuscitation (22%), endotracheal intubation (39%), advanced cardiac life support (75.0%) or using a defibrillator (94%).

Discussion

There were substantial and significant increases in the levels of confidence and proportion of students performing different skills with each additional clinical year, especially for procedural skills. Among the 12 listed procedural skills, vaginal deliveries, venepuncture and cannulation were most often performed (Table 2). Similarly, a large proportion of students across clinical years felt very confident in conducting vaginal deliveries, venepuncture and cannulation. From this survey, it was clear that by the end of the first year of clinical clerkship (5th year), all those surveyed reported to have inserted an intravenous cannula more than once, which is the first of the top 10 encountered procedures at the University Teaching Hospital. Similarly, all final-year students had performed the procedure at least once.

The proportions reported in this survey for intravenous cannula insertion are higher than those in previous studies; for example, an audit of clinical skills conducted among final-year medical students at the University of Port Harcourt in Nigeria reported that only 4.8% of final-year students had never inserted an intravenous cannula.[12] The vast majority of 4th-year students at Cincinnati University, USA, reported not performing intravenous cannula catheter insertion during their acting intern rotation.[8]

While the majority of final-year students had performed skills such as venepuncture, cannulation, bladder catheterisation, normal vaginal deliveries and examination of the newborn more than twice, the survey showed that a good proportion had never performed some common procedural skills: cardiopulmonary resuscitation, advanced cardiac life support, nasogastric tube insertion, endotracheal intubation and suturing. This may be a curriculum implementation gap that needs to be addressed. Of further concern, a large proportion of final-year students had never used a defibrillator. These findings should prompt educators of undergraduate medical students to find ways of, firstly, establishing a functioning skills monitoring system and, secondly, finding ways of addressing the gaps while training continues. Other studies have reported a number of final-year medical students or newly graduated doctors not attempting common procedural skills such as basic life support, nasogastric tube insertion, simple wound suturing, lumbar puncture, endotracheal intubation and thoracentesis.[8,12]

The majority of skills that students never attempted are performed in emergency situations in which trial-and-error by students is not acceptable owing to its negative implications on patient outcomes. To improve the skills experience of undergraduate medical students, Goldacre *et al.*[13] suggested the use of log books and skills laboratories. Skills laboratories allow students to learn clinical skills in a safe, standardised and controlled environment, encouraging trial-and-error with the ability to rewind, rehearse and practise without negative patient outcomes, thus expanding on students' hands-on experiences.[14,15] A recommendation would be to incorporate simulation methodology as an integral part of clinical years' medical education to allow students to practise such skills on simulators. Training in skills laboratories enables students to attain a specified level of confidence prior to practising on actual patients.[14,15]

Correlation between experience and confidence in procedural skills among final-year students was high in nasogastric tube insertion, followed by endotracheal intubation, suturing and bladder catheterisation (Table 3). However, overall correlation for all skills across clinical years was moderate. Within domains, there were also moderate correlations for medical- and surgical-related procedural skills, and obstetrics and gynaecology-related skills. On the other hand, low correlations were observed for history and communication skills, and physical examination. These findings suggest that increasing the students' experiences may not necessarily result in a corresponding increase in self-confidence – similar to an observation by Lai *et al.*[7]

However, high correlations between experience and confidence were observed among procedural skills, implying that increasing the number of times a student performs a procedure may result in improved self-confidence. Some literature supports repetitive practice in building confidence among medical residents in certain procedural skills. For skills such as lumbar puncture, Internal Medicine residents reported needing 6 - 10 lumbar puncture experiences to reach a 'comfortable threshold', defined as the number of procedures at which two-thirds of the house staff reported being comfortable or very comfortable performing.[16] Other factors that have been suggested facilitating development of self-confidence include direct supervision, feedback and deliberate practice.[2,7]

Limitations of the study

One limitation of this study was that self-reporting of competence was used as opposed to objectively measured competence. It is generally accepted that competency may be better assessed using the objective structure clinical examination (OSCE), as self-reporting is more subjective. Medical students also overestimate and underestimate their clinical performance.[17] As suggested by Eva and Regehr,[18] the fundamental cognitive limitation in the ability of humans to know themselves as others see them restricts the usefulness of self-assessment results. In assessing their level of experience, students were only asked whether they had performed a given skill up to two or more times, upon which they were requested to determine their confidence. The number of times students were requested to rate themselves could have been expanded to determine if the confidence level would continue to increase or if there is a threshold after which further increase may not result in further improvement in confidence. Therefore, the minimum level of exposure to ensure confidence could not be determined. Notwithstanding the above limitations, this comprehensive survey has marked out the progression of students with regard to clinical skills experiences and confidence across the three years of clinical medical education as a basis for future comparison.

Conclusion

We have reported on the confidence levels of medical students performing different skills, with a demonstrated increase in confidence with each additional clinical year, especially for procedural skills. However, despite this general progress, some deficiencies were noted in that a significant number of final-year students had never attempted common important procedures, including basic life support, nasogastric tube insertion, suturing, endotracheal intubation and use of a defibrillator – findings that should trigger concern. However, the majority of skills that students never attempted are performed in emergency situations in which trial-and-error is not accepted owing to its negative implications on patient outcomes.

We therefore recommend the incorporation of simulation methodology as an integral part of the clinical years of medical education to allow students to practise life-saving skills on simulators, and task trainers to improve their confidence and motivation to perform such procedures on actual patients with minimal errors. Simulation-based medical education is therefore an important and critical interventional strategy for improved health outcomes. This calls for appropriate and focused investment in training if it is to be realised.

Ethical consideration

The survey was conducted as part of the monitoring and evaluation activities of SOM; therefore an ethical waiver was obtained from SOM-UNZA's Research Ethics Committee. Waiver reference number: 017.01.14.

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