

A comparative study on how medical students learn about the use of abbreviations in medical practice

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Background: Misinterpretation of abbreviations by healthcare workers has been reported to compromise patient safety. Medical students are future doctors. We explored how early medical students acquired the practice of using abbreviations, and their ability to interpret commonly used abbreviations in medical practice.

Method: Eighty junior and 74 senior medical students were surveyed using a self-administered questionnaire designed to capture demographic data; frequency and reasons for using abbreviations; from where abbreviations were learned; frequency of encountering abbreviations in medical practice; prevalence of mishaps due to misinterpretation; and the ability of students to correctly interpret commonly used abbreviations. Comparisons were made between senior and junior medical students.

Results: Abbreviation use was highly prevalent among junior and senior medical students. They acquired the habit mainly from the clinical notes of doctors in the hospital. They used abbreviations mainly to save time, space and avoid writing in full sentences. The students experienced difficulties, frustrations and often resorted to guesswork when interpreting abbreviations; with junior students experiencing these more than senior students. The latter were better at interpreting standard and non-standard abbreviations. Nevertheless, the students felt the use of abbreviations was necessary and acceptable. Only a few students reported encountering mishaps in patient management as a result of misinterpretation of abbreviations.

Conclusion: Medical students acquired the habit of using abbreviations early in their training. Senior students knew more and correctly interpreted more standard and non-standard abbreviations compared to junior students. Medical students should be taught to use standard abbreviations only.

Keywords: Abbreviations, medical students, medical practice, medical errors, patient safety.

Introduction

Abbreviations and acronyms are closely linked and often are used interchangeably. However, the meanings of these two words are distinct from each other. Abbreviations are shortened or contracted forms of words or phrases while acronyms are words formed from the initial letters or group of letters in a set phrase. Healthcare providers use abbreviations and acronyms extensively in medical practice because they are short, space-saving, convenient and easy to use.¹ Doctors use abbreviations for the documentation of patients' history, physical findings, ordering of relevant investigations and the management plan for patients. These abbreviations are then read and interpreted by other healthcare professionals like other doctors, pharmacists and nurses.

However, problems may arise in medical practice due to misinterpretation of abbreviations especially by non-doctors. Sheppard *et. al.* (2008)² reported variations in the use and meaning of abbreviations resulting in misunderstandings between healthcare workers. Misinterpretation of abbreviations in medical practice may even lead to mismanagement of patients and medical catastrophes.³ The problem is further compounded by the ever-growing list of non-standard abbreviations that are not universally recognised, often created by doctors or nurses. These abbreviations may mean different things to different people depending on the users and settings where they are used. In short, errors in interpreting abbreviations may potentially compromise patient safety.

There have been no studies done to explore if the use of abbreviations began from medical schools. It is likely that medical students, who will be future doctors, acquire the habit of using standard and non-standard abbreviations during their undergraduate medical

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training when they are exposed to them in the wards. Some of these students may even create their own new abbreviations. It would be of interest to know if the practice of using abbreviations has its roots in medical school. Identifying the prevalence of abbreviation use among medical students may help medical health educationist plan interventional strategies to regulate its use.

We report the results of a study designed to explore the prevalence of abbreviations use among first and final clinical years' medical students in a private medical institution in Malaysia.

Materials and methods

We conducted a cross-sectional survey between December 2013 and May 2014. A total of 154 medical students, comprising of 80 first clinical year students and 74 final clinical year students from the International Medical University (IMU), Malaysia participated in the survey.

The survey tool was a self-administered questionnaire containing five sections. The first section contained questions designed to capture the demographic data such as identifiers (e.g. names, student number), gender, age, ethnicity and whether they were first or final year clinical students. The second section contained questions designed to assess the frequency of abbreviation usage, from where did they acquire the habit of using abbreviations, and the reasons for using abbreviations. The third section explored the perceptions of students regarding the use of abbreviations in medical practice. In this section, a 5-point (ranging from 1: strongly agree, 2: agree, 3: neutral, 4: disagree and, 5: strongly disagree) Likert scale was used to assess the students' responses to several statements. The final section was designed to explore the perceived impact of the use of abbreviations on the quality of patient care. The last section of the questionnaire assessed the ability of the students in correctly interpreting a list of standard and non-standard abbreviations. The list of standard and

non-standard abbreviations was compiled from a pilot study of abbreviations encountered in the admission notes of patients written by junior doctors in the medical wards. The list contained six of the most commonly used abbreviations and forty-seven less commonly used abbreviations. We used an established guideline containing a list of approved abbreviations produced by the Ministry of Health of Malaysia to categorise the list of abbreviations into standard and non-standard abbreviations.⁴ Twenty-three (43.0%) of the total of fifty-three abbreviations were standard abbreviations. The questionnaire was then piloted and validated with randomly selected junior doctors working in the hospital who had completed their medical rotation. Minor post-piloting adjustments were made to the questionnaire mainly to facilitate better comprehension before distribution.

The study site was the Clinical School of the International Medical University in the city of Seremban, Malaysia. First clinical year and final clinical year medical students at the study site were briefed about the objectives of the survey and participation was voluntary. Written consent was obtained from the students before distribution of the survey tool. The students were allowed 20 minutes to complete the questionnaire without assistance.

The sample size required for statistical significance was calculated to be 116 assuming 95% confidence interval (CI) with 5% margin of error. Data was presented in mean or percentage where appropriate. Descriptive analysis was used to delineate the demographic data of the respondents. The independent Student's t-test was used to compare the means between first year and final year students. Statistical significance was explored using the chi-square test. A p value of < 0.05 with 95% confidence interval was considered significant. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 20 for Windows 7.

This study was approved by the International Medical University Research Joint and Ethics Committee and was registered with the National Medical Research Registry of Malaysia.

Results

Demography

Eighty out of eighty-six first year clinical students and seventy-four out of eighty final year clinical students responded to the survey, giving response rates of 93% and 92%, respectively. The male to female ratio was 1:1. The majority of the students were Chinese (70.8%) followed by Indians (13%), Malays (8.4%) and others (7.8%) (Table 1).

Table 1: Demographic characteristic of first and final clinical years' students (N=154)

	1 ST YEAR (%)	FINAL YEAR (%)	TOTAL (%)
Number	80 (100)	74 (100)	154 (100)
Gender			
<i>Male</i>	41 (51.3)	37 (50.0)	78 (50.6)
<i>Female</i>	39 (48.7)	37 (50.0)	76 (49.4)
Ethnicity			
<i>Malay</i>	8 (10.0)	5 (6.8)	13 (8.4)
<i>Chinese</i>	55 (68.8)	54 (72.9)	109 (70.8)
<i>Indian</i>	10 (12.5)	10 (13.5)	20 (13.0)
<i>Others</i>	7 (8.7)	5 (6.8)	12 (7.8)

Prevalence of abbreviation use

Details regarding the usage of abbreviations by the medical students are shown in Table 2. Majority of both first year and final year students (37.0%) reported using abbreviations most of the time, while 31.2% reported using them sometimes and 18.8% reported using them all the time. The most common source from where these students acquired the use of abbreviations were from the documentations made by house officers (92.5% first year students vs. 91.9% final year students, $p = 0.888$) and medical officers (51.3% first year students vs. 67.6% final year students, $p = 0.040$), respectively.

Both groups of students (first year vs final year) reported using abbreviations in order to save time (86.3% vs 93.2%, $p = 0.155$); for convenience (67.5% vs 63.5%, $p = 0.603$); avoid the tedium of writing in full sentences (63.8% vs 55.4%, $p = 0.291$) and to save space (57.5% vs 54.1%, $p = 0.667$). Interestingly, a small number of students reported using abbreviations because they assumed "everyone understands it" (13.8% first year vs 27.0% final year, $p = 0.040$).

The number of students who reported encountering medical mishaps in the wards that could be attributed to the incorrect interpretation of abbreviations used was relatively small. Generally, the final year students reported encountering more incidences of delay in therapy administration ($p = 0.667$), delay in procedure ($p = 0.949$), delay in diagnosis ($p = 0.378$), error in therapy administration ($p = 0.145$), error in procedure done ($p = 0.458$) and diagnostic errors ($p = 0.041$); compared to first year students.

Table 2: Abbreviation use by first and final clinical years' medical students.

ITEM	1 ST YEAR (N = 80)		FINAL YEAR (N = 74)		TOTAL (N = 154)		P VALUE*
	N	(%)	N	(%)	N	(%)	
Frequency of using abbreviations							
All the time	13	(16.3)	16	(21.6)	29	(18.8)	
Most of the time	30	(37.5)	27	(36.5)	57	(37.0)	
Sometimes	26	(32.5)	22	(29.7)	48	(31.2)	
Rarely	11	(13.7)	7	(9.5)	18	(11.7)	
Never	0	(0.0)	2	(2.7)	2	(1.3)	
Source of learning the use of abbreviations							
Copied House Officer's entry	74	(92.5)	68	(91.9)	142		0.888
Copied Medical Officer's entry	41	(51.3)	50	(67.6)	91		0.040
Copied from Nurses' entry	16	(20.0)	24	(32.4)	40		0.079
Reasons for using abbreviations							
Saves time	69	(86.3)	69	(93.2)	138		0.155
Saves space	46	(57.5)	40	(54.1)	86		0.667
Tedious to write full sentences	51	(63.8)	41	(55.4)	92		0.291
It is convenient	54	(67.5)	47	(63.5)	101		0.603
Everyone understands the abbreviations	11	(13.8)	20	(27.0)	31		0.040
Problems encountered from the use of abbreviations							
Delay in administrating therapy	7	(8.6)	8	(10.8)	15		0.667
Delay in procedure	10	(12.5)	9	(12.2)	19		0.949
Delay in diagnosis	10	(12.5)	13	(17.6)	23		0.378
Wrong therapy given	6	(7.5)	11	(14.9)	17		0.145
Wrong procedure done	5	(6.3)	7	(9.5)	12		0.458
Wrong diagnosis made	7	(8.6)	15	(20.3)	22		0.041

*P value derived from chi-square test between 1st year and final year clinical students with 95% confidence interval

Students' perceptions on the use of abbreviations in medical practice

Majority of students from both groups reported frequent encounters with the use of abbreviations in medical practice. Similarly, majority of students reported difficulties when interpreting these abbreviations; feeling frustrated when interpreting the abbreviations;

and often had to resort to guessing the meaning of the abbreviations. Interestingly, junior students reported having more difficulties and feeling more frustrations when interpreting the abbreviations compared to their seniors; $p = 0.010$ and $p = 0.004$, respectively. Nevertheless, most of the students from both groups agreed that the use of abbreviations is necessary and acceptable in medical practice (Table 3).

TABLE 3: First and final clinical years' medical students' perceptions on the use of abbreviations in clinical setting

ITEMS	1 ST YEAR*						FINAL YEAR*						P VALUE#
	1	2	3	4	5	MEAN	1	2	3	4	5	MEAN	
1. I often encounter abbreviations in case file	59	20	1	0	0	1.28	56	15	2	0	1	1.31	0.594
2. I have difficulty interpreting abbreviations	17	39	22	2	0	2.11	4	38	22	9	1	2.53	0.010
3. I often have to guess the meaning of abbreviations	22	39	12	6	1	2.06	10	42	14	8	0	2.27	0.213
4. I feel frustrated when interpreting abbreviations	25	20	27	7	1	2.24	6	29	24	13	2	2.68	0.004
5. I think abbreviations are necessary	17	30	27	5	1	2.29	10	24	32	8	0	2.51	0.358
6. I think abbreviations are acceptable	17	43	15	4	1	2.11	7	42	23	2	0	2.27	0.121

*Number of respondents under each category of the Likert scale: 1: strongly agree; 2: agree; 3: neutral; 4: disagree; 5: strongly disagree.

#P value derived from comparison of means between 1st year and final clinical year students using the Student t-test between 1st year and final year clinical students with; 95% confidence interval.

Correct interpretation of standard and non-standard abbreviations.

Details regarding the proportion of first and final year medical students who correctly interpreted a list of standard and non-standard abbreviations in the questionnaire are shown in Table 4. The final year clinical students generally outperformed the first year clinical students in correctly interpreting the 23 standard abbreviations. However, many in both groups of students were unable to correctly interpret

several abbreviations such as MCL, OT, RTF/RT, STI and Tx.

Similarly, with regards to the non-standard abbreviations in the questionnaire, the final year clinical students again generally outperformed the first year clinical students in correctly interpreting these abbreviations. Both groups of students had difficulties in correctly interpreting certain non-standard abbreviations like DIL, ICD, N/A and W/out.

TABLE 4: Proportion of first and final clinical years' medical students who correctly interpreted standard and non-standard abbreviations.

NO	ABBREVIATION	MEANING	1 ST YEAR (%)	FINAL YEAR (%)	P VALUE#
STANDARD					
1	A/B	Antibiotic	52 (65.0)	58 (78.4)	0.183
2	ADL	Activity of Daily Living	17 (21.3)	67 (90.5)	<0.001
3	ANA	Anti-Nuclear Antibody	38 (47.5)	60 (81.1)	<0.001
4	BKA	Below Knee Amputation	15 (18.8)	66 (89.2)	<0.001
5	BP	Blood Pressure	80 (100.0)	73 (98.6)	0.297
6	BPH	Benign Prostate Hypertrophy/Hyperplasia	77 (96.3)	74 (100.0)	0.243
7	Cm	Coming/ Come Morning	7 (8.8)	41 (55.4)	<0.001
8	FFP	Fresh Frozen Plasma	31 (38.8)	65 (87.8)	<0.001
9	GXM	Group Cross Match	1 (1.3)	50 (67.6)	<0.001
10	HD	Haemodialysis	20 (25.0)	60 (81.1)	<0.001
11	MCL	Mid Clavicular Line	12 (15.0)	16 (21.6)	<0.001
12	NBM	Nil By Mouth	68 (85.0)	71 (95.9)	0.004
13	O/E	On Examination	56 (70.0)	70 (94.6)	<0.001
14	OT	Occupational Therapy	0 (0.0)	24 (32.4)	<0.001
15	PR	Pulse Rate	74 (92.5)	69 (93.2)	0.624
16	RA	Rheumatoid Arthritis	69 (86.3)	72 (97.3)	0.046
17	RTF/RT	Ryle's Tube Feeding/Ryle's Tube	3 (3.8)	19 (25.7)	<0.001
18	SOB	Shortness of Breath	79 (98.8)	74 (100.0)	0.335
19	STI	Soft Tissue Injury/Infection	3 (3.8)	15 (20.3)	0.001
20	STO	Suture To Open/ Off	34 (42.5)	48 (64.9)	<0.001
21	TRO	To Rule Out	70 (87.5)	74 (100.0)	0.002
22	Tx	Transfusion	4 (5.0)	14 (18.9)	0.001
23	U/S	Ultrasound/Ultrasonography	65 (81.3)	73 (98.6)	0.001
NON-STANDARD					
1	A/E	Air Entry	30 (37.5)	60 (81.1)	<0.001
2	Bil	Bilirubin	39 (48.8)	49 (66.2)	0.054
3	BPPV	Benign Paroxysmal Positional/Postural Vertigo	59 (73.8)	47 (63.5)	0.335
4	CECT	Contrast Enhanced Computerized Tomography	26 (32.5)	42 (56.8)	<0.001
5	Cigg	Cigarette	56 (70.0)	64 (86.5)	0.022
6	CRT	Capillary Refill Time	25 (31.3)	62 (83.8)	<0.001
7	DFU	Diabetic Foot Ulcer	36 (45.0)	73 (98.6)	<0.001
8	DIL	Death In Line	2 (2.5)	6 (6.1)	0.249

NO	ABBREVIATION	MEANING	1 ST YEAR (%)	FINAL YEAR (%)	P VALUE#
9	DRNM	Dual Rhythm No Murmur	55 (68.8)	70 (94.6)	<0.001
10	HAP	Hospital Acquired Pneumonia	42 (52.5)	61 (82.4)	<0.001
11	ICD	Implanted Cardioversion Defibrillator	2 (2.5)	3 (4.1)	0.861
12	ICS	Intercostal Space	14 (17.5)	38 (51.4)	<0.001
13	IVI	Intravenous Infusion	26 (32.5)	46 (62.2)	<0.001
14	K/C/O	Known Case Of	10 (12.5)	64 (86.5)	<0.001
15	KUB	Kidney Ureter Bladder	51 (63.8)	67 (90.5)	<0.001
16	LTOT	Long Term Oxygen Therapy/Treatment	22 (27.5)	42 (56.8)	0.001
17	MTF	Metformin	15 (18.8)	23 (31.1)	0.015
18	MZ	Mid/ Middle Zone	22 (27.5)	60 (81.1)	<0.001
19	N&V	Nausea and Vomiting	7 (8.8)	41 (55.4)	<0.001
20	N/A	No Abnormalities	9 (11.3)	18 (24.3)	0.072
21	NKDA	No Known Drug Allergies	46 (57.5)	54 (73.0)	0.129
22	NKFA	No Known Food Allergies	25 (31.3)	31 (41.9)	0.255
23	NPO2	Nasal Prong Oxygen	30 (37.5)	53 (71.6)	<0.001
24	OHA	Oral Hypoglycemic Agent	29 (36.3)	65 (87.8)	<0.001
25	P/w	Present With	68 (85.0)	74 (100.0)	0.002
26	RN	Runny Nose	11 (13.8)	46 (62.2)	<0.001
27	RRT	Renal Replacement Therapy/ Treatment	10 (12.5)	39 (52.7)	<0.001
28	SNT	Soft Non Tender	9 (11.3)	32 (43.2)	<0.001
29	U/L	Underlying	67 (83.8)	73 (98.6)	0.006
30	W/out	Watch Out	6 (7.5)	18 (24.3)	0.002

#P value derived from chi-square test between 1st year and final year clinical students with 95% confidence interval

Discussion

Our study showed that the habit of using abbreviations was acquired as early as the first clinical year of medical school. As these students progress to become seniors, they encounter and use abbreviations more. Similarly, their ability to correctly interpret abbreviations, standard or otherwise, improved as the students gain more knowledge with more clinical exposure.

Nevertheless, both groups of students had difficulties in correctly interpreting a number of standard abbreviations. This may be attributed to the relatively infrequent use of these abbreviations (e.g. DIL: death-in-line, or ICD: intra-cardiac defibrillator) in the wards resulting in fewer exposures for the students. The students also had difficulties in correctly interpreting abbreviations that may have ambiguous meanings such as 'STI' ('soft tissue injury' or 'sexually transmitted disease'), 'Tx' ('transfusion' or 'treatment'), 'MCL' ('mid-clavicular line' or 'medial collateral ligament'), 'N/A' ('not applicable' or 'no abnormalities'), and 'W/out' ('watch out' or 'without').

On the other hand most of the students were able to correctly interpret standard and widely used abbreviations such as 'BP' (blood pressure), 'BPH' (benign prostate hyperplasia), 'NBM' (nil by mouth), 'PR' (pulse rate), 'SOB' (shortness of breath), 'TRO' (to rule out), 'U/S' (ultrasound), and 'O/E' (on examination). In short, unfamiliarity to abbreviations and ambiguity of abbreviations were important contributing factors leading to misinterpretation of abbreviations by the students. These factors have been identified as significant factors leading to medical errors that have become an international patient safety issue.^{1,5,6}

The primary source from where these students acquired the habit of abbreviation use seemed to be from the clinical notes of patients in the wards. Notably, these notes were mostly written by house officers who themselves, may be relatively inexperienced in the use of abbreviations in medical practice. It is quite likely that these house officers acquired the habit of using

abbreviations, often non-standard and often relevant only to the department or hospital, from each other; the ward nurses or from medical officers. Although a Ministry of Health guideline for the use of approved standard abbreviation exists⁴, the information in the guideline is often not transmitted to junior doctors or nurses. To the best of our knowledge, house officers in the hospital, where these students received their clinical training, were not provided with formal training on the proper use of standard abbreviations in medical practice when they join the department.

It is hard to quantify whether misinterpretation of abbreviations in medical practice directly compromised patient safety in this study as only a small number of students reported encountering mismanagement of patients as a direct result of incorrect use of abbreviations. This is not unusual as the medical students were often not directly involved in the management of patients thus limiting their ability to accurately gauge the impact of misinterpretation of abbreviations on patient safety. Nonetheless, medical mishaps attributed to misinterpretation of abbreviations have been reported. For instance, the Institute for Safe Medication Practices reported that over 7,000 deaths per year might be attributed to medical errors in which the use of abbreviation and medical notation were significant contributors to the statistic.^{1,7}

Interestingly, despite the difficulties and frustrations felt in interpreting abbreviations in medical practice, both groups of students felt that the use of abbreviations is both a necessity and acceptable. This indicates, at least in the hospital where the students received their clinical training, the widespread use of abbreviations in the day-to-day management of patients and hence its acceptance.

Indeed, an ideal situation would be to totally eliminate the use of abbreviations in medical practice in order to avoid potential medical errors but in reality, many institutions produce their own list of approved abbreviations.¹ The alternative to a total ban on the

use of abbreviations would be to for organisations, and this should include medical schools, to design creative solutions and best practices that would support patient safety in relation to the use of abbreviations. These 'best practices' typically fall under three strategies, namely education, enforcement and leadership.¹

Medical schools have a responsibility to ensure early exposure for their undergraduate students to the reality of the widespread use of abbreviations in medical practice, the potential pitfalls from its use that may jeopardise patient safety outcome; and educating the students on the importance of using only approved standardised abbreviations.

Study limitations

The results of this study cannot be generalised to other medical institutions and hospitals elsewhere in Malaysia as the clinical exposures of the students and the list of approved abbreviations may differ. Indeed, as this study was conducted within the confines of the medical department of the hospital, the results may not be applicable in surgical-based departments. In addition, we had intentionally left out exploring the significant issue regarding the use of abbreviations in prescriptions leading to dispensing errors in our study, as we believed it was beyond the scope of a medical students' perspective although we recognise this issue to be one of the most common and preventable sources of medication errors.⁷

Conclusions

The habit of using abbreviations in medical practice among medical students was acquired as early as the first clinical year of medical school. Senior students knew more, used more and correctly interpreted more standard and non-standard abbreviations compared to junior students, suggesting that greater clinical exposure in the former had a significant role in the development of this habit.

The use of abbreviations in medical practice is a universal problem and is unlikely to be eliminated despite

efforts to promote the use of sanctioned abbreviations.^{3,8,9}

The source of knowledge of abbreviations among the medical students in this study appeared to be from the documentations made by the junior doctors in the wards. This link is a potential target for remedial actions. If this link can be regulated, medical students can be guided to develop the habit of using only approved or sanctioned abbreviations appropriately instead of using non-standard and potentially harmful abbreviations in their future practice as doctors. Further studies should be done to explore how medical students can be guided to use proper abbreviations for correct documentations in medical practice.

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