

How Residents MET their training: Resident's perception of Medical Emergency Team and its contribution to their Training

Kangqi Ng (✉ ng.kangqi@singhealth.com.sg)

Singhealth <https://orcid.org/0000-0001-8291-1761>

Daryl Jones

Austin Hospital

Augustine Tee

Singhealth

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Abstract

Background

Medical Emergency Teams (MET) have been implemented in many hospitals to improve patient safety. Few studies examined how residents perceive the MET as part of training.

Objective

We aimed to evaluate residents' perceptions of how MET rotation affected training in the core competencies specified by Accreditation Council for Graduate Medical Education (ACGME).

Methods

We conducted an online survey of 106 residents. They are either junior residents who are in training in internal medicine, non-trainee registrars or senior residents who are training in respiratory or advanced internal medicine.

Results

We achieved a response rate of 62.3%. More than 90% of residents agreed or strongly agreed that MET contributed positively to their training, made resuscitation of patients safer and more efficient, and disagreed or strongly disagreed that MET made resuscitation of patients more time-consuming or cumbersome. More than 80% agreed or strongly agreed that the MET improved their clinical judgement in medical emergencies, helped achieve their learning goals and exposed them to a wide variety of cases. At least two-thirds thought that the MET posting improved their procedural skills and communication in end of life care discussions. In contrast, 26.6% of respondents agreed or strongly agreed that the MET decreased autonomy of the primary team. One-third felt they needed formal training for the MET posting.

Conclusion

Our findings suggest that residents perceive participation in MET was beneficial in training and improved patient care. We also found that formal training and consultant oversight may be needed for junior team leaders of MET.

Background

Medical Emergency Teams (MET) exists in many hospitals as part of Rapid Response Systems (RRS). Rapid Response Systems are whole systems that provide a safety net for patients who suddenly become critically ill and have a mismatch between needs and resources. They consist of afferent limbs (case detection and response triggering) and efferent limbs (medical response) to prevent deterioration. MET refers to the efferent limb of the RRS.¹ MET is made up of a group of healthcare professionals who are focused on attending to critically ill patients before cardiopulmonary arrests in order to prevent the arrest

from occurring.² They were associated with reduced in-hospital mortality and rates of cardiorespiratory arrests outside of intensive care units.³⁻⁵

Few studies have examined how residents perceive the MET as part of their training. Most studies found that residents agreed MET enhanced the quality of their training. Benin also described the experiences and attitudes held by nurses, physicians and administrators regarding MET and concluded that MET is a good educational tool for doctors and nurses.⁶⁻⁸ However, MET may also be detrimental to junior doctor education as the independent decision-making process of primary team doctors can be compromised to expedite care for deteriorating patients.⁹

In view of contrasting perspectives, we conducted a survey of physicians who had completed a MET rotation to evaluate their perceptions of MET in contributing to the core competencies of their training programme. MET is primarily a clinical service, however, we believe that the educational value of MET is inherent from participation in MET activations.

Methods

Ethics Approval

Approval was obtained for the conduct of the survey (Approval number 2017/2858). Participation in the survey was anonymous and willingness to complete the survey was taken as indication of consent.

Study Setting

The study was conducted in 2016 in Changi General Hospital (CGH), situated in eastern Singapore, serving a population of about 1 million. It has approximately 1000 beds and is a major accredited teaching hospital with the SingHealth Residency Programme.

The MET in CGH

We implemented a MET system in 2009. When the survey was conducted in 2016, we had a maturing RRS with about 17 activations per 1000 admissions. Our MET activation criteria are summarized in Table A and are similar to MET activation criteria elsewhere.¹⁰

Role of Residents in the hospital MET

The MET in Changi General Hospital (CGH) is led by a non-trainee registrar (fellow equivalent with post-graduate degree in internal medicine) or senior resident who is undergoing training in either advanced internal medicine (AIM) or respiratory and critical care medicine (RCCM). We do not have a dedicated critical care residency programme. A locally accredited intensivist provides supervision and a MET committee is responsible for oversight. This was like the MET model in Australia and New Zealand, although the role of a physician was also variable.^{11,12} Other members of the team include junior resident(s), a critical care nurse and a respiratory therapist. Junior residents doing their intensive care unit

(ICU) rotation as part of Internal Medicine residency assisted the MET registrar. Each registrar or junior/senior resident performs MET duties for one month or more.

Development and implementation of the survey

The survey was conducted amongst residents who were posted to CGH medical intensive care unit from year 2013 to 2016 after these residents have completed their rotation to MET. Junior residents in the team are residents who are in their first few years of training in internal medicine. They are posted to MET during their posting in critical care medicine. Senior residents who lead the MET team are either trainees in AIM or RCCM. They have completed the basic internal medicine training as a junior resident and are pursuing specialist training. They are posted to MET for a period of one month or more. Due to the heterogeneous group of trainees posted to MET, our study examined a varied group of trainees who were at different stages in their training.

Details of survey process

We believe that resident's perception of MET will play a part in the training competency outcomes. Therefore, the objective of our survey was to evaluate trainees' perception of role of MET in contributing to the 6 core competencies of the residency programme as identified by the ACGME (Accreditation Council for Graduate Medical Education)¹³ which include 1) patient care and procedural skills, 2) medical knowledge, 3) practice-based learning and improvement, 4) interpersonal and communication skills, 5) professionalism and 6) systems-based practice (Supplementary data; Table B). There were also general questions to determine a resident's overall perception of MET. The survey was conducted using principles published elsewhere.¹⁴ It was an unvalidated survey used to assess a resident's training outcomes when performing MET duties and the effect of training outcomes.

Data collection and survey format

We conducted the survey using an online survey tool that was sent to every resident via email (supplementary data). The survey was distributed via email with periodic reminders regarding completion of the surveys. No interview was conducted. The residents surveyed had all completed their MET rotation and had been involved in running MET activations. No personally identifiable data were collected. However, to enable better analysis of MET in relation to training stages, residents answered questions regarding which residency program and which postgraduate year they were in. Responses were obtained using a five-level Likert scale with 1 being "strongly disagree" and 5 "strongly agree". Null responses were omitted. All completed and partially completed surveys were analysed by a research assistant.

Categorical data was presented as frequency (percentage). Likert scale data was presented as median (interquartile range). Mann-Whitney test was used for between 2-group comparisons and Kruskal-Wallis test was used for more than 2-group comparison. In case of statistically significant difference in Kruskal-Wallis test, Bonferroni post hoc adjustment was used for multiple pairwise comparisons.

We performed statistical analysis with SPSS statistical software, version 19.0 (IBM Corp. Armonk, NY). A two-sided, p-value of < 0.05 was taken to indicate statistical significance. We compared the perceptions of the different residency programs, postgraduate years 1-3, 4-6 or 7 and gender.

Results

Sample frame and survey response rate

A total of 106 residents were posted to MET over 3 years. The study survey was distributed to all residents who have completed the MET rotation, of which 66 submitted their responses (response rate 62.3%).

Demographics of residents

Out of the 66 respondents, 24 (36.4%) were junior residents and 42 (63.6%) were registrars or senior residents; 15.2% of the respondents were in postgraduate years 1 to 3, 39.4% postgraduate years 4 to 6, and 45.5% were in postgraduate years 7 or more. Of the 66 respondents, 60.6% were female (Table 1).

[Table 1 can be found in Tables Section]

General questions related to the MET posting overall

More than 90% of residents agreed or strongly agreed that MET contributed positively to patient care and their training (Table 2).

[Table 2 can be found in Tables Section]

Questions related to patient care and procedural skills

Eighty two percent of respondents agreed or strongly agreed that MET improved their clinical judgement in medical emergencies, and 70% thought that it improved their procedural skills (Table 3).

Table 3

Survey questions and responses in patient care and procedural skills, as well as medical knowledge

SURVEY QUESTIONS	SD	D	N	A	SA	MEDIAN (IQR)
PATIENT CARE & PROCEDURAL SKILLS						
THE POSTING IN MET IMPROVED MY CLINICAL JUDGEMENT IN MEDICAL EMERGENCIES N = 61 N(%)	1 (1.6)	1 (1.6)	9 (14.8)	26 (42.6)	24 (39.3)	4 (4–5)
THE POSTING IMPROVED MY PROCEDURAL SKILLS EG INTUBATION, CENTRAL VENOUS PRESSURE LINE SETTING, INTRA-ARTERIAL LINE SETTING N = 61 N(%)	1 (1.6)	3 (4.9)	14 (23.0)	21 (34.4)	22 (36.0)	4 (3–5)
I FEEL THAT MET POSTING HAS DECREASED CLINICAL AUTONOMY OF THE PRIMARY TEAM N = 61 N(%)	7 (11.5)	16 (26.2)	22 (36.0)	14 (23.0)	2 (3.3)	3 (2–4)
MET ACTIVATIONS INVOLVED COMPLEX MEDICAL EMERGENCIES THAT FREQUENTLY REQUIRED MY SUPERVISOR'S INTERVENTION N = 61 N(%)	2 (3.3)	17 (27.9)	30 (49.2)	10 (16.4)	3 (4.9)	3 (2–3)
MEDICAL KNOWLEDGE						
I DO NOT FEEL THAT I AM EQUIPPED TO RESOLVE DISPUTES AMONG CLINICIANS THAT AROSE DURING MET ACTIVATIONS N = 59 N(%)	1 (1.7)	23 (39.0)	24 (40.7)	9 (15.3)	2 (3.4)	3 (2–3)
I FEEL THAT WE NEED A HAVE FORMAL TRAINING BEFORE MET POSTING AND A FORMATIVE ASSESSMENT DURING/AFTER MET POSTING N = 59 N(%)	4 (6.8)	19 (32.2)	16 (27.1)	19 (32.2)	1 (1.7)	3 (2–4)
MET POSTING HAS EXPOSED ME TO A WIDE VARIETY OF CLINICAL CASES. N = 59 N(%)	0 (0.0)	1 (1.7)	8 (13.6)	33 (55.9)	17 (28.8)	4 (4–5)
SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree						

Questions relating to clinical autonomy of the primary team and involvement of clinical supervisors were more varied and 37% strongly disagreed or disagreed that MET has decreased clinical autonomy of primary team (Table 3).

Questions related to medical knowledge

Almost 85% of respondents agreed or strongly agreed that MET exposed them to a wide variety of clinical cases (Table 3).

There was varied level of agreement in relation to the need for formal training and assessment in relation to the MET posting, with approximately one third agreeing, one third neutral and one third disagreeing with this question (Table 3).

Questions related to practice-based learning and improvement

86% agreed or strongly agreed that the MET posting helped them achieve their learning goals (Table 4).

Table 4

Survey questions and responses in Practice-based learning and improvement, interpersonal and communication skills, professionalism.

SURVEY QUESTIONS	SD	D	N	A	SA	Median (IQR)
PRACTICE-BASED LEARNING & IMPROVEMENT						
I WAS UNCOMFORTABLE WITH MET ACTIVATIONS AS IT EXPOSED MY WEAKNESSES. N = 59 N(%)	11 (18.6)	32 (54.2)	12 (20.3)	4 (6.8)	0 (0.0)	2 (2-3)
THE MET POSTING HELPED ME ACHIEVE MY LEARNING GOALS. N = 59 N(%)	0 (0.0)	1 (1.7)	7 (11.9)	35 (59.3)	16 (27.1)	4 (4-5)
I WAS ABLE TO ASSUME A TEACHING ROLE DURING THE MET POSTING. N = 59 N(%)	2 (3.4)	15 (25.4)	24 (40.7)	16 (27.1)	2 (3.4)	3 (2-4)
INTERPERSONAL & COMMUNICATION SKILLS						
I TEND TO HAVE DIFFERING OPINIONS FROM THE RESPIRATORY THERAPISTS IN THE TEAM ESPECIALLY REGARDING NON-INVASIVE VENTILATION. N = 59 N(%)	13 (22.0)	37 (62.7)	8 (13.6)	1 (1.7)	0 (0.0)	2 (2-2)
THROUGH THE MET POSTING, I LEARNT TO COMMUNICATE WITH FAMILY PARTICULARLY REGARDING END OF LIFE ISSUES N = 59 N(%)	0 (0.0)	4 (6.8)	14 (23.7)	31 (52.5)	10 (16.9)	4 (3-4)
PROFESSIONALISM						
MET EXPOSED ME TO VARIOUS PATIENT POPULATIONS SUCH AS MEDICAL PATIENTS WITH ACUTE SURGICAL CONDITIONS OR SURGICAL PATIENTS WITH ACUTE MEDICAL CONDITIONS. N = 57 N(%)	0 (0.0)	3 (5.3)	11 (19.3)	33 (57.9)	10 (17.5)	4 (3.5-4)
MET TAUGHT ME THE IMPORTANCE OF PATIENT AUTONOMY AND SHARED DECISION MAKING WITH PRIMARY TEAM DOCTORS AND NURSES. N = 57 N(%)	0 (0.0)	2 (3.5)	13 (22.8)	30 (52.6)	12 (21.0)	4 (3-4)
MET TAUGHT ME THE INFLUENCE FAMILY HAS IN A PATIENT'S DECISION MAKING. N = 57 N(%)	0 (0.0)	1 (1.8)	17 (29.8)	29 (50.9)	10 (17.5)	4 (3-4)
SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree						

Questions related to interpersonal and communication skills

More than two-thirds of residents agreed or strongly agreed that through MET they learnt to communicate with family particularly regarding end of life care issues (Table 4).

Questions relating to professionalism

MET appeared to contribute positively to professionalism. Approximately three-quarters of participants agreed or strongly agreed that MET exposed them to various patient populations and importance of patient autonomy and shared decision making. (Table 4).

Questions about systems-based practice

Four out of five respondents agreed or strongly agreed that MET taught the importance of coordination of health care to ensure the best possible patient outcomes (Table 5).

Table 5
Survey questions and responses in the domain of Systems Based Practice.

SURVEY QUESTIONS	SD	D	N	A	SA	Median (IQR)
SYSTEMS BASED PRACTICE						
THROUGH MET POSTING, I LEARNT THE IMPORTANCE OF WORKING WITH VARIOUS DEPARTMENTS AND NEED FOR COORDINATING HEALTHCARE TO ENSURE BEST OUTCOME FOR PATIENT EG DIALYSIS PLANNING N = 57 N(%)	0 (0.0)	2 (3.5)	10 (17.5)	31 (54.4)	14 (24.6)	4 (4-4.75)
THROUGH THE MET POSTING, I LEARNT HOW HAVING A RAPID RESPONSE TEAM CAN HELP TO IMPROVE PATIENT CARE N = 57 N(%)	0 (0.0)	0 (0.0)	3 (5.3)	24 (42.1)	30 (52.6)	5 (4-5)
SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree						
Declarations						
Ethics approval and consent to participate: Ethical approval for this study was obtained from SingHealth Centralised Institutional Review Board (Approval number 2017/2858). Participation in the survey was anonymous and willingness to complete the survey was taken as indication of consent.						
Consent for publication: Not Applicable						
Availability of data and materials: All data generated or analysed during this study are included in this published article [and its supplementary information files].						

Comparison of respondent's perceptions according to level of seniority

The residents who are in the postgraduate years 1 to 3 are typically junior residents as our residency programme for junior residency lasts 3 years whilst those in postgraduate years 4 to 6 are usually senior

residents in their specialist training. We believe that the presumed experience of the different members of the MET team affects their perception of training.

We compared the above statements between gender, junior or senior residency programme and postgraduate year and did not find a significant difference except regarding whether they feel that they “needed to have formal training before MET and a formative assessment during/after MET posting”.

We compared 3 groups of residents (Postgraduate years 1–3, postgraduate years 4–6 and postgraduate years 7 or more) in their preference towards formal teaching before MET posting. Overall, there was a significant difference among the 3 groups ($p = 0.040$) (Fig. 1). A bonferroni post-hoc test showed that the significant difference lied between postgraduate year 1–3 and postgraduate year 4–6 only ($p = 0.021$). Other pairwise comparisons were not significant. There was no significant difference between postgraduate years 1–3 and more than 7 years ($p = 0.723$) and postgraduate years 4–6 and more than 7 years ($p = 0.504$).

Discussion

Summary of major findings

Our survey showed that most of residents perceive that MET contributed positively to their training and management of patients with urgent medical needs. It also showed agreement amongst residents that it improved their patient care and procedural skills, professionalism and systems-based practice in line with training curriculum. It was unclear if residents preferred formal training before MET, or whether they felt that it decreased clinical autonomy of primary team. We found that residents in post graduate years 4 and above tended towards formal teaching or assessment while residents who were in postgraduate years 1–3 felt less strongly.

Comparison with other studies

There is limited literature assessing a trainee’s perception of their role in MET with respect to contribution to their training.

Jacques et al and Butcher et al surveyed intensive care medicine trainees and resident physicians respectively; they regarded participation in MET as positive for training and on patient care in wards. Our residents have a similar experience with 90% of our residents agreeing or strongly agreeing that MET has contributed positively to their training. Similar to our study, residents surveyed by Sarani et al neither agreed nor disagreed that the creation of MET decreased their opportunities to obtain critical care skills or education.⁷ Butcher et al found that residents disagreed that MET decreased their clinical autonomy while our residents were divided in opinion.⁶ Our residents were also divided in opinion regarding need for formal training before MET while the majority of trainees surveyed by Jacques et al felt that they were well trained for MET.⁴

The residents surveyed by Butcher et al were part of the primary team while their RRS/MET were nurse-led which may explain the difference in opinion as our residents surveyed are part of MET. Our junior residents spent only 3 months out of a 3-year training programme in an ICU posting with a MET rotation. They could feel that MET decreased a primary team's clinical autonomy who would have more perspective.

Strengths and limitations

To our knowledge this is one of few surveys to evaluate the perceptions of doctors in relation to the impact of their role as MET responders in contribution to their training. Strengths of our study include the fact that the survey was directed at the resident's training curriculum, hence directly reflected how MET contributed to their training. These ACGME domains were familiar to our residents as they were used in their individual trainee evaluation. The survey was conducted on all residents who rotated through MET and responses were obtained in almost two-thirds of those surveyed.

Despite these strengths, our study has some limitations. Our response rate was not 100%, therefore, the residents who did not respond might view MET differently from those who responded. The residents who felt that a rotation in MET was beneficial to their training might be more willing to answer and respond to the survey. On the contrary, residents may be less inclined to respond if the perspective was more negative. Being an unvalidated survey, there was a risk of responders not understanding the question as it was intended to. Though the questions were structured according to the 6 ACGME domains to which the residents were accustomed to, reducing the need to pilot the survey to ensure consistent understanding.

Implications

Our study showed that residents in post graduate years 4 and above tended towards formal teaching or formal assessment while residents who were in postgraduate years 1–3 felt less strongly. Most residents in post graduate years 4 and above were senior residents who were team leaders in a MET activation. Therefore, they required clinical expertise in acute medicine, crisis team management, leadership qualities and good inter-professional communication skills. On the contrary, the role of residents in the early postgraduate years 1–3 was to learn from the senior residents and carry out bedside procedures. The residents in the early postgraduate years 1–3 may also have less clinical experience and may not fully appreciate the complexity behind decision making during such situations, therefore, may feel that formal teaching is not necessary.

Our study also showed that the residents are divided in opinion regarding whether MET decreased the clinical autonomy of the primary team. Some MET activations may require the MET team to lead resuscitation in rapidly deteriorating patients with little or no time to consult with the primary team, thus, may be the reason why some residents feel that it decreases the clinical autonomy of the primary team.

We would consider follow-up group discussions to identify reasons for residents' perception of why MET decreases clinical autonomy of the primary team and why junior residents feel less of a need for formal

training.

MET was introduced with patient safety and outcome in mind. With residents' participation in MET, it resulted in achieving educational objectives according to the ACGME requirements. Therefore, developing a structured training programme and increasing specialist's supervision might aid in both training and patient outcome.

Conclusion

Our residents view MET positively and in line with achieving training objectives and core competencies of ACGME. In particular, patient care and procedural skills, professionalism and systems based practice. In addition, our findings suggest that there is a need to provide formal training for residents who lead MET.

Abbreviations

MET

Medical Emergency Teams

ACGME

Accreditation Council for Graduate Medical Education

RRS

Rapid Response Systems

CGH

Changi General Hospital

AIM

Advanced internal medicine

RCCM

Respiratory medicine and critical care medicine.

Declarations

Ethics approval and consent to participate: Ethical approval for this study was obtained from SingHealth Centralised Institutional Review Board (Approval number 2017/2858). Participation in the survey was anonymous and willingness to complete the survey was taken as indication of consent.

Consent for publication: Not Applicable

Availability of data and materials: All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing interests: The authors declare that they have no competing interests

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Tables

Table A: MET activation criteria for activating MET if any of the criteria below is detected.

System	Detailed Description
Airway	<ul style="list-style-type: none">• If threatened i.e. noisy breathing, stridor or wheeze
Breathing	<ul style="list-style-type: none">• Acute change in respiratory rate <8 or >30 breath per minute• Acute change in pulse oximetry to <90% despite oxygen administration• Oxygen requirements of FiO₂ 50% or greater
Circulation	<ul style="list-style-type: none">• Acute change in heart rate to <40 or >130 beats per minute• Acute change in systolic blood pressure <90 mmHg
Neurology	<ul style="list-style-type: none">• Acute change in mental status (fall of Glasgow coma scale >2 points)
Others	<ul style="list-style-type: none">• Any patient that a staff member (doctor, nurse, allied health) is seriously worried about that does not fit the above criteria

Table 1: Demographics of the survey respondents

Demographics	N (%)
Gender	
Female	40 (60.6)
Male	26 (39.4)
Residency Programme	
Internal medicine junior residency	24 (36.4)
Advanced internal medicine senior residency	16 (24.2)
Respiratory medicine senior residency	10 (15.2)
Emergency Medicine Residency	8 (12.1)
Family Medicine Residency	5 (7.6)
Not in Residency programme	3 (4.6)
Postgraduate Years	
1 to 3	10 (15.2)
4 to 6	26 (39.4)
7 or more	30 (45.5)

Table 2: General questions related to perceptions of the MET

Overall	SD	D	N	A	SA	Median (IQR)
Overall, I feel MET contributed positively to patient care N =57 n(%)	0 (0.0)	0 (0.0)	1 (1.8)	31 (54.4)	25 (43.4)	4 (4-5)
Overall, I feel MET posting contributed positively to my training N =57 n(%)	0 (0.0)	0 (0.0)	6 (10.5)	28 (49.1)	23 (40.4)	4 (4-5)
Overall, regarding resuscitation of patients, MET activations made it more cumbersome N =57 n(%)	19 (33.3)	32 (56.1)	5 (8.8)	1 (1.8)	0 (0.0)	2 (1-2)
Overall, regarding resuscitation of patients, MET activations made it more time-consuming. N =57 n(%)	19 (33.3)	33 (57.9)	4 (7.0)	1 (1.8)	0 (0.0)	2 (1-2)
Overall, regarding resuscitation of patients, MET activations made it more efficient N =57 n(%)	0 (0.0)	0 (0.0)	3 (5.3)	29 (50.9)	25 (43.9)	4 (4-5)
Overall, regarding resuscitation of patients, MET activations made it safer. N =57 n(%)	0 (0.0)	0 (0.0)	2 (3.5)	28 (49.1)	27 (47.4)	4 (4-5)

SD= strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree

Figures

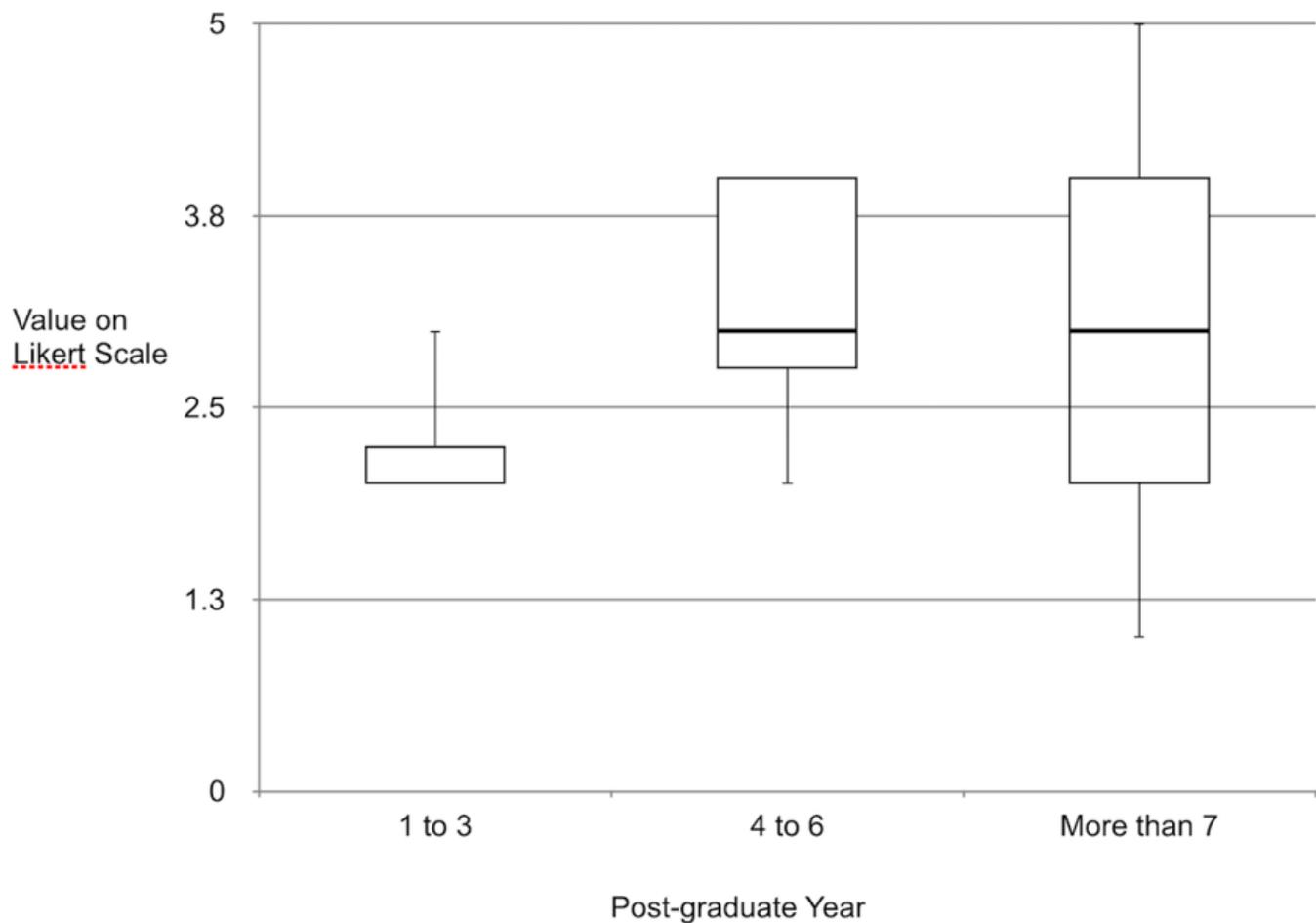


Figure 1

Comparison of the residents' preference towards formal teaching amongst different post-graduate years (p=0.04)

Supplementary Files

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- [Supplementaryfile.docx](#)