

Online Medical Education for Doctors: Identifying Potential Gaps to the Traditional, Face-to-Face Modality

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ABSTRACT

BACKGROUND: Online education options increasingly complement traditional face-to-face (F2F) approaches. Few studies have compared both formats on doctors, and little evidence exists to prove that the online approach is universally effective. This gap needs to be addressed to ensure that the quality of education and health care delivery is not compromised.

METHODS: A quantitative survey targeting 881 doctors that required online and F2F teaching sessions offers identical contents over a 12-month period. The surveyed doctors work in the Australian after-hours house-call (AHHC) industry, and the teachings were parts of their continuing professional development activities.

RESULTS: In all, 89 responses were received; 10 (11.2%) participated exclusively online, while 23 (25.8%) did so by F2F; 52 (58.4%) engaged through both modalities. No statistical differences existed based on sex, specialty, and post-graduate fellowship status, as well as on the perceptions with teaching structure, contents, and duration of the education programmes. However, F2F-only doctors were likely to be junior and younger than 40 years (odds ratio [OR]: 3.85; $P = .01$). They also admit easy access to effective teaching environment (OR: 4.07; $P = .01$) and receive better feedbacks (OR: 3.75; $P = .01$). Conversely, online-only participants were more likely to combine AHHC duties with regular-hours general practice (OR: 0.15; $P = .02$) and are generally more satisfied with the programme frequency (OR: 6.90; $P = .01$).

CONCLUSIONS: On multiple areas, no differences exist in the medical education delivered by online and the F2F methods to doctors and both should be encouraged. However, younger and junior practitioners, who tend to need feedbacks on their jobs, should participate more in the F2F sessions.

KEYWORDS: doctors, medical, education, online, face-to-face, traditional

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Background

Over the past few decades, the application of web-based technological learning and teaching tools has risen rapidly, and this has enhanced the potentials for collaborative learning, be it for knowledge construction at an individual level or for knowledge sharing at a group level.^{1,2}

Most of the existing research exploring the 'Online' and 'Face-to-face' (F2F) teaching formats have been on students, undergraduates, and non-medical participants. Through these, it is known that performances from online courses are as good as those taught by the traditional F2F methods.^{3–9} One publication concluded that the online format supports self-regulated learning and offers a more coherent structure of the learning materials, while the F2F format was better for communication, establishing interpersonal relationships and acquiring skills needed to apply knowledge.¹⁰

Unfortunately, how this applies to medical practitioners is not well known, as researches in this area are few. Even though not exclusively for doctors, one study was found to have made a direct comparison between the efficacy of online and traditional classroom education for health care providers, and it found that there was no difference between the two as it relates

to content and the programmes.¹¹ However, the explored aspects of medical education were limited to the contents and programme delivery, and there remained significant unknowns on various aspects of doctor behaviours and characteristics and how these interact with the choice of teaching modalities. For instance, it is not clear how age, sex, level of training (post-graduate fellowships or otherwise), and the combination of various job engagements interact with each learning modality.

No other studies made a direct head-to-head comparison, but one literature review on the impact of web-based learning to health professionals concluded that while online learning is a valuable addition to medical education, it is not superior and that further research needs to be done to define the peculiarities of the format and identify the group of doctors who will benefit most from it.¹² Another meta-analysis also revealed that while there are positives from Internet-based learning, the effects were inconsistent across multiple papers reviewed.¹³ This article contributes to reducing some of these knowledge gaps.

Interestingly, online education is widely adopted for teaching and mentoring in the medical profession.^{14–16} In addition, the advent of online education-support tools broadens the



options for clinical teachings, which can be diversified to better suit doctors with different commitments, particularly given the ever-busy nature of medical professionals. Most practitioners increasingly find themselves in remote areas, while medical organizations may have doctors in multiple centres across localities, regions, countries, and continents, making it difficult to have all staff in one physical location for F2F education sessions. Geographic isolation, in particular, has been identified as a factor that limits medical education.^{17,18} The online approach, no doubt, provides an attractive alternative, as evidenced by at least one study.¹⁹

Despite the afore-stated attractions of online learning in the medical profession, a few pertinent questions remain. Can medical educators guarantee that these online formats offer the same level of engagement to the participants when compared with the traditional, F2F approach concerning various education modalities? Would the same quality that comes with traditional education be sustained via online mechanisms or would it even be better if delivered solely online?

Without the evidence base provided through empirical research, answers to these questions would be guesswork at best. And, if there are differences in any aspect of learning between the 2 environments, it is important to define these, so that medical organizations, doctors, and all concerned stakeholders will note them and make appropriate adjustments in their education programmes.

This study hopes to contribute to addressing some of the foregoing questions, with the hope of finding useful answers for the medical industry. Hopefully, such findings will be useful globally, given that most hospitals and other employers and dispensers of medical education around the world increasingly adopt the 2 instructive formats for their education. It is also hoped that the answers will help boost the overall quality of health care delivery, as well-delivered clinical teaching programmes (whether online or by F2F) offer benefits to both the mentors, mentees, and the medical organizations.²⁰

For clarity, this study has 2 aims. First, to identify statistical differences, if any, in demographics and participation behaviours of doctors involved in online and F2F education, and second, to make appropriate recommendations based on the findings.

Methods

Setting and participants

This is a cross-sectional survey designed to explore and compare the Online vs F2F clinical teaching and mentoring services available to doctors. Doctors who undertake the Australian after-hours house-call (AHHC) services in Australia were chosen for this study because the education services they are exposed to provide a rare mix of online and F2F teachings, which allow the necessary comparisons. This article is part of a larger study that explored medical education in AHHC.

The AHHC services exist in all of Australia's 6 states and 2 territories and are delivered through registered Medical Deputizing Service (MDS) companies. All 7 MDS companies were approached for access to their individual doctors, and 3 accepted to participate in this study. However, as pre-agreed with all of them, the identities of both the participating and the declining MDS companies were not disclosed in this article. The individual doctors were reached via electronic, self-administered, semi-structured questionnaires delivered as links through emails sent to them by the parent MDS company which they work for.

Structure of clinical teaching/mentoring in Australian AHHC

Most MDS companies provide clinical education sessions on a weekly or monthly basis, with multiple events available in a particular week or month, allowing doctors to choose which ones to attend. The meetings can be held in a physical location (C meetings), with no more than 15 doctors in attendance, or online (usually a virtual conference setting, with participants calling in and having access to visual display of materials controlled by a Facilitator). The online sessions are capped at 20 participants and usually held at times independent of the F2F ones. Each session lasts between 60 and 90 minutes and is usually facilitated by a Mentor, who would normally be a senior doctor who has attained post-graduate (PG) fellowship with the Royal College of Australian General Practitioners (RACGP). The rest of the participants are mainly junior doctors, defined in Australian AHHC as those without the PG fellowships in general practice, or other non-general practitioners (GPs) engaged in the job, even if they are specialists (as the AHHC is not exclusively for GPs).

Questionnaire design, dispatch, and follow-up

This study used a 13-item, self-completed, cross-sectional questionnaire designed for a large study (Supplementary Data S1). The main aspect relating to this article is Question 7, which asked about the pattern of involvement of the respondents over the preceding 12 months. Options included 'Online only', 'F2F only', 'A mixture/combination of both', 'Not at all', and 'Other' means.

The questionnaire also collected responses on 12 Education Practices, presented as sub-questions of Number 2, with answers on a 5-point Likert-type Scale (from 'strongly agree' to 'strongly disagree'). These questions were adapted from the 2009 Australian Medical Association (AMA) junior doctor survey,²¹ but only 6 of the 12 Education Practices were used in this work. These 6 questions assessed the perception of the participants to each teaching format with respect to its 'Structure', 'Environment' 'Feedback Systems', and 'Satisfaction' with the 'Duration', 'Content', and 'Regularity' of the individual

education programmes. The other questions in the questionnaire were designed to collect data on various other demographics and behaviours of the participants.

Even though the major part of the questionnaire was from an already existing tool, piloting was necessary due to the slight modification and the inclusion of other questions. This was done with 10 doctors who engaged in occasional after-hours home visits, but was not affiliated with any MDS company. Comments from them were considered alongside views from experts and colleagues of the researchers to modify and produce the final, 4-page, 13-item questionnaire.

Data collection took just more than 6 weeks (middle of August 2017 to early October 2017). To optimize responses, 2 reminder emails were sent, at approximately fortnightly intervals. Completed responses were returned directly to the researchers by clicking a 'submit' link on completion of the survey. The responses did not go through the MDS companies so as to avoid any undue influence they might have on the respondents.

Data analysis

Data analysis was with the Statistical Package for the Social Sciences (IBM-SPSS), version 24. Both descriptive (presented as absolute data or as percentages) and inferential analyses (using a multi-step binary logistic regression [BLR]) were adopted. The inferential analysis attempted to explore associations between the dependent (outcome) variables and a number of independent (predictor) variables, with the latter made up of the behaviours of the participants over the preceding 12 months to the data collection. Each variable (dependent or independent) was dichotomized to allow feasibility of analysis and suitability to the BLR.

The Dependent Variables included the 2 major ways of participating in clinical teachings ('Online-only' and 'F2F' only), with options of 'Yes' or 'No'. As the focus of this study was to directly compare these 2 modalities, all participants who engaged in both teaching methods were excluded from the BLR analysis, so as to avoid cross-contamination. Details regarding those participants are reported in a separate paper, which addressed a separate aim.

For the 13 Independent Variables, the behaviours of the participants over the preceding 12 months to the data collection were used. They include 6 respondent characteristics, which are Sex (Female vs Male), Age (<40 or ≥40 years), Registration Status with the Australian Health Practitioners Regulation Agency (AHPRA) (Fellowship/Specialist attained or Not Attained), Specialty (GP or non-GP), and other involvement in other jobs outside of the AHHC (regular-hour general practice, hospital-based practice, and only AHHC: each having a 'yes or no' option). The remaining 7 independent variables were the 6 Education Practices identified earlier, with the options of 'Yes' (Agree and Strongly Agree) or 'No' (Unsure, Disagree, and Strongly Disagree).

For each BLR analysis, an odds ratio (OR) was generated, along with 95% confidence intervals (CIs). Probability (*P*) values of <.05 were deemed significant.

Ethical considerations

Ethical clearance was obtained from the Griffith University Human Research Ethics Committee, with reference number (GU Ref No: 2017/648). Consent was mandatory before questionnaire completion.

Results

Basic respondent characteristics

A total of 881 doctors were contacted via emails (Table 1). Out of the 112 responses received, 89 completed as many questions as was needed to warrant inclusion in the analysis. This gives a 10.1% (89 out of 881) response rate; 10 (11.2%) respondents participated only online, 23 (25.8%) do so by F2F-only, while 52 (58.4%) engaged through both modalities. One participant engaged through recorded teachings, while the remaining 3 respondents did not participate with either method. Other characteristics are as shown in Table 1.

Education aspects

The highest responses were on the usefulness of the cases and reviews presented in the clinical teachings, as well as on the satisfaction with the duration of the individual sessions, each with 84.3% (Table 2). The least response was on the existence of proper supervision processes (58.4%).

Analysis of online-only and F2F-only participation in medical education

Doctors who participate in the Online-only format were more likely to report satisfaction with the regularity of the teaching activities (OR 6.90; 95% CI: 1.69-28.15; *P* = .01), but less likely to combine their AHHC duties with regular hours' general practice (OR: 0.15; 95% CI: 0.03-0.73; *P* = .02; Tables 3 and 4). A further analysis, not shown in Tables 3 and 4, revealed that doctors who required compulsory mentoring (junior doctors) were more likely to combine working in AHHC with jobs in regular-hour general practice (OR: 2.63; 95% CI: 1.09-6.33; *P* = .03).

Conversely, doctors engaged in F2F-only sessions were likely to be those aged under 40 years (OR: 3.85; 95% CI: 1.34-11.00; *P* = .01) and were more likely to admit easy access to an effective environment for clinical teaching (OR: 4.07; 95% CI: 1.36-12.15; *P* = .01). They were also more likely to report proper consultations and feedback on their jobs (OR: 3.75; 95% CI: 1.39-10.10; *P* = .01).

As shown in Table 3, there were no differences between the online-only and F2F-only participants with respect to Sex, Specialty, and Fellowship Status. Similarly, Table 4 shows that

Table 1. Demographics and patterns on involvements in clinical teachings by after-hours home-visit doctors in Australia over the preceding 12 months (n=89).

S. NO.	PATIENT VARIABLE	VARIOUS COMPONENTS OF VARIABLES	NUMBER	PERCENT
1.	Sex	Female	16	18.0
		Male	73	82.0
2.	Age range (years)	≤25	0	0.0
		25-39	44	49.4
		40-59	39	43.8
		≥60	6	6.7
3.	Status with AHPRA	GP Fellowship (VR) /specialist	24	27.0
		No GP fellowship (non-VR)/non-specialist	65	73.0
4.	Specialty	General practice	70	78.7
		Emergency department	8	9.0
		Medical specialty (includes occupational health, public health, etc)	4	4.5
		Surgical specialty (includes obstetrics/ gynaecology, ENT, etc)	1	1.1
		Paediatrics	0	0.0
		Other	6	6.7
5.	Other jobs engaged in by doctors involved in AHHC	Office-based GP	37	41.6
		Hospital-based doctor	17	19.1
		Only AHHC	31	34.8
		Other (visa medical, educator, etc)	4	4.5
6.	Location of service (by state or territory in Australia)	Australian Capital Territory	3	3.4
		New South Wales	27	30.3
		Northern Territory	0	0.0
		Queensland	19	21.3
		South Australia	9	10.1
		Tasmania	3	3.4
		Victoria	23	25.8
		Western Australia	5	5.6
7.	Preferred Format of participation in clinical teachings	Not at all	3	3.4
		Online only	10	11.2
		Face-to-face only	23	25.8
		Mixed (online and face-to-face)	52	58.4
		Other (recorded for listening later)	1	1.1

Abbreviations: AHPRA, Australian Health Practitioners Registration Association; AHHC, after-hours house calls; GP, general practitioner; VR, vocationally registered.

Table 2. Responses to aspects of clinical education, supervision, and mentorship to doctors involved in after-hours home-visits in Australia (n=89).

S. NO.	EDUCATION AND SUPERVISION ASPECT	RESPONSE	
		NO (%)	YES (%)
1.	I have access to a structured clinical teaching programme	28 (31.5)	61 (68.5)
2.	I have access to an environment for effective clinical teaching (online and/or face-to-face)	18 (20.2)	71 (79.8)
3.	The clinical teachings/meetings have useful cases and reviews applicable to the our job	14 (15.7)	74 (84.3)
4.	I have access to a proper system of consultations and feedbacks regarding my work	30 (33.7)	59 (66.3)
5.	A system for sound and effective supervision and assessment of my work is in existence	37 (41.6)	52 (58.4)
6.	I am satisfied with the length of time allocated for each clinical teaching activity	14 (15.7)	75 (84.3)
7.	I am satisfied with the content(s) of the clinical teaching activities	19 (21.3)	70 (78.7)
8.	I am satisfied with the regularity of the existing teaching activities	15 (16.9)	74 (83.1)

Yes=Agree + Strongly Agree; No=Unsure + Disagree + Strongly Disagree.

Table 3. Final results of binary logistic regression showing associations of online and face-to-face participations in medical education with selected characteristics of doctors in after-hours home visit doctors (n=89).

S. NO.	DOCTORS' CHARACTERISTICS	ONLINE-ONLY		FACE-TO-FACE ONLY	
		ODDS RATIO (OR) (95% CI)	SIGNIFICANCE (P VALUE)	ODDS RATIO (OR) (95% CI)	SIGNIFICANCE (P VALUE)
1.	Age (<40 vs ≥40)	0.38 (0.09-1.57)	.18	3.85 (1.34-11.00)	.01*
2.	Sex (female vs male)	0.86 (0.17-4.50)	.86	0.51 (0.16-1.60)	.25
3.	AHPRA registration status Fellow (+Specialists) vs non-fellow	0.31 (0.08-1.21)	.09	0.79 (0.28-2.26)	.66
4.	Specialty (GP vs non-GP)	0.91 (0.18-4.70)	.91	1.03 (0.33-3.27)	.96
5.	Regular-hour GP (in addition to AHHC vs no additional)	0.15 (0.03-0.73)	.02*	1.47 (0.55-3.94)	.44
6.	Hospital doctor (additional hospital-based practice vs not)	2.29 (0.27-19.38)	.45	0.57 (0.18-1.76)	.33
7.	AHHC only (only AHHC vs additional jobs)	5.51 (0.66-45.69)	.11	1.31 (0.47-3.62)	.61

Abbreviations: AHPRA, Australian Health Practitioners Regulation Authority; CI, confidence interval; GP, general practitioner; AHHC, after-hours house call.
*Statistically significant.

there were no differences in the perceptions of the 2 groups on the Structure, Content, and Duration of the Education programmes.

Discussion

With a ratio of approximately 4:1, male and female respondents in this study are similar to those from a 2015 publication of a survey of doctors in Australian AHHC.²² Also, 93.2% of the respondents in this survey were aged between 25 and 59 years (Table 1), compared with 94.7% in the 2015 study,²² while the fraction of GPs in the 2 studies were 78.7% and 84.4%, respectively. These similarities indicate that this study is generally similar in various demographics compared with the older paper, indicating that the sample is representative.

The significant associations identified in this article are quite revealing, and will no doubt influence the approach to teaching medical practitioners if they can be replicated in larger studies. First, the fact that online-only participants were about 7 times more likely to be satisfied with the regularity of the teaching activities (OR: 6.90; $P = .01$) may be attributed to the freedom and flexibility that come with getting on to the teaching sessions from wherever one might be. This enables doctors to choose and pick the sessions that suit them, which in turn allows them to fit into various schedules on the available academic programmes to suit their self-directed targets, without the restriction posed by the need for a physical environment. As explained earlier, the AHHC online education programmes are organized in conference-like settings, and participants can

Table 4. Results of binary logistic regression for the associations between selected aspects of medical education for after-hours home visit doctors involved in online-only and face-to-face only sessions (n=89).

S. NO.	EDUCATION ASPECTS (YES VS NO)	ONLINE-ONLY		FACE-TO-FACE ONLY	
		ODDS RATIO (OR) (95% CI)	SIGNIFICANCE (P VALUE)	ODDS RATIO (OR) (95% CI)	SIGNIFICANCE (P VALUE)
1.	I have access to a structured clinical teaching programme	0.93 (0.22-3.88)	0.92	2.64 (0.99-7.09)	.05
2.	I have access to an environment for effective clinical teaching (online and/or face-to-face)	1.83 (0.42-7.91)	0.42	4.07 (1.36-12.15)	.01*
3.	I have access to a proper system of consultations and feedbacks regarding my work	1.36 (0.35-5.24)	0.66	3.75 (1.39-10.10)	.01*
4.	I am satisfied with the length of time allocated for each clinical teaching activity	2.65 (0.59-11.81)	0.20	0.75 (0.19-2.97)	.68
5.	I am satisfied with the content(s) of the clinical teaching activities	1.69 (0.39-7.26)	0.48	1.03 (0.33-3.27)	.96
6.	I am satisfied with the regularity of the existing teaching activities	6.90 (1.69-28.15)	0.01*	0.39 (0.08-1.87)	.24

Abbreviations: CI, confidence interval.

*Statistically significant.

join with their phones or computers and from their homes or cases or offices. This way, even if the programmes come up weekly, fortnightly, or monthly, they are likely to find suitable times. This finding seems to be broadly consistent with reports that online teachings appeal more to students with goals on self-regulated learning,¹⁰ as well as those who are more satisfied with general online experiences.²

Another association with online-only participants is that they were less likely to combine office-based general-practice duties with working in AHHC (OR: 0.15; $P=.02$). This finding is unexpected, and there is no clear explanation for it, but there may be a connection between the findings that doctors who require compulsory mentoring were more likely to work in regular-hour general practice in addition to working in AHHC (OR: 2.63; $P=.03$). Given that this group of doctors requires more feedbacks as part of their job and that these are better obtained through F2F sessions as also found in this study, one might argue that the explanations may be related to these. However, further research may be needed to fully explore this.

Just like the online-only associations, the associations with F2F only participation are also revealing. First, the finding that doctors aged under 40 years were more likely to favour F2F teaching (OR: 3.85; $P=.01$) is a bit of a surprise, as one would expect the younger individuals to be more online-savvy.²³ In any case, it should be noted that, even though they were younger, none of the doctors in this study was under 25 years of age (Table 1). This finding does not entirely agree with results from another study, which reported a none difference in the online and F2F groups with respect to age.⁸ The participants in the cited study were not doctors though, and this comparison should be taken with caution, given that among doctors, as our study focused on, the younger age groups are likely to be more

junior and therefore would require more feedbacks. As already established by this study, doctors who require feedbacks and consultations on their work are more likely to favour F2F learning (OR: 3.75; $P=.01$), and this is broadly supported by the findings of another paper on Austrian students, which reported that the F2F teaching modality was preferred where communication and interpersonal relationships need to be established.¹⁰ These associations have important policy and practice implications, as it might be necessary for medical educators to ensure that appropriate feedback mechanisms are in place for junior doctors (and all cases where feedbacks are necessary) who are educated online, or, if possible, ensure that occasional F2F teachings exist alongside online education programmes.

Ordinarily, the finding that F2F-only practitioners were 4 times more likely to admit easy access to effective environment for clinical teaching (OR: 4.07; $P=.01$) should not be a surprise as one would expect this to be the case. However, no other study in the existing literature has looked at or reported a similar finding among doctors. In any case, the efficacy of online sessions is influenced by a lot of variables, including reliable Internet connections and good audio quality among others, which might create uncertainties not obtainable in F2F meetings. All these may combine to reduce the perceived efficacy of the online teachings compared with F2F.

There were no surprises on the findings that there were no differences between the online-only practitioners and their F2F-only counterparts with respect to Sex, Specialty, and Fellowship Status, as well as the doctors' perceptions of the Structure, Content, and Duration of the Education programmes. While no previous studies have looked at all of these aspects in one whole, these findings appear to be broadly consistent with the reports

from multiple sources on non-medical practitioners that performances between the 2 groups are similar.^{3-7,9}

Limitations

The applicability of the findings of this study to the wider medical profession may be limited by the fact that the data came from doctors (mainly GPs) involved in after-hours duties. However, the demographics (Table 1) reveal that the practitioners were drawn from multiple non-general practice specialties, so the impact of this limitation may not be huge.

The study's poor response rate is another limitation. This raises the potential for non-response bias and heightens concerns to the generalizability of the findings as the answers from the non-responders may be different from those captured in this study. However, the basic respondent demographics, which match those in the existing literature, suggest that this limitation may also not have a huge impact. In any case, this work relied on comparisons between 2 different groups, so the response rate may not be a huge factor in determining the differences between the groups as might be the case if characteristics in one group were the focus.

Despite these limitations, this article, which can be seen as a pilot study, makes some important policy and practice contributions by revealing a number of unique associations between online and F2F teaching modalities for doctors. Future studies can further explore these.

Conclusions and Recommendations

There were no observed differences among doctors' participation in online and F2F medical education programmes with respect to Sex, Specialty, and Postgraduate Fellowship Status, as well as with the Structure, Content, and Duration of the education programmes. Although, a few differences were observed on a number of characteristics. First, doctors who prefer online-only approach are more likely report satisfaction with the regularity of the existing teaching activities, but were less likely to combine their AHHC jobs with other medical jobs. Conversely, those who engage in the face-to-face modality were more likely to benefit more on consultations and feedback regarding their jobs and are likely to be younger than 40 years of age, implying that they are likely to be more junior practitioners. The F2F-only participants are also more likely to report effective environments for clinical teaching.

Should the above findings be replicated in larger studies, medical organizations and hospitals may consider online teaching options to their programmes alongside the traditional F2F ones. This is important because, even though both approaches deliver largely the same benefits to participants in multiple areas, the online sessions add more flexibility, while the F2F formats may be better suited to junior doctors given its advantages with feedbacks and communications. Ensuring reliable and efficient Internet and telephone connectivities, along with

strong audio quality during online teachings, may also help improve the perceptions of the online environment as being effective.

The above recommendations can contribute towards the enrichment of the teaching options available to doctors, particularly those in geographically separated and remote areas.

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Author Contributions

CI was solely responsible for the all aspects of this study.

Ethical Approval

Ethical clearance was obtained from the Griffith University Human Research Ethics Committee (Reference number of GU Ref. No. 2017/648) prior to commencing the study. Consent was mandatory before questionnaire completion.

Supplemental Material

Supplemental material for this article is available online.

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