



Original Article

Self- and rater-assessed effectiveness of “thinking-aloud” and “regular” morning report to intensify young physicians' clinical skills

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Abstract

Background: This study compared the effects of the “thinking aloud” (TA) morning report (MR), which is characterized by sequential and interactive case discussion by all participants, with “regular” MR for clinical skill training of young physicians.

Methods: Between February 2011 and February 2014, young physicians [including postgraduate year-1 (PGY₁) residents, interns, and clerks] from our hospital were sequentially enrolled and followed for 3 months. The self- and rater-assessed educational values of two MR models for building up clinical skills of young physicians were compared.

Results: The junior (intern and clerk) attendees had higher self-assessed educational values scores and reported post-training application frequency of skills trained by TA MR compared with the senior (PGY₁ resident) attendees. Higher average and percentage of increased overall rater-assessed OSCE scores were noted among the regular MR senior attendees and TA MR junior attendees than in their corresponding control groups (regular MR junior attendees and TA MR senior attendees). Interestingly, regular MRs provided additional beneficial effects for establishing the “professionalism, consulting skills and organization efficiency” aspects of clinical skills of senior/junior attendees. Moreover, senior and junior attendees benefited the most by participating in seven sessions of regular MR and TA MR each month, respectively.

Conclusion: TA MR effectively trains junior attendees in basic clinical skills, whereas regular MR enhances senior attendees' “work reports, professionalism, organizational efficiency, skills in dealing with controversial and professional issues.” Undoubtedly, all elements of the two MR models should be integrated together to ensure patient safety and good discipline among young physicians.

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1. Introduction

A “regular” morning report (MR) usually consists of a group of junior and senior attendees, meeting with the teacher functioning as a facilitator in the medical education system.^{1,2} One or more inpatients are presented, and the teacher uses the case as an opportunity to oversee events that occur clinically.

Conflicts of interest: The authors declare that there are no conflicts of interest related to the subject matter or materials discussed in this article.

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In the course of regular MR, the attendees are asked to perform academically in front of their colleagues and teacher. As a result, regular MRs can be embarrassing, particularly when attendees have no idea how to answer a question posed by the teacher. Additionally, some attendees have reported that they feel isolated during a regular MR because of their lack of experience and find it difficult to join in the discussion with the more senior participants.^{3–5}

During regular MRs, most teachers use a “pattern recognition” form of discussion, which often results in premature closure in terms of the differential diagnosis (DD) and may miss some important possibilities.^{3–5} Thus, medical educators have suggested using “think-aloud” approaches that may help the development of critical thinking and clinical reasoning skills during MR.^{2,6–10}

The “thinking aloud” (TA) approach asks participants to illustrate the thought process by verbalizing their ideas. TA is an effective way to assess and develop higher level thinking processes. It has been used to assist pediatric nurse practitioner students to develop their critical thinking and clinical reasoning skills.¹⁰

In this context, we introduced the TA MR model, which is characterized by the stepwise presentation of cases using the following concepts: (1) establish a positive learning climate; (2) control the teaching session; (3) review medical knowledge; (4) enhance understanding and information retention in DD skills; (5) allow evaluation and obtain feedback via an open interactive discussion; and (6) allow self-directed learning in critical clinical reasoning and treatment planning skills.^{1,4,5,9–11}

In this study, our aim was to compare the efficiency of the TA MR model with that of the regular MR model when they were used to train young physicians in clinical skills.

2. Methods

2.1. Setting

MRs are a mandatory conference attended by chief residents (CRs), postgraduate year-1 (PGY₁) residents, interns, and clerks during inpatient medicine rotations at Taipei Veteran General Hospital (VGH), Taipei, Taiwan. Taipei VGH is a 2800-bed regional medical center and teaching hospital that provides primary and tertiary care to active duty and retired military members and their dependents. There are, in total, nine subspecialty divisions in the internal medicine department of this hospital plus the general medicine division. For the past few years, the general medicine division has held TA MRs,^{10,11} whereas the other 10 subspecialty divisions held regular MRs.

2.2. Study participants

Between February 2011 and February 2014, TA MR was held three to four times per week in two separate meeting rooms of the general medicine division; these were attended by individuals from the general medicine division and other

various different divisions of the internal medicine department. Meanwhile, regular MR was held one to two times per week in the other eight divisions of our internal medicine department.

All CRs, PGY₁ residents, interns, and clerks who were on internal medicine department inpatient medicine rotations (medical consultations or medical wards) were included. These individuals were randomly assigned to participate in the TA MR each month. In parallel, others individuals who were attending regular MR served as controls. After enrollment, the TA MR attendees did not participate in the regular MR. Conversely, the regular MR attendees did not participate in the TA MR. In general, all participants in our program attended eight to 16 MRs during each month of their internal medicine ward rotation. Staff members who had attended less than two MR per week were excluded from the study.

2.3. Ethics statement

This study was approved by the Ethics Committee of Taipei VGH and complied with the principles of the Declaration of Helsinki Guidelines.

2.4. Regular MR model

In the weekly regular MR, the nighttime on-call resident would present the cases that were admitted during the previous night. Emphasis was placed on appropriate data gathering—its concise collation and its presentation as a database—and practical approaches to initial therapeutic management. The teachers interacted with the CRs in order to help the participants form good work habits, improve their case presentation skills, and sometimes provide a minilecture on topics related to the new cases. Occasionally, teachers evaluated the performance of all attendees in a regular MR.

2.5. TA MR model

The junior attendees (clerks/interns) described the patient's initial presentation (Table 1 and Fig. 1). In unfolding the case, the presenter needed to demonstrate a thoughtful understanding of the patient's illness and the disease process. Next, other junior attendees (clerks/interns) and participants were invited to ask the presenters for more information. All attendees wrote and reported their TA DD of the case in the final 10 minutes.

Subsequently, the teachers and CRs had a patient-centered open discussion based on the attendee's initial TA DD. Then, other junior attendees (clerks/interns) were assigned to provide appropriate laboratory data and additional findings. Senior attendees (PGY₁ residents) interpreted the results of laboratory and imaging tests. Next, all attendees had a chance to revise their TA differential diagnoses. Again, the attending physician and CRs carried out a discussion according to the second run of the TA DD and integrating/summarizing the key learning objectives identified during the TA process.^{10,11}

Table 1
Guidelines for “TA” morning report (MR).

Time (min)	Topic	Owner	Expectation	Details
10	Case presentation	Junior attendees (clerks)	<ul style="list-style-type: none"> – Presenter guides viewers through their thought process and toward their differential. – Presentation illustrates presenter's understanding of the patient and the disease process. 	PH: Include patient identifier, chief complaint, and pertinent history ± ROS. Medical, family, social, medication, and other history. PE: Vital and pertinent findings, Present your patients as you would on rounds. Your goal is to have all participants come up with your differential.
10	Interactive Open discussion	Junior attendees (clerks) and all participants	Ask all questions about HP and physical examination.	
10	1° differential diagnosis “First think-aloud”	All participants	Develop differential tailored to the patient's risk factors and key elements of disease including temporal course and symptoms	Reasoning for each diagnosis should be explained by participant to chief residents and attending physicians.
10	Workup	Junior/senior attendees (interns/residents)	Order and interpret laboratory and imaging test carefully.	Pretest probability, cost, timeliness, and reasoning for each test should be considered.
10	Reprioritize differential diagnosis “Second think-aloud”	All participants	Reevaluate diagnosis with new data; does it change your diagnosis?	Underlying reasoning for each diagnosis should be explained by all participants to chief residents and attending physicians.
10	Learning summary and patient management	All residents	Summarize treatment planning for patient and key learning points.	All participants are involved in the open interactive discussion; chief resident and attending physicians give a minilecture to all participants.

PE = physical examination; PH = personal history; ROS = review of system; TA = thinking-aloud.

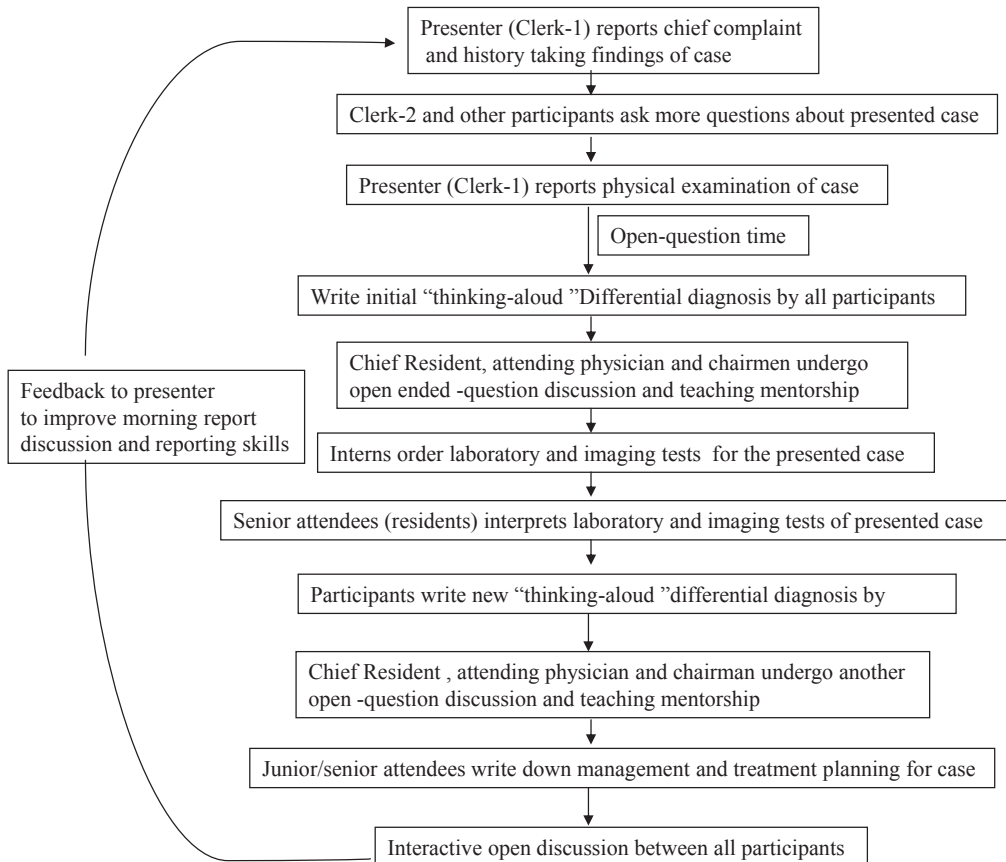


Fig. 1. Schematic representation of key steps used in the “thinking aloud” (TA) morning report (MR) model.

2.6. Basal and post-training self-assessed attendees' perception of educational values to train different skills in MR

All attendees were asked to fill out a 10-minute anonymous questionnaire at the beginning of the study and at the end of the study 3 months later (Tables S1 and S2). Subsequently, the individual's changes in the frequency of application of the skills learned between the two MR models were compared between junior MR attendees (interns and clerks) and senior MR attendees (PGY₁ residents).

2.7. Objective structured clinical examinations

The objective structured clinical examination (OSCE) setting was similar to that used in our previous studies and was conducted at the beginning (1st month) and at the end (3rd month) of the follow-up period for comparison of the effects of the 3-month MR-based clinical skills training between senior (PGY₁ residents) and junior (intern and clerk) attendees of the regular and TA MRs.^{12,13} The MR-assessed OSCE consisted of six stations [history taking (HT), physical examination (PE), DD, laboratory and images (data) ordering and interpretation, problem solving/decision making, and skills of dealing with controversial/professional issues] that evaluated the seven clinical skills being taught in MRs. A faculty rater graded each medical student and resident according to a set of 10–12 predetermined items presented in the form of a checklist. The attendees' summary scores of individual station and average rater-assessed scores of six MR-based OSCE stations were converted into percentage values for final analysis.

2.8. Miniclinical examination exercise

The miniclinical examination exercise (mini-CEX) is easy to implement, and it can be routinely applied by attending

physicians to provide a seamless evaluation of young physicians in any setting within 20–30 minutes.^{14–16} Prior to analysis, the mini-CEX score was converted into a percentage value. Then, the mini-CEX scores covering different aspects of the attendees' patient care skills were compared between senior (PGY₁ residents) and junior (interns and clerks) MR attendees. Specifically, monthly mini-CEX evaluations were carried out at the beginning (1st month) and end (3rd month) of the follow-up period for comparison of the effects of the 3-month MR-based clinical skills training between groups. In addition to medical interview (similar to HT) and PE skills, mini-CEX can evaluate the humanistic qualities, professionalism, consulting, and organization efficiency skills of young physicians.

2.9. Statistical analysis

The average self-assessed application frequency and educational perception toward the different clinical skills taught in the two MR models were analyzed using two-sample *t* tests. The means and standard deviations for each item of the questionnaires, mini-CEX, and OSCE scores were determined. The basal and 3-month follow-up self-assessed application frequency of MR-trained clinical skills, rater-assessed mini-CEX, and OSCE scores were analyzed with paired *t* tests. Then, the scores of the two MR models were compared by Chi-square test using Excel software (Microsoft Corp., Bellevue WA, USA). A *p* value < 0.05 was set as the level of significance.

3. Results

3.1. General characteristics of the individuals who attended the two MR models

Notably, similar percentages (40–41%) of senior (PGY₁ residents, 41% vs. 40%) and junior (interns and clerks, 35% vs. 33% and 24% vs. 27%) attendees were noted in the regular and TA MRs (Table 2). The mean attendee age, the female/

Table 2
Characteristic of attendees of the two models of morning reports (MR).

Characteristic	Regular MR model	Thinking-aloud (TA) MR model
Number (total) of attendees	265	135
PGY ₁ resident/intern/clerk (%)	108/93/64 (41/35/24)	54/47/34 (40/33/27)
Age, mean y (range) of attendees	30 ± 5 (19–33)	31 ± 4 (21–34)
Sex of attendees, % female	29	35%
No. of cases discussed	3–5	1*
Duration of MR (min)	45–60	60
Times per week	1–2	3–4
Who led the sessions of MR? Attending physician/chief resident/resident (%) ^a	49/86/0	100*/3*/0
Who presented the cases? Attending physician/chief resident/resident/medical student (%)	1/11/83/5	0/0/2/98
Frequency of MR each month	4 ± 1	12 ± 3
Location of MR	8 divisions other than the general medicine division of the internal medicine department	Division of general medicine of the internal medicine department

**p* < 0.01 versus corresponding “regular” MR model.

PGY₁ = postgraduate year-1.

^a Sometimes the MR will have two chairmen.

male ratio, and the MR participation frequency were also not significantly different between the two MR models. However, the regular MR model involved discussion of more cases (3–5 cases) over a similar time frame (45–60 minutes) than did the TA MR model (1 case). Notably, the attending physician—rather than the CR—led the TA MR. The clerks/interns were responsible for the presentation of the case with the TA MR model, whereas the senior resident reported the cases with the traditional MR model.

3.2. General self-assessed perceptions of educational values in different aspects of the two MR models across all attendees

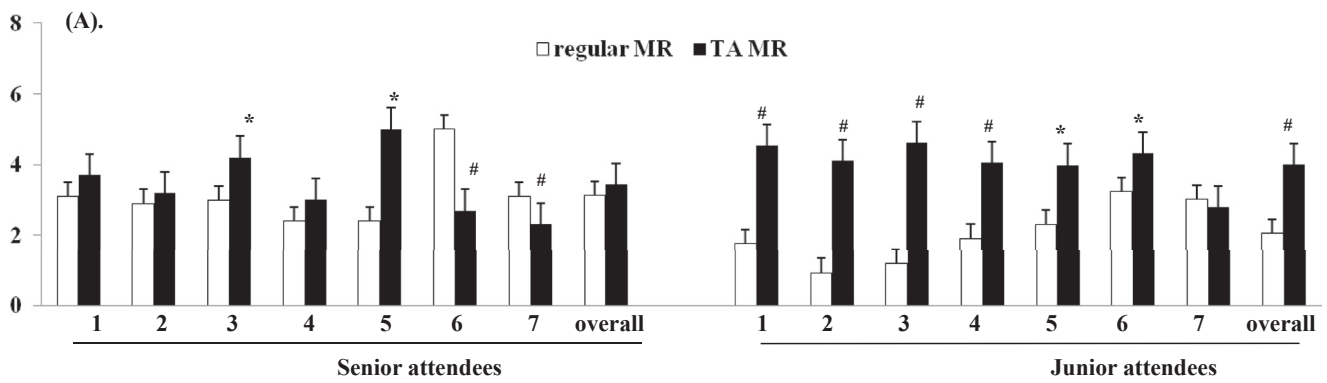
Senior attendees gave higher educational value scores to TA MR in training their “DD” and “data interpretation” skills, but gave higher scores for regular MR in cultivating their “problem solving/decision making and controversial/professional issues dealing” skills (Fig. 2A). Except for the “controversial/professional issues dealing” skills, junior attendees gave higher educational value scores to TA MR in

enhancing their “HT, PE, DD, data ordering, data interpretation and problem solving/decision making” skills. Notably, the overall self-assessed educational value scores given by senior attendees were not different between TA and regular MRs. Overall, junior attendees reported that TA MR was superior to regular MR in augmentation of their seven clinical skills.

3.3. Self-assessed application levels of the skills learned from the two MR models for the attendee's daily clinical work

The variables listed in Table 3 comprise the basic clinical skills of young physicians for “patient care.” At baseline, senior attendees of both MR models had higher self-assessed application frequencies for “DD, data ordering, problem solving/decision making and controversial/professional issues dealing” skills during their daily work compared to junior attendees (Table 3).

Comparison of the baseline and follow-up self-assessed application frequencies of MR-trained skills between groups



* , # P < 0.05, 0.01 vs. regular MR

1 History taking (HT), 2 Physical examination (PE), 3 Differential diagnosis (DD), 4 Data (laboratory and images) ordering, 5 Data (laboratory and images) interpretation, 6 Problem solving/decision making, 7 Controversial/professional issues dealing skills

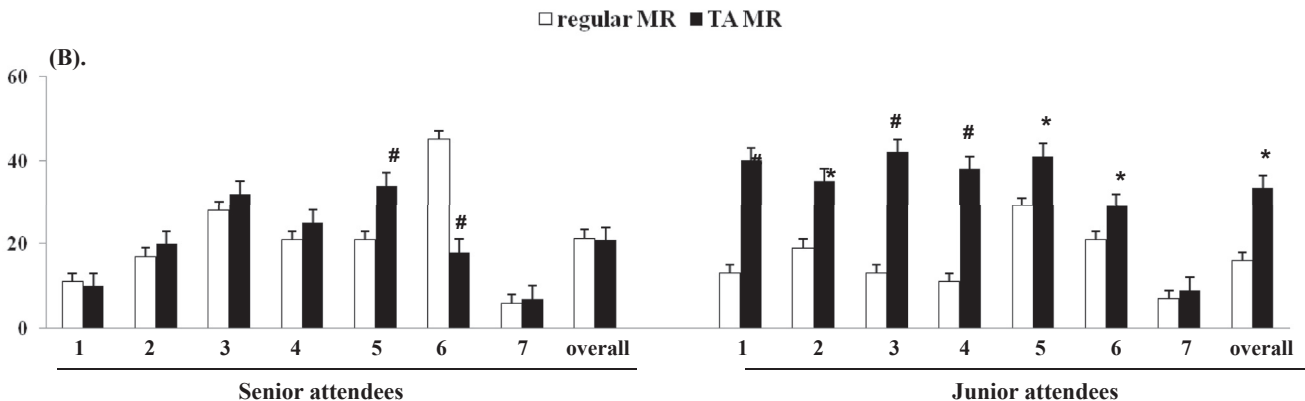


Fig. 2. (A) Comparison between self-assessed attendee's perceptions of the educational values of “regular” and “thinking-aloud” (TA) morning report (MR) models. (B) Comparison of the increase in self-assessed attendee's application frequency after 3 months of regular and TA MR training.

Table 3
Degree of self-assessed baseline application of clinical skills taught in two MR models on attendee's daily work.

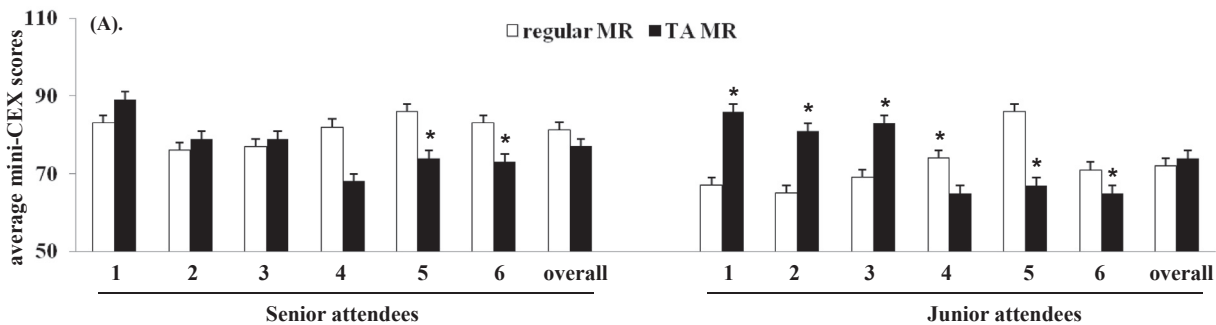
	Regular MR model (n = 265)		Thinking-aloud (TA) MR model (n = 135)	
	Levels of attendees		Levels of attendees	
	Senior	Junior	Senior	Junior
History taking (HT) skills	50.6 ± 0.9	49 ± 3	52.1 ± 3.2	53.1 ± 1.9
Physical examination (PE) skills	65.1 ± 3	58.1 ± 4	66.1 ± 4	53.2 ± 3.5
Differential diagnosis (DD) of clinical problems skills	67.0 ± 2	44 ± 1*	69.4 ± 5	51 ± 2*
Laboratory and images (data) ordering skills	59.7 ± 2	31 ± 4*	56.4 ± 4.8	33.1 ± 2.3*
Laboratory and images (data) interpretation skills	58.4 ± 1	53 ± 3	61.0 ± 3.3	51.2 ± 3.1
Critical clinical problem solving/decision making skills	69.7 ± 1.2	43.5 ± 1.2**	73.8 ± 2.4	49.6 ± 2.1*
Controversial/professional issues dealing skills	59.1 ± 2.3	39.4 ± 2*	66.2 ± 1.6	37.1 ± 1.6**

*p < 0.05.

**p < 0.01 versus senior attendees: 100%; frequently: 75–100%; often: 50–75%; occasionally: 25–50%; rarely: 0–25%. The summarized percentage of always + frequently + often application frequency were expressed in each item of every group.

helped elucidate the training efficiency of the two MR models. Except for the “controversial/professional issues dealing” skills, the application frequency of the other six trained clinical skills was significantly increased among TA MR junior attendees compared with regular MR junior attendees (Fig. 2B). In comparison with regular MR senior attendees, the

self-assessed application frequency of the learned data interpretation skills was significantly higher among TA MR senior attendees. Significantly, the self-assessed application frequency of the learned “problem solving/decision making” skills was increased among regular MR senior attendees compared with TA MR senior attendees.



1 Medical interviewing (history taking, HT); 2 Physical examination (PE); 3. Humanistic qualities; 4 Professionalism; 5 Consulting skills; 6 Organization efficiency

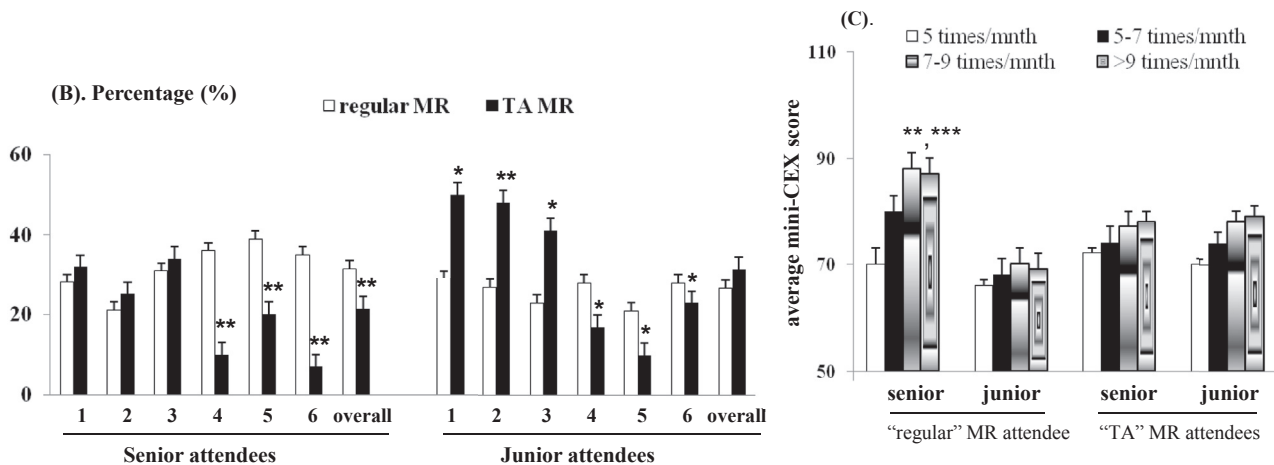


Fig. 3. (A) Comparison between the rater-assessed senior/junior attendees' mini-CEX scores of “regular” and “TA” MR models. (B) Percentage (%) of improvement in rater-assessed mini-CEX scores after 3 months of follow-up. (C) Effect of participation frequency of different MRs on the rater-assessed attendees' mini-CEX score. *p < 0.05 versus regular MR model. **p < 0.05 versus scores of lower frequency of MR participation. ***p value for trend < 0.05 (incremental ↑ in relation to ↑ frequency of MR participation). mini-CEX = miniclinal examination exercise; MR = morning report; TA = thinking-aloud.

3.4. Comparison between the rater-assessed OSCE scores of two groups of MR attendees

The “HT, PE, DD” aspects of rater-assessed OSCE scores were significantly higher among TA junior attendees than those among regular junior MR attendees (Fig. 4A). Additionally, the “problem solving/decision making, controversial/professional issues dealing” aspects of OSCE scores were significantly higher among regular senior/junior attendees than those among TA senior/junior MR attendees. In comparison with regular MR participants, the overall rater-assessed OSCE scores were lower among TA senior MR attendees, whereas the overall OSCE scores were higher among TA junior MR attendees (Fig. 4A). In terms of the seven clinical skills taught in the two MR models, senior MR attendees benefited more from regular MRs, whereas junior MR attendees benefited more from TA MRs.

For junior attendees, the improvement (%) magnitudes in the HT, PE, and DD aspects of rater-assessed OSCE scores were higher in the regular MR group than in the TA MR group after 3 months of training (Fig. 4B). Nonetheless, improvement (%) magnitudes in the “problem solving/decision making” and “controversial/professional issues dealing skills” aspects of

OSCE scores were significantly higher among senior/junior regular MR attendees than those in senior/junior TA MR attendees. In comparison with regular MR participants, the improvement (%) magnitudes of overall rater-assessed OSCE scores was lower in TA senior MR attendees, whereas the overall rater-assessed OSCE scores was higher among TA junior MR attendees (Fig. 4B). In terms of the seven presented clinical skills trained in these two MR models, senior MR attendees benefited more from regular MRs, whereas junior MR attendees benefited more from TA MRs.

3.5. Comparison between the rater-assessed mini-CEX scores of two groups of MR attendees

Among senior attendees, TA MR participants obtained significantly higher rater-assessed mini-CEX scores for HT skill compared with regular MR participants (Fig. 3A). TA MR junior attendees obtained higher rater-assessed mini-CEX scores for “HT, PE, humanistic qualities” skills than did the regular MR junior attendees (Fig. 3A). Both regular MR senior/junior attendees scored higher in the “professionalism, consulting skills and organization efficiency” aspects of mini-CEX scores than did TA MR senior/junior attendees.

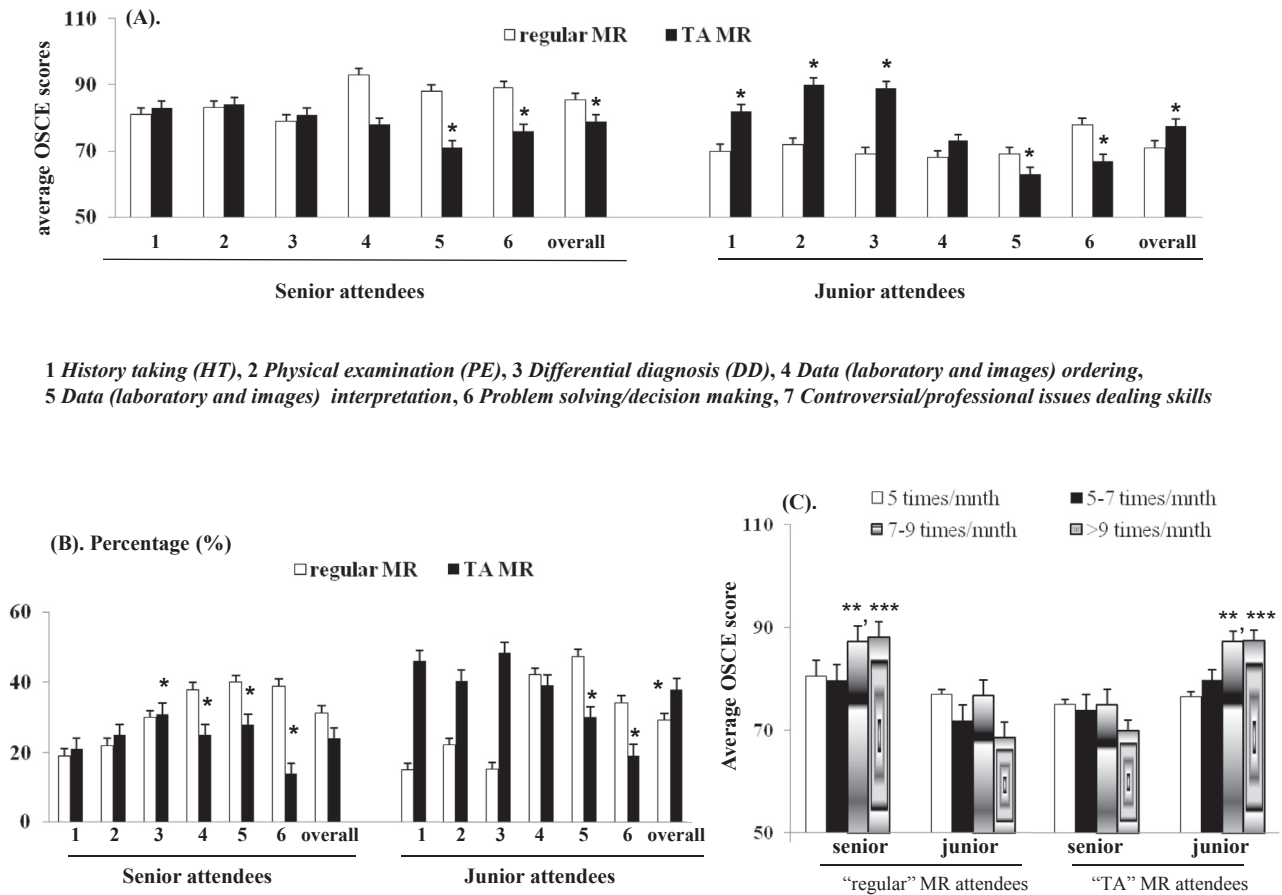


Fig. 4. (A) Comparison between the rater-assessed senior/junior attendees' OSCE scores of “regular” and “TA” MR models. (B) Percentage (%) of improvement in rater-assessed OSCE scores after 3 months of follow-up. (C) Effects of the participation frequency of different MRs on the rater-assessed attendees' OSCE score. * $p < 0.05$ versus regular MR model. ** $p < 0.05$ versus scores of lower frequency of MR participation. *** p value for trend < 0.05 (incremental \uparrow in relation to \uparrow frequency of MR participation). MR = morning report; OSCE = structured clinical examination; TA = thinking-aloud.

After 3 months of training, the improvement (%) magnitudes in the “HT, PE and humanistic qualities” aspects of mini-CEX scores were higher among regular MR junior attendees than among TA MR junior attendees (Fig. 3B). Nonetheless, improvement (%) magnitudes of the “professionalism, consulting skills and organization efficiency” aspects of mini-CEX scores were significantly higher among senior/junior regular MR attendees than those among senior/junior TA MR attendees. The improvement (%) magnitudes of overall rater-assessed mini-CEX scores were significantly higher among regular MR senior attendees than among TA MR senior attendees. Significantly, the trends of the changes in the overall rater-assessed mini-CEX scores indicated that junior attendees benefited more from the TA MR attendees (Fig. 3A–B). In other words, the regular MR provides additional beneficial effects in enhancing the more complicated clinical skills of senior/junior attendees that are not included in the design of TA MR.

3.6. Effects of participation frequency in the two MR models on the rater-assessed mini-CEX and OSCE scores of senior (PGY₁ residents) and junior (clerks and interns) attendees

The overall OSCE scores of regular MR senior attendees and TA MR junior attendees were sequentially elevated with the increase in participation frequency (Fig. 4C). Interestingly, the magnitude of the increased overall OSCE scores reached a plateau when the participation frequency was more than seven times each month among regular MR senior attendees and TA MR junior attendees (Fig. 4C). However, this positive correlation between OSCE scores and frequency of MR participation was absent among regular MR junior attendees and TA MR senior attendees.

As shown in Fig. 3C, we found that the rater-assessed mini-CEX scores of senior attendees were sequentially elevated with the increasing participation frequency of regular MR. Interestingly, the magnitude of the increased rater-assessed mini-CEX scores reached a plateau when the participation frequency was more than seven times each month among regular MR senior attendees (Fig. 3C). However, this positive correlation between mini-CEX scores and frequency of MR participation was not observed among regular MR junior attendees and TA MR junior/senior attendees.

4. Discussion

MRs should be able to help young physicians to actively learn through group discussions about interesting cases.^{17–20} The crucial element for a positive learning MR environment is the alignment of the learner's expectations with the actual outcomes.^{21–23} The regular MR model is unable to fully achieve these goals because senior attendees (residents) deliver most of the presentations and discussions. For example, the CRs will have gone through every medical record to make sure that the blood smears, stool guaiacs, and urinalyses had been satisfactorily completed without there being

any interaction with junior attendees. Consequently, after finishing the MR, these residents might bring negative or unpleasant “feedback” from the CR to the medical students who had done the workups on the clinical wards. Sometimes, a medical student might be summoned by the CR for a word of congratulation, or just as often, there might be “constructive criticism” during the MR. Thus, some medical students have begun to call the regular MRs the “morning racking.”²⁴

In contrast to the above, the attending physician encourages residents and the CR to discuss how they managed and overcame clinical problems by presenting cases to the junior attendees at the TA MR.^{25,26} The single-case TA MR model provides sufficient time for a stepwise discussion that emphasizes critical thinking/clinical reasoning skills and ethical issues adjusted to the skill levels of the attendees.^{25–27} In a less stressful environment, both junior (clerks and interns) and senior (residents) attendees get to play a more active role in the TA MR. So, with TA MR, it is hoped that attendees will be more willing to expose their knowledge and weaknesses, which can be corrected and augmented by their teachers. Additionally, the “real-time” discussion processes of TA MRs can stimulate identification of additional information including the diagnostic workup, evaluation of tests/procedures, and the decision making and the DD processes.^{10,11}

In order to generally train individuals in terms of “patient care” skills, our TA MR model emphasizes general medical knowledge rather than basic science, medical anecdotes, or specific subspecialty knowledge.²⁸ The reasons discussed above are the factors why TA MR benefits junior attendees more than senior attendees as represented by the increased application frequencies of the various clinical skills learned from MR at the 3-month follow-up.

Notably, an unsatisfied perception regarding educational level was accompanied by less application of the “controversial/professional issues dealing skill” during daily work after 3 months of exposure to the two MR models. In the future, the training of “controversial/professional issues dealing” issues should be reemphasized in both MR models.

Both the rater-assessed mini-CEX and OSCE aim to evaluate the basic clinical skills, which are also the training goals of MRs, of young physicians.^{12,14–16} In our hospital, both mini-CEX and OSCE are routinely performed by well-trained mentors among clerks, interns, and residents.^{12,13} Specifically, we have found that the TA MR junior attendees obtained higher rater-assessed OSCE scores than did the regular MR junior attendees. This trend is consistent with the results of self-reported questionnaires, which examined the attendees' perception of educational levels and the application frequency of the seven clinical skills that are mainly taught by the TA MR. Notably, the mini-CEX evaluated the more complicated skills, such as humanistic qualities, professionalism, consulting skills, and organization efficiency, which are not included in the initial training goals of TA MR. Thus, an analysis of these additional four items of the mini-CEX score helps the program director decide whether these four elements are to be integrated into the training goals of the TA MR model. Actually, we revealed that the regular MR training will also

enhance young physicians' four additional mini-CEX-evaluated clinical skills, which are crucial for taking care of patients. In other words, our study discovered an interaction between these four additional regular MR-trained mini-CEX elements and the seven TA MR-trained clinical skills. Our results suggested that these four additional clinical skills assessed by the mini-CEX be incorporated into the training goals of the TA MR model.

There are several limitations affecting our survey methodology that should be considered. The study was performed in a single program at a single center. Additionally, this study is limited by the fact that the questionnaire used to track and assess the effectiveness of the training program may have been affected by recall bias. Another limitation is the possibility of selection bias regarding the discussed patients and case reporters of the two MR models. The TA MR only applied to the general medicine division, whereas the regular MR only applied to the subspecialty divisions. In addition, the fact alone that regular MR is conducted by nighttime on-call residents to present patients who were admitted the previous night for conceivably more serious conditions with complications, adds noise and bias to the analysis. Meanwhile, there are differences in frequency/depth of teaching exposure between the two MR groups. Notably, TA MR was held three to four times per week and attended by individuals from various different divisions of the internal medicine department, whereas regular MR was held one to two times per week in other subdivisions of the internal medicine department. With that kind of gap in exposure during the duration of 3 months, it is difficult to exclude the possibility that the different results between these two MRs are not related to the MR methods *per se*, but are, instead, a reflection of the frequency/depth of the exposure. Following our initial study, a large crossover study alternatively holding these two different MRs at multiple sites focusing on patients with similar disease severity and featuring similar training level of case reporters (PGY₁ residents or interns/clerks) should be carried out prior to making a definite suggestion. In other words, from the results of our current study, it is difficult to conclude whether the TA MR model is able to facilitate positive educational outcomes among all attendees.

However, all our consecutively collected cases were prospective randomized follow-up for 3 months in the past 3 years. Additionally, both the self- and rater-assessed effectiveness of the two MRs in clinical skills training was included. All features of our study suggest that this new MR model is a possible strategy in clinical work.

In the interpretation of our results, it is important to consider the internal variation in the general performance and learning attitude of individuals among either TA or regular MR groups. Additionally, the different durations of clinical work exposure might have affected the learning potential of senior and junior attendees in the two MR models. Indeed, the “patient care” skills that need to be cultivated among senior attendees are different from those of junior attendees. It is clear that regular MRs focus on training senior attendees in the areas of “work reports,” “peer support,” “sense of mastery and

confidence,” and “ensure patients safety,” whereas TA MR emphasizes training in the basic clinical skills of junior attendees.^{25–27}

Our study suggested that all elements of regular and TA MRs need to be properly integrated in order to ensure good discipline among young physicians. In the future, developing the mixed MR model with senior attendee-centered regular MR model and junior attendee-centered TA MR model might equally benefit both junior and senior attendees.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jcma.2015.04.003>

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