



Submitted: 28 January 2023  
Accepted: 17 August 2023  
Published online: 2 January, TAPS 2024, 9(1), 3-19  
<https://doi.org/10.29060/TAPS.2024-9-1/OA2947>

# Micro CEX vs Mini CEX: Less can be more

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## Abstract

**Introduction:** The mini-Clinical Evaluation Exercise (CEX) is meant to provide on the spot feedback to trainees. We hypothesised that an ultra-short assessment tool with just one global entrustment scale (micro-CEX) would encourage faculty to provide better feedback compared to the traditional multiple domain mini-CEX.

**Methods:** 59 pairs of faculty and trainees from internal medicine completed both the 7-item mini-CEX and a micro-CEX and were surveyed regarding their perceptions of the 2 forms. Wordcount and specificity of the feedback was assessed. Participants were subsequently interviewed to elicit their views on factors affecting the utility of the CEX.

**Results:** Quantity and quality of feedback increased with the micro-CEX compared to the mini-CEX. Wordcount increased from 9.5 to 17.5 words, and specificity increased from 1.6 to 2.3 on a 4-point scale,  $p < 0.05$  in both cases. Faculty and residents both felt the micro-CEX provided better assessment and feedback. The micro-CEX, but not the mini-CEX, was able to discriminate between residents in different years of training. The mini-CEX showed a strong halo effect between different domains of scoring. In interviews, ease of administration, immediacy of assessment, clarity of purpose, structuring of desired feedback, assessor-trainee pairing and alignment with trainee learning goals were identified as important features to optimize utility of the (mini or micro or both) CEX.

**Conclusions:** Simplifying the assessment component of the CEX frees faculty to concentrate on feedback and this improves both quantity and quality of feedback. How the form is administered on the ground impacts its practical utility.

**Keywords:** Workplace Based Assessment, Mini-CEX, Micro-CEX, Feedback, Assessment

## Practice Highlights

- Simplifying the assessment component of the CEX frees faculty to concentrate on feedback.
- A simpler form can result in better and more feedback.
- Making it easy for faculty to use the form is important and increases its utility in providing feedback and assessment.

## I. INTRODUCTION

The Mini-CEX is one of the most widely used workplace based assessment (WBA) tools and is supported by a large body of theoretical and empirical evidence which have shown that when used in the context of repeated sampling, it is both a valid assessment tool and is also an effective education tool in giving feedback to the trainee (Hawkins et al., 2010; Norcini et al., 2003). However, in practice, the educational value of the mini-

CEX, as measured chiefly by trainee and faculty perceptions and satisfaction, varied significantly (Lorwald et al., 2018). Factors affecting the educational value have been described by Lorwald et al. and categorised into context of usage, and user, implementation and outcome factors (Lorwald et al., 2018).

Context refers to the situation in which the mini-CEX is executed, and factors which impact its actual usage, such as time needed for conducting the Mini-CEX, or the usability of the tool. Time constraint on the part of both the residents and the assessors is an especially frequent issue across multiple studies (Bindal et al., 2011; Brazil et al., 2012; Castanelli et al., 2016; Lörwald et al., 2018; Morris et al., 2006; Nair et al., 2008; Yanting et al., 2016). The mini-CEX was conceived as a 30-minute exercise of directly observed assessment, and there are 6 or 7 domains which faculty are expected to assess (Norcini et al., 2003). In a busy clinical environment however, what actually occurs is often a brief clinical encounter of 10-15 minutes or even less where only a few of the mini-CEX's domains were assessed (Berendonk et al., 2018).

User factors refers to trainee and faculty knowledge of the mini-CEX and their perceptions of its use. Studies have found that the mini-CEX is frequently regarded as a check box exercise (Bindal et al., 2011; Sabey & Harris, 2011). Assessor's and trainee's training and attitudes, or unfamiliarity with the WBA tools also negatively impact the educational value of the mini-CEX (Lörwald et al., 2018). Reports have shown that educating faculty on the formative intent of mini-CEX can improve feedback provided (Liao et al., 2013).

Implementation factors refer to how the mini-CEX is actually executed on the ground. Some studies have reported that the mini-CEX often occurs without actual direct observation (Lörwald et al., 2018) or feedback provided (Weston & Smith, 2014). Implementation in turn affected outcome, which refers to the trainees appraisal of the feedback received. (Lörwald et al., 2018)

One way of improving the educational value of the mini-CEX then might be to improve the context of its usage, by redesigning the mini-CEX to better fit the realities of the clinical workplace. In different clinical encounters, specific domains of performance are more easily and obviously observed and assessed than others (Crossley & Jolly, 2012). Reducing the number of dimensions the assessors are asked to rate was shown to decrease measured cognitive load and improved interobserver reliability (Tavares et al., 2016). It has also been shown that using rating scales that align with the clinician's cognitive schema perform better, for instance, scales that ask the clinician assessors about the trainees ability to practice safely with decreasing levels of supervision (i.e. entrustability) showed better discrimination and higher reliability (Weller et al., 2014). Compared to multidimension rating scales, global rating scales have greater reliability and validity in assessing candidates in OSCE examinations (Regehr et al., 1998), assessing

technical competence in procedures (Walzak et al., 2015) and in simulation-based training (Ilgen et al., 2015).

We proposed therefore to replace the multiple domains with a single rating asking faculty what level of supervision the resident would require in performing a similar task, i.e. a global entrustment scale. The shorter assessment task should refocus the faculty on the feedback component, whilst still retaining the ability to identify trainee progression. One such form has been proposed by Kogan and Holmboe (2018), and we designated this the micro-CEX.

We hypothesised that these changes would improve the usability ("context" as described by Lorwald et al.) and hence improve the educational value of the assessment, measured in this study by the specificity and quality of the feedback given by faculty.

Our study aims to show therefore that the shorter micro-CEX can provide better feedback than the usual mini-CEX. We also sought to find out, from the perspective of the end-users, what other adjustments to the implementation and design of the mini or micro-CEX can be made to improve its acceptability, educational value and validity.

The study focussed on the following questions:

Does the micro-CEX stimulate faculty to provide more specific and actionable feedback compared to the mini-CEX?

Can the micro-CEX provide discriminatory assessment for residents across different years of practice?

What are the perceptions of the faculty and residents regarding the factors affecting utility of the assessment instrument in providing feedback and assessment?

## II. METHODS

### A. Setting and Subjects

The study was conducted in the division of Internal Medicine in a 1700 bed hospital in Singapore between September and December 2018. All faculty and residents rotating through internal medicine were invited to participate via e-mail, and agreeable faculty and residents paired up. In usual practice, residents must complete at least 2 mini-CEX covering standard inpatient or outpatient encounters during each three-month internal medicine posting, hence both residents and faculty are familiar with the usual mini-CEX.

### B. Design

In order to evaluate for any participant reactivity affecting the CEX data (i.e. a Hawthorne effect) (Paradis & Sutkin, 2017), a baseline sample of 30 of the usual mini-CEX performed in the 3 months prior to the study was randomly selected and deidentified (from June to August 2018). The quantity and specificity of feedback in these was evaluated as detailed below.

For the study itself, faculty and residents used the usual mini-CEX as the first assessment in the first 2 weeks of the month, followed by a second assessment using the micro-CEX in the next 2 weeks. This sequence was chosen as performing the micro-CEX first might affect how the subsequent mini-CEX was performed. Cases chosen for the mini-CEX and micro-CEX were inpatient

or outpatient internal medicine encounters, and faculty were simply instructed to choose cases that represented typical cases of average difficulty with no restrictions on the exact cases to be chosen.

Faculty and residents completed an anonymised survey on their experiences at the end of the study and were invited to participate in a semi-structured group interview to elicit their views regarding which aspects of the mini-CEX exercise influenced feedback and assessment (Appendix 2). Both faculty and residents were informed that the survey and interviews were part of this study and participation in either was taken to be implied consent. The workflow of the study is seen in Figure 1.

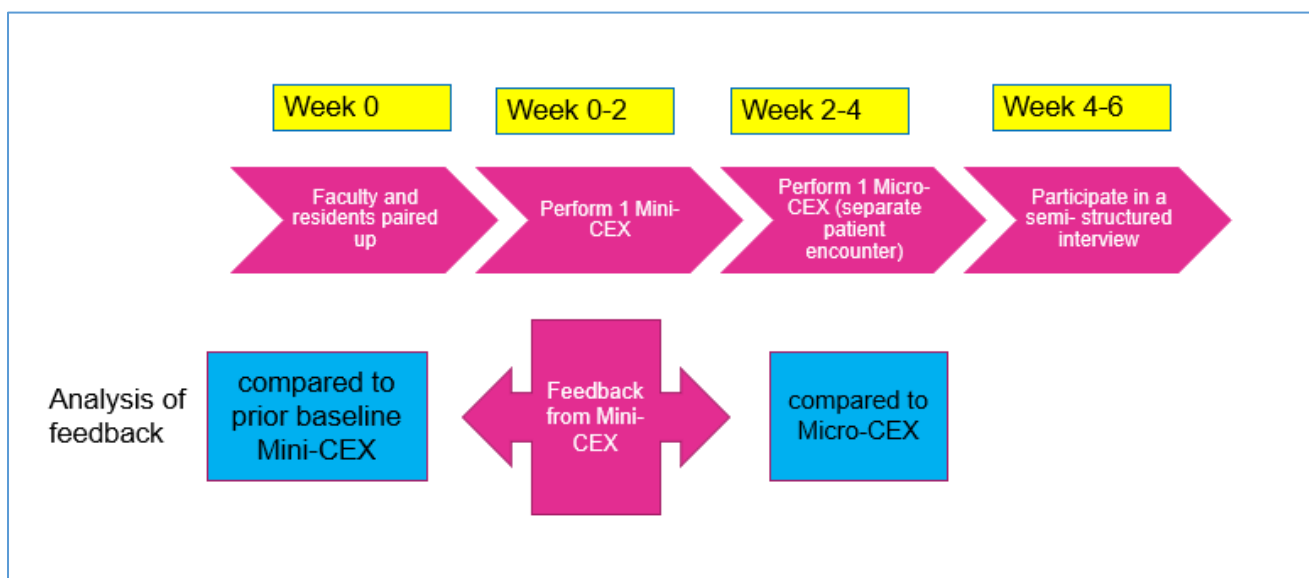


Figure 1. Study workflow

### C. Instruments

The mini-CEX used in the program is based on the one described by Norcini (Norcini et al., 2003). This form was hosted on the internet (New Innovations, Ohio, USA) and could be accessed by faculty from their mobile devices or their email. The micro-CEX was hosted on an open-source online survey tool (LimeSurvey GmbH, Hamburg, Germany) and can be accessed from mobile devices. A copy of both forms is available in Appendix 1.

### D. Analysis of Feedback

The quality of feedback was assessed firstly by a word count, and then by grading the specificity of the feedback on a three-point scale (Pelgrim et al., 2012) (Appendix 3) and finally by the presence or absence of an actionable plan for improvement. In order to avoid rater bias, the assessor for the specificity of the feedback was blinded

to the source of feedback (mini or Micro CEX). The first 20 forms were independently graded by two separate assessors (OTH and AC) using the above criteria, achieving a kappa coefficient of 0.852; all subsequent forms were graded by OTH, with any uncertainty resolved by discussion between AC and OTH. Word count and specificity, as well as faculty and resident preferences between the forms, were analysed using paired samples T-test. Proportion of Feedback which showed an actionable plan was compared using a Chi-Square test.

### E. Semi-structured Interviews

Faculty and residents were interviewed separately. 21 residents and 6 faculty were interviewed over 8 sessions lasting between 20 to 30 minutes each. Interviews were conducted by the investigator (OTH). The interviews were audiotaped and transcribed verbatim. Data

collection ended when saturation was reached. Member checking of the transcripts was carried out.

The inductive template analysis as described by Nigel King was used to analyse the interview transcripts (King, 2012). Two transcripts were studied and coded separately by the investigator (OTH) and a collaborator (OHK). A priori themes of assessment, feedback and administration were used to structure the data so that the research question could be answered. Codes were discussed between OTH and OHK until a consensus was reached, and a codebook was created. The subsequent transcripts were coded by OTH. OHK, AC and OTH subsequently met to discuss the categories and emerging themes. NVivo 12 was used to store and manage the codes and transcripts. Results were triangulated with data from the quantitative surveys.

For all quantitative data, an alpha of 0.05 was used as the cut-off for significance. IBM SPSS 25 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY) was used for calculations.

### III. RESULTS

The data that support the findings of this study are openly available in Figshare repository, at <https://doi.org/10.6084/m9.figshare.21862068.v1> (Ong, 2023).

There were 33 internal medicine residents during the study period and 32 (97%) participated in the study; one resident declined to participate. They were paired with 39 different faculty over the three months of the study. 59 unique faculty- resident pairs completed both sets of CEX. 30.5% of the residents were in their first year of residency (R1), 47.9% in second year (R2), and 22.0% were in their third year (R3). The residents completed an average of 1.96 pairs of mini and micro CEX each. Time taken to complete the assessments was estimated by faculty to be 11.33 +/- 6.56 min for mini-CEX vs 9.42 +/-5.51 min for the micro-CEX (p = 0.02).

#### A. Evaluation of Feedback in the Mini-CEX: Baseline and During Study

30 de-identified mini-CEX were extracted randomly from the 3 months preceding the initiation of the study. These served as a baseline control and were compared to the feedback from the first, traditional mini-CEX done during the study (Table 1). During the period of the study, faculty using the same mini-CEX provided feedback that was more specific. Proportion of actionable feedback provided was much more in the mini-CEX done as part of the study compared to baseline controls (Table 1: 3.3% controls vs 28% study mini-CEX, p = 0.005).

	Mini-CEX vs prior baseline control			Mini-CEX vs Micro-CEX		
	Prior baseline control mini-CEX (mean+/-SD)	Study Mini-CEX (mean +/- SD)	p value	Mini-CEX (mean ±SD)	Micro CEX (mean ±SD)	p value
<b>Q1 in which areas did the resident do well</b>						
Word count	12.1 +/-14.1	9.5 +/- 7.0	0.93	9.5 +/- 7.0	17.5 +/- 10.3	<0.001
Specificity*	1.2 +/- 1.0	1.6 +/- 0.90	0.08	1.6 +/- 0.9	2.3 +/- 0.7	<0.001
<b>Q2/3 Areas needing improvement/ recommendations for future improvement</b>						
Word count	3.8 +/- 6.8	5.7 +/- 7.3	0.06	5.7 +/- 7.3	19.3 +/- 15.1	<0.001
Specificity*	0.5 +/- 0.7	1.1 +/-1.1	0.01	1.1 +/- 1.0	1.8 +/- 0.9	<0.001
Actionable	1/30 (3.3%)	17/59(28.8%)	0.005	17/59 (28.8%)	18/59(30.5%)	0.84

Table 1. Quality and quantity of feedback in prior baseline control vs study mini-CEX, and in mini vs Micro-CEX

\*Specificity rated on a 4-point scale: 0 - no feedback, 1 - not specific, 2 - moderately specific, 3 - specific

#### B. Evaluation of Feedback in the Micro and Mini-CEX During Study

Comparison of the feedback given in the mini and micro-CEX during the study is shown in Table 1. Feedback wordcount increased and was more specific with micro-CEX compared to the contemporaneous mini-CEX done by the same pair. However, there were no differences in the proportion of actionable feedback given in both forms.

#### C. Discrimination Between Residents in Different Years of Training

The micro-CEX was able to show progression between the years of training, with a significant rise in the resident's mean score across the three years of training. On a 4 point score the mean entrustment score increased from 2.45 in the first year of training to 3.30 by the third year (p<0.05). (Figure 2)

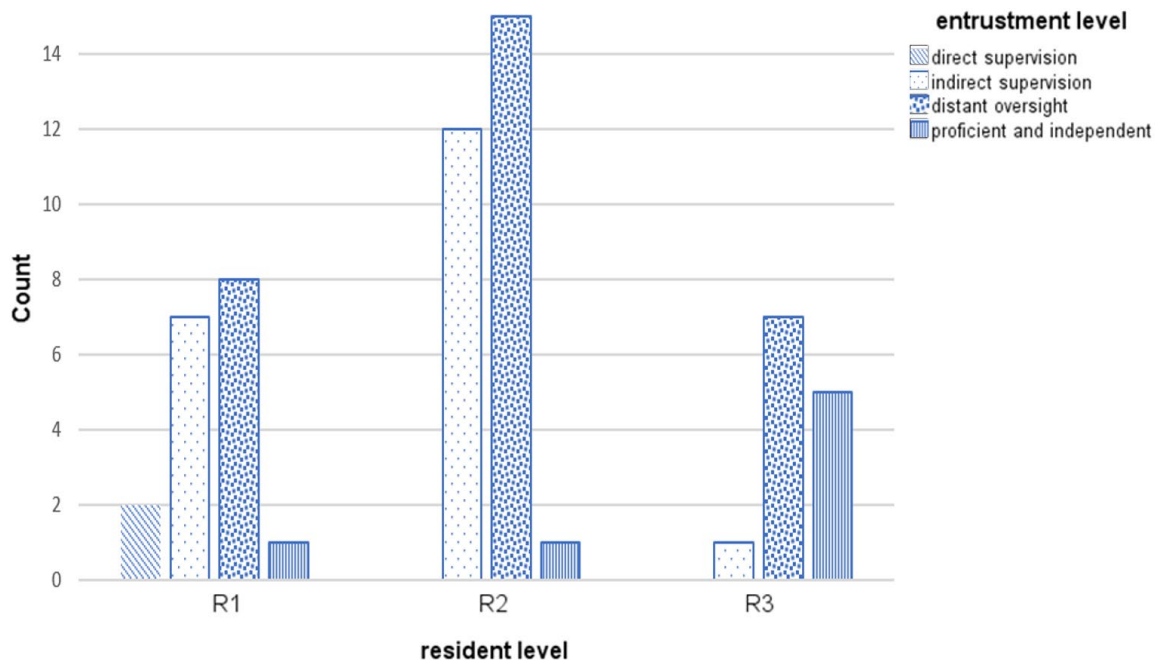


Figure 2. Level of entrustment vs Year of training

Correlation of residents' year of training and grading of the mini-CEX domains was moderate (kappa 0.39 to 0.60). There was high correlation between all seven questions in the mini-CEX (kappa 0.7 to 0.8) (see appendix 4), implying that the resident's score in one domain heavily influenced the score in other domains i.e. a halo effect.

#### D. Faculty and Resident Preferences

21 (out of total 32 participating residents, 65% response rate) residents and 25 (out of total 39 participating faculty, 64.9% response rate) responded to the survey. Faculty and residents felt that the Micro -CEX had better value for both assessment and feedback compared to the Mini-CEX (Table 2).

	Mini-CEX Mean + SD	Micro CEX Mean + SD	p value	t-Stats	Cohen's d
<b>Usefulness for assessment</b>					
Faculty	6.04 +/- 1.34	6.57 +/- 0.95	0.04	2.23	0.46
Residents	6.00 +/- 1.62	6.9 +/- 0.91	0.03	-2.31	0.52
<b>Usefulness for feedback</b>					
Faculty	6.00 +/- 1.35	6.87 +/- 1.10	0.01	-3.07	0.64
Residents	5.43 +/- 1.40	6.81 +/- 1.57	0.09	-3.82	0.83

Table 2. Perceptions of faculty and residents regarding usefulness of mini and micro-CEX for assessment and feedback

\*Scoring is on a 9-point Likert scale, with 1 = not useful at all .... 9 = very useful

#### E. Qualitative Data

Qualitative data from the semi-structured interviews was analysed to better understand what the features of the micro-CEX driving this preference were, and to look for helpful features in the CEX. Themes from the semi-structured interviews were distilled into 6 themes (Table 3):

1) *Make it easy*: A recurrent theme was that the micro-CEX was easier to use and the short form could be used by the bedside, on resident or faculty mobile devices.

2) *Immediacy is important*: Faculty and residents both prized the ability to integrate the assessment into their

daily routines, and this immediacy was very important in enhancing the value of the feedback.

3) *Tell us what it's for*: Faculty and residents both expressed that the intended purpose of the forms needed to be explicit. Uncertainty in purpose of the form resulted in a perception of redundancy with the other assessments, and confusion about summative vs formative intent of the assessment inhibited honest feedback and assessment.

4) *Structure the form so we know what you want*: Structuring the form with specific areas to remind them to provide narrative feedback, and what specific areas to

provide feedback in, was useful. Faculty and residents both felt that the micro-CEX had better learning value than the mini-CEX.

5) *Choice of assessor matters depending on objective of the tool:* Faculty and residents agreed that assessments were frequently affected by the prior experiences between the two, impacting the objectivity of assessments via both the micro-and mini- CEX. Prior engagement with the resident facilitated provision of feedback. However, for assessment purposes, residents

felt that a faculty with no prior knowledge of the trainee might be more objective.

6) *Align assessment with learning goals:* Many of the residents were preparing for their postgraduate medical examinations, and they found the mini-CEX exercise especially useful if it was conducted in a way similar to their examinations (the Royal College of Physicians PACES exam) – in other words, the utility of the exercise increased greatly when the assessment was aligned with the residents’ own learning goals.

S/N	Themes	Quotations
1.	Make it easy to do	<p>The micro-CEX was <i>“more succinct. So, it's, it's much easier to administer” -F</i></p> <p><i>“If it's a shorter form, even though the quantity may be less maybe the fact that the quality of whatever feedback we're given is better because they're really giving the one or two points that really stood out to them that we need to improve on or the one or two things that we really did well” -R</i></p> <p>(Regarding the mini-CEX) <i>“The fact that it's more detailed actually maybe reduces the quality of the feedback because ... if you ask me for additional remarks for every single domain, then they just put nil, nil, nil because there's no time” -F</i></p>
2.	Immediacy is important	<p><i>“Memory is also fresh because you've just done the case and so I think the learning value's a lot better” -R</i></p> <p><i>“I think looking at it in terms of like a learning experience also, um, when we have that micro-CEX on the spot, ah, not only can we address, like all the points immediately, like what the resident should, um, but at the same time, ah, you can kinda go through certain topics at the same setting as well” -F</i></p>
3.	What is this for	<p><i>“I think we need clear goals as to why we do these, rather than to simply check boxes.” -R</i></p> <p><i>“The form should come with what is the expectation of this, uh, assessment, whether it's for assessing, or it's for a feedback, or it's .... whether this person can work as a HO. I mean, the intention will drive how I assess” -R</i></p> <p><i>“We have a lot of forms, the 360 and the mini-cex and all. Sometimes maybe I personally don't really see what the difference is sometimes or how it can help to change assessment. I think it's just extra admin for everyone and everyone just gets fed up doing it” -R</i></p> <p><i>“I think the assessor, sometimes they're very nice, they know it affects your, your grading or your, your overall performance in the residency, so they try not to be too strict” -R</i></p>
4.	Be specific about what you want to know	<p>The micro-CEX had <i>“I think several features currently that are really quite useful. Number one is that there is the mandatory open-ended field, um, for areas that need improvement and areas that need to be reinforced” -F</i></p> <p><i>“I find the comments, uh, quite useful. Maybe not the grades itself, because usually people would just give, like, mod- middle-grade. But, the written comments are actually quite useful” -R</i></p>
5.	Choice of assessor matters depending on objective for the tool	<p><i>“It's quite easy for me to, to, to, remember each of them and give them dedicated feedback” -F</i></p> <p><i>“It should be someone that you don't really know, but maybe in the same department. So, that it can be like, really, like a proper case scenario, yeah. Instead of grading you based on what their other impressions are” -R</i></p>
6.	Align assessment with learning goals	<p><i>“So I had this one particular case, that was a very good PACES case, that I clerked in the morning, and, we impromptu made it into a mini-CEX kind of session and, and we went in quite in depth into the discussion, and PACES that sort of stuff, and I thought that was very useful.” -R</i></p>

Table 3. Themes with supporting quotations

\*1 PACES = Membership of Royal Collage Physicians clinical examination, a required exit certification for the residents.



#### IV. DISCUSSION

The most striking result from this study is that even without specific faculty training or other intervention, simplifying the assessment task alone led faculty to write longer, and more specific feedback. Faculty and residents also perceived that the feedback was better. By simplifying the assessment, the faculty's attention was shifted from grading the resident in multiple domains toward qualitatively identifying good and bad points in the encounter, providing feedback for the residents.

Proportion of actual actionable feedback in the two forms, however, was not different. This is perhaps because there was no specific faculty training for the study as we felt that the additional training itself would impact results. Specific faculty training may be needed to improve this aspect.

A Hawthorne effect was noticed in the study (Adair, 1984). The proportion of actionable feedback provided was much more in the mini-CEX done as part of the study compared to baseline controls (Table 1: 3.3% controls vs 28% study mini-CEX,  $p = 0.005$ ). Word count and specificity also increased. However, despite this, we were still able to show that the micro-CEX induced faculty to provide more and better feedback.

From the global entrustment scale used in the micro-CEX, it was possible to demonstrate progression from first year to third year of residency (Figure 2). One potential concern is loss of granularity in assessment of different domains, i.e., that we might lose the ability to identify the specific domain in which the resident is weak if we do not ask faculty to score physical examination, history taking, management etc. separately. However, we found a high correlation between the scores in all domains in the mini-CEX (kappa ranged from 0.7 to 0.8, see appendix 4), indicating a strong halo effect. This suggests that in practice, faculty are making a global assessment anyway rather than a separate assessment of separate domains. Faculty and residents perceived that the single global assessment with the micro-CEX provided better assessment.

The messages from faculty and residents about what they perceive to be important in making the CEX work for them speak for themselves. The importance of making the form easy to administer is very intuitive; the bureaucratic impracticality of paper portfolios was pointed out long ago and e-portfolios were touted as the preferred solution (Van Tartwijk & Driessen, 2009) but the message here is that administrative details have significant impact on the utility of the CEX – many of the issues cited such as the number of assessments an

individual assessor has to make, whether the assessor is equipped to do the assessment on the spot, or whether the assessor has prior exposure to the resident or not - are administrative and educational design details that faculty training alone cannot solve.

Our study had several limitations. Variations in the clinical environment such as ward vs ambulatory clinic, variable workload or competing responsibilities of the faculty and residents might have affected how the CEX was administered. However, distractions in the ward do affect the performance of CEX in real life as well.

We also note that in this study design, the mini-CEX was performed before the micro-CEX. This was deliberate as the residents and faculty were used to doing the mini-CEX on an ongoing basis so the first mini-CEX would be a “usual” assessment followed by the new assessment. Performing the micro-CEX first might affect how the subsequent mini-CEX was performed.

In this study, we did not attempt to make judgements about reliability and validity of the micro-CEX as only one specific data point was obtained for each trainee. The mini-CEX is validated to be reliable ~~only~~ mainly in the context of repeated tests, and preferably in the context of a coherent program of assessment (van der Vleuten & Schuwirth, 2005). Whether the micro-CEX is able to provide equivalent robust and valid assessment compared to the mini-CEX depends on how it is used and is an area ripe for future study.

#### V. CONCLUSION

Our study demonstrated that the micro-CEX has a high rate of acceptability amongst faculty and residents, as well as a measurable improvement in feedback characteristics compared to the usual mini-CEX. The context in which the form is administered in actual practice has significant impact on its utility for feedback and assessment.

##### Ethical Approval

The study protocol was reviewed by the hospital Institutional Review Board, who deemed this as an educational quality improvement project which did not require IRB approval (Singhealth CIRB Ref: 2018/2696).

##### Notes on Contributors

Thun How Ong conceptualised and designed the study, administered the interviews, analysed the data and wrote the manuscript.

Hwee Kuan Ong participated in data analysis and coding of the qualitative data.

Adrian Chan participated in data analysis and in grading of the feedback specificity.

Dujeepa D. Samarasekera provided input on initial study design and reviewed the manuscript.

C. P. M. van der Vleuten provided guidance and input at all stages of the study, from initial study design to data analysis and manuscript writing.

### Data Availability

The data that support the findings of this study are openly available in Figshare repository, at

<https://doi.org/10.6084/m9.figshare.21862068.v1>

### Acknowledgement

The authors would like to acknowledge the contributions of the following:

Tan Shi Hwee and Nur Suhaila who provided the administrative support that made the whole project feasible.

The Faculty and Residents who were willing to do the extra CEX and the interviews, and who labour daily in pursuit of the ultimate goal of providing better care for our patients.

### Funding

No funding was obtained for this study.

### Declaration of Interest

All authors have no declaration of interest.

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Appendix 1a: Usual Mini-CEX

- Select an answer -

Setting

Case Summary:

Remaining Characters: 5,000

1. Medical Interviewing Skills

(Effective questioning technique. Active listening. Facilitates patient's telling of story. Comprehensive collection of data.)

Competent M3	Competent M4	Competent SIP	Competent R1	Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Physical Examination/Procedural Skills

(Logical & efficient sequence. Good explanation of steps. Good Technique. Pick up relevant signs.)

Competent M3	Competent M4	Competent SIP	Competent R1	Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Medical Professionalism

(Attends to comfort and modesty. Shows respect, compassion & empathy. Respects confidentiality & signs.)

Competent M3	Competent M4	Competent SIP	Competent R1	Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Clinical Judgement

(Reasonable differential diagnosis. Orders appropriate investigations & treatment. Balanced consideration of risks & benefits)

Competent M3	Competent M4	Competent SIP	Competent R1	Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Communication and Counselling

(Obtains patient consent. Educates & counsels regarding investigation & treatment.)

Competent M3	Competent M4	Competent SIP	Competent R1	Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Organization

(Appropriate prioritization.)

Competent M3	Competent M4	Competent SIP	Competent R1	Timely & succinct. Logical sequence.) Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 7. Clinical Competence

Competent M3	Competent M4	Competent SIP	Competent R1	(Demonstrates judgement, efficiency & caring.) Competent R2	Competent R3	Competent SRY1 (R4)	Competent SRY2 (R5)	Competent Specialist	Not Observed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Positive areas that can be reinforced.

Remaining Characters: 5,000

Areas that need development.

Remaining Characters: 5,000

Close Window

Appendix 1b: Micro-CEX

Name of Resident:

Name of Assessor:

PGY:

Date Performed:

Domain (s) assessed:  History  Physical Examination  Presentation

Synthesis of information and differentials  Clinical Management  Communication skills

Difficulty level:  Easy  Medium  Hard

Feedback

Detailed and specific feedback is very important to help the trainee improve, and also for CCC to assess the trainee’s progression. After observing the resident in this skill, my feedback is as follows:

1. What did the resident do well(strengths)?
2. What could be done better(deficiencies and errors)?
3. Please provide at least one recommendation for learning and future practice

4. Based on your observation of this single clinical encounter, for **this skill** the

1	2	3	4	5
Trainee needs to be guided step by step or is an observer only	Trainee needs direct supervision – I need to watch trainee practice this skill in real time	Trainee needs indirect supervision – I don’t need to watch trainee in the room, but will need to confirm findings/ reassess patient myself	Trainee needs distant oversight – I don’t need to watch trainee in the room , but am available for consultation and feedback	Trainee is proficient and can be trusted to practice this skill independently

*Entrustment scale based on (Kogan & Holmboe, 2018)*

## Appendix 2: Survey Questions and Interview Guide

### Survey for faculty (end of month/prior to interview)

1. Number of years that I have supervised residents
  - a. <3
  - b. 3-<5
  - c. 5-<10
  - d. >=10
2. Estimated number of CEX I have completed in the last 6 months
3. I have received previous training in doing mini-CEX
  - a. None at all
  - b. Have received some prior faculty development which may not be directly relevant
  - c. Have received some prior relevant training, but not enough
  - d. Have received adequate prior training
4. I understand why we do the mini-CEX for the trainees
  - 1- Strongly disagree-----9 – strongly agree
5. Previously, I fill in the mini-CEX immediately or soon after ( <1 day ) an episode of direct observation ----% of the time.
6. Previously, I generalize performance to fill in the mini-CEX -----% of the time.
7. How useful do you think the **conventional mini-CEX** is for assessment of the resident ( ie determining that the resident is overall competent in a skill)
  - 1- Not useful at all-----9 – very useful
8. How useful do you think the **conventional mini-CEX** is for learning for the resident?
  - 1- Not useful at all-----9 – very useful
9. How useful do you think the **micro -CEX** is for assessment of the resident ( ie determining that the resident is overall competent in a skill)
  - 1- Not useful at all-----9 – very useful
10. How useful do you think the **micro-CEX** is for giving feedback to the resident
  - 1- Not useful at all-----9 – very useful
11. If we were to use new form, how likely am I to do direct observation w trainee using this form?
  - 1- 0-10% of the time -----9 - >90% time



### Survey for Trainees (end of month/prior to interviews)

1. Years in residency program
2. In previous mini-CEX, how often were they done immediately or soon after ( within a day of) an episode of direct observation? -----% of the time
3. How long does faculty take to fill in the form? -----min or I don't know, have not observed faculty filling in form.
4. I understand why we do the mini-CEX  
1- Strongly disagree-----9 – strongly agree
5. How useful to your learning have you found the usual mini-CEX  
1- Not useful at all-----9 – very useful
6. How well do you think the previous mini-CEX assessments reflected your performance?  
1- Not accurately at all-----9 – very accurately
7. How long did your assessor take to fill in the new form? -----min or I don't know, have not observed faculty filling in form.
8. How useful to your learning did you find feedback with new form  
1- Not useful at all-----9 – very useful
9. How well do you think the new mini-CEX reflected your performance?  
1- Not useful at all-----9 – very useful
10. Other suggestions for implementation/improvement of the mini-CEX?

### Interview guide for semi-structured interviews (residents)

Thank you all for taking time to help. I expect to take about 45min of your time. Our aim today is to find out what features are important to you to improve the design and implementation of the mini-CEX in order to make it more useful and user-friendly.

1. How did you find the experience of being assessed using the mini-CEX?
2. How did you find the experience of being assessed using the micro-CEX?

---

The mini-CEX was designed to be a tool that can be used for teaching/feedback, and provides one of many points of information for the CCC to eventually decide on progression/ entrustment decisions ( ie that you're ready for the next level).

3. How do you think we can make the mini-CEX more useful to you  
- for feedback?  
-for assessment?

## Interview guide for semi-structured interviews (faculty)

Thank you for taking time to help in this interview. I expect to take about 45 minutes of your time. Our aim today is to find out what features are important to you to improve the design and implementation of the mini-CEX in order to make it more useful and user-friendly.

1. How did you find the experience of using the mini-CEX?
2. How did you find the experience of using the micro-CEX?

---

The mini-CEX was designed to be a tool that can be used for teaching/feedback, and provides one of many points of information for the CCC to eventually decide on progression/ entrustment decisions ( ie that resident is ready for the next level).

3. How do you think we can make the mini-CEX more useful
  - for feedback?
  - for assessment?

### Appendix 3: Feedback

Using Pelgrim's grading system, feedback is rated on a 4 point scale:

- **(3) specific:** meets three criteria- which part of the consultation the feedback refers to, what did and did not go well, and why it did or did not go well. For instance, "Good list of differentials, discussed the presentation and diagnosis of Sarcoidosis. SR performed EBUS TBNA (under supervision) very well".
- **(2) moderately specific:** when it only referred to one of the three criteria e.g.: "More in depth history taking, and improve in organizing the information elicited and present in a sequential manner"
- **(1) not specific:** when it was too general, relating only to the consultation as a whole, eg "continual learning and exposure to further hone and refine clinical acumen"
- **(0) no feedback given**

Appendix 4: Pearson's correlation coefficient between different domains in Mini-CEX and year of training

	resident level	miniCEXQ 1	miniCEXQ 2	miniCEXQ 3	miniCEXQ 4	miniCEXQ 5	miniCEXQ 6	miniCEXQ 7
resident level	1	.557**	.467**	.389**	.499**	.409**	.601**	.568**
miniCEXQ1	.557**	1	.799**	.860**	.846**	.744**	.890**	.826**
miniCEXQ2	.467**	.799**	1	.682**	.698**	.539**	.749**	.695**
miniCEXQ3	.389**	.860**	.682**	1	.840**	.724**	.770**	.831**
miniCEXQ4	.499**	.846**	.698**	.840**	1	.710**	.817**	.822**
miniCEXQ5	.409**	.744**	.539**	.724**	.710**	1	.764**	.711**
miniCEXQ6	.601**	.890**	.749**	.770**	.817**	.764**	1	.816**
miniCEXQ7	.568**	.826**	.695**	.831**	.822**	.711**	.816**	1