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Structured vs Unstructured Debriefing: Finding the Right Approach in Cabin Crews' Simulation-Based Resuscitation Training

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Simulation-based medical education consistently finds debriefing to be the most important element in providing effective learning. Yet, there are limited studies that demonstrate the outcomes of debriefing on simulation-based resuscitation learning in the non-medical community. This mixed-method study examined the effects of debriefing methods (*DIAMOND* vs Customary) in 2 simulation experiences on 130 cabin crews' resuscitation knowledge, technical & non-technical skills. The quality of debriefing was assessed using a survey followed by analysis through face interview. The findings showed that there was no significant effect on the usage of different debriefing method by both groups on the retention of all variables, F (3,123) = .540, p = .656, partial $\eta 2$ = .013. The *DIAMOND* debriefing was showed to be more quality as perceived by the DASH-SV scores, t = -6.244, df = 98, p = <.001. Elements such as Cognitive, Methodology & Psychosocial were reported to promote the retention of knowledge and skills among the participants. Despite not generating a statistically significant difference, this study reports important information about the influence of structured debriefing with additional investigations conducted with improved designs are needed to provide further evidence and perceptual effectiveness of structured debriefing.

Keywords: *DIAMOND* structured debriefing; resuscitation training; simulation-based learning; cabin crew

I. INTRODUCTION

The development of the aviation industry in Malaysia occurs rapidly, which directly encouraging more people in Malaysia to choose commercial flights which are increasingly rising to 2 million as compared to years ago. The statistics of airlines activities around the world indicates that with the accelerated use of commercial flights across the globe in addition to an ageing population contributes to an increase in cases related to medical emergencies in flight (http://www.transtats.bts.gov). Emergency medical cases that occur in flight is a new phenomenon that's lack of attention (Amit & Shauna 2013). Aside from compact and small cabin with minimum space to provide medical care in addition to the low possibility to get help from a medical doctor, nurse or medical assistant indirectly impacted and cause a variety of complications to passengers (Amit & Shauna 2013).

The above issues can be overcome through the presence of the crew trained in first aid in ensuring proper treatment is given fast and accurately. Every crew member on duty had

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undergone intensive training and are certified the first aider. In addition, almost 3-quarters of all cases of emergency prevailing are handled alone by the crew, and the crew demonstrate competence in carrying out their duties as a first aider (Dowdall 2007). The guidelines issued by the Federal Aviation Administration (FAA), the Aerospace Medical Association (AsMA) Air Transport Medicine Committee's and the International Civil Aviation Organization (ICAO), recommended that every aircraft ought to have an emergency medical kits, Automated External Defibrillators (AED) and crew involved in each flight should be certified in accordance to the syllabus of first aid Basic Life Support (BLS).

However, a study carried out by the Wellington School of Medicine in assessing the knowledge and performance of the CPR (Cardio Pulmonary Resuscitation) and AED (Automated External Defibrillator) among the crew who sit for the recurrent examination in renewing the safety and emergency license after a year showed an unsatisfactory result. These consist of their failure to place proper hand position while performing CPR, usage of AED as well as the low level of knowledge and self-confidence. Low mastery of technical skills and knowledge retention in first aid amongst crew members were documented in several previous studies that attributed to several key factors which includes teaching and learning techniques that are much less effective, modular teaching and learning of different uses for each airline academy and short duration within the training of the crew to acquire the knowledge of first aid (Mahony 2008).

In addition to knowledge and technical skills, non-technical skills also play an important role in improving the safety of patients (Sevdalis *et al.*, 2012). In medical and health sciences education, professional training conducted by faculty is more focused on technical knowledge and skills which is not explicitly geared to non-technical skills such as communication, teamwork and leadership. However, presently in the medical world, non-technical skills are the skills that should be mastered in full view as this skill is the most important skill that must be practised in everyday work (Rasmussen *et al.*, 2012).

In developing a quality crew in providing medical care to patients, teaching and learning methods need to be extended and not centred on the technical knowledge and skills alone, due to the lack of exposure to non-technical skills, in particular, that contribute significantly to an error in giving emergency treatment to passengers (Pronovost 2013). Similarly, the lack of exposure in an emergency, short training duration together with time constraints to engage with the facilitator is an additional factor leading to much less effective exercise in conveying knowledge effectively and consequently have an impact on the quality and crew performance in imparting emergency treatment to patient (Dreifuerst 2009).

Different disciplines and types of trainees have successfully applied simulation as a technique for practice and learning (Gaba 2006). Known as a technique (rather than technology), simulation amplify and replace real-life experiences with guided ones, which immerse naturally that replicates or evokes aspects of the real world. Learners, patients and health system have been shown to have the benefits of using simulation in health professions' education (Riley *et al.*, 2003). Low to high fidelity simulation-based learning is educationally effective as to date.

Attention is being paid on how simulation can best be used to develop technical and non-technical skills since it is accepted as part of everyday education and training for medical communities (Issenberg *et al.*, 2005). Nevertheless, the core element of simulation learning, which is the concept of debriefing is often neglected since most training is using a simulation of emergency tends to reflect on relevant practical and behavioural skills alone.

Medical education reviews find debriefing as the most important element in providing effective learning (McGaghie *et al.*, 2010). "Facilitated or guided reflection in the cycle of experiential learning" was a commonly used definition to describe debriefing (Fanning & Gaba 2007). Technically, debriefing is a guided instructor conversation aim to promote and develop strategies and experiential learning for future application. Somehow, evidence to prove how the instructor should guide a debriefing process is about to emerge (Rudolph *et al.*, 2007).

For the instructors to conduct the debriefing sessions, several different conversational structures have been listed in the literature. These conversational structures break up the session into a series of phases to ensure that the conversations progress in an orderly manner until the end of the session. Generally, a three-phase structure is commonly

used. This includes an analysis of the events, followed by a discussion and lastly, a summary whereby the knowledge acquired throughout the debriefing is solidified. Rudolph *et al.* (2006; 2008) have described a three-phase conversational module which consisted of reaction, analysis, and summary. Similar structures have been described as well, such as the 3D model by Zigmont *et al.* (2011), Debriefing with Good Judgement by Rudolph *et al.* (2006), GAS model by Phrampus and O' Donnell (2013), as well as DIAMOND by Jaye *et al.* (2015).

The DIAMOND structured debriefing provides an approach to a high-quality debriefing in the area of non-technical skills. The series of specially constructed questions were developed for each of the phases (description-analysis-application). Description phase starts with taking the group to an agreed description of the simulation scenario through creating a shared understanding, followed by the analysis phase, the facilitative process by facilitators to explore learners feel through a prompt with open questions which encourage facilitators to construct a framework which later can be broken down into specific actions for future application in the workplace setting and lastly, the application phase which encourages the participant to consider how the knowledge and skills acquired can be applied in their working environment.

The model was useful and valuable debriefing tool which benefitted both participants and faculty members based on learners and faculty members feedback (Jaye *et al.*, 2015). Despite the recognition, only a few examples available to guide a debriefer based on the literature. In the area of non-medical communities, the debriefing potential for success or failure in simulated-based training was not fully explored. As such, our primary objective was to empirically test and compare the resuscitation knowledge, technical and non-technical skills of cabin crews who participated in structured debriefing sessions using the DIAMOND model and of cabin crews who received unstructured debriefing (customary). The secondary objective was to compare the debriefing quality as perceived by the cabin crew, and the final objective was to conduct an in-depth exploration in identifying the elements from the structured debriefing (DIAMOND) that were thought to affect cabin crews' retention of knowledge, technical and non-technical skills through the simulation experience.

II. MATERIALS AND METHOD

A. Study Design

This project was developed by a team of health educationist from Universiti Kebangsaan Malaysia (UKM) together with collaboration from an Airline Company in Malaysia. As the study was executed together with the Airline authority, a mutual written agreement was obtained as per the ethic committee requirement. Ethics approval was obtained from the Faculty of Health Sciences, Universiti Kebangsaan Malaysia (UKM) Research Committee (NN-2017-105) on Ethical Research in humans. This mixed-method with sequential explanatory study used a randomised controlled trial with a parallel design for the quantitative component of the study and sequentially followed by a face-to-face interview to further explain the findings through the qualitative component of the study. All cabin crews enrolled in this study participated in two simulations, the first simulation was carried out at the beginning of the study (baseline) and the second simulation was carried out at 6 weeks after the initial study. Table 1 explains the overall design of the study in details for both groups.

The type of debriefing (Structured DIAMOND vs Unstructured Customary) was the intervention for this study. Before the study, the train-the-trainer workshop was conducted to ensure two chosen trainer from the respective airline academy are fully equipped with theories and skills to conduct a basic simulation learning using role-playing with case scenario together with the elements of debriefing following simulation. The Basic-SiM – Train of Trainer for Airline Instructor handbook was the manual used for this workshop. It was primarily based upon the content of Structure & Support Debriefing Instructor Training (AHA 2015) & SimPle Teach (Simulation Practice for Teaching & Learning) which was endorsed by Simulation Skills Lab Department of PPUKM (Ismail *et al.*, 2016).

Table 1. Study design

Intervention	Group (Control)	Group (Experiment)
Baseline	Pre-Briefing **MCQ** test (Pre) Simulation (Case Scenario 1) – **TSTC & CETAM** Debriefing (Customary Unstructured) Debriefing Assessment for Simulation in Healthcare (**DASH-SV**)	Pre-Briefing **MCQ** test (Pre) Simulation (Case Scenario 1) – **TSTC & CETAM** Debriefing (*DIAMOND* structured) Debriefing Assessment for Simulation in Healthcare (**DASH-SV**)
Retention Duration	6 weeks	6 weeks
Post Intervention	Pre-Briefing **MCQ** test (Post) Simulation (Case Scenario 2) – **TSTC & CETAM** Debriefing (Customary Unstructured)	Pre-Briefing **MCQ** test (Post) Simulation (Case Scenario 2) – **TSTC & CETAM** Debriefing (*DIAMOND* structured)
In Depth Analysis (Face-to-Face Interview)	N/A	Yes

The outcomes variable for knowledge and technical skills encompass three approaches which are to maintain patients' airway and breathing, provide adequate Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) utilisation associated with non-technical skills including effective communication, teamwork, decision making and situational awareness and each of these variables were measured by MCQ test, Technical Skills Testing Checklist (TSTC) & Crew Emergency Teamwork Assessment Measure (CETAM) respectively. The structured DIAMOND debriefing, developed by Jaye *et al.* (2015), was used for the experimental group while the control group received the unstructured debriefing. For the unstructured debriefing, there was no specific format given to the facilitator to follow, but generally included the three main phases of standard debriefing practice.

The learning session was divided into two different groups, and each session was held from 0800 hrs to 1600 hrs which includes general briefing, assessment, simulation via role-playing, and debriefing sessions. The intervention started with a general briefing, followed by a pre-assessment on the cabin crew's knowledge on BLS using a 30-multiple choice questions test which lasted for approximately an hour. Next, the participants were grouped into teams of five members for a flight simulation using the case scenario method. They were oriented to the role-play based on the case scenario given, which covers the expected learning objective and skills (technical & non-technical) to be acquired. The afternoon session included the role-play session, which lasted for 10-15 minutes.

Following this session, the trainer conducted a 30-45 minutes debriefing session to reflect on the participants' actions. To evaluate overall debriefing experience, the participants also completed the Debriefing Assessment for Simulation in Healthcare-Student Version (DASH-SV) debriefing assessment survey (Simon *et al.*, 2009), which took approximately five minutes to complete. At 6 weeks, all participants had to go through an identical assessment as follow-up except for the DASH-SV survey, which was only administered once during the baseline assessment.

B. Setting & Sample

This study was conducted in the Airline Academy of the respective company between August and December 2017. A simple randomisation sample of 130 cabin crews from the airline company was chosen by the Human Resource Department to enrol in this study following the board-approved internal review process based on the inclusion and exclusion criteria. The details of the study were described to the cabin crew as per protocol, before the intervention session and written consent was acquired before the commencement of the study and 100 % response rate of eligible cabin crew participating in the study were obtained.

For a total sample size of 130, all cabin crews were assigned randomly to both groups, either the experiment or the control group with a total of 65 cabin crews each in both groups. By

using G power, an estimated minimum total of 128 participants were needed to provide power greater than 80% to detect a statistically significant difference between both groups with a medium effect size at 0.05 significance level.

C. Data Collection Procedures

The knowledge was assessed based on the scores in an MCQ test. At the same time, the overall performance of technical and non-technical skills amongst cabin crew in a simulated cardiac event was evaluated based on the raters' scores through the recorded video. The assessment was completed immediately pre and once more at 6 weeks for post-training, following the recommendation given of international guidelines that advocated repeat assessment to ensure adequate retention of knowledge and skills following training (Nolan *et al.*, 2010). It is plausible that learning independently would possibly occur following the intervention before the post-assessment, that may have affected the post-assessment performance. However, the exclusion criteria set up by our team advised eliminating any participants who might have involved in any similar medical emergencies onboard throughout the post duration of intervention.

1. *Knowledge assessment: MCQ test*

The modified version of the American Heart Association (AHA) Basic Life Support (BLS) multiple choice question (MCQ) was adopted, modified as per case scenario and validated professionally in terms of its content material. Each correct answered question was awarded one mark and no penalty given for neglected or incorrect answers. As for the post-assessment test, similar questions were used, but the participants were not informed about their test score, nor were they given remarks on their answers. Our team attempted to minimise the learning by means of rearranging the questions accordingly in different orders and develop a brand new set for post MCQ test since it is possible that repeated testing may have contributed to the elevated knowledge performance.

2. *Skills assessment: Technical & Non-Technical*

Video assessment of simulated scenarios is an established methodology in measuring the effectiveness of resuscitation training (Brennan *et al.*, 1996; Whitfield *et al.*, 2003). In minimising possible independent learning, a different set of case scenario were designed with similar learning objectives but in a different setting, in additional no discussions were made in between the facilitators and participants before the simulation session. The recorded simulated scenario was marked by two different expert raters as selected by the researcher. The observational checklist was adapted and modified from a validated tool such as Technical Skills Testing Checklist (Mahony 2008) for technical skills assessment and Crew Emergency Teamwork Assessment Measure (Fariduddin *et al.*, 2018) for non-technical skills and each checklist were consistent with the guidelines from the Safety and Emergency Procedure Manual for Cabin Crew of the respective airline company. Participants video were presented to the raters for the blind rating (pre or post). The technical skills were analysed as binary outcomes (YES/NO) for the task performed whereas, for non-technical skills, a Likert scales were used to indicate the level of performance from poor to excellent (1-10).

3. *Debriefing Assessment for Simulation in Healthcare – Student Version (DASH-SV)*

The DASH-SV assessment tool uses a six-element behavioural rating scale to identify the extent which student perceives that the debriefing model utilised by the facilitator demonstrated six elements of effective debriefing following simulation experience (Simon *et al.*, 2009). Each element is scored on a seven-point Likert scale, from 1 (extremely ineffective/detrimental) to 7 (extremely effective/ outstanding).

4. *Face to Face Interview*

The qualitative portion of this study used data from the face-to-face interview (experimental group) to acquire the in-depth understanding of the elements in DIAMOND debriefing that may have contributed on the retention of

knowledge and skills from the overall simulation experience. These interviews were conducted by a single researcher with the cabin crews to discuss the environment, methods, timing and length as well as the role of facilitator and how all of these factors influenced their learning and the overall simulation experience. All 65 cabin crews who participated in the intervention were invited to take part in the session, however only 16 cabin crews accepted this invitation. The value obtained was sufficient in accordance with the 1:10 ratio in selecting a participant based on the sample size (Creswell, 2012). A face-to-face interview was conducted by the end of the program to ensure more meaningful experiences can be shared among them and all participants were given an explanation in terms of the confidentiality and were consented before the session begins. The 16 in-depth one-on-one interviews lasted for 45 to 60 minutes each. All sessions were conducted in English, and all communications were tape-recorded. The audio recordings were transferred into an electronic file and transcribed using the VLC audio player. The interviewer then listened to all the interview transcripts to verify their accuracy.

To identify the common themes for further analysis, the transcripts were imported into the ATLAS.ti, and content analysis was performed. Descriptive coding of many potential/patterns code was the first step involved, followed by a search of suitable themes via sorting of different codes into potential themes and collating all relevant coded data extracts within the identified themes. (Bryman 2006; Riessman 1993). At this point, the authors started to think about the relationships between the codes, between the themes, and between the different levels of themes.

The second step was to refine the themes to ensure (i) the meaningful coherence of the data and (ii) the presence of clear and identifiable distinctions between the themes (Patton 1990). The third step was to define and name the themes, as well as develop a thematic map of the data (Bryman 2006). At this point, the authors measured the reliability of data through inter-rater agreements in terms of Kappa calculation (Landis & Kosh 1977; Zamri Mahamod & Noriah 2003). This final step further defined and refined the themes to ensures that the findings were truly representative of the data.

III. RESULT AND DISCUSSION

There was (n = 69) flight steward (53.1%) and flight stewardess (n = 61) (46.9%) enrolled in this study, to begin with. The rest of the demographic characteristics such as age distribution, education level, nationality and working experience were presented in Table 2. The MCQ test, technical and non-technical skills scores of cabin crews in the intervention and control group were compared after the second scenario, which occurred at 6 weeks from the baseline intervention.

The results for knowledge and non-technical skills showed retention following the intervention. However, a decay in technical skills was shown for both groups (Table 3). The mean MCQ scores for the knowledge assessment increased from 22.78 to 24.18 (control) and 21.89 to 24.37 (experimental), with better retention in the experimental group. A similar trend was recorded for the non-technical skills assessment with increases of mean scores from 8.45 to 8.54 (control) and 8.59 to 8.66 (experimental). However, both groups showed a decrease in the mean scores for technical skills from 11.85 to 10.75 (control) and 11.05 to 11.10 (experimental).

Table 2. Demographic characteristics of the study population

Demographics		N (%)	
		Control	Experiment
Sex	Male Female	34 (52.3) 31 (47.7)	35 (53.8) 30 (46.2)
Nationality	Malaysian Non-Malaysian	65 (100) -	65 (100) -

Education	SPM STPM/Matriculation Diploma Bachelor's Degree Master's Degree PhD	35 (53.8) 7 (10.8) 17 (26.2) 4 (6.2) 2 (3.1) -	40 (61.5) 10 (15.4) 10 (15.4) 5 (7.7) - -
Mean (S.D)			
Age	18-22 23-27 28-32 33-37 38-42 43-47 48-52 > 52	1.75 (.500) 1.70 (.483) 1.44 (.527) 1.40 (.516) 1.50 (.548) 1.36 (.505) 1.45 (.522) 1.25 (.500)	1.50 (.577) 1.50 (.577) 1.30 (.483) 1.14 (.378) 1.50 (.522) 1.53 (.514) 1.43 (.535) 1.00 (.490)
Working Experience (years)	1-5 6-10 11-15 16-20 > 21	1.73 (.467) 1.75 (.452) 1.69 (.480) 1.33 (.577) 1.35 (.485)	1.77 (.439) 1.80 (.447) 1.55 (.522) 1.64 (.505) 1.28 (.458)

Table 3. Mean scores for knowledge, technical & non-technical skills assessment

Assessment	Group	Baseline (Mean & S.D)	Post (Mean & S.D)
Knowledge	Control Experiment	22.78 (3.25) 21.89 (3.69)	24.18 (2.62) 24.37 (2.71)
Technical Skills	Control Experiment	11.85 (3.2) 11.10 (2.44)	10.75 (2.86) 11.05 (3.2)
Nontechnical Skills	Control Experiment	8.45 (.686) 8.59 (.681)	8.54 (.564) 8.66 (.542)

Means of total scores at 6 weeks for all variables were analysed with multivariate analysis of covariance (MANCOVA) to assess differences between groups with the total mean scores from baseline as a covariate. All data were tested using SPSS to ensure all of the underlying analysis were met before the MANCOVA analysis. Boxplots and Shapiro-Wilk were used to assessed univariate normality and can be assumed. No multivariate outliers were detected within the data which support the Multivariate Normality assumption. Multicollinearity was not a problem based on correlations between the dependent variables which were not excessive. Moreover, the relationship that did exist among the dependent variables were more or less linear. Subsequently, Box's M was not significant at α = .001, indicating that Homogeneity of Variance-Covariance Matrices can be assumed. As all the underlying assumptions were supported through the data, a MANCOVA was performed. Findings confirmed that there was no significant effect on the use of debriefing method (DIAMOND vs Customary) on the combined dependent variables, F (3,123) = .540, p = .656, partial η = .013 (Table 4).

Table 4. Multivariate Test

Effect	Value	F	Hypothesis df	Error df	Sig	Partial Eta Squared
Pillai's Trace	.013	.540	3	123	.656	.013

Despite the lack of significant effect on the usage of different types of debriefing methods, there were several retentions noted. However, no significant differences were observed for each of the variables. The most prominent retention were knowledge, which both groups retained (C = 22.34 - 24.13, E = 22.34 - 24.41) after the training intervention followed by non-technical skills (C = 8.51 - 8.58, E = 8.51 - 8.64). However, the decay of mean scores was observed by both groups (C = 11.68 - 10.76, E = 11.68 - 11.09) following the intervention with the control group showing the most decay of technical skills (Table 5).

Table 5. Estimated marginal means

Variables	Groups	Baseline Mean (Co-variate)	Post - Mean	S.E	95% Confidence Interval	
					Lower Bound	Upper Bound
Knowledge	Control	22.34	24.13	.307	23.528	24.744
	Experiment		24.41	.307	23.810	25.026
Technical Skills	Control	11.68	10.76	.274	10.221	11.304
	Experiment		11.09	.274	10.557	11.640
Non-technical skills	Control	8.51	8.58	.073	8.443	8.731
	Experiment		8.64	.073	8.501	8.789

DASH-SV were used to analyse the participant satisfaction from the assessment survey. Each item was measured using a Likert scale, and a composite score was formed by adding item scores across the six items. Descriptive statistics are presented in Table 6. The mean DASH-SV scores of experimental groups (6.61) were higher than the control group (6.04), which showed that participants who receive the *DIAMOND* structured debriefing method have a more favourable learning experience.

Table 6. Mean & Standard Deviation

Group	Mean	Standard Deviation
Control	6.04	.618
Experimental	6.61	.371

To determine the significant differences between both groups, an independent t-test was conducted. As shown in Table 7, there was a statistically significant difference, with subjects in the experimental group obtaining significantly higher DASH-SV scores than those in the control group, $t = -6.244$, $df(98)$, $p < .001$ with large effect size, $d = .85$.

Table 7. Independent t-test of group differences in DASH-SV

Variable	*t*-test for Equality of Means			
DASH-SV	*t*	*df*	*Sig* (2-tailed)	Mean difference
	-6.244	98	.000	-.57687

Despite the lack of significant effect on the usage of different debriefing method, the participants perceive DIAMOND structured debriefing method to be more favourable and provide a satisfying learning experience than the unstructured debriefing, with a large effect size ($d = .85$) between the two groups. To further explain this finding, we obtained valuable information from the 16 cabin crews who completed the interview sessions. Three themes and 12 sub-themes emerged from a total of 115 codes reaching saturation after approximately 13 interviews with a Kappa value of .80 (good) were obtained based on five selected raters agreement. Three main themes resulted from the data analysis: Cognitive, Methodology & Psychosocial, which included different sub-themes.

Some suggestions were also made regarding the application of the structured debriefing. As Table 8 shows, the majority of the cabin crews mentioned that the structured debriefing has a positive impact on their knowledge and skills development. Furthermore, in the first theme 'Cognitive', cabin crews mentioned that the debriefing process was very engaging (n = 7), and at the same time allows them to conduct a self-reflection on their actions (n = 8). The majority agreed that the safe learning environment (n = 16) created among participants and facilitators are the main factors which contribute towards the effective learning process among the cabin crews.

Concerning the 'Methodology' theme, cabin crews believe that the structured concept (n = 13) applied. At the same time, the session was conducted, couples with debriefing scripts (n = 7) help to navigate the discussion conducted by the facilitators in a more organised and oriented to the specific learning objectives. On top of it, the questioning techniques (n = 3) imposed by the facilitators enable the development of a framework for effective learning which can improve their performance and enables the development of specific skills.

Finally, in the 'Psychosocial' theme, cabin crews report that the structured debriefing helps to create a positive relationship (n = 9) among themselves as well as with the facilitator involved. On top of it, the majority felt that they were much more confidence (n = 11) after going through the sessions and developed a positive attitude (n = 2). At the same time, an increase in self- awareness (n = 7) and all of the aspects were acquired after structuring their thoughts with the help of the facilitator.

Nevertheless, some cabin crews mentioned that the working culture (n = 9) emphasising the aspect of the hierarchy might hinder the entire process of debriefing especially when there is a difference in terms of rank and seniority among them which limits the discussion and difficulty in pointed out mistakes as these remarks will be considered as destructive criticism rather than constructive which coupled with fear attitudes. However, cabin crews made suggestions on the methodology aspects on how to improve the debriefing session, namely :

- The sessions should be conducted simultaneously with the recorded video terms' video-assisted debriefing process'.
- Utilised the 'play' & 'pause' techniques to allows cabin crew to reflect further. Facilitators are highly encouraged to ask several questions about the theory or practical skills related to the particular situation depicted in the video.

The data in this study revealed no statistically significant differences between control and experiment group on the use of different debriefing method (DIAMOND vs Unstructured) for each of the variables. The huge confidence interval observed in the analysis may have been due to the lack of statistical significance. The huge variation could indicate low effect size or inadequate sample size for the intervention. Either or both of these condition existing in the analyses could have prevented the detection of significant differences between groups.

Table 8. The elements of *DIAMOND* structured debriefing

Theme	Sub-Theme	Categories	Recording Units
Cognitive	Engaging (n = 7)		*'it was very engaging it makes you want to speak out so want to know more and ermmm I guess that's how it helps me understand my flaw and also strengthen my confidence when I repaired those flaws'*
	Learning Environment (n = 16)	• Friends • Facilitator	*'you ask everyone opinion so that way we feel like a group rather than teacher ….so it's like student centred rather than teacher centred'* *'It was really fun because she instils a bit like she put in a bit of jokes here and there but she does not deviate from the main topic and she correct you from that side. It was a safe learning environment…everyone enjoys and engaged and it also break the ice between student and teacher'*
	Ability to Reflect (n = 8)	• Student Self – Assessment	*'when she asked, everyone will keep looking for answer, your mind will keep on looking for answer, so we all pause a bit'*

Methodology	Debriefing Concept (n = 13)	• Reaction • Analysis • Conclusion	*'debriefing is not to find fault. It's more towards helping you out'* *'I am able to witness my own mistake, see my friend's mistake also and try to remember whatever the facilitator taught us, correct us'* *'highlight back few points not supposed to do what supposed to do so urmm it's a good urmm whatever resource that we can implement together so for us to enhance better instead of arrr keep on doing the same mistake'*
	Questioning Techniques (n = 3)		*'the questions were relevant…meaning it helps us to build up our knowledge'*
	Elements in Debriefing (n = 7)	• Debriefing Scripts	*'the facilitator conduct the session in a structured manner, from one point to another, then she summarize most of the points and turns out it's like a quick action guidelines'*
	Aspects to Improve (n = 9)		*'while the video is playing, we stop then we highlight each part'*
Psychosocial	Attitude (n = 2)		*'I'm preparing myself to be more positive, because positive attitude will deliver positive action'*
	Self-Awareness (n = 7)		*'I will always do my homework, my own mind mapping everything. In case there's an emergency onboard I will apply and also at the same time I will share with others'*
	Relationship (n = 9)	• Student/Student • Student/Facilitator	*'we can work in classroom no issue…….no problem…i don't feel insecure or inferior…not at all'* *'I'm comfortable with the facilitator, I've known her for years and she's really nice to all of us'*
	Self-Confidence (n = 11)		*'emergency happen I'll be much more calm more confidence and I would definitely can take charge even though there is no supervisory crew available so that's how I feel I can apply there'*
	Working Culture (n = 9)	• Hierarchy	*'I still think maybe it's a because of the gap because the supervisor and the non-supervisor has a gap or maybe its our culture because the non do not questioned or correct them'*

Dreifuerst (2012) findings, who used Debriefing for Meaningful Learning (DML) model differ from our study through the same study design was used among nursing students. The sample size used in Dreifuerst's study was significantly larger (N = 240) compared with the sample of 130 students in this study. Driefuerst's study using a large sample size may have provided more observed power to detect differences between the experimental and control groups.

A significant difference was also found in Cheng *et al.* (2013) between the experimental group, which had debriefing after a simulation experience with a debriefing script, and the control which do not have any scripts to assist the debriefing process. In this study, involving 387 interprofessional groups ranging from paediatricians, nurses and paramedics, the elements of non-technical skills as per Crisis Resource Management (CRM) measured with Behavioural Assessment Tool (BAT) increased significantly in both groups after they engaged with the debriefing sessions following simulation with a higher BAT score observed in the experimental group. More observed power may have been provided in the study to detect differences between the groups due to the large sample size of participants.

Nevertheless, findings reported by Mariani *et al.* (2013) are consistent with the findings generated from this study, who used DML with similar study design to measured nursing students' clinical judgement using Lasater Clinical Judgement Rubric (LCJR) instrument. The small sample size (N = 86), utilised in the study may have been inadequate to detect differences between groups.

Instructors' debriefing training experience on debriefing practices may show statistically significant differences in providing the students with effective debriefing sessions aside from sample size. This too may indicate that simulation instructors who had completed debriefing training actively are more likely to facilitate student reaction and discussion to simulation and provide feedback during debriefing, which results in an effective learning process. As mentioned, this study offers the train of trainer workshop to both facilitators who participated in the intervention to fully equipped the

facilitators with theories and skills to conduct effective simulation and debriefing process.

It is anticipated that both selected facilitators with similar working experience and skills may have accepted the training components equally. Although the Certified Simulation Healthcare Educator (CSHE) were involved in the training session to train one of the facilitators on how to utilise the specific DIAMOND debriefing model effectively, likewise the unstructured model used in this study may have mimicked the elements presented in DIAMOND model, and this may be influenced by the teaching skills of the experienced facilitators. As a result, this study shows a failure to apply the elements of DIAMOND debriefing models sufficiently. It seems to be that because simulation-based learning among aviation facilitators is in its infancy in Asia. Novice facilitators tend to place the highest priority during the simulation phase itself, leaving the debriefing phase far behind.

Ineffective debriefing session could also be the case of a low number of participants per group. In this study, facilitators spend twice the simulation time for debriefing as highlighted by Johnson-Russell & Bailey (2010), whereby the time required for debriefing should be twice or more than the time for simulation phase and the longer the simulation session, the longer the time for debriefing. Approximately 10-15 cabin crews are in one class for the simulation and debriefing. Ample time frame together with a small group of students may allow them to take turns expressing what they have acquired during the simulation. Still, it may be impossible for Asian students who are not as expressive as Western counterparts, make it difficult to carry out effective debriefing, which was depicted in the qualitative portion of this study (Chung *et al.*, 2013).

This study too reveals that both facilitators who had undergone training sessions are more likely to provide students with the opportunity of discussing their emotional reactions about simulation and feedback during debriefing. This is the most important stage which allows the participants to ventilate their emotions with the aimed to ensure the participants is in a state of calm and free of any threats that may interfere with the debriefing process. Hence, this phase helps to reduce the stresses rose from the simulation, especially for those who fail to achieve satisfactory performance. Aside from it, effective debriefing sessions were also affected by the safe learning environment and the positive relationship among participants and facilitators. The presence of these facilitators among the cabin crew indirectly created a psychological safety towards them which leads to effective debriefing sessions despite the usage of different debriefing models (Fanning & Gaba 2007; Ha 2014).

One of the significant attributes in successful debriefing session falls into the facilitator's role as an individual who learns alongside and does not exhibit authoritarian to ensure effective two-way discussions and at the same time to encourage the students to take a more active role in open communication. However, the hierarchal differences exist among the cabin crews as reported in the qualitative finding, causing difficulty and fear of voicing their opinions and proposals which minimises the effects of DIAMOND and subsequently leads to an ineffective debriefing session. This might be aggravated by the fact that these cabin crews are very self-conscious with their performance and easily embarrassed or having a fear of threats if the input given were inappropriate during the debriefing session (Smith *et al.*, 2008).

Lastly, this study shows a failure in improving the cabin crews' technical skills despite both knowledge and non-technical skills improved after the debriefing session by both groups. It seems to be that the level of exposure and participation in dealing with actual medical emergencies on a daily basis might affect the individual performance rather than the simulation exercise or the debriefing session (Einspurch *et al.*, 2007; Reder *et al.*, 2006). The cabin crew, who is also novices in dealing or little to no exposure with actual medical emergencies can be potentially be distracting rather than add meaning to the learning process during the simulation exercises (Van Merrienboer & Sweller 2005).

It is crucial to note that even providers from different disciplines or specialities (medical vs non-medical community) may experience different rates of decay in knowledge and skills due to the differences in frequency and type of clinical exposure (Jensen *et al.*, 2009). This supports the fact that cabin crew who works in aviation sectors rarely confronted medical emergencies in their workplace, which directly affects the decay to occurs at a faster rate.

A. Study Limitation

This study has several limitations. Inadequate observed power for the statistical analysis was the most notable limitation. A minimum total of 128 participants with 64 cabin crews per group was needed, as suggested through priori power analysis. Nevertheless, the actual sample size in this study was 130 participants with 65 cabin crews each in both groups. Despite the adequate but minimal number of participants, assuming a medium effect size for the intervention may have been the result of low power, which reduced the estimated sample size. By selecting larger effect size, perhaps with a larger sample size would have yielded the statistically significant differences among the groups.

Secondly, the possibility of independent learning may have occurred before the intervention or after completing the intervention on all of the variables measured. Since each of the cabin crew was assigned to a certain group (either control or experiment) blindly, as this strategy was used to eliminate possible bias, somehow cross-contamination of the sample between the groups might have occurred since the researcher did not know whether the cabin crew might have shared the outcome of the intervention through a shared social media platform among them. Besides, the intervention focused on the element of BLS from the perspective of knowledge and skills in which each of the selected participants is certified BLS provider with years of experience and would have acquired the pre-existing knowledge and skills before the intervention.

Thirdly, homogeneity of the sample based on age and working experience may have been the limitation. Despite that the demographics of the sample accurately reflect the cabin crew population of the airline company, more than half of the participants had years of flying experiences, and this may have skewed the results. Thus, homogeneity was unavoidable. Any type of debriefing, either structured or unstructured may not pose a significant benefit for the cabin crew since the knowledge and skills in the form of schemata may have developed through years of experience, and the effectiveness between these types of debriefing would be limited.

Variation of the unstructured debriefing used in the control group could be the fourth limitation since the elements acquired from the train-of-trainer sessions conducted earlier could be one of the unidentified contamination of the intervention. Despite no exposure to DIAMOND model, the high skills and experienced facilitators who debrief the control group may have unintentionally included some of the structured elements obtained from the training session for the control group. All of the variable scores would have been influenced if this occurred.

Research design is another limitation of this study. Measuring retention of knowledge and skills by a longitudinal study design over several months could be more accurate. In this study, the cabin crews' knowledge and skills were measured once following the intervention due to the operational requirement which supersedes the availability of the cabin crews involvement in this study, as such the decaying pattern may not be visible.

B. Future Research Design

Some aspects can be improved when researching the future. First, it is important to ensure a larger sample size is successfully obtained, with a longitudinal research design to allow more accurate assessment on the retention. Replication of this study with a more diverse group of cabin crews is indicated. It is crucial to note that the debriefing efficacy may be affected by the facilitators' debriefing skills. It is important to provide a rigid and proper guideline on the usage of unstructured debriefing to prevent any further contamination from the structured debriefing elements. Additional instructors may be more suitable in minimising personal style variations in carrying out the interventions. On the technical part, while conducting the debriefing sessions, we noticed the participants had difficulties in reflecting on their actions and recalling events, which might impair the discussion. Thus, the usage of video-assisted debriefing is highly suggested since there is still a wide knowledge gap in using video-assisted debriefing with structured debriefing model. Several technical errors in this study should be addressed accordingly, such as the usage of a high-quality camera to produce a good image which helps raters for better rating and upgrading several medical devices and mannequins to minimise technical difficulties during the simulation. Lastly, selected participants from both groups should be interviewed following the debriefing session instead of focusing on the *DIAMOND* group. Triangulation of

data generated from the interview session would yield similarities and differences between the elements presented in structured and unstructured debriefing techniques which would provide further exploration of the research finding.

IV. CONCLUSION

This study empirically testing and compare between structured and unstructured debriefing and its effectiveness on cabin crews' knowledge, technical and non-technical skills in resuscitation training. Differences between the groups' mean for all variables scores were not statistically significant. However, there were slight retained reported on the knowledge and non-technical skills at 6 weeks after the intervention despite the decay of technical skills and this lack of statistically significant differences such as small sample size, possible independent learning among cabin crews, the homogeneity of the samples and the high skills facilitators which may have been the limitations operating in the study design. The DASH-SV surveys and qualitative findings did, however, indicate that cabin crews perceived *DIAMOND* to more quality and benefited the overall acquisition and retention of knowledge and skills from several elements present in the structured debriefing such as cognitive, methodology and psychosocial. To provide further empirical and perceptual evidence of structured debriefing on cabin crews' learning outcome, additional investigation conducted with improved designs are needed. Though no statistically significant difference detected, this study yielded important information regarding the influence of structured debriefing on cabin crews' learning in simulation-based resuscitation training.

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