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In situ simulation training for a better interprofessional team performance in transferring critically ill patients with COVID-19: a prospective randomised control trial

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ABSTRACT

Background Transferring critically ill patients with COVID-19 is a challenging task; therefore, well-trained medical team is needed. This study aimed to determine the role of in situ simulation training during pandemic by using high-fidelity manikin to improve interprofessional communication, skills and teamwork in transferring critically ill patients with COVID-19.

Methods This single-blinded randomised control trial included 40 subjects allocated into standard low-fidelity simulator (LFS) and high-fidelity simulator (HFS) groups. Subjects, who were not members of multiprofessional team taking care of patients with COVID-19, in each group were assigned into small groups and joined an online interactive lecture session, two sessions of in-situ simulation and a debriefing session with strict health protocols. The first simulation aimed to teach participants the skills and steps needed. The second simulation aimed to assess transfer skills, communication and teamwork performance, that participants had learnt using a validated, comprehensive assessment tool. Data were analysed using unpaired t test or Mann-Whitney test.

Results The HFS group showed significantly better overall transfer and communication skills than LFS group (89.70±4.65 vs 77.19±3.6, <0.05 and 100 vs 88.34 (63.33–100), p=0.022, respectively). The HFS group also demonstrated significantly better teamwork performance than the standard LFS group (90 (80–900) vs 80 (70–90), p=0.028).

Conclusion In situ simulation training using HFS significantly showed better performance than the standard training using LFS in regards to overall transfer and communication skills as well as teamwork performance. The training using HFS may provide a valuable adjunct to improve interprofessional skills, communication and teamwork performance in transferring critically ill patients with COVID-19.

Trial registration number NCT05113823.

INTRODUCTION

Safe transportation of critically ill patients is challenging. It depends on patient selection, staff training, interprofessional teamwork, predefined hospital transport protocols and checklists, appropriate transport equipment availability and also transport timing.[1–5] Such complex system and situation could be recreated in a simulated environment. Simulation-based learning has proven to have a good impact on the students' competence. An in situ simulation, conducted with multidisciplinary team, could recreate the circumstances similar to which they conduct their usual activities, thus further accelerate the students' knowledge, skills and safety attainment process.[6] High-fidelity simulator (HFS) has also started to be used widely in simulation-based training aside from low-fidelity simulator (LFS). It supports a realistic yet safe environment, where participants can face a rare clinical situation and learn from mistakes without harming the patients.[3 5]

Simulation may play an integral role in the medical education's response to the pandemic era. COVID-19 pandemic created an urgent need for targeted and adaptive training for all intensive care and medical emergency team members, especially in conducting safe intrahospital transportation of critically ill patients with COVID-19. Modifying interprofessional simulation-based training by implementing strict health protocols is necessary to initiate simulation-based training. This implementation enable us to continue improving knowledge, skills, communication and teamwork performance in managing and transferring patients with COVID-19 during pandemic era. This study aimed to determine the role of in situ simulation training by using HFS compared with the standard LFS to improve interprofessional skills, communication and teamwork performance in transferring critically ill patients with COVID-19.

METHODS

This single-blinded randomised control trial aims to study in situ simulation training using HFS compared with a standard use of LFS. The study was held in the High Care Unit Cipto Mangunkusumo Hospital and Simulation-Based Medical Education and Research Center (SIMUBEAR), IMERI Universitas Indonesia. The sample size was determined using a numeric analytical formula to achieve a 80% power with 5% error rate and an estimated drop out of 10%, resulting in 20 subjects in each group. After obtaining ethical approval from the Ethics Committee of the Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, achieving Clinical Trial approval, 40 subjects,

comprised of 16 medical doctors and 24 nurses, who were in good physical condition, not detected positive from COVID-19 infection and had no history of involving COVID-19 patient care, were voluntarily recruited. All subjects provided informed consent. The study fully implemented the principles outlined in the Declaration of Helsinki and followed the CONSORT checklist (online supplemental file 1online supplemental figure 1)

The simulation-based training consisted of an online interactive lecture session 1 day before simulation, two sessions of in situ simulation and debriefing at the end of each simulation session. Eight scenarios (online supplemental figure 2) were developed to prevent information bias, as the study was spread throughout 3 days. We divided eight groups into 3 days as there was a time limit on the venue. Reading materials of the interactive lecture topic were given to the subjects a day before. Subjects were obliged to complete an online 5-item multiple-choice pretest and post-test for cognitive evaluation.

Specific assessment tool was developed based on focus discussion group, after that it was developed and validated to evaluate interprofessional teamwork, communication and the team's ability to perform each step in the COVID-19 critically ill patient transportation checklist were used. Skills and communication assessment tools were developed from predefined hospital transport protocols and checklists. Interprofessional teamwork was assessed using interprofessional teamwork assessment tools that had been developed in the previous study.[7–11] Each item was rated '0' for undone skill, '2' for a incompletely done skill and '5' for the skill that had been done completely. Validation of the study checklist was performed by measuring Cronbach's alpha by our senior anaesthesiologist consultants (online supplemental figure 3). The panel consisted of five senior anaesthesiologist consultants who were not part of the research team.

Subjects were randomly allocated into two large groups, the HFS and the LFS groups using a random allocator downloaded from wwwrandomizerorg. Each group was divided into smaller groups, consisting of two doctors and three nurses. All subjects joined the same interactive lecture session discussing patient transfer methods during COVID-19 and two sessions of in situ simulation according to their assigned group. Each group was given a 1-hour lecture session and an approximately 2-hour in situ simulation session. In situ simulation and debriefing were performed by implementing appropriate personal protective equipment (PPE) and social distancing. At the end of each simulation session, each group underwent a debriefing session conducted by an experienced instructor.

The first simulation was aimed to teach participants skills and steps in transporting critically ill patients with COVID-19 according to the hospital checklist. Meanwhile, the second simulation was aimed to assess skills, teamwork and communication that participants had learnt from the previous simulation by using the abovementioned assessment tools. In addition to comparing each point in the assessment tool between the two groups, the points earned were added to get the overall points for total skills, cooperation and communication score. At the end of the session, subjects gave feedback immediately online, which provided accountability for attendance, content learning and course evaluation in general.

All collected data were then analysed using SPSS V.26.0. Categorical data are presented in the form of numbers and percentages (n (%)). Numerical data are shown in the form of mean±SD if the data distribution is normal or in the form of the median (minimum–maximum value) if the distribution is not normal. Unpaired t test and Mann-Whitney test were used to analyse the two numerical variables.

Table 1 Subject characteristics

Variables	HFS group (n=20)	LFS group (n=20)
Age (year)	27.5 (23–41)	30 (24–46)
Sex		
Male (n)	4	7
Female (n)	16	13
Working experience (Year)	3.5 (1–13)	8 (0.25–27)
Working unit		
Emergency doctor (n)	8	5
Inpatient unit (n)	4	4
Outpatient unit (n)	4	4
HCU and ICU (n)	4	4

*Value in percentage (%).
†Value in median (minimum–maximum).
HFS, high-fidelity simulator; ICU, Intensive Care Unit; LFS, low-fidelity simulator.

RESULTS

All the participants completed the study. The majority were woman (80% in the HFS group and 65% in the LFS group), and an average of 27.5 years and 30 years old in the HFS and LFS groups, respectively. Participants in the HFS group had median working experience of 3.5 years, and those in the LFS group had 8 years. The participant characteristic details are summarised in table 1.

There was no significant difference in pretest and post-test cognitive scores between the two groups (table 2). Thetable 2 also presents the overall transfer skill, communication skill and teamwork scores. The subsection analysis of the skill components is presented in table 3.

DISCUSSION

Intrahospital transfer of critically ill patients with COVID-19 is challenging and requires proper strategies to maintain patient safety and prevent disease exposure to the medical team. Sixty-eight per cent of critically ill patients could experience unexpected events; and 9% could experience severe unexpected events, including hypotension, airway problems and increased intracranial pressure during transport.[12] In handling critically ill patients with COVID-19, medical teams require skills, communication, good teamwork and sufficient knowledge.

Since the pandemic started, there have been increasing needs in intrahospital transfer of critically ill patients with COVID-19. Two studies reported that 63.4% of transferred patients were confirmed for COVID-19.[13 14] Cautious planning and prudent decision are needed to ensure the safety of the critically

Table 2 Comparison of cognitive, transfer skill, communication skill and teamwork scores between the groups

Variable	HFS group (n=4)	LFS group (n=4)	P
Cognitive			
Pre-test	72.99±11.13	68.99±14.55	0.335*
Post-test	87.67±7.26	86.99±9.79	0.889†
Transfer skills	89.70±4,65	77.19±3,61	0,000†
Communication	100	88.34 (63.33–100)	0, 022†
Team work	90 (80–90)	80 (70–90)	0,028†

*Unpaired t-test; .
†Mann-Whitney test.
.HFS, high-fidelity simulation; LFS, low-fidelity simulation.

Table 3 Distribution of skill components of the two groups

Variable	HFS group (n=4)	LFS group (n=4)	P
Pre-transfer preparation skills			
Equipment preparation and donning	86.54±13.92	77.95±12.49	0.287*
Patient preparation	87.41±7.12	77.78±7.70	0.048*
Medical team preparation	100 (50–100)	100	1.000†
Skills during patient transfer	93.2 (83–98)	85 (83–97)	0.090*
Monitoring of patient and equipment	90 (73.33–90)	76.67 (56.67–90)	0.067*
PPE doffing	85.83±8.01	48.33±23.80	0.010†

*Mann-Whitney test.
†unpaired t-test.
HFS, high-fidelity simulation; LFS, low-fidelity simulation; PPE, personal protective equipment.

ill COVID-19 transferring process. Hence, there are urgent needs for targeted and adaptive training for all intensive care and medical emergency team members conducting intrahospital transportation of critically ill patients with COVID-19.

Doubts about the risk of COVID-19 infection have made many institutions withhold in-hospital training. Modifying interprofessional simulation-based training by implementing strict social distancing and appropriate PPE might be the solution to improve the knowledge, skills, communication and teamwork needed to manage and transfer patients with COVID-19. Additionally, simulation-based training using HFS might allow learners of all levels an opportunity to immerse themselves in a better realism-simulated clinical scenario, suspend their disbelief and engage more in the learning activity. Hence, this highly needed simulation base training can be carried out more effectively.

There were no differences in the baseline age and workplace characteristics between the HFS and LFS groups (table 1). Subjects in the LFS group had longer working experience compared with those in the HFS group. The outcome of the post-test supports the homogeneity of the participants between the groups. After the team training, there was an increase in participants' knowledge in both groups, but there was no significant difference found between both groups. The team-based simulation assessment revealed significant difference in the global skill performance scores ($p>0.05$) between the HFS (89.70±4.5) and LFS (77.19±3.61) groups. There were also significant differences in the global communication and teamwork performance scores ($p=0.022$ and $p=0.028$, respectively) in both groups. Adequate communication and good teamwork are critical to the safe transfer of a critically ill patient. The results are in line with the previous researches that HFS is preferable for skills training, stress exposure training and team training than LFS.[7–11] Training using HFS enhances participants' skills, teamwork and leadership.[9] Obviously, HFS contains features such as realistic physiological responses, the ability to communicate and interact with the manikin and various other feedback mechanisms. Hence, HFS enables low-risk, standardised training with a complex, immersive scenario and realistic feedback.[15–18]

The subject characteristic may also play an essential role in this study. Most of the subjects participating in this training had work experience for 4–7 years. Based on the simulation training given, the participants achieve a different competency levels. A high degree of realism simulation training favours a higher clinical competence in the classical Miller pyramid of clinical competence assessment.

Both HFS and LFS simulations were performed as in situ simulations. The attendee had opportunities to identify hazards and deficiencies in their clinical systems, the environment and know another provider. Patients with COVID-19 are often highly complex Intensive Care Unit (ICU) patients with more than one organ system failure. Pretransfer preparation is needed to ensure patient's physiological stability than patient safety during transfer. Unstable patients and lack of potential events' anticipation during transfer can worsen patient outcomes. Physiological stability during transfer involves careful pretransfer assessment and care and preparation.[19] Troncoso *et al* stated that approximately 25.4% of critically ill patients with COVID-19 need vasopressor, 13,1% were pharmacologically paralysed and 22% required change of ventilator setting during transfer.[20] Allen *et al* stated that 45% of patients with COVID-19 needed to be intubated, 40% required additional paralytic drugs and 40% of the patients required to be given vasopressors before transfer.[13] Most patients require oxygen therapy ranging from high-flow nasal cannula, continuous positive airway pressure (CPAP), to mechanical ventilation. The success of transfer critically ill patients with COVID-19 is based on anticipation and prevention of potential complications and hazards to the patient and transfer team.[16]

When inspecting the individual section of the assessment tool, the statistically significant difference between HFS and LFS was noted for item patient preparation but not for equipment preparation, team preparation and donning items (table 3). Preparing patients before a transfer is a more complex procedure than equipment preparation, team preparation and donning. This procedure also requires good clinical reasoning, judgement and communication between team members. HFS was better than LFS in this case. A higher level of fidelity was needed in achieving higher intended learning goals.[21] In the immersive and safe learning environment of HFS, participants can make mistakes, revise those mistakes in real time and learn from them without fear of compromising patient safety. Previous research has also shown that the effect of stress that participants gain from simulation-based high-fidelity training will be appraised as a challenge rather than a threat. This positive reaction will contribute to performance improvement.[22 23]

Interestingly, both groups do not show significant difference in medical team preparation items, including donning items to ensure healthcare provider safety. The participants might have been accustomed to preparing themselves in this pandemic state, including wearingPPE and maintaining a good protocol.[24] Donning items included wearing appropriate masks and other PPE (gloves, fluid-repellent long-sleeved gown and eye protection devices), which were put in order based on the level of precautions required.

There was no significant difference in skill score during the transfer between both groups (table 2). This might be because the task to be fulfilled during transfer was not as difficult and complex as pretransfer preparation. If appropriate and precise measures have been taken pretransfer, there should be little requirement for active intervention during transport. During the transfer, medical teams should continue to reassess the patient's clinical status, ensuring that vascular access sites remain accessible, good teamwork and communication.

After transfer, the HFS group showed a higher result in PPE doffing (table 3). Doffing involves more complex and challenging steps than donning.[25] As mentioned before, HFS is better than LFS in achieving competence in a more complex and difficult task. In line with this result, deviation in doffing protocols was more often found than in donning protocols. Ensuring safe

practices for high-risk, highly potential COVID-19 exposure scenarios in minimising contamination risks requires specific training methods in doffing protocols compliance.

Limitation

Although this study tested the participants' team performances and attitudes using simulation-based assessments and validated tools, the self-reported attitude towards teamwork and collaboration of the attendee and the retention of team performances were not measured. Further studies can be conducted to gain insights into the more effective training methods and the use of the attendee's self-reported attitude in transferring critically ill patients with COVID-19.

CONCLUSION

In situ simulation training improved skills, communication and interprofessional team cooperation in transferring critically ill patients with COVID-19. HFS-based training showed better team performance compared with the standard LFS-based training.

Main messages

- In situ simulation training, both using high-fidelity simulator (HFS) and low-fidelity simulator (LFS), improved skills in transferring critically ill patients with COVID-19.
- In situ simulation training, both using HFS and LFS, improved communication in transferring critically ill patients with COVID-19.
- In situ simulation training, both using HFS and LFS, improved interprofessional team cooperation in transferring critically ill patients with COVID-19.

Current research questions

- Will in situ simulation training improve skills of its participants?
- Will in situ simulation training improve communication of its participants?
- Will in situ simulation training improve interproffesional team cooperation of its participants?

What is already known on the subject

- Subjects' Characteristics
- Subjects are health professionals that are usually handle hospital patient transfer

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Contributors SKM and ART planned the study and concepted the study. AS conducted study survey. IRS and TOHP processed and analysed study data. TOHP supervised the study. SKM developed the theoretical framework. SKM, ART and AS wrote the manuscript. All authors discussed the results and commented on the manuscript. ART submitted the study. ART and TOHP revised the manuscript. SKM and ART are the guarantors of the study.

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Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by Ethics Committee of Universitas Indonesia (Approval Number KET-591/UN2.F1/ETIK/PPM.00.02/2020). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. Not applicable.

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CONSORT 2010 checklist of information to include when reporting a randomised trial*

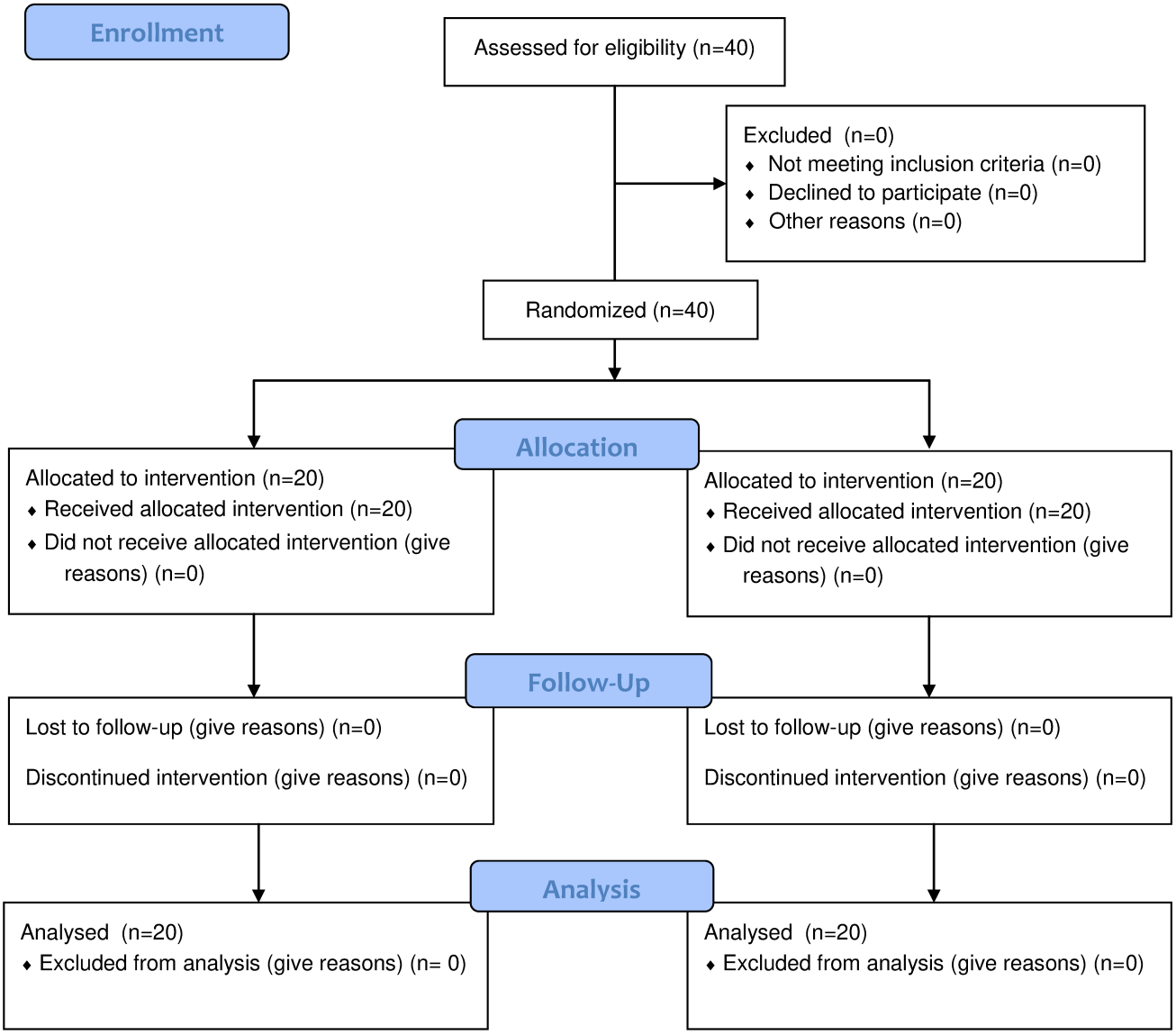
Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	1
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	2
	2b	Specific objectives or hypotheses	2
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	3
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	3
Participants	4a	Eligibility criteria for participants	3
	4b	Settings and locations where the data were collected	3
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	3
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	4
	6b	Any changes to trial outcomes after the trial commenced, with reasons	-
Sample size	7a	How sample size was determined	3
	7b	When applicable, explanation of any interim analyses and stopping guidelines	-
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	3
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	3
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	3
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	3
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	3

		assessing outcomes) and how	
	11b	If relevant, description of the similarity of interventions	-
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	4
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	4
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	4
	13b	For each group, losses and exclusions after randomisation, together with reasons	4-5
Recruitment	14a	Dates defining the periods of recruitment and follow-up	4
	14b	Why the trial ended or was stopped	-
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	4-5
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	5
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	5
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	-
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	6
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	-
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	9
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	7-9
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	7-9
Other information			
Registration	23	Registration number and name of trial registry	3
Protocol	24	Where the full trial protocol can be accessed, if available	3
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	10

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

CONSORT
TRANSPARENT REPORTING of TRIALS

CONSORT 2010 Flow Diagram



In Situ Simulation Training for a Better Interprofessional Team Performance in Transferring Critically Ill COVID-19 Patients: A Prospective Randomized Control Trial

Scenario 1: Male, 56 years old, 70 kg. Post code blue with ARDS due to Pneumonia Probable COVID-19 + Controlled Hypertension + Diabetes Mellitus type 2. The patient is planned to be transferred from ED to ICU. He was already intubated with 7.5 ETT with 21 cm in depth. The patient received midazolam 1mg/hr and Morphine 0,5 mg/hr with peripheral IV access (abbocath no.20) **Vital Sign:** BP 100/60 mmHg **(on NE 0,05 mcg/kg/min)** RR: 12x/m on manual ventilation SpO2 99% on manual ventilation BVM 15LPM HR: 118x/m regular	**Physical Exam:** Consciousness: DPO Thorax's movement symmetrical +/+ rhonchi +/+ Haemodynamic stable with NE NGT and urine catheter was already in place **Urine:** 70 cc (in 2 hours), initial urine has been removed. **NGT:** Minimal production **Lab Results:** Leukocyte: 4700/uL Hb: 11,2 g/dL Ht: 34% Platelet: 134.000/uL Neutrophyle: 70% (Normal value: 40-80) Lymphocytes: 15% (Normal value:20-40) **AGD (pre-intubated with NRM 15LPM)** pH: 7,34 pCO_2: 46 pO2: 90 HCO_3:30 GDS 157 **Xray:** - Bilateral consolidation at the base of the lung	**Task:** • Preparing the tools and PPE donning • Prepare the patient for transfer • Fill the transfer form • Confirm with the intensivist and ICU before transferring the patient

	- The tip of the ETT around 4.7 cm di over the carina **PCR:** Ongoing **Therapy** IVFD NaCL 0,9% 500cc/12 hr IVFD Azitromisin 1x500mg IV Ceftriaxone 2x2gr IV Vit C 1x1gr IV NE 0,05mcg/kg/min Midazolam 1mg/hr Morfin 0,5mg/hr Novorapid 10iu-10iu-10iu SC Lantus 8 iu (every 22.00) SC PO amlodipine 1x10mg	
During transfer: The patient is stable during transfer, IV line, NGT, urine catheter, and ETT are all secure **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 120x/m regular The monitor's alarm suddenly goes off due to sudden detachment of the ECG monitor and peripheral saturation from the patient.	The transfer is accompanied with 1 doctor and 2 nurses with PPE level 3. The patient is transferred with portable ventilator (PC 12, FiO2 60%, PEEP 5, Rate 12) **Task:** • Monitor the patient every 5 minutes. • Stop the transfer process when the alarm ringing, search for the causes and handle the cause.	

Arrive at the ICU:	**Task:**
The patient is stable, IV line, NGT, urine catheter and ETT are secure. *secure* **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 120x/m regular	• Connect the ETT to the ICU ventilator and check the airway and breathing • Transfer the continuous drug delivery via syringe pump by transferring the drug to the ICU's syringe pump. • Re-evaluate the ABC and the patency of the access on the patient. • Use SBAR when the team handover the patient • Doffing PPE in a different room

Scenario 2:	**Physical Examination:**	**Task:**
65 years old woman, 70 kg was referred to your ED Sepsis+Covid-19 +CHF+DM-tipe 2. The patient's condition worsened when she was being observed in ED (WOB increased, desaturation and hypotension) Code blue was then activated. Afterwards, the patient was intubated and planned to be transfer to the ICU. The patient received midazolam 2mg/hr dan Morfin 0,5mg/hr with peripheral IV access (abbocath no.20) and femoral access (abbocath no.18) **Vital Sign** BP 110/70 mmHg **(On NE 0,1mcg/kg/min + Dobutamine 5mcg/kg/min)** RR: 18x/m on bagging manual SpO2 99% on Bagging BVM 15LPM HR: 120x/m regular	Consciousness: DPO Thorax's movement symmetrical +/+ rhonchi +/+ The patient's hemodynamics parameters are all stable with NE + dobutamine NGT and urine catheter was placed **Urine:** 70 cc (in 2 hours), initial urine has been removed. **NGT:** Minimal production **Lab results:** Leukocyte: 18000/uL Hb: 12 g/dL Ht: 37% Platelet: 150.000/uL Neutrophyle: 86% (N: 40-80) Lymphocyte: 20% (N:20-40) Lactate: 3,0 Random Blood Sugar: 183 **AGD (before intubation with NRM 15LPM)** pH: 7,32 pCO2: 45 pO2: 111 HCO3: 28	• Preparing the tools and PPE donning • Prepare the patient for transfer • Fill the transfer form • Confirm with the intensivist and ICU before transferring the patient

	CT scan dan PCR: Confirmed COVID-19 **Therapy** NaCL 0,9% 500cc/12 hr IVFD Azitromisin 1x500mg IV Meropenem 3x1gr IV Vit C 1x1gr IV NE 0,1mcg/kg/min dobutamine 5mcg/kg/min Midazolam 2mg/hr Morfin 0,5mg/hr PO etformin 3x500mg PO captopril 3x25mg PO Candesartan 1x16mg	
During transfer: The patient is stable during transfer, IV line, NGT, urine catheter, and ETT are all secure **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 120x/m regular The monitor's alarm suddenly goes off due to sudden detachment of the	The transfer is accompanied with 1 doctor and 2 nurses with PPE level 3. The patient is transferred with portable ventilator (PC 12, FiO2 60%, PEEP 5, Rate 12) **Task:** • Monitor the patient every 5 minutes. • Stop the transfer process when the alarm ringing, search for the causes and handle the cause.	

ECG monitor and peripheral saturation from the patient.	
Arrive at the ICU: The patient is stable, IV line, NGT, urine catheter and ETT are secure. **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 120x/m regular	**Task:** • Connect the ETT to the ICU ventilator and check the airway and breathing • Transfer the continuous drug delivery via syringe pump by transferring the drug to the ICU's syringe pump. • Re-evaluate the ABC and the patency of the access on the patient. • Use SBAR when the team handover the patient • Doffing PPE in a different room

Scenario 3: Male, 48 years old, 70 kg, post code blue with impending respiratory failure + pneumonia *probable* covid 19 + Renal Tumor dextra pro Nephrotomy and biopsy The patient was intubated with ETT no. 7,5 21 cm in depth. The patient received midazolam 1mg/hr dan Morfin 0,5 mg/hr with peripheral access IV (abbocath no.20) **Vital Sign** TD 120/80 mmHg **(On NE 0,05 mcg/kg/min)** RR: 18x/m on manual ventilation SpO2 97% on manual ventilation BVM 15LPM HR: 117x/m regular	**Physical exam:** Consciousness: DPO Thorax's movement symmetrical +/+ rhonchi +/+ The patient's hemodynamics are all stable with NE + dobutamine NGT and urine catheter was placed **Urine:** 70 cc (in 2 hours), initial urine has been removed. **NGT:** Minimal production **Lab results:** Leukocyte:8100 Hb:10,7 Ht: 32 Platelet: 145.000 Neutrophyle: 75 Lymphocyte:18 Random Blood Sugar: 129 **AGD (preintubasi dengan NRM 15LPM)** pH: 7,32 pCO2: 38 pO2: 235 HCO3:26 **Rapid Test:** IgM dan IgG POSITIF,	**Task:** • Preparing the tools and PPE donning • Prepare the patient for transfer • Fill the transfer form • Confirm with the intensivist and ICU before transferring the patient

	PCR: Belum ada hasil **Xray:** - terdapat gambaran konsolidasi bilateral di kedua lapang paru bawah - ETT dengan tip sekitar 4.7 cm di atas carina **Therapy** IVFD NaCL 0,9% 500cc/8 hr IVFD Levofloxacin 1x750mg Ceftriaxone 2x1gr IV NE 0,05mcg/kg/min Midazolam 1mg/hr Morfin 0,5mg/hr Vip Albumin 3x1	
During transfer: The patient is stable during transfer, IV line, NGT, urine catheter, and ETT are all secure **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 110x/m regular The monitor's alarm suddenly goes off due to sudden detachment of the ECG monitor and peripheral saturation from the	The transfer is accompanied with 1 doctor and 2 nurses with PPE level 3. The patient is transferred with portable ventilator (PC 12, FiO2 60%, PEEP 5, Rate 12) **Task:** • Monitor the patient every 5 minutes. • Stop the transfer process when the alarm ringing, search for the causes and handle the cause.	

patient.	
Arrive at the ICU: The patient is stable, IV line, NGT, urine catheter and ETT are secure. **Vital Sign:** BP 110/70 mmHg RR: 12x/m on venti SpO2 99% HR: 120x/m regular	**Task:** • Connect the ETT to the ICU ventilator and check the airway and breathing • Transfer the continuous drug delivery via syringe pump by transferring the drug to the ICU's syringe pump. • Re-evaluate the ABC and the patency of the access on the patient. • Use SBAR when the team handover the patient • Doffing PPE in a different room

Scenario 4:	**Physical Examination:**	**Task:**
Male, 54 years old, 70 kg, post code blue with Hypovolemic Shock ec Hematemesis Melena+ Pneumonia probable covid 19 +DM-type 2 is going to be transferred from ED to the ICU **Vital Signs:** BP 100/70 mmHg post loading 250cc Nacl 0,9% **(On NE 0,1 mcg/kg/min + Dobutamin 5mcg/kg/min)** RR: 12x/ mnt on ETT no 7,5 SpO2 97% (FiO2 50%, PEEP 5) HR: 114 x/m regular Peripheral IV access with abbocath No. 20 IV Femoral access with abbocath No. 18	Consciousness: GCS E3M5V4 (before intubation) Airway: ETT clear Thorax's movement symmetrical +/+ rhonchi +/+ Patient's hemodynamic parameters are stable with NE and dobutamine NGT and urine catheter were placed **Urine:** 200 cc (in 2 hours) **NGT:** production: 50cc black-colored liquid **Lab results:** Leukocytes: 12.000 Hb: 10,1 Ht: 28 Platelet: 142.000 Neutrophyle: 81 Lymphocyte: 16 Lactate: 3 Random Blood Sugar: 190 **AGD (NRM 10LPM before intubation)** pH: 7,309 pCO2: 60 pO2: 158	• Preparing the tools and PPE donning • Prepare the patient for transfer • Fill the transfer form • Confirm with the intensivist and ICU before transferring the patient

	HCO3:33 **CT scan thorax:** *probable* COVID-19 **Rapid Test IgM dan IgG** POSITIF **PCR:** ongoing **Theraphy** IVFD NaCL 0,9% 500cc/8jam IVFD Azitromisin 1x500mg Ceftriaxone 2x1gr IV Omeprazole 2x40mg IV Vit C 1x1gr IV NE 0,1mcg/kg/min Dobutamin 5mcg/kg/min SC Novorapid 3x18iu SC Lantus 1x10iu PO Sucralfat 3x15cc	
During transfer: Desaturation during transfer. ETT Clear, Jalur IV secure. Rh +/+ TD 105/70 x/mnt RR 12x/ mnt on venti SpO2 92% with FiO2 venti 50% PEEP 5 HR: 120x/m regular	Transfer accompanied by 1 doctor and 2 nurses with PPE level 3 **Task:** • Stop the transfer process when the alarm sounds • Increase FiO2/ PEEP→ SaO2 95-96%	
Arrived at the ICU: Pasien stable. IV line *secure*	**Task:** • Transfer continuous drugs in the syringe pump transfer to ICU syringe pump	

Vital sign: TD 100/70 mmHg RR: 12x/m on Venti SpO2 96% HR: 120x/m regular	• Recheck patient's ABC and all the lines installed on the patient • Hand over the patient with SBAR • *Doffing* APD in different room

Scenario 5	**Examination:**	**Task:**
Female patient, aged 59 years old, body weight 70 kg, post code blue with a diagnosis of septic shock, severe CAP, probable COVID-19, and Diabetes Mellitus. Patient is planned to be transferred from Kiara's ER to Kiara's ICU. BP 110/70 mmHg (on NE 0.05 mcg/kg/min) RR 12x/min on ETT no 7 lip limit 21 spO2 97% HR 120x/min regular Abocath peripheral IV access no. 20 Access IV femoral abbocath no. 18	Awareness: GCS E3M5V3 (before intubated) Patent airway Symmetrical thorax motion, rhonchi +/+ Hemodynamically stable with support NGT and urine catheter inserted **Urine:** 200 cc **NGT:** minimal production **Laboratory Results** WBC: 14.900 Hb: 10 Ht: 28 Tr: 150.000 Neutrofil: 86.8 Lymphocyte: 7,3 Blood glucose test: 142 **BGA (on NRM 12LPM)** pH: 7,31 pCO2: 45 pO2: 112 HCO3:35 **Thorax CR:** probable COVID-19 **Rapid Test IgM dan IgG** POSITIVE **PCR:** no results yet	• Prepare tools and PPE*donning* • Preparing the patient • Intubate the patient before transfer • Fill in the transfer form • Confirmation to Kiara's *intensivist* and ICU

	Therapy IVFD NaCL 0,9% 500cc/8hrs IVFD Azitromisin 1x500mg Drip PCT 3x1gr IV Inj Meropenem 3x1gr IV Inj Vit C 1x1gr IV Drip NE 0,1mcg/kg/min Drip Dobutamin 5mcg/kg/min Inh Ventolin/8 jam SC Novorapid 3x10iu PO NAC 3x200mg	
During Transfer: Patient has decreased blood pressure, and undetected saturation. IV line is *secure* **Vital Sign:** BP 85/40 mmHg (Alarm sign) RR: 12 x/min on ventilator SpO2 **????** % HR: 115x/m regular	Transfer accompanied by 1 doctor and 2 nurses using PPE level 3 **Task:** • Stop the transfer process when the alarm sounds • Raise NE/dobutamine dose → BP rises to 95/60 mmHg	
Patient arrive at ICU: Patient is stable on arrival in the iCU. IV line is secure **Vital signs:** BP 100/70 mmHg RR: 12x/min on venti SpO2 96%	**Task:** • Transfer continuous drugs in the syringe pump transfer to ICU syringe pump • Recheck patient's ABC and all the lines installed on the patient • Hand over the patient with SBAR • *Doffing* APD in different room	

HR: 115x/m regular	

Scenario 6 Female patient, aged 32 years old, body weight 70 kg, reffered from type B hospital to Kiara's ER with diagnosis of Confirmed COVID-19, pneumonia, and Asthma. In Kiara's ER, patient complained of increasing shortness of breath and tends to be hemodynamically unstable during examination in the ER. After being treated in ER, patient planned to be transferred to ICU for further treatment. **Vital signs:** BP 102/63 mmHg (On **NE 0,05** mcg/kg/min) RR: 12x/mnt on ETT no 7 SpO2 97% HR: 128x/m regular Abocath peripheral IV access no. 20 Access IV femoral abbocath no. 18	**Pemeriksaan:** Awareness: GCS E4M6V5 (before intubated) Patent airway Symmetrical thorax motion, rhonchi +/+ Hemodynamically stable with support NGT and urine catheter inserted **Urine:** 200 cc **NGT:** minimal production **Laboratory Findings:** WBC: 13.000 Hb: 15 Ht: 45 Tr: 210.000 Neutrofil: 78 Lymphocyte: 18 GDS: 143 **BGA(NRM 10LPM)** pH: 7,31 pCO2: 53 pO2: 230 HCO3:36 **Thorax CT:** ground glass appereance in both lungs **Rapid Test IgM dan IgG** POSITIVE	**Task:** • Prepare tools and PPE*donning* • Preparing the patient • Intubate the patient before transfer • Fill in the transfer form • Confirmation to Kiara's *intensivist* and ICU

	PCR: Positive **Therapy** IVFD NaCL 0,9% 500cc/8hrs IVFD Azitromisin 1x500mg Drip PCT 3x1gr IV Inj Ceftriaxone 2x1gr IV Inj methylprednisolone 2x80mg IV Drip NE 0,05mcg/kg/min Inh Ventolin/8 hrs	
During transfer: Patient has decreased blood pressure, and undetected saturation. IV line is *secure* **Vital signs:** TD 85/51mmHg **(Alarm aounds)** RR: 12x/m SpO2 ???? % HR: 130x/m regular	Transfer accompanied by 1 doctor and 2 nurses using PPE level 3 **Task:** • Stop the transfer process when the alarm sounds Raise NE/dobutamine dose → BP rises to 95/55 mmHg	
Patient arrive at ICU: Patient is stable on arrival in the iCU. IV line is secure **TTV:** BP 105/68 mmHg RR: 12x/m SpO2 96% HR: 120x/m regular	**Task:** • Transfer continuous drugs in the syringe pump transfer to ICU syringe pump • Recheck patient's ABC and all the lines installed on the patient • Hand over the patient with SBAR • *Doffing* APD in different room	

Scenario 7 Male patient, aged 72 years old, body weight 79 kg, with diagnosis of Confirmed COVID-19, and COPD. Patient complained of shortness of breath in the ER. After being treated in ER, patient planned to be transferred to ICU for further treatment. **Vital signs:** BP 92/57 mmHg (On **NE 0,05** mcg/kg/min) RR: 18x/mnt on ETT no 7 SpO2 93& HR: 118x/m regular Abocath peripheral IV access no. 20 Access IV femoral abbocath no. 18	**Pemeriksaan:** Awareness: GCS E4M4V5 (before intubated) Patent airway Symmetrical thorax motion, rhonchi +/+ wheezing +/+ Hemodynamically stable with support NGT and urine catheter inserted **Urine:** 300 cc **NGT:** minimal production **Laboratory Findings:** WBC: 18.000 Hb: 14,6 Ht: 42 Tr: 316.000 Neutrofil: 78 Lymphocyte: 18 GDS: 147 **BGA(NRM 10LPM)** pH: 7,31 pCO2: 53 pO2: 230 HCO3:36 **Thorax CT:** pneumonia bilateral	**Task:** • Prepare tools and PPE*donning* • Preparing the patient • Intubate the patient before transfer • Fill in the transfer form • Confirmation to Kiara's *intensivist* and ICU

	Rapid Test IgM dan IgG POSITIVE **PCR:** Positive **Therapy** IVFD NaCL 0,9% 500cc/8hrs IVFD Azitromisin 1x500mg Drip PCT 3x1gr IV Inj Ceftriaxone 2x1gr IV Inj methylprednisolone 2x80mg IV Drip NE 0,05mcg/kg/min Inh Ventolin/8 hrs	
During transfer: Patient has decreased saturation on transfer. ETT clear, path IV is secure. Rh +/+ Wh +/+ **Vital signs:** TD 85/51mmHg **(Alarm aounds)** RR: 12x/m SpO2 77 % HR: 143x/m regular	Transfer accompanied by 1 doctor and 2 nurses using PPE level 3 **Task:** • Stop the transfer process when the alarm sounds • Raise FIO2/peep → saturation rises 95%	
Patient arrive at ICU: Patient is stable on arrival in the iCU. IV line is secure **TTV:** BP 105/68 mmHg RR: 12x/m SpO2 96%	**Task:** • Transfer continuous drugs in the syringe pump transfer to ICU syringe pump • Recheck patient's ABC and all the lines installed on the patient • Hand over the patient with SBAR • *Doffing* APD in different room	

HR: 120x/m regular		

Scenario 8 Male patient, aged 58 years old, body weight 54 kg, with diagnosis of Confirmed COVID-19, and Lung cancer. Patient complained of shortness of breath in the ER. After being treated in ER, patient planned to be transferred to ICU for further treatment. **Vital signs:** BP 102/69 mmHg (On **NE 0,05** mcg/kg/min) RR: 21x/mnt on ETT no 7.5 SpO2 93& HR: 112x/m regular Abocath peripheral IV access no. 20 Access IV femoral abbocath no. 18	**Pemeriksaan:** Awareness: GCS E4M4V4 (before intubated) Patent airway Symmetrical thorax motion, rhonchi +/+ Hemodynamically stable with support NGT and urine catheter inserted **Urine:** 250 cc **NGT:** minimal production **Laboratory Findings:** WBC: 8.000 Hb: 9.3 Ht: 42 Tr: 316.000 Neutrofil: 78 Lymphocyte: 18 GDS: 147 **BGA(NRM 10LPM)** pH: 7,31 pCO2: 53 pO2: 230	**Task:** • Prepare tools and PPE*donning* • Preparing the patient • Intubate the patient before transfer • Fill in the transfer form • Confirmation to Kiara's *intensivist* and ICU

	HCO3:36 **Thorax CT:** pneumonia bilateral **Rapid Test IgM dan IgG** POSITIVE **PCR:** Positive **Therapy** IVFD NaCL 0,9% 500cc/8hrs IVFD Azitromisin 1x500mg Drip PCT 3x1gr IV Inj Ceftriaxone 2x1gr IV Inj methylprednisolone 2x80mg IV Drip NE 0,05mcg/kg/min	
During transfer: Patient has decreased saturation on transfer. ETT clear, path IV is secure. Rh +/+ Wh +/+ **Vital signs:** TD 85/51mmHg **(Alarm aounds)** RR: 12x/m SpO2 772 % HR: 143x/m regular	Transfer accompanied by 1 doctor and 2 nurses using PPE level 3 **Task:** • Stop the transfer process when the alarm sounds • Raise FIO2/peep → saturation rises 94%	
Patient arrive at ICU: Patient is stable on arrival in the iCU. IV line is secure **TTV:**	**Task:** • Transfer continuous drugs in the syringe pump transfer to ICU syringe pump • Recheck patient's ABC and all the lines installed on the patient • Hand over the patient with SBAR • *Doffing* APD in different room	

BP 115/70 mmHg RR: 12x/m SpO2 96% HR: 90x/m regular	

Cronbach Alpha Validation

	N	Mean	Variance	SD
Statistics for Scale	38	62.2000	48.164	6.94004

	Alpha	Standardized Item Alpha
Reliability Coefficients for Item	.819	.811