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Simulation and education

Potential benefits and challenges of simulation-based neonatal resuscitation competition: A survey analysis of provincial competition in China

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Abstract

Background: Simulation-based neonatal resuscitation training has been implemented worldwide with good educational and clinical results. Simulation-based competition (SBC), as an innovative derivative of neonatal resuscitation training, has been practiced recently but its potential effectiveness and challenges of competition are rarely studied. We tested the hypothesis that after SBC, participants could improve compliance with NRP algorithm and teamwork, achieve lower stress and higher confidence in neonatal resuscitation.

Methods: In February 2023, 108 health care providers in 27 teams from different regional centres participated in provincial SBC. Each team consisted of 4 members (NICU physician [lead], NICU nurse, midwife and obstetrician). The teams were to complete a resuscitation scenario (16 min) and their performance was evaluated. All participants were encouraged to take part in a post-resuscitation questionnaire survey voluntarily immediately after the scenarios finished. Demographic characteristics and questionnaire results of participants were collected, including the confidence and perceived stress levels before and after the competition.

Results: Ninety-eight (90.7%) participants completed the survey with 114 post-resuscitation questionnaire surveys. Participants perceived top benefits of SBC including improved compliance with NRP algorithm, technical skills and teamwork, with the least benefit in improving self-confidence (vs. other benefits, $P < 0.001$). The confidence level did not change before and after the competition, whereas stress was reduced after the competition.

Conclusions: Participants in SBC might be benefited with improved compliance with NRP algorithm, technical skills and teamwork. However, the impact, influence and sustainability of these benefits are uncertain. Further research is needed to explore ways to improve self-confidence and decrease stress in neonatal resuscitation.

Keywords: Neonatal resuscitation, Simulation, Education, Competition, NRP algorithm, Teamwork

Introduction

Most neonates go through transition successfully from intrauterine to extrauterine environment. However, approximately 10% of infants need resuscitative interventions whereas 1% of neonates require extensive resuscitation.[1–4] Neonatal resuscitation is a high-pressure, high-risk process that can be stressful for providers[5–7] and is frequently associated with medical errors.[6] Although extensive resuscitation occurs not frequently in clinical work, it might cause significant stress on the providers and thus affect the performance. Furthermore, for successful neonatal resuscitation, it is essential to promptly identify perinatal risk factors and arrange team members with corresponding skills based on the risks.[8]

The goal of neonatal resuscitation program (NRP) is to ensure that there is at least one trained neonatal resuscitation provider at each delivery.[1,9] As a central component of standard neonatal resuscitation training, simulation has been implemented worldwide with educational and clinical results.[10–16] Simulation training in neonatal resuscitation has been shown to be an effective strategy in improving knowledge, technical performance, teamwork and confidence level.[10–12] It also has the potential to decrease neonatal mortality and improve neonatal outcomes.[13–16]

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Simulation-based competition (SBC), as an innovative derivative of neonatal resuscitation training, has also been practiced in recent years.[17,18] After implementation of simulation training and annual competition, the incidence of asphyxia and associated mortality has decreased.[17] In 2023, Zanetto et al reported improved self-perceived knowledge and confidence expressed by 81 pediatric residents after a SBC in Italy.[18]

Limited information is known about the potential benefits and challenges of SBC in healthcare professionals (HPs), especially conducted among HPs of different disciplines. We aimed to investigate the effectiveness and challenges of SBC in HPs attending neonatal resuscitation SBC. We hypothesized that after SBC, HPs could improve compliance with NRP algorithm and teamwork, achieve lower stress and higher confidence in neonatal resuscitation.

Methods

Study setting

To further emphasize the importance and improve quality of neonatal resuscitation, provincial SBC was organized by the Guangdong Medical Association, and conducted at the University of Hong Kong-Shenzhen Hospital (HKU-SZH) on 28–29 February 2023. HKU-SZH is one of the "High Level Summit Program" hospitals in the province of Guangdong. As the pilot hospital for high-quality development of public hospitals, HKU-SZH has adopted evidence-based practices and neonatal resuscitation workshops to provide training to NICU and obstetric staff in HKU-SZH since 2013 and to HPs nationwide as the regional simulation training center since 2016.

Intervention: The provincial competition design

Preparation: Regional and municipal training and competition: A total of 1,012 participants in 253 teams participated in the regional training and selection competition from May to August in 2022. Over 2,920 HPs from 319 hospitals participated in the regional neonatal resuscitation training. At preparation stage, the training and preliminary competition was conducted in seven cities respectively. The top 3–4 teams from 30 to 40 teams in each city advanced to the semi-finals. The scoring form was practical, including assessments of NRP algorithm, technical skills and teamwork. Twenty-seven teams from 15 cities advanced to the semi-finals.

Reinforcement of training was provided to the 27 teams on September 3, 2022. Didactic lecture including key points of neonatal resuscitation, NRP update, special considerations, format and rules of competition for the semi-finals and performance tips. After that, 108 HPs from 27 teams practiced in respective hospitals.

Implementation: Semi-final and final SBC was conducted at the simulation center in HKU-SZH on 28–29 February 2023. Before semi-finals, two meetings were held among assessors and facilitators to discuss scenarios and assessment criteria.

Participants of study

A total of 108 HPs in 27 teams from different regional centres in the province of Guangdong participated in the competition. Each team consisted of 4 members (NICU physician [lead], NICU nurse, midwife and obstetrician). To promote and encourage participation of both obstetrical and neonatal HPs in neonatal resuscitation, all teams were homogeneous. The order of performance in the competition was determined by drawing lots. The participants worked as a team to complete a resuscitation scenario (16 min) and their performance including teamwork was evaluated by 6–8 assessors who were senior neonatologists in semi-final and final rounds of SBC. A generic assessment form was developed to evaluate the performance of neonatal resuscitation by the assessors. The assessment form followed the NRP algorithm and was consistent with NRP textbook and manual for instructors (Supplement). The participants were expected to ask questions to identify risk factors, predict possible actions, propose an appropriate plan, give clear role assignment and check equipment before delivery (4 min). After the simulated baby was born, the participants would perform appropriate resuscitation steps in the context of scenarios following the 2020 NRP algorithm[1] with modifications for the context in China.[19] To ensure fairness, there was no immediate debriefing after each scenario and live broadcast was only opened to the participants who had completed the scenarios. The top ten teams advanced to the final round and were assessed by 8 assessors. Summary and feedback to each team was provided at the end of competition. To mitigate potential conflicts of interest, both assessors and participants came from different institutions who were also required to turn off the communication devices throughout the competition.

Simulator: Laerdal SimNewB^{TM} high fidelity manikin and preterm Annie were used in the corresponding scenarios in simulation center.

Scenarios

The scenarios were put in envelopes and were selected and revealed by each team leader immediately prior to SBC. Standardized parents or other relative staff also played a role in the scenario. The rationality of scenarios and evaluation criteria was discussed and revised among facilitators and assessors before competition.

Scenario 1: maternal polyhydramnios with unknown antenatal history, a neonate of 40 weeks gestation had single umbilical artery and left congenital diaphragmatic hernia associated with persistent pulmonary hypertension of newborn.

Scenario 2: maternal abdominal pain with rupture of the uterus, a neonate of 40 weeks gestation had no detectable heart rate at birth.

Scenario 3: meconium-stained amniotic fluid and absence of diastolic blood flow in the umbilical artery, a neonate of 35 weeks gestation had meconium aspiration syndrome.

Scenario 4: a neonate of 37 weeks gestation and an estimated fetal weight of 4100 g had shoulder dystocia with left pneumothorax.

Scenario 5: maternal hypertension, a neonate of 26 weeks gestation and an estimated fetal weight of 700 g, needed intubation and high FiO_2 in resuscitation with surfactant administered at the delivery room.

Scenario 6: a neonate of 30 weeks gestation had pulmonary hemorrhage during resuscitation at birth.

Post-resuscitation questionnaire survey

All participants were invited to take a post-resuscitation questionnaire survey (Supplement file) immediately after the scenarios finished. The completion of survey was absolutely voluntary with no effects of their evaluation results. For the possibly most important benefit of the SBC, six options were given including improving (1) compliance with NRP algorithm, (2) teamwork, (3) technical skills, (4) clinical reasoning, (5) adaptability under stress and (6) self-confidence. The participants could choose at least one and at most three items from the options. The survey was conducted in a digital format with QR code to ensure privacy, confidentiality and anonymous personal details.

Demographic characteristics and questionnaire results of participants were collected, including the confidence and perceived stress levels (in ten-point Likert scale) of participants before and after the competition. In China, junior and mid-career team members were usually residents and fellows physicians in their respective specialty training and equivalent titles in the nursing and midwifery training. The objective evaluation of teamwork by the assessors was also collected and analyzed.

Ethical approval

This study involving human participants was reviewed and approved by the Institutional Review Board of HKU-SZH (#2023106). Participants were informed of this educational study which aimed at improving quality of simulation training and consented to participate in the anonymous questionnaire survey voluntarily. The demographic characteristics of participants including working and simulation training experience were obtained in the questionnaire.

Statistical analysis

Data was presented in mean ± SD or median and IQR for parametric and non-parametric variables, respectively. Sixteen participants competed in both semi-final and final rounds of SBC and completed post-resuscitation questionnaire twice; the data from the latter questionnaire was used for analysis. Comparisons between groups were analyzed using Student *t* test for continuous parametric variables with normal distribution, and Chi-square test or Fisher Exact test as appropriate for categorical variables. Differences in confidence and stress levels between participants before and after SBC were analyzed by paired *t* test. SPSS Statistics (v.23) was used for data analyses. A *P* value less than 0.05 was considered statistically significant.

Results

Ninety-eight of 108 (90.7%) participants completed the survey with 114 post-resuscitation questionnaire surveys, including 16 participants who finished 2 surveys in both semi-final and final rounds.

Among the HPs in the team, there were 26 NICU physicians, 25 NICU nurses, 24 obstetricians and 23 midwifes with 83.7% female participants. The average age of participants was 32.1 ± 4.2 years old, with an average of 9.0 ± 4.7 years of work experience for all 4 team members and 7.5 ± 5.0 years of work experience in NICU. The participants had junior (n = 52, 53.1%) and mid-career (n = 42, 42.8%) professional qualifications in their respective disciplines.

Ninety (91.8%) participants had experience in simulation training and 95 (96.9%) had regular neonatal resuscitation training in respective hospitals. Among the 95 participants who had regular training, 84 (88.4%) had simulation training instead of didactic lecture(s) or technical skill training, and 67 (70.5%) had regular training of collaboration with obstetric and pediatric colleagues. High-fidelity simulator was adopted by 50 participants (57.9%) during training (Table 1).

Participants perceived top benefits of SBC including improved compliance with NRP algorithm (76.3%), technical skills (77.2%) and teamwork (70.2%) (Fig. 1), with the least benefit in the improvement of self-confidence (6.1%) (vs. other benefits, $P < 0.001$).

After the competition, the confidence level did not change but the stress level was reduced significantly from that before SBC (Table 2). In subgroup analysis, the stress level was significantly reduced among leaders ($P = 0.003$) but not among other team members (Table 2). We further examined the relationship between confidence and stress perception and results of competition of subgroups of participants who advanced to final competition (n = 25) or not (n = 50). The confidence and stress levels of both subgroups of participants did not change significantly before and after SBC (Table 2). The confidence level of participants who advanced to the final competition was modestly higher than that of participants who did not advance to final competition ($P = 0.08$, *t* test).

Teamwork was assessed by the team members themselves after the SBC during the semi-final and final rounds (Table 3). It was also evaluated by 6–8 assessors and the scores were not different from those by the self-assessment of team members. The average score of overall performance evaluated by assessors using the assessment form was 76.3 ± 11.6 (out of 100 points total).

Discussion

To our knowledge, this is the first study to evaluate the potential benefits and challenges of SBC in neonatal resuscitation among HPs of different disciplines. In this observational study, the most important benefits from the SBC were improving compliance with NRP algorithm, technical skills and teamwork as perceived by the participants immediately after the competition.

The high-fidelity, well-designed, SBC in neonatal resuscitation involving multi-disciplinary staff and standardized parents reproduced a variety of clinical scenarios of critically ill newborns and created a realistic state and atmosphere. The questionnaires were completed by participants from multiple centers immediately after finishing scenarios, with a high responding rate of 91%. The findings suggest that SBC could be a feasible novel format for neonatal resuscitation training.

In neonatal resuscitation, clinical practice and training is basically guided by formal algorithms developed by the International Liaison Committee on Resuscitation (ILCOR).[1] However, the compliance is variable and often suboptimal with deviations in clinical practice from internationally recognized algorithms.[6,20–22] Further extensive resuscitation was associated with increased deviations from NRP algorithms.[6] Gaps include but not limited to ineffective or unnecessary positive pressure ventilation, inappropriate oxygen use and failure to complete tasks within the allocated time.[20]

Dissemination and implementation of guidelines is considered as one of strategies to improve adherence.[20] We speculate the possibly improved compliance and technical skills perceived by participants may be attributed to several aspects. First, through official organization of SBC by the Guangdong Medical Association, the importance of neonatal resuscitation and training was being strengthened by province-wide institutions and HPs within a relatively short period. This educational activity at provincial level was organized originally to aim at raising awareness of the guidelines, enhancing the importance of neonatal resuscitation among healthcare institutions and obstetric and pediatric medical staff to perform high-quality neonatal resuscitation. Secondly, the multiple training strategies before competition were based on updated NRP and guidelines/recommendations and best practices in China. These strategies were implemented to enable participants' adequate acquisition of cognitive, technical and non-technical skills. Thirdly, majority of participants (96.9%) had regular neonatal resuscitation training before the competition. We speculated that the frequency of practice before

Table 1 – Demographic characteristics of 98 participants in simulation-based competition in neonatal resuscitation.

Age (y)	32.1 ± 4.2	
Working experience (y)	9.0 ± 4.7	
Working experience in DR or NICU (y)	7.5 ± 5.0	
Occupation	NICU physician	26 (26.5%)
	NICU nurse	25 (25.5%)
	Obstetrician	24 (24.5%)
	Midwife	23 (23.5%)
Gender	Male	16 (16.3%)
	Female	82 (83.7%)
Qualifications	Junior	52 (53.1%)
	Mid-career	42 (42.8%)
	Senior	4 (4.1%)
Experience in simulation training	Yes	90 (91.8%)
	No	8 (8.2%)
Regular resuscitation training in respective hospitals	Yes	95 (96.9%)
	No	3 (3.1%)
Training methods (n = 95)	Teaching by lecture	5 (5.3%)
	Technical skill training	6 (6.3%)
	Simulation training	84 (88.4%)
Regular training of single discipline or collaboration of obstetrics and pediatrics (n = 95)	Single discipline	28 (29.5%)
	Both obstetrics and NICU	67 (70.5%)
Whether high-fidelity simulation model was used in your training? (n = 95)	Yes	55 (57.9%)
	No	40 (42.1%)

Data are expressed in mean ± SD or n (%).
DR = delivery room; NICU = neonatal intensive care unit.

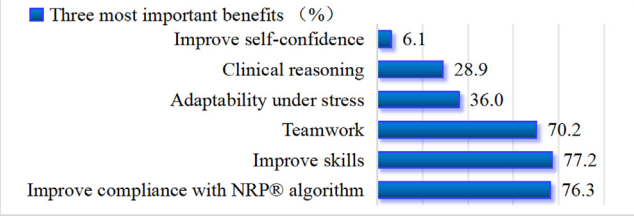

Fig. 1 – The benefits expressed by 98 participants in 114 questionnaires from simulation-based competition in neonatal resuscitation.

SBC increased in respective hospitals, although the detailed information was not recorded. Regular practice and drills are recommended and ideally the training should be repeated more frequently than once a year.[23] Given that deviations from the algorithm are frequent, our findings suggest SBC might facilitate the implementation of NRP and national guidelines, especially during the phase after the guideline update.

Improving teamwork is another important potential benefit according to participants. Indeed, both assessors and participants themselves had teamwork scored at means of 6.7 and 7.0 out of 10 points in the Likert scale, respectively, with only 32% and 47%

Table 2 – Confidence and perceived stress levels[a] perceived by 98 participants before and after simulation-based competition in neonatal resuscitation.

	Before the competition	After the competition	*P* value
Confidence level in real neonatal resuscitation (n = 114)	6.9 ± 1.9	7.1 ± 2.1	0.27
Confidence level (team leader) (n = 30)	7.2 ± 1.9	7.7 ± 2.0	0.07
Confidence level (other team members) (n = 84)	6.8 ± 1.8	6.9 ± 2.2	0.79
Confidence level (participants advanced to final competition) (n = 25)[b]	7.4 ± 2.1	7.6 ± 2.1	0.66
Confidence level (participants not advanced to final competition) (n = 50)[b]	6.7 ± 1.9	6.7 ± 2.1	0.93
Stress level in real neonatal resuscitation (n = 114)	7.0 ± 2.1	6.6 ± 2.3	0.03
Stress level (team leader) (n = 30)	7.7 ± 2.2	6.8 ± 2.5	0.003
Stress level (other team members) (n = 84)	6.8 ± 2.1	6.6 ± 2.2	0.39
Stress level (participants advanced to final competition) (n = 25)[b]	6.9 ± 1.9	6.5 ± 2.3	0.43
Stress level (participants not advanced to final competition) (n = 50)[b]	7.4 ± 2.1	7.1 ± 2.2	0.24

Data are expressed in mean ± SD.
Notes:
[a] Level range: 1 (lowest) – 10 (highest) confidence and stress level.
[b] Excluded 23 participants in subgroups with incomplete information from surveys.

Table 3 – Behavioral skills and teamwork assessment by assessors and team members.

	Assessors (n = 37)	Self-assessment (n = 114)	*P* value
Behavioral skills[a]	7.1 ± 1.5	7.2 ± 2.0	0.815
Behavioral skills (>80%)	14 (38%)	51 (45%)	0.461
Teamwork[b] during resuscitation	6.7 ± 1.7	7.0 ± 2.2	0.358
Teamwork during resuscitation (>80%)	12 (32%)	53 (47%)	0.133

Data are expressed in mean ± SD or n (%).

Notes:

[a] Behavioral skills included the use of available information e.g. antenatal consultation, identification of risk factors, anticipation, resuscitation team composition, roles and responsibilities and planning, communication and teamwork after birth.

[b] Teamwork included leadership, clear and concise communication, closed-loop communication, collegiality, rational use of resources and call for help if needed.

of participants had > 80% scores, and this implies an area of improvement. Although each team member possesses knowledge and skills for neonatal resuscitation, individual abilities could not be optimized without effective collaboration and communication in teamwork.[1] Neonatal Resuscitation is stressful and sometimes unanticipated with limited time to prepare. Team members are not consistent and may indeed work together infrequently. Therefore, different HPs need to be integrated into teams. Teamwork facilitators include multidisciplinary team composition.[24] In our study, 70.5% participants expressed that they had collaborative simulation training with NICU and obstetric department. We believe that multidisciplinary teamwork training plays an important role in implementing neonatal resuscitation, improving understanding and communication among different HPs.

There were four team members in each resuscitation in SBC. Although there is no single standard answer to the ideal number of providers in the resuscitation team, four or more people might be required for complex resuscitation.[1] The high proportion of female HPs was similar to the reality in neonatal and obstetrical units in China. Different from the resuscitation team including respiratory therapists in many north American centers,[25] NICU physician, midwife, NICU nurse and obstetrician are the members who often forms a team in delivery room in China. Midwife is frequently the first respondent managing the unexpected resuscitation within first minutes. In addition, the composition of neonatal resuscitation team is also dynamically changing due to staff rotation. During extensive resuscitation which occurs infrequently, obstetric staff are needed for alternative chest compression or other tasks. Moreover, in multidisciplinary training, obstetricians could understand the situation and outcomes of high-risk newborns and reflect on the management process of high-risk pregnant women thus probably improve the quality of obstetric and perinatal care. There was no significant difference in teamwork assessed between neonatologists and HPs participants, which indicated that the self-evaluation by participants was indeed reliable. A checklist including pre-resuscitation briefing, equipment, providers and corresponding tasks, post-resuscitation debriefing was found to be helpful to improve communication during neonatal resuscitation.[26] Interestingly, most teams in SBC performed briefing and debriefing, but none of them utilized the checklist, which should be emphasized in teamwork training.

In this study, only 6% of participants considered improving self-confidence as an important benefit from SBC. This unexpected observation was consistent with the unchanged confidence levels of team leaders and members after SBC. In this survey, we did not ask the specific role of participants during the scenario. We therefore only compared the confidence and stress levels of NICU physicians who presumably were the leaders in the scenarios and those levels of other team members (NICU nurses, obstetric physicians and midwives) but did not analyze the correlation between the role of participants and respective confidence or stress perception. In the analyses of confidence and stress perception in subgroups of participants who advanced to final competition or not, it is uncertain if the progress of scenario and results of competition may be related to the confidence and stress levels of participants. In addition to the competition format of SBC, the lack of confidence may reflect the absence of immediate debriefing after simulated scenarios. Debriefing provides participants with meaningful learning opportunities via experiential reflection, encouraging reflective learning and behavior change, without being judged.[27,28] The latter is important in adult learning. Effective debriefing allows providers to integrate the experience during scenario with the theoretical frameworks and the procedural guidelines. In the pre-competition training stage, debriefing was integrated after simulation, which took 2–3 times longer as much as that of scenarios. In the semi-final and final competition, debriefing was not performed immediately after scenarios and feedback was provided at the end of competition. We believe that structured debriefing might need to be implemented in SBC, and to improve self-confidence in future studies and training.

The perceived stress was lower after the SBC but remained high in our study. Neonatal resuscitation is a time-critical and stressful event. In a randomized crossover study, the impact of observers significantly increased stress of providers when performing intubation on manikin.[29] The assessors, standardized parents and other staff in the scenarios might have the effect of observers causing stress to participants. However, the relationship between stress and performance is not linear but has an inverted-U-shape, indicating a moderate level of stress leads to better performance.[30] Individuals might have different limits and thresholds of stress. The complexity of scenarios varied, which might also have impacts on the perceived stress of the participants, and could be another source of bias. Future studies should explore and understand the factors that cause and alleviate stress in neonatal resuscitation.

Limitations

Our study has several limitations. First, the perception of participants was survey-based subjective feelings. The results might be influenced by individual cognition and psychological resilience to stress. When designing questionnaires, we set certain options of potential benefits, which might lead to design bias. Objective evaluation of teamwork, stress and self-confidence using validated tools including

TEAM (Team Emergency Assessment Measure) score,[31] and General Self-Efficacy Scaley[32] would be helpful in the assessment of outcomes of SBC. Further for the comparison of self-confidence and stress level before and after scenario, it might be more reasonable to have surveys before and after the scenario which were not conducted for logistic reasons. Secondly, the environment and equipment in scenarios is similar with clinical settings but could not fully represent clinical settings. Limited conclusions can be drawn about its impact on clinical performance and patient outcome since the respective measurement is challenging. Thirdly, due to the design of SBC, the team who performed at the end in the competition had less opportunities for observing and learning from the performance of other teams. Furthermore, with the consideration of standard assessment, all scenarios were designed as extensive resuscitation with Airway-Breathing-Circulation-Drug steps or special considerations, causing some participants intentionally finish all steps. Further structured design implementing checklist and immediate debriefing, is expected to provide more evidence/information for sustainable and effective ways of neonatal resuscitation training. Despite the improvement in the compliance with NRP algorithm, technical skills and teamwork as perceived by the participants after the SBC, it is uncertain if the beneficial effects are sustainable. A small number of participants had no previous simulation experience or did not participate in neonatal resuscitation regularly, and this might be considered as a potential bias to the results. Finally, it is uncertain regarding the dispersion and knowledge transfer of the benefits of participants to other HPs in the institutions before and during the SBC.

Conclusions

Participants in SBC might be benefited with improved compliance with NRP algorithm, technical skills and teamwork. However, the impact, influence and sustainability of these benefits are uncertain. Further research is needed to explore ways to improve self-confidence and decrease stress in neonatal resuscitation.

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CRediT authorship contribution statement

Chenguang Xu: Writing – review & editing, Writing – original draft, Validation, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Qianshen Zhang:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Fang Lin:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation. **Yihua Chen:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation. **Yin Xue:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Wenjie Yan:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation. **Rong Zhou:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation. **Yuqian Yang:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Data curation. **Po-Yin Cheung:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

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