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Is the "in situ" simulation for teaching anesthesia residents a lower cost, feasible and satisfying alternative to simulation center ? A 24 months prospective observational study in a university hospital

F. J. Lois, A. L. Pospiech, M. J. Van Dyck, D. A. Kahn and M. F. De Kock

Abstract : *Background :* The value of simulation in medical education is increasingly obvious. Nevertheless, the high cost of running a simulation center and the time's availability for students to get to simulation center remain a major problem. Technological developments and miniaturization of computer systems now allow handling of simulation manikins. Therefore, "in situ" simulation seems a valuable alternative to center simulation.
Objective(s) : To identify the costs and feasibility of "in situ" simulation. To conduct an evaluation of the sessions by participants in order to adapt the educational objectives.
Design : Observational study.
Setting : 118 "in situ" simulation sessions were organized between March 2011 and February 2013 in the university hospital of Université Catholique de Louvain. Sessions took place in OR facilities. At the end of each session, a questionnaire was given to each participant.
Participants : 357 of 368 participants completed a questionnaire. For each session, one or two nurses and 2 residents in anesthesia were invited.
Main outcome measures : Total costs for organizing the sessions. Number of realized sessions. Global satisfaction of participants.
Results : Total cost for organizing the sessions is 18 414 €. One hundred and one among the 118 scheduled sessions were performed, which corresponds to a rate of 85%. Three hundred and sixty-five people participated in training simulations. During the sessions, 357 questionnaires were completed. The global satisfaction was high with a median Likert scale of 5 (5-5) to the question "*I would like to participate in other sessions in the future*".
Conclusion : The "in situ" simulation in anesthesia is feasible in a university hospital using the available facilities of the operating theater during the working hours of both participants and trainers. However, the number of annual sessions may be limited by the availability of the simulation room or staff.

Key words :

Introduction

The beginnings of simulation in anesthesia training date from the late '60s. At this period, Abrahamson *et al*. showed the usefulness of simulator in resident's learning with Sim One manikin (1). This concept was quickly abandoned because teaching method by simulation didn't correspond to the traditional model of education based on "See one, do one, teach one". Another reason was its high cost and its impressive logistics in the absence of micro-computer. In the '80s, the simulation in anesthesia was reintroduced by Gaba and DeAnda at Stanford University in California and by Good and Gravenstein at Gainsville University in Florida. Simultaneously and independently, they developed high fidelity simulators. In 1988, Gaba *et al*. (2) published their model, the Comprehensive Anesthesia Simulator Environment (CASE), involving a recreated operating room environment and a high fidelity mannequin. The purpose of this simulator was the improvement of safety in anesthesia by development of non-technical skills or Anesthesia Crisis Resources Management (ACRM) by anesthesia residents. In 1993, an enhanced version of CASE was installed in Belgium at the Military Hospital, in

Fernande J. Lois, M.D. ; Audrey L. Pospiech, M.D. ; Michel J. Van Dyck, M.D. ; David A. Kahn, M.D. ; Marc F. De Kock, M.D., Ph.D.
Université catholique de Louvain, SSS, Cliniques universitaires Saint-Luc, Department of Anesthesiology , Brussels.
Correspondence address : Fernande Lois, M.D., Cliniques universitaires Saint-Luc, Department of Anesthesiology, Avenue Hippocrate , 10/1821, 1200 Brussels. Tel. : + 32 2 764 18 21. Fax : + 32 2 764 36 99. E-mail : fernande.lois@uclouvain.be

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the "Aneshesia Simulator Training Center" and simulation became a part of anesthesia residents training (3) at the Université catholique de Louvain (UCL). However, in early 2000s, the costs of running such a simulation program were more than 500 € / participant .

In parallel, the traditional model of education was jeopardized by the refusal of the patient to be «a learning object». It was therefore suggested that the use of simulation associated with the deliberate practice that involves goal-directed activities, which tend to be repetitive and to enable rapid feedback could be superior to traditional clinical medical education in achieving specific clinical skill acquisition goals (4). But if the value of simulation in medical education is increasingly evident (5), two major problems still remain : the high cost of running a simulation center and the reduced time for students to get to simulation center due to the legal regulation that reduces their working and training times.

Technological developments and miniaturization of computer systems now allow mobilisation of the simulation models. Therefore, the "in situ" simulation is a possible solution to the above mentioned problem. Faced with technical and financial requirements related to the sustainability of center, with the resident's time constraints and in order to reduce costs and improve accessibility, we decided to develop an "in situ" simulations training program. Since March 2011, simulation sessions are weekly organized in the operating rooms of Cliniques universitaires Saint-Luc as part of the training of operating room nurses and of residents in Anesthesia from UCL.

The purpose of this study was to identify the costs and feasibility of "in situ" simulation within our hospital and if these were improved to an acceptable situation compared to simulation center. The secondary aim was to conduct an evaluation of the sessions by participants and highlight if it was influenced by the scenario or the level of formation in order to adapt the educational objectives.

Material and Methods

This study was approved by the Ethics Committee of the Cliniques universitaires Saint-Luc (No. 4032011274).

In 2010, thanks to a grant from the *Fondation Saint-Luc*, a simulation manikin (SimMan 3G, Laerdal Medical, Stavanger, Norway) was acquired by the department of Anesthesiology at the *Cliniques universitaires Saint-Luc* for "in situ" simulation sessions. The manufacturer's initiation was dedicated to learn how to manage and technically implement the simulator and to ensure its basic maintenance.

At the same time, three anesthetists (a young graduate, a graduate for 5 years and an experienced one for more than 20 years) were trained in the use of simulation for learning health sciences.

Between March 2011 and February 2013, 118 simulation sessions were planned on a weekly basis during working hours. A shift was attributed to these sessions in an unoccupied room of the operating theater in the afternoon. This operating room with its usual equipment is located next to a hall suitable for debriefings and logistics of the session.. As the room is used in the morning for the elective program, it is cleaned and reconditioned in the late afternoon. For each session, two anesthesia residents (a junior and a senior) and one or two operating room nurses were appointed. There was no obligation to participate for residents, but the sessions were recommended as part of the curriculum. A date by semester was given to each resident in training in the department. The participation for nurses was voluntary within the mandatory hours for continuing education. If present in the service, a medical and/or nurse trainee was also invited. During the sessions, each participant has a role similar to current practice. Depending on the scenario and his availabilities, a graduate anesthetist might be called for help. Two of the trainers led each session.

The session last 105 minutes and is divided into 3 parts. The first part consists in a standardized 30-minute briefing. During this briefing, the learning objectives of the session are exposed as well as the rules of simulation, particularly regarding privacy and the right to make mistakes. An overview of the room and functionality of the manikin is then performed. Finally, the case history and context is presented to all the participants. After this introduction, a simulation of 30 minutes, filmed by the system supplied with the manikin, takes place. At the end of the session, a 45-minute debriefing is realized. At this time, medical management of cases as well as the quality of teamwork are discussed.

Eight scenarios were used during this period : intraoperative anaphylactic shock, unplanned difficult intubation, intraoperative ventricular fibrillation, preoperatively poorly tolerated tachycardia, inhalation at induction, postoperative pneumothorax, local anesthetics systemic toxicity (LAST) and a "cannot ventilate cannot intubate"

situation. The scenarios were gradually developed by supervisors based on their personal experience and the cases reported in the meetings of morbidity and mortality during the previous two years. For each topic, the clinical case and the context presented to participants are the same. To ensure the confidentiality of the scenario, a confidentiality clause was introduced in the informed consent document. Scenario is randomly selected .

At the end of each session, after the debriefing, an evaluation questionnaire was given to each participant. The questionnaire includes 15 questions in the form of affirmative statements with an agreement scale Likert of five response categories. Among the 15 questions, 13 are directly related to the satisfaction of participants : what he (or she) expects, what he (or she) needs (Appendix 1).

All costs in charge of anesthesiology department, including equipment, supervisor training and personnel, incurred during the period were identified and separated into program startup costs and ongoing costs.

Statistical analysis

Costs data, program feasibility and demographics of sessions, participants and scenario are presented descriptively.

Because the questionnaire was prepared by the simulation staff and was not validated, a generazibility study (G study) was applied to the questionnaire in order to estimate its reliability to evaluate participant satisfaction depending on the scenario or formation . The estimated variance components of responses to questionnaire for generalizability study are : participant (P) by scenario (S) or by level of formation (F) by affirmative statements (A). Based on the results of the generalizibility study, the variance components were used to estimate the reliability of the questionnaire for various others measurements designs. Data related to the questionnaire results are expressed as median (IQR 25-75). To assess if the scenario could influence the responses to the questionnaire, we use a Kruskall-Wallis test. For this analysis, we considered the six most frequently used scenarios (intraoperative anaphylactic shock, unplanned difficult intubation, intraoperative ventricular fibrillation, preoperatively poorly tolerated tachycardia, LAST and a "cannot ventilate nor intubate" situation). We also use a Kruskall-Wallis test to assess if the level of formation of the participants could influence the responses to the questionnaire. For this analysis, we divided the participants into 9 groups (trainee nurses, operating room nurses with more than 5 years experience and less than 5 years experience, medical students , and residents of each year) . Due to their small number, we excluded from this sub-analysis nursing assistants, fellows and supervisors. When a influence of scenario or level of formation on the response of participants has been found, the groups were compared in pairs. To evaluate the effect of a second session on the responses, we used for the comparison of data between two sessions the signed rank test of Wilcoxon. A p-value < 0.05 was considered significant. The G study was performed using EduG version 6.1f. All others statistical tests were performed using software R version 2.15.0 (Easter Beagle).

Results

Costs

The costs for starting the simulation program "in situ" in the *Cliniques universitaires Saint-Luc* and the operating costs of the two years are summarized in Table 1.

Program feasibility

Out of 118 scheduled sessions between the beginning of March 2011 and the end of February 2013, 101 sessions have been performed, which corresponds to a rate of 85%. Seven sessions had to be postponed due to unavailability of the room (6%), 4 for technical problems related to the manikin (3%), 6 for supervision problem with only one instructor available at the time of the session (5%) and 4 for unavailability of more than one participant (3%).

Three hundred and sixty-eight people participated in training simulations. Of these 368 participants, 57 residents and 5 nurses participated in 2 sessions, 9 residents participated in 3 sessions and 3 residents in 4 sessions. The distribution of participants is included in Table 2.

The distribution of scenarios used during the sessions is resumed in Table 3.

Evaluation of participants

Three hundred and fifty-five of 368 participants (96%) complete the questionnaire. Of the 13 participants who did not complete the questionnaire, three

Table 1

Startup and Operating costs

Program startup costs	
Simulation system costs	
Adult high-fidelity manikin 3G	Grant from Saint-Luc Foundation of 68 339 €
Operating theater or PACU environment	0 €
Ancillary equipment costs	
Office supplies	
Consumable medical equipment	3608 €
Simulation cart	Obtained from expired stock
Equipment for customization of the manikin (wigs, ...)	Obtained from declassed material 39 €
Training costs	
Manikin operation training	
Training Registration Fees for trainers	Included with purchase
Total startup costs	6067 € *9714 €*
Ongoing costs	
Simulation system ongoing warranties	4349 € / year
Personnel costs	
Technic staff salaries	0 €
Supervision staff salaries	«Redirect» paid educational time for clinicians • Time / session / supervisor : 135 minutes (room preparation and storage of equipment included) • Time to prepare a scenario : between 2 and 8 hours depending of the objectives
Total costs	*86 753 €*
Total costs (excluding acquisition of manikin)	*18 414 €*
Total costs / participant	*235 €*
Total costs / participant (excluding acquisition of manikin)	*50 €*

(1 nurse and 2 trainees) have not received the questionnaire, 6 nurses due to lack of time at the end of the session and four staff members for leaving before the end of the debriefing. The results of G study are summarized in table 4. The analysis of variance indicates that it is neither the participants nor the type of formation or scenario that most influences the variability of answers. The G study shows that the questionnaire generate the most of error. The questionnaire as drafted is thus not reliable to evaluate participant satisfaction. To improve the questionnaire for the future, decisions studies were conducted. This analysis indicates that increasing the number of questions to 20 would improve the reliability of results.

The overall results of the various items are summarized in Table 5. The global agreement with the statements is high. However, it appears that for three issues, namely the well-being of the simulation environment, the previous experience of the situation and the use of simulation for student assessment, participants give a lower score.

Sub-analysis on the impact of the scenario on responses allow to demonstrate that scenario influences the answer to the questions *"The objective of the scenario was within my reach"* ($p = 0,01$), *"I learned something through the simulation session"* ($p = 0,009$) and "*I have already encountered in my practice a situation similar to that presented in the session*" ($p < 0,001$) (Fig. 1). LAST scenario seems less affordable by the participants that the scenarios of unplanned difficult intubation (40% vs 13%) or anaphylactic shock (40% vs 13%). Unplanned difficult intubation scenario is less conducive to learning that the preoperatively poorly tolerated tachycardia (75% vs 95%) or LAST scenarios (75% vs 95%). The unplanned difficult intubation situation

Table 2

Distribution of participants and responders

	n =
Staff members	6
5th year residents	41
4th year residents	25
3rd year residents	43
2nd year residents	39
1st year residents	46
Fellows	2
Medical students	49
Operating room nurses	105
Trainee nurses / nurses in complementary training	10
Nursing assistants	2
Total	368

Table 3

Distribution of scenario

Type of scenario	Number of sessions
Anaphylactic shock	21
Unplanned difficult intubation	13
Intraoperative ventricular fibrillation	10
Preoperatively poorly tolerated tachycardia	21
Inhalation at induction	2
Postoperative pneumothorax	1
Cannot ventilate or intubate	12
Local anesthetics systemic toxicity	21
Total	101

has been encountered by most participants compared to all the others.

Level of formation also influence answers to some questions. A significant difference was found for 4 questions : *"The objective of the scenario was within my reach"* ($p = 0.001$), *"I participated actively in the debriefing session"* ($p = 0.002$), "*I have already encountered in my practice a situation similar to that presented in the session*" ($p < 0,001$) and *"I would like to participate in others sessions in the future"* ($p < 0,001$) (Fig. 2).

The objectives of the scenario seem less affordable by medical students than 3rd year residents (18% vs 49%), 4th year residents (18% vs 54%), 5th year residents (18% vs 50%) or experienced nurses (18% vs 36%). This observation is also made for residents compared to unexperienced nurses (23% vs 50%). On the involvement in the debriefing, 1st year residents feel they have been more involved than medical students (80% vs 48%) or inexperienced nurses (80% vs 37%). 3rd year residents (74% vs 37%) or experienced nurses (49% vs 37%) feel that they have been more involved than inexperienced nurses. Logically, a significant difference on the absence of previous experience was found between medical trainees and experienced nurses (69% vs 18%), 2nd (69% vs 34%), 3rd (69% vs 43%) , 4th (69% vs 28%) or 5th year (69% vs 36%) residents. A difference was also observe between experienced nurses and 1st year residents (19% vs 48%) , 2nd year residents (19% vs 34%), 3rd year residents (19% vs 43%), trainee nurses (19% vs 70%) and unexperienced nurses (19% vs 52%). Experienced and inexperienced nurses wish less than residents of 1st (69% and 65% vs 98% respectively), 2nd (69% and 65% vs 100%), and 3rd year (69% and 65% vs 95%) to go back to a session of simulation.

The answers to the 15 items were compared for the 74 individuals who participated in two

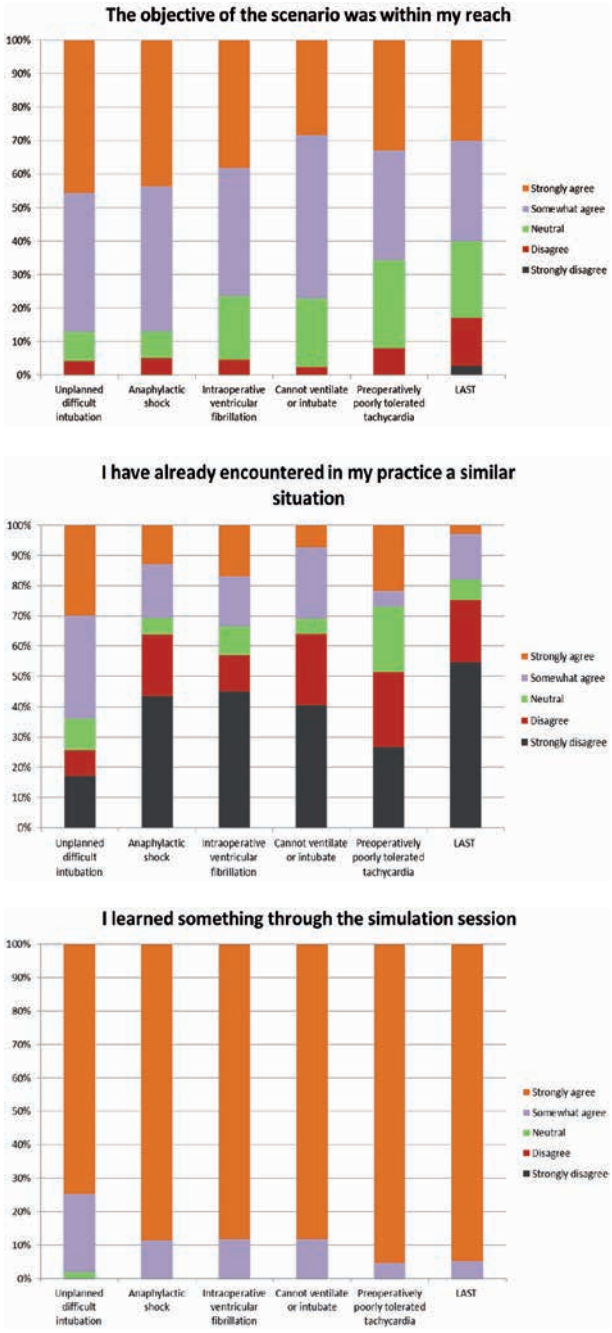

Fig. 1. — Influence of scenario

training simulations. No significant difference was found in the answers between the 2 sessions.

Discussion

To the best of our knowledge, this is the first study demonstrating the feasibility of "in situ" simulation in anesthesia in a teaching hospital and this at a reasonable cost using unoccupied facilities of the operating theater during the working time of participants and trainers.

Table 4

Generalizability results

Variance components of responses to questionnaire			Decision studies		
Variance component	Estimate	% of total variance	I = 10	I = 15	I = 20
Scenario					
Participant (P)	35,4	0			
Affirmative statement (A)	535,2	27,7			
Scenario (S:P)	214,7	8,0			
Participant X Affirmative statement (PA)	214	0,9			
Affirmative statement X Scenario (SA:P)	1012,8	63,5			
Relative generalizability coefficient (ρ2)	-	-	0,55	0,65	0,71
Formation					
Participant (P:F)	92,7	6,7			
Affirmative statement (A)	345,8	36			
Formation (F)	19,6	1			
Participant X Affirmative statement (PA:F)	456,7	54,8			
Affirmative statement X Formation (FA)	62,1	1,5			
Relative generalizability coefficient (ρ2)	-	-	0,58	0,67	0,73

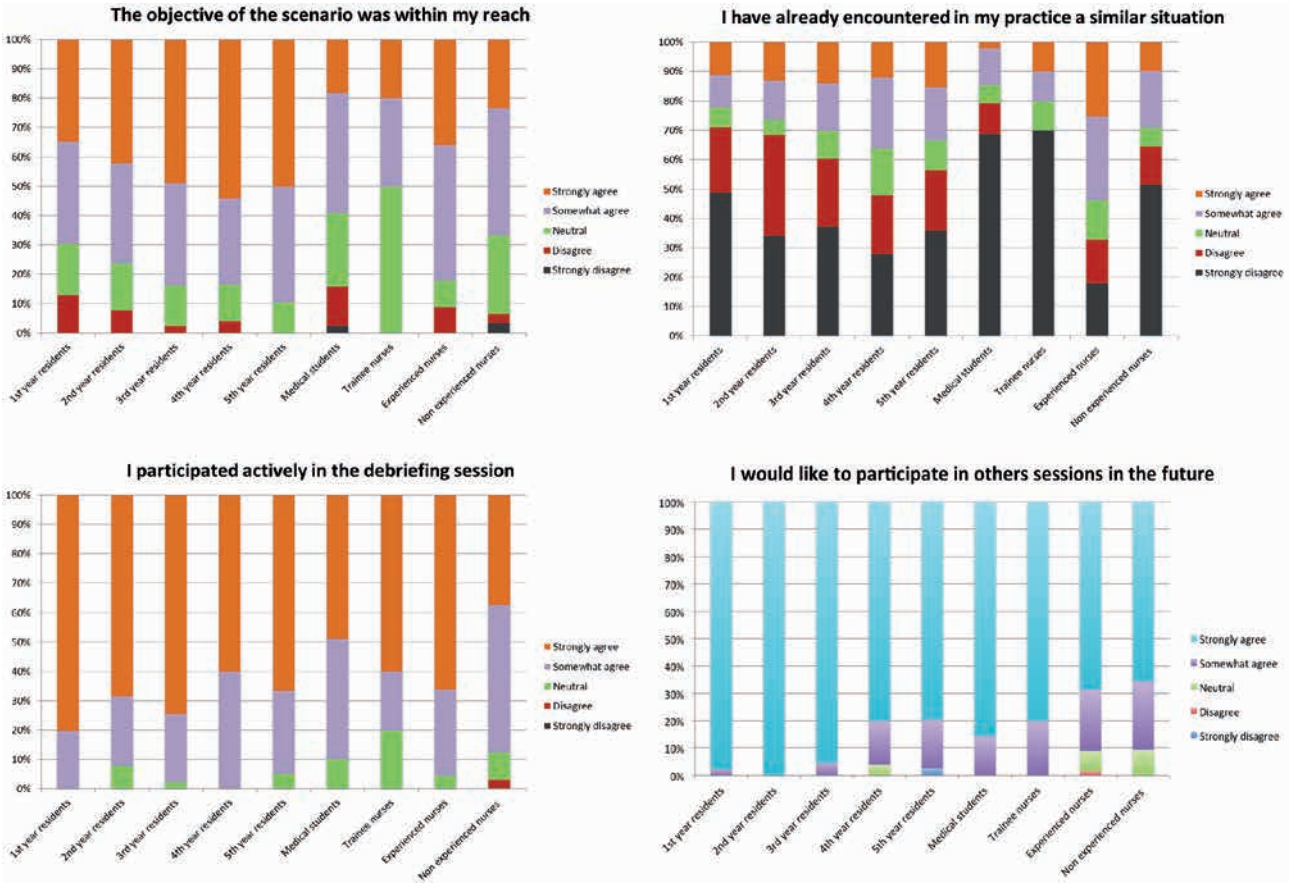

Fig. 2. — Influence of the level of formation

Table 5

Overall Results

Questions	Median (IQR 25-75) Likert Scale
The operation of the simulator was clearly explained to me and I received sufficient instructions	5 (5-5)
I felt comfortable in the simulation environment	4 (3-4)
The scenario was realistic	5 (4-5)
The objective of the scenario was within my reach	4 (4-5)
The feedback was constructive	5 (5-5)
I participated actively in the debriefing session	5 (4-5)
I enjoyed the debriefing session	5 (5-5)
I learned something through the simulation session	5 (5-5)
The session allowed me to gain useful knowledge in my daily practice	5 (5-5)
I have already encountered in my practice a situation similar to that presented in the session	2 (1-4)
The session inspired me to deepen my knowledge	5 (4-5)
I would like to participate in other sessions in the future	5 (5-5)
Time spent on simulation was appropriate	5 (4-5)
Simulator could be used to assess students	4 (3-5)
Preliminary contact with simulator is necessary to use sessions as an assessment method	5 (4-5)

Costs and feasibility

With this model, global costs (including purchase of manikin) are about € 235/person and operating costs about € 50/person. In our previous experience with simulation center, the cost for the service was approximately of € 500/person. These costs can be explained by the need to pay a technician for management of simulator, the price of equipment maintenance, the need for specific equipment (anesthesia machine, defibrillator,...) or facilities. Moreover, these costs could be attributed to a limited number of participants due to the difficulties to liberate them from their clinical work and to send them to simulation center located several kilometers from the hospital. This high cost was the major reason of discontinuation of simulation program in the curriculum of our residents in the late 2000s because it could not be supported by the department without external inputs. It should be noted that in two cases, the salaries of supervisors is "redirect" paid educational time. Nevertheless, the need to go to the center of simulation reduces the time available for teaching. The costs to participate to a "in situ" simulation session are then divided by a factor of 2 if we take into account global costs. But, this cost is divided by 10 if we consider only the operational costs. These new costs linked to "in situ" simulation appear to be acceptable and fundable by department with no external input. The "in situ" price / person, despite annual maintenance, should decrease if the number of participants trained per year remains constant. Because the participants should not move in a outside center, they don't exceed the scheduled time for training. So there is no additional salary costs to pay for nurses or medical participants and the impact of training in work planning is reduced. Indeed, these trainings are part of the hours of mandatory training included in working time. Moreover, contrary to the conventional training in the department where whole team participates, simulation as mandatory training allow the participation of only 3 to 4 people at the same time and therefore activity is maintained.

However, there are limits to this approach. In our experience, 17% of sessions had to be delayed from the initial planned timetable. However, reorganization of program allowed to each resident to participate in a session during the semester. In this study, 65% of delays were due to the availability of operating room or lack of supervision. It seems that this swap point is what is usually found in models of "in situ" simulation. Indeed, CALHOUN *et al*. reported a rate of canceled meetings of about 23% in pediatrics (6). Despite the postponing of sessions, 368 persons participated in 101 sessions over 24 months. Compared with our initial experience in the simulation center (7), the transition to the "in situ" simulation helped to increase the number of sessions from an average of 35 to 51 sessions /

year. The time spent in simulation has not increased because sessions are shorter. The number of residents who have benefited from the simulation has meanwhile risen sharply from 64 practitioners in 3 years to 194 during the reported period of 24 months. In practice, this means that each resident rotating in the department participates in one simulation session per semester. During their 5-year rotation training, residents spend an average of 2 and half years in our academic hospital, meaning that they would have the opportunity to participate in 5 sessions of simulator training. In the initial program, residents participated only to 2 or 3 sessions during their training. Based on this initial experience of "in situ" simulation, the number of annual sessions could be increased because sessions are planned over the 9 month in which the academic training is organized and because the operating room was initially only available one afternoon a week. However, such increase could be limited by the availability of facilities. Although the use of a free operating room raises the problem of its vacation at the session and cost effectiveness of the operating theater, it seems more interesting to keep mobility in the operating theater rather than have a dedicated room. It allows you to vary clinical cases (from procedure room to the recovery room) and avoid the additional costs related the equipment of a dedicated room. Nevertheless, the availability of supervisors is the most critical issue in this model because each teacher has other duties to carry out in addition to the simulation program.

Increasing the number of sessions available to residents seems essential when we consider the retention time of learning, such as in the management of difficult airways where adherence to guideline process was sustained only for 6–8 weeks for the cannot intubate scenario (8) or the diversity of rare clinical situations such as malignant hyperthermia, anaphylaxis, scenario of "cannot intubate cannot ventilate", intoxication with local anesthetics or severe arrhythmias especially since the limitation of working hours. Time between simulation sessions should also take into account the observed improvement in clinical routine, such as the preparation of the anesthesia machine by residents who have benefited from training simulations in comparison to the others who didn't. (9)

Another interesting feature in the shift from the former simulation center to the "in situ" simulation is the integration of paramedical staff in training simulations. Previously, paramedics didn't participate due to participant funding but also due to the time that could be dedicated to training during working hours. The "in situ" simulation allows for the sessions to be organized on workplace during working hours reducing the total time required to participate in a simulation. Moreover, the low cost of operation of the simulator can also avoid to request a financial contribution to the nursing department. The advantage of this paramedical participation is the development of skills related to teamwork and communication. Indeed, a recent study (10) has shown that what primarily interested the senior trainees was mainly behavioral aspects rather than the skills and knowledge.

Evaluation of sessions

Although it is known that the simulation sessions are generally appreciated by the students, we presented an evaluation questionnaire to each participant in order to improve the educational objectives and the quality of sessions. Nevertheless, these results should be interpreted cautiously because there are limitations to the reliability of the questionnaire as demonstrated by the G-study. Our results showed that the training simulations were appreciated. Indeed, the level of agreement is important for issues related to satisfaction, defined as giving someone what she or he expects, what she or he needs. Moreover, most participants, both medical and paramedical, are interested in participating in other future sessions. However, we must be careful because there are some limitations related to the organization of sessions. Indeed, although they are not mandatory, training hours for residents are required during working time. However, 5th year residents completing their training, with the exception of one participant who left the room during the scenario, arguing that he could not get into the situation, want to participate in other sessions while simulation is not yet part of the continuous education.

Among the evaluation questions asked to the participants, we focused on realism of scenarios and wellbeing in simulation environment. Indeed, Seropian (11) highlighted the necessity for a successful simulation to reproduce a plausible environment, plausible answers and plausible interactions in addition to a familiar environment and a realistic simulation equipment. The "in situ" simulation involves a regular work team and takes place in its daily workplace with its usual material. This leads us to think that "in situ" simulation would be more suited to meet aforementioned criteria. It appears however that despite this special context of

"in situ" simulation and a quality briefing, participants are not always comfortable in the simulation environment. This perception does not seem to change with the repetition of sessions. In this observational study, no difference was found in learner's responses between their first and second participation. The most frequently cited items to explain this discomfort are the presence of a camera, the difficulty to associate the simulation manikin to a patient and technical constraints related to manikin. However despite this difficulty relative to the environment, participants felt that the scenario was realistic.

Taking into account the limited number of training sessions, the choice of educational objectives and therefore of the scenarios is important. We have therefore been interested in the adequacy of scenarios in relation to professional practice. Despite that the scenarios were designed based on the personal experience of supervisors and cases reported in morbidity and mortality meetings of department, the results suggest that all the topics that were used in the sessions were rarerely or never encountered in clinical practice of the participants with the exception of unplanned difficult intubation. Nevertheless, regardless of the subject of the scenario or initial level of formation, students declared having learned something useful for their future clinical practice during the session. This observation of utility of simulation, even for the most frequent clinical conditions such as unplanned difficult intubation, can probably be explained by the learning of a more structured approach in this clinical situation as it has been previously demonstrated by Kudivalli *et al*. (8). Another point that has also caught our attention is the level of objectives in relation to the level of training. Although each one has its own role, younger believe that scenarios were not within their reach. This may illustrate difficulties in organizing multidisciplinary sessions with common goals and tailored to each individual.

Another issue considered in the evaluation is constructiveness of feedback, assessment and perception of active involvement in debriefing. A review of the literature in 2005 (12) for high-fidelity simulation has identified feedback as the most important feature of simulation-based medical education. However the literature on debriefing is poorly developed. Most publications resume expert opinions and there are few research on this part of simulation. In 2007, FANNING *et al*. (13) concluded their non-exhaustive review of the role of debriefing in simulation-based learning by pointing out that it was the "heart and soul" of the simulation experience. In the present work, the debrief model used is the "debriefing with good judgment". The partcipants are first invited to share their first impression. The situation is subsequently analyzed in a chronological way using a written support. Participants reconstitute together the algorithm or guidelines for the correct medical management of the simulated problem in similar situations. This way of teaching is based on a model of contextualization, decontextualization and recontextualization developped by TARDIF (14). At each step, teamwork and ACRM issues (ergonomics of work, communication, call for help, ...) based on observations done during the session are introduced by the supervisor according to the educational objectives defined. The debrief will be fenced by resuming the items "first impression" to ensure they were all discussed and by sharing didactic support listing the major medical purpose. This can not be improvised and the supervisors of simulation sessions have all been trained in techniques for debriefing. However, some medical students and inexperienced nurses feel less involved in the debriefing. Several explanations are possible, including the difficulty of topics, but also the fact that people leading the debriefing are graduate anesthetists not meeting the learning objectives expected by some young students. The importance of debriefing can be restrictive in the development of "in situ" simulation in each institution because each structure should therefore have trained supervisor, which is time consuming and costly.

The last issue we were interested in is the views of participants on the place of simulation in the assessment. Indeed, simulation is becoming more important in medical education. Moreover, we try to develop the "in situ" simulation tool for the selection of future residents. It is therefore legitimate to ask the question of its place in an assessment being no longer formative as the running sessions but also summative. According to BOULET *et al*. (15), significant elements to consider in order to use the simulation tool as summative evaluation methodology is a scenario adapted to the technical and non-technical skills, that we want to assess, the development of appropriate metrics that are reproducible and are valid, ie that they measure well the skill evaluated. In our experience, it seems that participants are globally ready to be assessed by a simulation tool whatever their initial formation and their training level. They nevertheless claim as a condition to this assessment the preliminary use in a formative context of simulation.

Conclusion

If we cannot affirm that this model is generalizable to other institutions or conditions because it is specific to our institution and that our primary goal was not to assess the external validity of the model , it looks important to us to share our experience with the "in situ" simulation.

Indeed, "in situ" simulation in anesthesia was feasible at a reasonable price in our university hospital using the unoccupied facilities of the operating theater during the working hours of both participants and trainers. However, the number of annual sessions may be limited by the availability of the simulation room or staff. The major advantage in our new model compared to previous was the integration of paramedics in the sessions leading to a better development in the learning of skills related to teamwork.

Despite the "in situ" context of our model, it appears that participants are not always comfortable in the simulation environment. This is something that must be considered both for the debriefing to avoid stigmatizing the participants on errors which were allegedly committed merely because of this discomfort, but also if we would like to develop the tool of simulation for summative evaluation. It seems also important to appropriately choose the scenarios if the number of sessions is limited during a training. A balance between exceptional cases and more common circumstances must be kept in mind since it appears that even for the previously encountered situations, learners recall important knowledges for their future practice.

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Appendix 1 : Questionnaire

Specialist / Resident Year : / Nurse since ……..…

Medical Trainee / Nurse Trainee ….……..…..……..…

Session number : Scenario : ……..

	strongly disagree	disagree	neutral	somewhat agree	strongly agree
1. The operation of the simulator was clearly explained to me and I received sufficient instructions	O	O	O	O	O
2. I felt comfortable in the simulation environment	O	O	O	O	O
3. The scenario was realistic	O	O	O	O	O
4. The objective of the scenario was within my reach	O	O	O	O	O
5. The feedback was constructive	O	O	O	O	O
6. I participated actively in the debriefing session	O	O	O	O	O
7. I enjoyed the debriefing session	O	O	O	O	O
8. I learned something through the simulation session	O	O	O	O	O
9. The session allowed me to gain useful knowledge in my daily practice	O	O	O	O	O
10. I have already encountered in my practice a situation similar to that presented in the session	O	O	O	O	O
11. The session inspired me to deepen my knowledge	O	O	O	O	O
12. I would like to participate in other sessions in the future	O	O	O	O	O
13. Simulator could be used to assess students	O	O	O	O	O
14. Preliminary contact with simulator is necessary to use sessions as an assessment method	O	O	O	O	O
15. Time spent on simulation was appropriate	O	O	O	O	O