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Assessment of a multiprofessional training programme by in situ simulation in the maternity units of the Pays de Loire regional perinatal network

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Summary

Introduction: Initially dispensed in specialized simulation centers, simulation training has recently begun to take place directly in healthcare facilities, that is, in situ. The objective of this study is to assess the effect of training by in situ simulation in obstetrics.

Material and methods: The training program, dispensed over a 2-day period, took place in maternity units of the members of the Pays de la Loire perinatal network, Réseau Sécurité Naissance (Network Safety Birth). All participants received a learner satisfaction questionnaire to complete (5-point Likert-like scales). Then, at least 6 months later, each maternity ward received a general questionnaire to assess the effect of the training, as well as a second questionnaire specific to each institution, about the areas for improvement proposed by the teaching team after debriefings.

Results: The 14 establishments included in our study returned 375 satisfaction questionnaires. In all, 91.1% were very satisfied and reported that the training met their expectations, and 99.7% thought the program would have an impact on their professional practice. More than 94% of the learners wanted more simulation sessions. Among the 14 facilities, 9 (64.3%) returned their evaluation questionnaires. In 44.4% of cases, they reported improvement in team cohesion and in team communication, while the others reported these elements remained stable. All maternity units reported that the training had a positive impact on their team, and that they would be interested in new training program with in situ simulation.

Discussion: Most participants clearly appreciated this training. In situ simulation training also led to the identification of areas for improvements, many of them accomplished, through the drafting of protocols or material modifications aimed at improving staff practices and therefore global patient care. There are many ways by which these training programs can be made sustainable, including the development of a new training program of in situ simulation or the creation of onsite simulation sessions on demand or by the professionals at each institution.

Conclusion: This survey demonstrated the enthusiasm of healthcare professionals about in situ simulation. Moreover, overall improvement in team communication and cohesion was reported in the medium term (evaluation at more than 6 months). The interest of continuing these training sessions appears undeniable.

Mots-clés : simulation in situ, simulation pour patient, entraînement, amélioration de la qualité, formation, éducation, évaluation

Keywords: in situ simulation; patient simulation; training; quality improvement; education; assessment

Introduction

Simulation in health care training developed first in North America and has spread more recently to France. It aims to respond to the desire for a global improvement in patient management and specifically to reduce the morbidity and mortality associated with care.

Several approaches to simulation coexist in the health domain. The best known and most used are human simulation (therefore on live or standardized patients), synthetic simulation on life-sized or procedural manikins, and hybrid simulation, involving the combination of a standardized patient and of a part of a manikin, such as a maternal pelvis and its fetus. These approaches enable an immersion in the patient-care environment [1, 2].

Simulation is relevant to numerous medical disciplines or specialties, most especially emergency medicine, anesthesiology-intensive care, obstetrics, and neonatology. In these disciplines, many technical procedures can be adapted to learning by procedural simulation but also to learning with a multiprofessional approach [3]. Simulation of scenarios with learners is thus a perfectly appropriate pedagogical vector.

Simulation has demonstrated its effectiveness in terms of learner satisfaction, skill improvement, improved team work, and changes in practices [4]. Despite the difficulty of proving the impacts of simulation on health indicators, this pedagogical method has been validated. Moreover, the generalization of morbidity and mortality audits is already evidence of major changes in the assessment of professional practices. In situ simulation is a natural continuation of these trends [5,6].

The objective of this study is to assess the effects of training by in situ simulation in obstetrics among teams working in maternity units and to envision perspectives toward sustaining this training.

Material and methods

The Réseau Sécurité Naissance (RSN, network for safety in birth) of the Pays de la Loire is a perinatal network created in 1998 and funded by the regional health agency (ARS) of the Pays de la Loire [7]. It comprises 23 maternity units (10 level 1, 10 level 2, and 3 level 3) in 5 districts: Loire-Atlantique, Maine et Loire, Mayenne, Sarthe, and Vendée. It accounted for 39 351 births of the 714 000 in metropolitan France in 2019.

Since 2011, the RSN has partnered with the specialized simulation centers in Nantes (LeSIMU) and Angers (All'Sims) to cover the region's training needs. Initially, these programs involved multiprofessional practices (midwives, pediatricians, neonatologists, nurses' aides,

and childcare assistants) in the NICU. In 2014, multiprofessional training around the management of life-threatening obstetric situations was also offered.

Setting up the training program

A recurrent demand of professional coming for training at the simulation centers was to be able to do in their usual working conditions, in terms of environment, team resources, and equipment. It became clear that the simulation training should be moved to the learners' real working environment.

The design of the project took 4 months, and the equipment purchases, scenario writing, and contacts with the maternity units another 3 months. The final program comprised six programs per year in the Pays de la Loire, conducted by 2 teams of instructors who were experts in both simulation and clinical practice: one team for the sector closest to Nantes (Loire-Atlantique and Vendée) and another for that around Angers (Sarthe, Mayenne, and Maine-et-Loire), in accordance with the geographic distribution of pre- and postnatal transfers. Each team included an obstetrician/gynecologist, an anesthesiologist critical-care specialist, a pediatrician, and two midwives.

Priority was given to level 1 maternity units, where demand for short-term training programs was greatest. The participants reproduced the on-duty team with the organizational constraints of each hospital. No observers were authorized, and the participants were released from all regular duties during the program. The program philosophy was to provide kind support, be friendly, and avoid any value judgments of participants. The training program was scheduled over two days. One priority was given to anesthesia and neonatology on the first day, followed by a debriefing meeting with the instructors the first evening. The second day was devoted to obstetrics and to maternal obstetric resuscitation. A scenario with a multiprofessional crisis situation began the second day with anesthesia, obstetrics, and neonatal resuscitation, because in some maternity units, the midwife and/or anesthetist can help out in neonatal emergencies, requiring redistribution and prioritization of tasks and roles.

At the completion of the training session, pedagogical documents may be provided to the teams. A month or two after the program, a second meeting allows mutual feedback about it, and the learners receive a synthetic document about the points of improvement discussed by the teams during the debriefings, with some suggestions for improvements. This synthetic document does not contain any individual evaluation, but is rather organizational (concerning human and/or material resources).

The cost of the training is estimated at 10,000 €/2 days. Each session of in situ simulation engenders the following costs:

- Financial compensation for the instructors
- Instructors' travel (transportation, accommodation, meals)
- Network coordination time (pre- and post-training visits)
- Depreciation of equipment: the equipment investment of 30,000 € breaks down as follows: simulation materiel (pelvis, 2 newborns, thorax, and scope screen simulator) and the purchases of mobile computer and audio-video equipment (3800 €)

It would have been difficult to offer a training program solicit professionals at the same time, for a fee. This cost would probably have kept at least some maternity units from participating in the project. Financial support from the ARS for the program for 3 years thus enabled us to offer to it all the maternity units for free. Simulation has been included in the regional health program (PRS) and in situ simulation is now a part of the network's missions. The only remaining financial constraint for the institution is that they must release participants from two days of their usual responsibilities.

Assessment of the impacts of the simulation training

Evaluation of a training program is a difficult topic to consider in view of the numerous parameters involved. Kirkpatrick has developed a model for such an assessment [8]. It uses a pyramid divided into 4 levels:

- First level: assessment of the learners' satisfaction
- Second level: assessment of the skills (including attitudes) that can be self-assessed or measured
- Third level: assessment of behaviors and of the impact on learners' practices
- Fourth level: assessments of the patients' benefits from a change in management.

The first level is the easiest to assess. A questionnaire about learner satisfaction can be distributed to participants in any type of simulation. These results are very often quite encouraging [9]. On the other hand, the acquisition of skills (second level) and improvements in behavior (third level) are already more difficult to assess, especially as this training is about what are essentially rare events [10]. As for the fourth level and benefits for patients, and thus most often a reduction in morbidity and mortality, this parameter is still harder to quantify given its multifactorial nature [11].

We therefore distributed a satisfaction questionnaire to all participants at the end of each session of their in situ simulation. The three sessions at each maternity ward were thus assessed by a satisfaction questionnaire: neonatal resuscitation, life-threatening impatient emergencies, and simulation in the delivery room. All the professionals who participated actively in these sessions were asked to complete a satisfaction questionnaire composed of 5-point Likert-like scale questions [12] to assess the general organization of the session, the interest of the clinical situations considered, the performance of the simulation scenarios,

the debriefing, and finally their overall appreciation of the session. The questionnaire finished with two questions: Should these simulation sessions be continued? Should they be made mandatory?

The first objective, which was to not create any opposition to this training, was met successfully. Next, aware that most of the participants were likely to be satisfied with the program, we wanted to assess the second and third levels of Kirkpatrick's pyramid by a questionnaire distributed a reasonable time after the training to the supervisors of maternity units to assess the changes noticed in the learners' skills, organization, and behaviors. Each maternity ward received one questionnaire identical for all, as well as a second questionnaire specific to it, covering the areas for improvement proposed by the RSN training team. That is, at the conclusion of the onsite training and debriefings, the training team met to draft a document describing improvements that could be envisioned within the facility, to improve the care environment, based on the notes they took during the debriefings. These documents were intended for the department head and department manager (*cadre de santé*). We chose to send these questionnaires at least 6 months after the report was submitted, to leave time for the staff and the administration to make some of the changes and/or adjustments suggested, but also to assess the impact of the training in the medium term.

Results

Among the RSN's 23 maternity units, the "Code Red at the Maternity Ward" training program has thus far taken place at 17 (Figure 1). Among them, 3 only recently underwent the training or received their document of possible improvements and were therefore not included in this study because it was too soon for a useful evaluation.

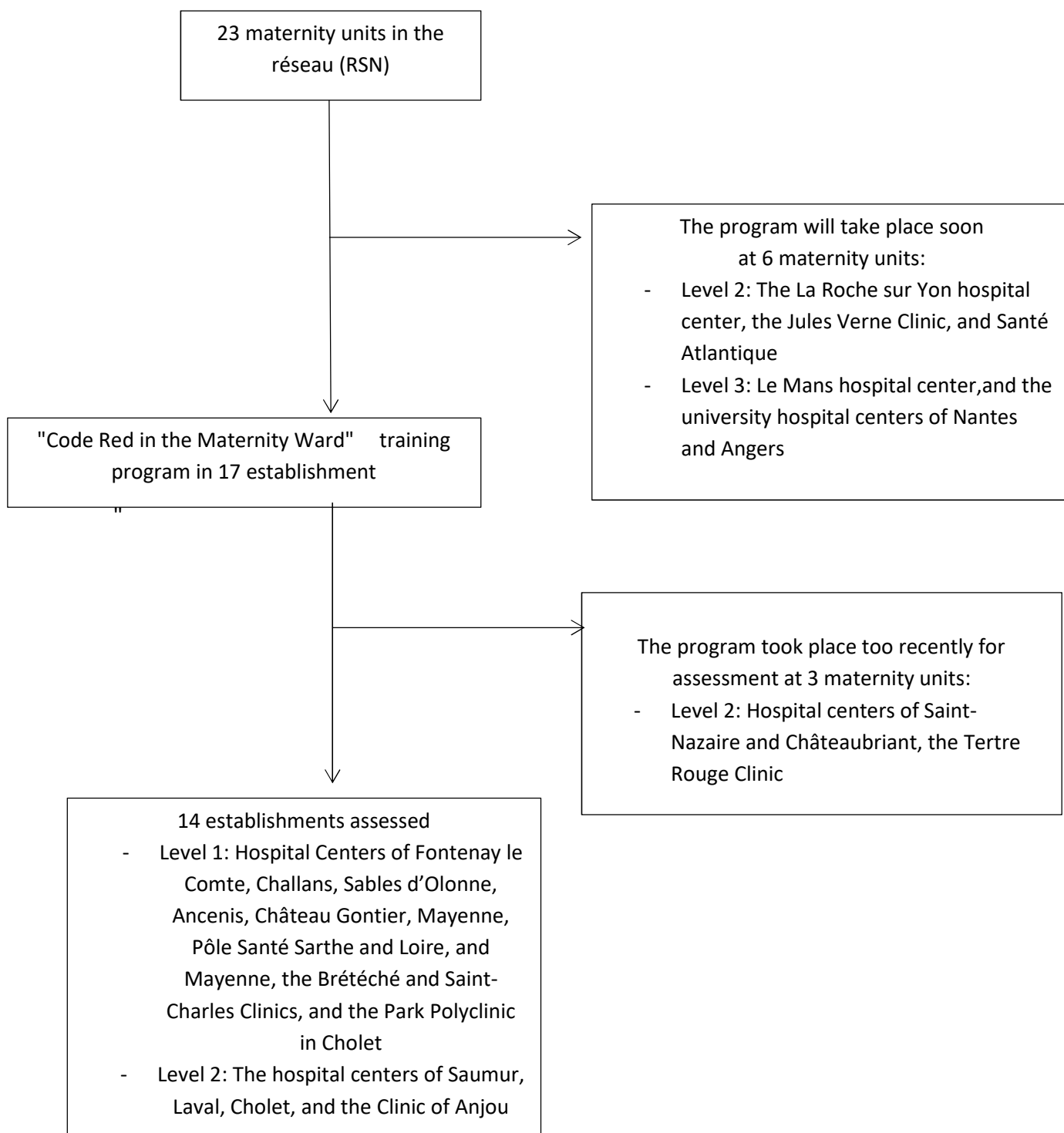


Figure 1: Flow chart of the establishment involved

Participant satisfaction questionnaires

From the 14 maternity units included in this study, we received 127 questionnaires about the neonatal resuscitation session, 100 about the session on life-threatening emergencies in inpatients, and 148 about the delivery room session (Table 1).

The staff members involved in the training were as similar as possible to the usual on-duty team (in numbers and specific professions) working in the department in that hospital. Accordingly, in some institutions, a nurse anesthetist (IADE) was available in the delivery room, and in others, the anesthesiologist was only on call from home. The session on life-threatening inpatient emergencies included only nurses, midwives, nurses' aides and childcare assistants, because the pedagogical objective was to identify the first procedures to perform in this situation while awaiting a physician's arrival.

Among the 375 professionals who responded to these questionnaires, 343 were very satisfied with the pedagogical quality of the debriefing (91.5%) and 370 of 373 respondents very satisfied or satisfied with the debriefing as a whole (99.2%) (Table 2). For the global appreciation of the training, 327 of the 359 respondents were very satisfied and reported it met their expectations (91.1%), 331 of the 371 respondents were very satisfied about updating their knowledge (89.2%), and 356 of 357 thought that it would affect their practices (99.7%).

Medium-term questionnaires to maternity units especially concerning areas of improvement

Among the 375 professionals who responded, 354 suggested that the sessions ought to continue (94.4%) and only one did not want them to (0.3%) (Table 3). Overall, 281 responded that these simulation sessions should be made mandatory (74.9%) while 50 disagreed (13.3%).

Among the 14 hospitals to which we sent these questionnaires, 9 (64.3%) responded (the hospital centers of Fontenay le Comte, Sables d'Olonne, Ancenis, Pôle Santé Sarthe and Loire, Mayenne, Laval, and Challans, and the Clinic Saint-Charles and the Park Polyclinic).

For the shared questionnaire, 8 maternity units (88.9%) mentioned that the staff had asked for new simulation sessions for themselves or their colleagues. Moreover, in 8 maternity units (88.9%), after the training, staff members actively indicated that they wanted to take

part in sessions with their team. We note that since these in situ simulation sessions, 6 of these maternity units (66.7%) have had new sessions, either organized by the RSN (n=3), or organized onsite by professionals working there (n=2) or by an exterior instructor (n=1).

Not only was team cohesion reported to be improved in 44.4% of the teams (4/9), but **also improved communication** (4/9); in the other cases, these elements remained at least stable. No respondents reported any cases of worsening of cohesion or communication within any team. All maternity units reported that the training had a positive impact on their team, and that they would be interested in new program with in situ simulation.

A global analysis of the questionnaires specific to each maternity ward is more difficult, because the questions were specifically constructed for each establishment. For example, the questionnaire might have asked if the neonatal resuscitation emergency cart now contains serially numbered seals, or if a postpartum hemorrhage follow-up form is now routinely used in these cases. Nonetheless, some items were repeated for several maternity units (Table 4).

Discussion

Assessment of learner satisfaction and changes made by the obstetrics departments

More than 90% of the learners were very satisfied with the pedagogical quality of the debriefings and more than 99% satisfied or very satisfied with the debriefings as a whole. With more than 94% of learners reporting that these sessions of in situ simulation ought to be continued, it appears clear that most participants appreciated this training. Almost everyone questioned (99.7%) affirmed that it would have an impact on their daily practice. These positive results thus encourage us to continue this training program.

A guide for this assessment (Debriefing Assessment for Simulation in Healthcare© – DASH©) was developed several years ago [13]. It exists in three versions. One is designed for those assessing instructors, another for learners to assess their instructor, and the last one for instructors for their own self-evaluation. It includes six elements coded on a scale of 1 to 7 (maximum grade) and enables the exploration of various dimensions of debriefing practices. These scales have already been evaluated during simulation sessions in neonatal resuscitation [14], but not yet for multiprofessional obstetric simulation. We have not yet used this tool, but it may be relevant for a second training program.

Nonetheless, this training has financial, material, and human costs. It is therefore essential that funders have more concrete feedback about their effectiveness in improving practices and team work, rather than looking only at learner satisfaction [15]. For this reason we sought to assess the second and third levels of Kirkpatrick's pyramid [8] by sending questionnaires to each maternity ward. A first questionnaire, common to all facilities, focused globally on changes that have taken place since the training program; the second was individualized for each department, asking about the organizational, material, or procedural modifications that had been discussed during the debriefing sessions.

It is clear that the nine maternity units that responded to this questionnaire found that the training had a positive impact on the team (100%), and all were interested in participating in a new session of in situ simulation. This is in itself already an immense success for the network, showing that it is perceived as a professional facilitator and not as the arm of its supervisory authority or as a university hospital center that would judge and criticize without empathy.

Four of the nine maternity units (44.4%) reported improvement in both team cohesion and communication, and no reports suggested that the training resulted in impairing either of these elements. This is important because one of the instructors' fears had been that in situ simulation, in causing exposure of the different professionals' lacunae in front of their own teams, would lead to a loss self-esteem and cause tensions within the team. These elements of team cohesion and communication are nonetheless rather subjective and are sometimes difficult to assess. Accordingly, we sought to assess concretely whether some improvement in areas we suggested had occurred after the training program.

For example, in the five maternity units for which the creation of a specific preterm drawer in the neonatal resuscitation cart was suggested, four (80.0%) had made this change. Similarly, seven of the eight maternity units (87.5%) to which the drafting of a protocol for a code red cesarean was suggested have written this document. All five maternity units to which the team suggested the use of a specific postpartum hemorrhage follow-up form applied this recommendation (100.0%). In situ simulation training thus led to the identification of topics for improvements that have been made, by drafting protocols or material modifications aimed at improving staff practices and thereby the global management of patients.

It should nonetheless be noted that these changes concerned most especially frequent or concrete procedures. When these areas for improvements involved very rare situations (such as maternal cardiac arrest) or concerned rarely used material (cesarean kit in the emergency cart or memos about rarely used drugs), these changes have thus far almost never been made (in only 0 to 20% of cases). **Even if many articles show an interest in simulation, and in particular in situ simulation, in many situations, and even recently in connection with COVID-19 [16], it is difficult to assess the impact of simulation on indicators health [17,18]. Nevertheless, according to the latest Inserm – Equipe EPOPé report on maternal deaths in France, published in January 2021 [19], while the postpartum hemorrhage was for many years the leading cause of maternal mortality, it is falling to 5th place, perhaps thanks to these numerous simulation sessions set up across the territory [20].**

Perspectives

With nearly all the professionals apparently satisfied with these sessions of in situ simulation, the question to be answered is what follow-up this training program should

have. More than 94% of the learners wanted more simulation sessions, but 13% did not want them to be mandatory. It therefore appears necessary to find different options to continue this training program.

One of these options could be to develop a second training program using in situ simulation. That is, when the first program has been provided to all 23 maternity units in the network, and in view of the different questionnaires, another program, with different scenarios but the same general outline could be designed. It would of course be adapted and enriched by the experience of the first one. There is a frequent debate about whether simulation should take place inside a maternity ward or in a special center [21]. That is, although some suggest simulation in dedicated learning centers is more reproducible and less expensive, others on the contrary, argue that in situ simulation has more benefits and more useful when it uses the facility's own human and material resources. In a prospective randomized trial involving 140 professionals in training for obstetrics emergencies, the site of the simulation did not emerge as a determinant factor in its effectiveness [22]. These results are compatible with those of a Danish team for multiprofessional obstetrics scenarios also involving the anesthesia teams [23]. Nonetheless these randomized trials involved only a few professionals and did not assess the benefit at the scale of a region or territory. We therefore think that in situ simulation is an alternative that complements simulation in a special center [24]. These programs can focus on obstetrics, pediatrics, or even be multidisciplinary, although that is sometimes more difficult to organize, at least at the beginning, although its value has clearly been demonstrated already [25].

Nonetheless, creating and conducting simulation training programs is time consuming and cannot be improvised. The use of an evaluation tool, such as the DASH© rubric/scale, can be helpful for new instructors [26]. Regardless of the best efforts of learners and future instructors, logistic and pedagogical support is necessary. The Réseau Sécurité Naissance can help provide this support. A working group devoted to simulation training will be created, organized around neonatal, anesthesia, and obstetric simulations. Initially planned for June 2020, its creation has been postponed to October, 2020, in view of the health situation related to Covid-19. Moreover, to be able to make these simulation sessions sustainable in the different maternity units, a two-or three-person committee, motivated to work on simulation, could represent each institution and participate in the working group to exchange and optimize these simulation sessions. It might nonetheless be better to envision this third approach only after the completion of the first in situ simulation training program. It has made it possible to prove the interest and feasibility of this type of training. Moreover, the material used was appropriate for the institution concerned, so that everyone can take ownership of the ideas. Finally, this program has made it possible to show the importance of working on the human factor as much as on the procedures.

Conclusion

The experience and stability of the in situ simulation according to the model described here and used in the Pays de la Loire perinatal network is unique in France and has demonstrated some benefits for team cohesion and improving both knowledge and positive perceptions of the perinatal network and our supervisory agency (ARS). This survey has demonstrated the enthusiasm of healthcare professionals for in situ simulation. The utility of continuing these training sessions appears undeniable. There are many ways by which these training programs can be made sustainable, including by a new training program of in situ simulation, by the creation of onsite simulation sessions on demand, and by their creation by the professionals at each establishment. Although the impact of these training programs on the rest of the team or on patient themselves is difficult to demonstrate, the continuation of training by in situ simulation seems essential for the professional staff, for the network, and for the patients, to optimize global patient care and ultimately to diminish the morbidity and mortality associated with care.

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Table 1: Staff involved in the training session

| | Neonatal resuscitation n (%) | Life-threatening emergencies for inpatients n (%) | Delivery room n (%) |
|--|------------------------------------|--|------------------------|
| Nurses' aides and childcare attendants | 41 (32.2) | 47 (47.0) | 36 (24.3) |
| Nurses | 2 (1.6) | 0 | 0 |
| Nurse-Anesthetists | 7 (5.5) | 0 | 18 (12.2) |
| Midwives | 51 (40.2) | 48 (48.0) | 50 (33.8) |
| Pediatricians | 13 (10.2) | 1 (1.0) | 3 (2.0) |
| Anesthesiologists | 8 (6.3) | 0 | 16 (10.8) |
| Gynecologist-Obstetricians | 0 | 1 (1.0) | 23 (15.5) |
| Total | 127 | 100 | 148 |

Table 2: Professionals' Satisfaction

| | | Neonatal resuscitation n=127 (%) | | | | | Life-threatening emergencies for inpatients n=100 | | | | | Delivery room n=148 (%) | | | | |
|--|---------------------------------------|-------------------------------------|-----------|--------------|-------------------|-------------|--|-----------|--------------|-------------------|-------------|----------------------------|-----------|--------------|-------------------|-------------|
| | | Very Satisfied | Satisfied | Dissatisfied | Very dissatisfied | No Response | Very Satisfied | Satisfied | Dissatisfied | Very dissatisfied | No Response | Very Satisfied | Satisfied | Dissatisfied | Very dissatisfied | No Response |
| Performance of simulation scenarios and debriefing | Pedagogical quality | 114 (89.8) | 13 (10.2) | 0 | 0 | 0 | 89 | 11 | 0 | 0 | 0 | 140 (94.6) | 8 (5.4) | 0 | 0 | 0 |
| | Realism | 77 (60.6) | 50 (39.4) | 0 | 0 | 0 | 77 | 22 | 0 | 0 | 1 | 113 (76.4) | 33 (22.3) | 2 (1.4) | 0 | 0 |
| | Pedagogical quality of the debriefing | 115 (90.6) | 11 (8.7) | 0 | 0 | 0 | 94 | 6 | 0 | 0 | 0 | 137 (92.6) | 11 (7.4) | 0 | 0 | 0 |
| | Debriefing as a whole | 113 (89.0) | 12 (9.4) | 1 (0.8) | 0 | 1 (0.8) | 91 | 8 | 0 | 0 | 1 | 129 (87.2) | 17 (11.5) | 2 (1.4) | 0 | 0 |
| Overall assessment | Globally helpful | 111 (87.4) | 14 (11.0) | 0 | 0 | 2 (1.6) | 89 | 10 | 0 | 0 | 1 | 132 (89.2) | 15 (10.1) | 0 | 0 | 1 (0.7) |
| | Met my expectations | 110 (86.6) | 14 (11.0) | 1 (0.8) | 0 | 2 (1.6) | 86 | 11 | 1 | 0 | 2 | 131 (88.5) | 15 (10.1) | 0 | 0 | 2 (1.4) |
| | Updated knowledge | 112 (88.2) | 13 (10.2) | 0 | 0 | 2 (1.6) | 89 | 10 | 1 | 0 | 0 | 130 (87.8) | 15 (10.1) | 1 (0.7) | 0 | 2 (1.4) |
| | Changed practices | 99 (78.0) | 22 (17.3) | 0 | 0 | 6 (4.7) | 75 | 17 | 0 | 0 | 8 | 122 (82.4) | 21 (14.2) | 1 (0.7) | 0 | 4 (2.7) |

Table 3: Continuation of simulation training sessions for professionals

| | Continue these sessions | | | Make them mandatory | | | |
|---|-------------------------|---------|------------|---------------------|----------|-----------|------------|
| | Yes | No | Don't know | Yes | Why not? | No | Don't know |
| Neonatal resuscitation n=127 (%) | 120 (94.5) | 1 (0.8) | 6 (4.7) | 102 (80.3) | 0 | 17 (13.4) | 8 (6.3) |
| Life-threatening emergencies n=100 (%) | 93 (93.0) | 0 | 7 (7.0) | 80 (80.0) | 3 (3.0) | 9 (9.0) | 8 (8.0) |
| Delivery room n=148 (%) | 141 (95.3) | 0 | 7 (4.7) | 99 (66.9) | 11 (7.4) | 24 (16.2) | 14 (9.5) |

Table 4: Identical questionnaire for all maternity units (n=9)

| | Number of maternity units concerned | Yes n (%) |
|--|--|--------------|
| Creation as a specific drawer in the neonatal resuscitation cart | 5 | 4 (80.0) |
| Placement of numbered seals on the neonatal resuscitation cart | 6 | 2 (33.3) |
| Purchase of neonatal endotracheal tubes with a lateral channel | 4 | 1 (25.0) |
| Presence of an emergency cesarean kit on the adult emergency cart for inpatients | 9 | 0 |
| Existence of a memo about the rarely used drugs on the emergency cart | 7 | 0 |
| Drafted a protocol for a code red cesarean | 8 | 7 (87.5) |
| Drafted a protocol for management of maternal cardiac arrest | 6 | 1 (16.7%) |
| Drafted a protocol for Nalador® use in the delivery room | 1 | 1 (100.0) |
| Routine use of a postpartum hemorrhage follow-up form | 5 | 5 (100,0) |