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RESEARCH

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Quality of the Situation-Background-Assessment-Recommendation tool during nurse-physician calls in the ICU: An observational study

Emil Scolari MsN[1,2,3] | Leda Soncini BsN[1] | Anne-Sylvie Ramelet PhD[4,5] | Antoine Guillaume Schneider PhD[1,5]

[1]Adult intensive care Unit, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, Switzerland

[2]School of Health Sciences (HESAV), HES-SO University of Applied Sciences and Arts Western, Délemont, Switzerland

[3]Haute Ecole de Santé Vaud (HESAV), Lausanne, Switzerland

[4]Institute of Higher Education and Research in Healthcare, University of Lausanne and Lausanne University Hospital, Lausanne, Switzerland

[5]Faculty of Biology and Medicine, University of Lausanne, Lausanne, Switzerland

Correspondence
Antoine Guillaume Schneider, Service de Médecine Intensive Adulte, Centre Hospitalier Universitaire Vaudois, 46, Avenue du Bugnon, 1011 Lausanne, Switzerland.
Email: antoine.schneider@chuv.ch

Abstract

Background: Situation-Background-Assessment-Recommendation (SBAR) is a tool for structuring communication between healthcare professionals. SBAR reduces medical errors, however few studies have evaluated its quality in real practice.

Aims: To describe the quality of SBAR utilization by intensive care unit (ICU) nurses during phone conversations with physicians. To assess the influence of nurses' training, professional experience, and call circumstances on this quality.

Study Design: This observational study was conducted in the adult ICU of a university hospital in French speaking Switzerland. All consecutive telephone calls from nurses to physicians during a calendar month, were recorded. Those related to a change in patients' clinical status were selected and analysed. The quality of SBAR utilization was assessed using a pre-defined analysis grid. Scores ranged from 0 (worst quality) to 100% (best quality). Nurses' sociodemographics and training record were collected. Multiple regression was used to assess determinants of SBAR quality including nurses characteristics and level of training.

Results: We analysed 290 phone calls, made by 99 nurses. The median SBAR quality score was 41% (interquartile range [IQR] 33–48). Quality scores varied across the four items of SBAR: Situation 88% (81–94), Background 17% (6–27), Assessment 17% (0–33), and Recommendation 33% (17–40). Factors independently associated with higher SBAR quality were age (−0.66%, $p = .002$, 95% CI [−1.07; −0.25]), primary language other than French (−8.40%, $p = .017$, 95% CI [−15.29; −1.51]), lack of ICU expertise (−9.25%, $p = .013$, 95% CI [−16.5;1–1.99]), and SBAR training in pre-graduate nursing education (+11.53%, $p = .028$, 95% CI [1.27; 22.79]).

Conclusions: The quality of SBAR utilization remains low in ICU clinical practice. Pre- and post-graduate training seem to improve its quality.

Relevance to Clinical Practice: Pre-graduate mandatory training associated with multiple repetitions could improve nurses' SBAR utilization. Training using the SBAR tool should be combined with the development of nursing skills in assessment and clinical judgment.

KEYWORDS
communication, critical care, Situation-Background-Assessment-Recommendation, TeamSTEPPS, telephone calls

1 | INTRODUCTION

Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS®) is an evidence-based framework aiming to optimize team performance across healthcare delivery services.[1] TeamSTEPPS® includes several tools designed to improve communication quality. Among those, Situation-Background-Assessment-Recommendation (SBAR) is particularly suited for structuring communication in a standardized way between healthcare professionals, which is crucial in critical care. SBAR has been introduced in various healthcare areas with the aim of increasing patients' safety.[1-3] It helps healthcare providers to deliver structured and targeted information during team communication, patient hand-over, and nurse–physician telephone communication.[4] A systematic review found moderate evidence for improved patient safety through SBAR implementation, especially when used to structure communication over the phone.[2] In anaesthesia[5] and intensive care units (ICUs), SBAR utilization has been demonstrated to reduce medical errors leading to a decrease in mortality and hospital length of stay.[2,6]

Supported by these data, SBAR is progressively being implemented in ICU throughout the world.[2] For adequate use of the SBAR tool, specific training is required.[7-10] Among the training methods that have been tested, simulation and e-learning appear to be the most effective on SBAR quality.[11-14] However, to the best of our knowledge, few studies have evaluated the quality of SBAR utilization in a real life setting.

Our institution introduced the TeamSTEPPS® communication tools to improve intra- and interprofessional communication and consequently patient's safety in 2019. An institutional e-learning system has been set to promote learning. In addition, interprofessional simulation sessions held on a monthly basis, include SBAR utilization among their learning objectives.

We have conducted a study aiming at evaluating the quality of SBAR utilization by nurses during calls to the ICU physicians in the real life setting. In addition, we sought to assess the influence of different types of training (e-learning, traditional lectures, and simulation) on SBAR quality.

What is known about the topic

- SBAR helps healthcare providers to deliver structured and targeted information during team communication, patient hand-over, and nurse-physician telephone communication.
- SBAR utilization has been demonstrated to reduce medical errors leading to a decrease in mortality and hospital length of stay.
- Adequate use of the SBAR tool requires specific training. Among the training methods that have been tested, simulation and e-learning appear to be the most effective.

What this paper adds

- One year after the implementation of SBAR in the ICU of a university-affiliated hospital, the overall utilization of SBAR during nurse–physician communication remains low.
- Specifically, among the four components of the SBAR tool, only the 'situation' component was frequently utilized.
- Nurses with specific SBAR training during their pre-graduate training appeared to have a better utilization of the tool.
- E-learning and simulation should be tailored to participants' daily practice, needs and environment.

2 | METHODS

2.1 | Study design and setting

This observational study was conducted in the adult ICU of a University Hospital located in the French speaking part of Switzerland. This is a 35-bed ICU with approximately 2000 admissions per year. Between the 1st and the 30 September 2019, all telephone calls received by junior ICU physicians were recorded. Those arising from the unit's nurses were identified and analysed. For each of these recordings, the quality of SBAR use was evaluated using a predetermined analysis grid. The current work is reported according to the SQUIRE 2.0 guidelines.[15]

2.2 | Context

Given our ICU's structural layout (five sub-units and separate physician's office) and since junior physicians are occasionally required to intervene in other parts of the hospital (patients' evaluation, transportation to radiology department, etc.), a significant part of nurse-physician communication takes place over the phone particularly in case of emergency situations.

2.3 | SBAR training

An e-learning training programme has been proposed in early 2019 to ICU nurses and physicians. This e-learning programme, lasting about 2 h, allowed the learning of the TeamSTEPPS® communication tools and among others the SBAR. On interprofessional simulation training, the use of the SBAR was trained in the different scenarios proposed to the participants. Every nurse has to participate in an interprofessional simulation day per year. In addition, traditional lectures were delivered.

2.4 | Ethical considerations

According to Swiss law, this project was considered as a quality improvement project. It was, thus, reviewed by our institutional Medical Direction and legal department and approved on 18 July 2019. Informed signed consent was obtained from all nurses and physicians meeting eligibility criteria prior to the initiation of the study. In addition, a pre-recorded reminder that the conversation was going to be recorded was given at the beginning of each telephone communication. All data were stored in coded form within an Excel® spreadsheet.

2.5 | Nurse participants' socio-demographic and training characteristics

All 192 registered nurses working in our institution's ICU during the study period were eligible to participate in the study. Nursing students were not considered. Socio-demographic data (age, first language, nationality, years of professional experience, critical care expertise, and employment status) as well as SBAR-related training (e-learning, courses, and simulation) were collected at the time informed consent was obtained. Only those who participated in at least one phone call to an eligible telephone number during the study period were included in the analyses.

2.6 | Calls recording and selection

Since, as per our institution policy, nurses are required to call junior physicians first, we have only considered calls emitted toward these doctor's telephone numbers. Each junior physician carries a personal telephone plus occasionally an 'on-call' telephone. Hence, all conversations directed towards 21 telephone numbers (19 personal and 2 on-call) were recorded during the study period. Recordings were carried out by the telephone operator and sent, in encrypted form, to a member of the research team on a 24 h basis. All data were kept in encrypted form in an institution's password secured computer.

To be included in the study, the call had to be initiated by a nurse on duty and related to a change in a patient's clinical status. All calls related to other matters (e.g. patient's transport, family-related issues, administrative issues, etc.) were excluded.

2.7 | Degree of emergency of the situation

The situation presented in the call was considered as 'life-threatening' if one of the following criteria was met: severe hypoxaemia (pulse oxygen saturation of 84% or less), severe hypotension (mean blood pressure <55 mmHg), or accidental extubation. All other situations were considered as 'non-life-threatening'.

2.8 | Outcome measures

2.8.1 | Quality of SBAR utilization

A grid to analyse the quality of SBAR utilization in each call was developed according to the recommendations of the Institute for Healthcare Improvement[1] (Appendix S1). It included the four sections of SBAR and each item was evaluated using a nominal 3-points scale (1 = present and adequate, 0.5 = present but incomplete, and 0 = absent). To normalize for the different number of items between the SBAR sections, we computed, for each section, an indexed score (total score/maximum score in section × 100). Thus, quality assessment ranged from 0% (worst quality) to 100% (best quality).

In addition to the quality of each section of the SBAR, we have assessed the structure of the tool utilization. The structure was considered adequate if the elements were presented in the proposed order (Situation, Background, Assessment, and Recommendation).

2.9 | Data analyses

All calls were analysed by a single investigator (ES) using the evaluation grid described earlier. In addition, inter-rater reliability of the SBAR quality assessments, using a random sample of the calls (20%) evaluated by another blinded researcher (LS), was assessed with the interclass correlation absolute agreement test.[16] Based on the 59 calls analysed by two investigators, intraclass correlation was 0.86 (p < .001, 95% CI [0.73; 0.92]). An ICC > 0.80 is indicative of a low risk of measurement bias.

Continuous variables were assessed for normality using Saphiro–Wilk test. Normally distributed continuous variables are reported as mean and standard deviation and compared with Student's t-test while non-normally distributed variables are reported as median and interquartile range (IQR). In case of repeated calls by the same nurse, to avoid repetition bias and ascertain data independence, the mean value of scores obtained by a single nurse was computed. Multiple linear regression was conducted to determine the influence of socio-demographic characteristics on SBAR quality. Variables entered in the model were: age, nationality, primary language, critical care expertise, years of professional, and in-service experience. Finally, to assess for

the specific effect of training methods (e-learning, conventional lecture, SBAR in pre-graduate nurse education, and interprofessional simulation) on the SBAR quality, we performed logistic regression models testing each teaching modality as well as variables identified to be determinants of SBAR quality. All analyses were conducted using STATA® V.15 (Stata corp., college Station, TX, USA). *p* values less than .05 were considered statistically significant.

TABLE 1 Nurses characteristic and education and telephone calls characteristic

Nurses' characteristics ($n = 99$)	
Mean age, years (SD)	35.4 (6.5)
Mean professional experience, years (SD)	11.2 (6.4)
Mean ICU experience, years (SD)	6.2 (5.2)
Employment type, *n* (%)	
Full time (100%)	54 (54.5)
Part time (80%–90%)	17 (17.2)
Part time (50%–70%)	28 (28.3)
Country of origin, *n* (%)	
Switzerland	38 (38.4)
France	43 (43.4)
Others	18 (18.2)
French as primary language, *n* (%)	86 (86.9)
Critical care specialization, *n*[a] (%)	
Nurse with critical care nurse specialization	65 (65.7)
Nurse undergoing critical care training	18 (18.2)
Nurse with no critical care training	16 (16.1)
Type of nursing degree, *n* (%)	
Bachelor degree	47 (47.5)
French state degree[b]	34 (34.3)
Swiss degree red cross level 2[c]	18 (18.2)
Type of SBAR training	
In pre-graduate education, *n* (%)	6 (6.1)
E-learning, *n* (%)	80 (80.8)
Traditional lectures, *n* (%)	15 (15.2)
Interprofessional simulation, *n* (%)	53 (53.5)
Telephone calls characteristic ($n = 290$)	
Median number of calls per nurses (IQR)	2.0 (0-3)
Calls associated with life-threatening situation, *n* (%)	19 (6.6)
Calls made after hours, *n* (%)	174 (60.0)

Note: The situation presented in the call was considered to be 'life-threatening' if one of the following criteria was met: severe hypoxemia (pulse oxygen saturation of 84% or less), severe hypotension (mean blood pressure <55 mmHg), or accidental extubation. All other situations were considered as 'non-life-threatening'.

[a]All nurses are registered.

[b]In France, nursing education has become a Bachelor's degree in 2009, French state degree corresponds to nursing education before 2009.

[c]In Switzerland, nursing education has become a Bachelor's degree in 2007, Swiss degree red cross level 2 corresponds to nursing education before 2007.

3 | RESULTS

3.1 | Calls and nurses

During the study period, 99 nurses (51.6% of all nurses working in the ICU) made at least one eligible phone call to one of the 21 junior physicians numbers and were included in the study. Their characteristics are presented in Table 1. Briefly, 65 (65%) had specific ICU training, 6 (6%) had received specific SBAR training during their pre-graduate training, while 80 (80%) had enrolled in a specific e-learning course.

A total of 3205 calls were recorded. Of those, 2594 (81%) were not from ICU nurses, 305 (10%) were not related to a change in patient's condition, and 16 (0.5%) were terminated early by the physician. Hence, 290 (9%) telephone calls were included in the study and analysed. Of those, 174 (60%) occurred during after-hours shifts and 271 (93.4%) dealt with non-life threatening issues. The median number of calls per nurse was 2.0 (interquartile range 0–3) (Table 1). Of note, recordings of two on-call numbers had to be interrupted after 3 weeks due to technical issues.

3.2 | SBAR quality score and structure

The SBAR overall quality median score was 41% (IQR 33–48). Quality scores across the four SBAR sections are presented in Figure 1. It was 88% (IQR 81–94) for the 'Situation' section, 17% (IQR 6–27) for the 'Background' section, 17% (IQR 0–33) for the 'Assessment' section, and 33% (IQR 17–40) for the 'Recommendation' section.

The full SBAR structure was followed in 93 (32%) of calls.

3.3 | Influence of call circumstances

The mean SBAR quality was higher in calls made during after-hours shifts compared with those made during the day (43% SD [13.9]

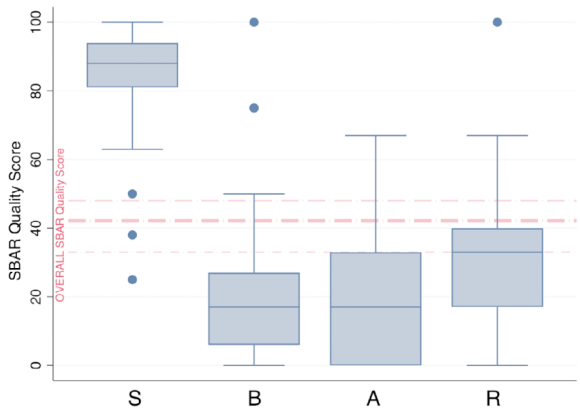

FIGURE 1 SBAR quality score use according to the different sections. Displayed values are median quality score by SBAR section. Dotted lines are median score and Q1;Q3. S, situation; B, background; A. appreciation; R, recommendation. Red line represents overall SBAR median Score (41) and Q1;Q3

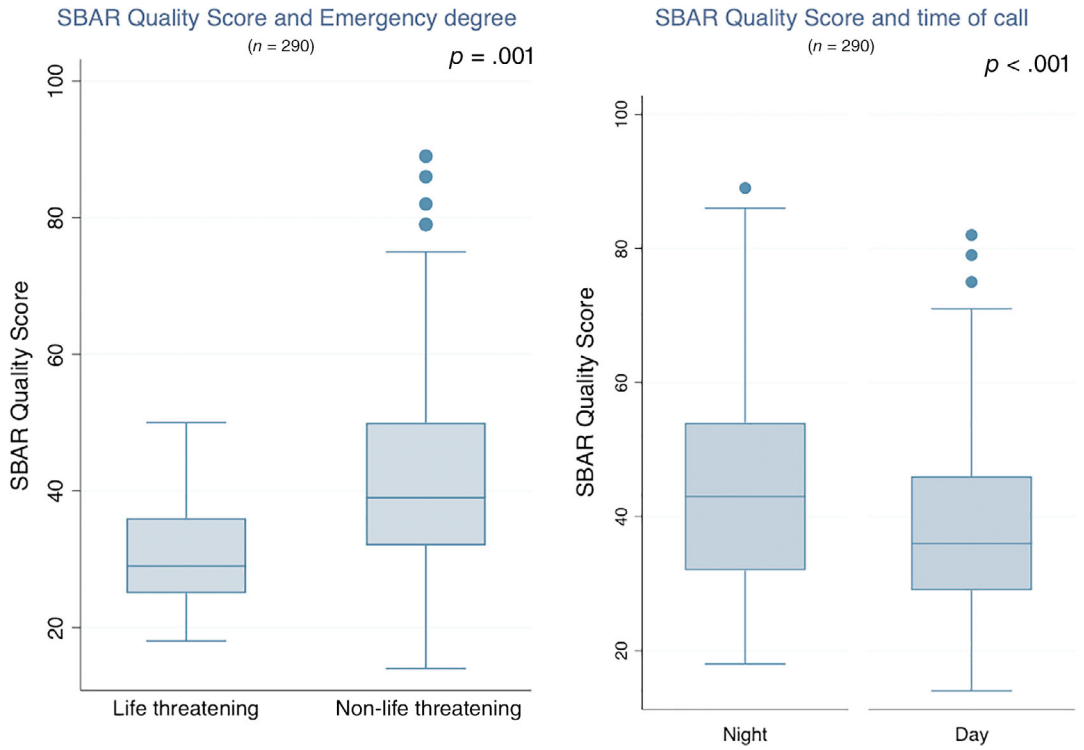

FIGURE 2 SBAR quality score according to call circumstances. Values are mean SBAR quality score according to emergency degree (left panel) or time of the call (right panel). Comparison made using Student's *t*-test. Emergency degree: $t = -3.35$, time of the call: $t = 2.69$

TABLE 2 Socio-demographic determinants of the SBAR quality score and Specific effect of training methods on the SBAR quality

Variable	Coefficient	*p*	[95% conf interval]
Age	−0.66	.002	−1.07; −0.25
Primary language	−8.40	.017	−15.29; −1.51
Critical care specialization			
Critical care nurse specialist (reference)			
Critical care nurse in training	−7.96	.057	−16.2; 0.25
Nurse with no critical care training	−9.25	.013	−16.51; −1.99
Work percentage			
100% (reference)			
80%–90%	−0.96	.779	−7.74; 5.82
50%–70%	7.96	.036	0.53; 15.39
Specific effect of training methods on the SBAR quality			
E-learning	0.73	.81	−5.25; 6.71
Conventional lecture on SBAR	−3.04	.59	−14.08; 8.01
SBAR training in pre-registration nursing education	11.53	.03	1.27; 22.79
Interprofessional simulation	−4.22	.26	−11.55; 3.11

Note: Multiple linear regression to determine the Influence of nurses' characteristics and their training on the SBAR quality score. R-squared: 0.184, F-test: 3.47, number of obs: 99, Prob > F: 0.004. Variable description: Primary language not French. Logistical regression to assess the impact of each training method. Final models included age, primary language, critical care specialization and work percentage.
Models descriptions:
E-learning: R-Squared: 0.185, F-test: 2.95, number of obs: 99, Prob > F: 0.008.
Conventional lecture: R-Squared: 0.187, F-test: 2.99, number of obs: 99, Prob > F: 0.007.
SBAR training in pre-grade nursing education: R-Squared: 0.227, F-test: 3.81, number of obs: 99, Prob > F: 0.001.
Interprofessional simulation: R-Squared: 0.200, F-test: 3.17, number of obs: 99, Prob > F: 0.005.

vs. 39% [SD 13.2], $p < .001$, t-test = 2.69). Similarly, as illustrated in Figure 2, it was higher in calls referring to non-life-threatening issues compared to those referring to life threatening issues (42% [SD 13.8] vs. 31% [SD 8.3], $p = .001$, $t = -3.35$).

3.4 | Socio-demographics determinants of SBAR quality

As detailed in Table 2, age and critical care expertise of the nurses were associated with SBAR quality. It was higher in younger nurses (−0.66% per year of age, $p = .002$, 95% CI [−1.07; −0.25]) and those working part time (+ 7.96%, $p = .036$, 95% CI [0.53; 15.39]). It was lower in nurses whose primary language was not French (− 8.40%, $p = .017$, 95% CI [−15.29; −1.51] and those who were not critical care nurse expert (− 9.25%, $p = .013$, 95% CI [−16.51; −1.99]). We considered as critical care expert nurse any nurse who followed the specific post graduate training (2 years) in our institution. All other nurses were considered as non-expert.

3.5 | Specific effect of training methods on the SBAR quality

As shown in Table 2, after correction for age, primary language, critical care expertise, and work percentage, SBAR training in pre-graduate nursing education was significantly associated with higher SBAR quality (+11.53%, $p = .03$, 95% CI [1.27; 22.79]) but e-learning ($p = .81$), simulation ($p = .26$), and conventional lecture SBAR tool ($p = .59$) were not.

4 | DISCUSSION

This observational study is, to the best of our knowledge, the first to evaluate the quality of SBAR utilization in real life nurse-physician communication. Using a pre-defined grid, we found that, during nurse-initiated calls, the quality of the SBAR utilization to communicate about patient clinical status changes was poor. We found that SBAR quality was influenced by nurses' age and ICU expertise. Finally, we found that teaching at the pre-graduate level was associated with higher quality score while e-learning, simulation, and traditional lectures were not.

4.1 | Comparison with previous studies

The importance of communication tools in ICU and their association with adverse events has already been established.[17,18] Adequate use of communication tools might decrease the number of adverse events.[2]

Our real life data confirm observations made in a simulation centre at the University of Texas Health Science (USA),[19] in which the authors also observed that the 'situation' section was generally well utilized while the other three sections were not in after-hours nurse-physician phone communication. Similarly and unsurprisingly, they observed a low compliance in the utilization of the different SBAR components and the way communication is structured (correct in only 32% of the cases). The order of the SBAR components is indeed important, because it structures the information to be provided in a logical manner and promotes efficient information processing. Unstructured SBAR might considerably decrease its relevance.

The observed lack of effect of e-learning, simulation, or coaching to improve SBAR utilization quality is however surprising. Indeed, several other studies have suggested that such methods were associated with a better SBAR utilization.[8,11,12] These studies were conducted in different countries and hospital services: neonatal unit in Cape Town (South Africa),[8] University hospital in the northeast United States,[11] and in a teaching hospital in Iran.[12] The lack of efficacy of e-learning in our study might be explained by two elements. First, it was often completed during shifts. Hence, nurses were likely to be frequently interrupted. These suboptimal conditions might have affected learning abilities. Second, our institution's e-learning tool was not specifically tailored for ICU use, potentially limiting its direct applicability for nurses. Similarly, interprofessional simulation have numerous training objectives and SBAR is only one of them. In addition, nurses were only offered to participate to one simulation session per year. Perhaps, more focused and frequent simulations sessions would have generated different results.[20]

4.2 | Strengths and limitations

This study has a number of strengths. First, the use of telephone call recording allowed direct observation of SBAR use in real life practice. It avoided numerous biases associated with evaluation in simulation room or by direct observation. Second, all consecutive calls during the study period were included. This limited selection bias and permitted the researchers to obtain a relatively large number of observations in a short period of time. Third, we used an objective and reproducible evaluation grid as confirmed by the good inter observer agreement. Fourth, we carried out a general (total score) and detailed (section by section) analysis of the SBAR utilization. This appears fundamental to better define areas for improvement. Fifth, nearly 100 nurses (about 50% of nurses in the ICU) participated in the study, which can be considered as a large and representative sample. Finally, our study design enabled the evaluation of several variables on the quality of SBAR.

On the other hand, our study also has several limitations worth discussing. Only calls directed to junior physicians were included because according to our institution guidelines nurses call junior physicians first and the majority of their calls are directed to them. Another factor of attrition was the discontinuation of the recording of two on-call numbers due to logistical problems. Nevertheless, only 2 out of the 21 numbers were affected and this had a minimal effect of the number of calls missed. Finally, we did not use a validated evaluation grid, since such tool does not exist. To ascertain the validity of

our grid, however, a subsample was evaluated by a second investigator, blinded to the first investigator's results and inter-observer agreement appeared satisfactory.

4.3 | Implications for practice and research

Our study shows that, despite important institutional effort (e-learning, specific post graduate, and conventional teaching), SBAR utilization remained low 10 months after its implementation. Early implementation of such teaching might be needed to improve communication skills using SBAR. Indeed, it appears logical that early mandatory training associated with multiple repetitions would improve nurses' SBAR utilization. Training using the SBAR tool should be combined with the development of nursing skills in assessment and sound clinical judgment.[21]

Although our data did not show an effect of e-learning and simulation on SBAR quality, other studies have established their effectiveness.[8,11,12,22,23] Our data suggest that inadequate e-learning or simulation sessions are not effective. E-learning should be tailored to participants' daily practice, needs, and environment. Similarly, simulation sessions, should be used as a complement, to enable rehearsal, repetition, and feedback. In addition, in order to improve interprofessional communication, SBAR teaching should probably not be restricted to nurses but to all healthcare professional.

Altogether, programs should be integrated into a broader cultural change. Indeed, beyond the potential improvement of teaching material, our study findings underlines the need for a change in nursing culture and posture. The SBAR tool must allow a clear organization of the information to be transmitted to the physician. It requires the ability to process complex information and the confidence to express a proposal which requires an active attitude from the nurses.

Future research should attempt to assess whether the combination of SBAR and clinical judgment training can improve the quality of SBAR use. Finally, further studies should attempt to evaluate the impact of SBAR quality on patients centred outcomes.

5 | CONCLUSIONS

In this real life study, the quality of SBAR utilization during nurse-initiated calls to junior physician was low. This quality appeared to be higher in nurses who had received SBAR training during their pre-graduate education. The effect of e-learning and simulation was limited. Further studies should evaluate the potential impact of inadequate SBAR utilization and patients' outcomes.

AUTHOR CONTRIBUTIONS

Conceptualization, methodology, validation, resources, investigation, visualization, formal analysis, data curation, writing – review and editing, software: Emil Scolari. *Validation, resources*: Leda Soncini. *Conceptualization, methodology, validation, writing – review and editing, visualization, supervision*: Anne-Sylvie Ramelet. *Project administration, supervision, conceptualization, methodology, validation, writing – review and editing, visualization*: Antoine Guillaume Schneider.

ETHICS STATEMENT

According to Swiss law, this project was considered as a quality project. It was, thus, reviewed by our institutional Medical Direction and legal department and approved on 18 July 2019.

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ORCID

Emil Scolari https://orcid.org/0000-0002-7910-4309
Anne-Sylvie Ramelet https://orcid.org/0000-0001-8809-2920
Antoine Guillaume Schneider https://orcid.org/0000-0003-0576-7094

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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