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Clinical paper

SBAR improves nurse–physician communication and reduces unexpected death: A pre and post intervention study☆

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ABSTRACT

Background: The Joint Commission International Patient Safety Goal 2 states that effective communication between health care workers needs to improve. The aim of this study was to determine the effect of SBAR (situation, background, assessment, recommendation) on the incidence of serious adverse events (SAE's) in hospital wards.
Method: In 16 hospital wards nurses were trained to use SBAR to communicate with physicians in cases of deteriorating patients. A pre (July 2010 and April 2011) and post (June 2011 and March 2012) intervention study was performed. Patient records were checked for SBAR items up to 48 h before a SAE. A questionnaire was used to measure nurse–physician communication and collaboration.
Results: During 37,239 admissions 207 SAE's occurred and were checked for SBAR items, 425 nurses were questioned. Post intervention all four SBAR elements were notated more frequently in patient records in case of a SAE (from 4% to 35%; $p < 0.001$), total score on the questionnaire increased in nurses (from 58 (range 31–97) to 64 (range 25–97); $p < 0.001$), the number of unplanned intensive care unit (ICU) admissions increased (from 13.1/1000 to 14.8/1000 admissions; relative risk ratio (RRR) = 50%; 95% CI 30–64; $p = 0.001$) and unexpected deaths decreased (from 0.99/1000 to 0.34/1000 admissions; RRR = −227%; 95% CI −793 to −20; NNT 1656; $p < 0.001$). There was no difference in the number of cardiac arrest team calls.
Conclusion: After introducing SBAR we found increased perception of effective communication and collaboration in nurses, an increase in unplanned ICU admissions and a decrease in unexpected deaths.

1. Introduction

The Joint Commission International Patient Safety Goal number 2 (Standard IPSG 2) states that effective communication among health care workers has to improve.[1] According to the Institute of Medicine the six aims in the 21st-century health care system are: safe, effective, patient-centred, timely, efficient and equitable.[2] Many potential barriers have been reported in nurse–physician communication such as lack of structure, hierarchy, language, culture, sex and difference in communication style.[3–5] Nurses tend to be more detailed in their communications whereas physicians use more brief statements.[4] In the context of critical events, nurses and physicians often communicate over the phone which makes these communications error-prone.[6] Up to 65% of serious adverse events (SAEs) include communication as a contributing factor.[7] Root cause analysis of SAEs on wards reveals failure in three domains.[8] First, no observations are made for a prolonged period and/or changes in vital signs are not detected. Second, despite the recording of vital signs, clinical deterioration is not recognized and/or no action is taken. Finally, when deterioration is recognized and assistance sought, medical attention is delayed. This delay in receiving medical attention can originate from sub-optimal nurse–physician communication or collaboration.[8] In answer to these three domains of failure, rapid response systems (RRSs) have been widely introduced although they are not supported by a high level of evidence.[9] It remains uncertain which elements of RRSs contribute most to patient outcome but there is growing awareness that the effect depends on the different components such as the ability to detect and interpret deterioration, to communicate clearly and to start the correct response without delay.[10] By implementing a standard observation protocol incorporating the modified early warning score (MEWS), better and accurate patient observation and

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interpretation of abnormal vital signs was achieved in our hospital.[11] The components "detection" and "interpretation" were improved. It remained unclear whether in cases of patient deterioration the nurse–physician communication was clear and provided the best information to optimize collaboration so physicians could respond without delay. Dr. Michael Leonard, physician-leader at Kaizer Permanente in Denver introduced standardised communication with the SBAR (situation, background, assessment, and recommendation) structure to optimize effective communication.[12,13] By using the SBAR tool nurses could be empowered to formulate a recommendation to a physician. This is only possible after formal assessment of the patient and knowing the situation and the background of the patient. We hypothesized that if nurses are better prepared before calling a physician and by structuring the communication, physicians should be better informed and able to prioritise in their work, give the best orders and take the right actions.

The aim of this study was to determine the effect of standard SBAR communication in deteriorating patients on the perception of effective communication and collaboration between nurses and physicians and on the incidence of SAEs in adult hospital wards.

2. Method

2.1. Design, setting and participants

We investigated SAEs and conducted a questionnaire for nurses pre and post the introduction of SBAR in the Antwerp University Hospital (AUH). AUH is the tertiary referral hospital of the University of Antwerp and has one campus of 573 beds. AUH provides all medical and surgical specialties but has no beds for chronic or psychiatric hospitalization. In the research period there were 244 beds on nine medical wards including a 10-bed cardiac care unit, 205 beds on seven surgical wards including eight beds for medium care and 45 beds on five intensive care units (ICUs). Of the 16 medical and surgical wards nine have one nurse and seven have two nurses during the night shift. A mobile team of two nurses and one nursing aid support these nurses each night shift. The hospital has a physician-led cardiac arrest team 24 h a day, seven days a week. No additional rapid response team is available. The pre intervention period was 10 months between July 2010 and April 2011, and the post intervention period was 10 months between May 2011 and March 2012. To measure perception of effective nurse–physician communication and collaboration, nurses and physicians were asked to respond to the "Communication, Collaboration and Critical Thinking Quality Patient Outcomes Survey Tool" (CCCT Tool) questionnaire by Vazirani et al. pre and post intervention.[14] The participants for this questionnaire were all nurses involved in the direct care for patients on medical and surgical wards. The face validity of the Dutch translation of the CCCT Tool was verified by a staff nurse, one director of nursing and two physicians. Consensus on wording was achieved. The translation was then back-translated into English for validation by an academic qualified expert. The hospital admission and discharge registration system and the hospital registration for emergency calls were used to detect cases of SAEs. This included all patients older than 16 years without do not attempt resuscitation (DNAR) order who stayed for at least one night on a medical or surgical nursing unit during the study period. Patients with a DNAR code were excluded from the study because the outcome indicator "unexpected death" was defined as "death without pre-existing DNAR code".[15] The Ethics Committee of the hospital approved the study (EC Nr 11/43/316) registered in Belgium under number B300201112705. Informed consent for patients was waived as no therapeutic intervention was scheduled or influenced by the trial. Nurses participating in the questionnaire signed for informed consent.

2.2. Intervention

The intervention was the second step in the introduction of the afferent limb of a RRS.[9] The afferent limb of a RRS has the following components: patient observation, measurement of vital signs, patient assessment, recognition of clinical deterioration, call criteria for triggering a response and a policy to communicate with the health care workers of the efferent limb of the RRS. The first step was introduced on 1 November 2009 and consisted of the introduction of a standardised nurse observation protocol including the MEWS and a coloured graphical observation chart.[11] The MEWS includes 6 vital signs: heart rate, respiratory rate, oxygen saturation, consciousness (AVPU = alert, voice, pain, and unresponsive), systolic blood pressure and temperature.[16] This second step focused on better communication, collaboration and critical thinking in cases of clinical emergencies on medical and surgical wards. Nurses were educated and instructed to use the SBAR tool for handover communication between nursing shifts and to use SBAR in cases of deteriorating patients when calling a physician. Physicians were not instructed because the aim of this study was to use SBAR only in the communication of nurses calling physicians. First, for each ward one or two reference nurses received a two-day course in SBAR by discussing the problem of communication-related errors and the need for standard communication in clinical emergencies, explaining the use of SBAR and training in using SBAR by role-play. Second, the other nurses were educated and instructed by the reference nurse of their ward in a 2-h training session. Additionally, a 4-h lesson on early detection, the ABCDE algorithm (airway, breathing, circulation, disability, and exposure), critical thinking and SBAR communication for all nurses was part of the intervention.[17,18] Nurses were instructed to be better prepared before calling for help by taking every step in the early warning process: frequent patient observation and measuring six vital signs at the same time according to the standardised nurse observation protocol, calculation of MEWS, assessing the patient by using the ABCDE algorithm and notating their findings in the patient record according the SBAR structure. No instruction was given about writing down and reading back the verbal orders given by physicians.

2.3. Main outcome measures

2.3.1. The questionnaire

The perception of effective communication was measured by the CCCT Tool.[13] Twelve questions were postulated for nurses about physicians. A 4-point Likert scale was used scoring each question in the same direction: "strongly agree (4 points)", "agree (3 points)", "disagree (2 points)", and "strongly disagree (1 point)". Three dimensions were deducted: collaboration, communication between nurses and physicians and perception of communication.

2.3.2. Cases of a SAE

Patient records with identified SAEs were checked by an investigator for a period of 48 h before the SAE for SBAR items according to the SBAR form of the Kaiser Permanente Centre for Health Research (1) to investigate if nurses prepared their communication according to the SBAR protocol, (2) to analyze the type and frequency of vital signs noted in the patient record. SAE's were defined as: unexpected deaths (=deaths without do not attempt resuscitation code), unplanned admission to an ICU and cardiac arrest team calls.[19,20]

Table 1
Demographics of "Communication, Collaboration and Critical Thinking Quality Patient Outcomes Survey Tool" questionnaire participants.

		Total	Pre intervention period	Post intervention period
Nurses	Number	425	245	180
Gender (male)	%	10.6	9.1	12.9
Age in years	Mean (range)	40.0 (21–64)	40.5 (21–64)	39.51 (21–63)
Medical nursing unit	%	42.9	46.9	37.3*
Surgical nursing unit	%	57.1	53.1	62.7*
Experience in years	Mean (range)	15.4 (0–44)	15.4 (0–44)	15.4 (0–37)
Years in the nursing unit	Mean (range)	12.0 (0–32)	11.3 (0–32)	13.2 (1–32)

p-Values: independent samples *t*-test, Pearsons' chi-square, Mann–Whitney *U*-test not significant.
* Pearsons' chi-square = p < 0.05.

2.4. Statistical analysis

Descriptive analysis of the study population was performed comparing the characteristics of the pre and post intervention population. Independent sample *t*-test, Pearsons' chi-square, Fishers' exact test and Cronbachs alfa were performed. In cases of non-normally distributed continuous variables the non-parametric Mann–Whitney *U*-test was used. The relative risk ratio (RRR) and number needed to treat (NNT = ((1/ARR) × 100)) were calculated. For data analysis we used SPSS®, version 20.0 (IBM, Chicago, IL, USA) and statistical significance was set at $p < 0.05$.[21]

2.4.1. The questionnaire

The total score on the CCCT Tool ranges from 12 to 48. We transformed this to a 0–100 scale by using the formula: ((total score − lowest possible score)/range of total score) × 100 for clarity reasons. Mean values are reported. The three dimensions were: "*collaboration*" (questions 1, 2, 3 and 4), "*overall perception of communication*" (questions 5, 6, 7), "*communication between physicians and nurses*" (questions 8, 9, 10, 11 and 12).

2.4.2. Patient record analysis

Wards were divided according to medical and surgical specialty. Length of stay (LOS) was coded in days. The variable SBAR was scored "1" if all 4 elements of SBAR were found in the patient record and all other possible combinations were scored "0" as not compliant with the SBAR protocol.

3. Results

3.1. The questionnaire

The questionnaire was completed by 425 nurses. Nurses' response rate in the pre intervention period was 72% ($n = 245$) and 53% in the post intervention period ($n = 180$). For questionnaire participants there were no demographic differences between pre and post intervention group (Table 1). The mean age of the respondents was 40 years, they were mainly female (90%) of Belgian nationality (92%) and worked as a nurse for 15 years. Sixty percent of the nurses had a bachelor degree. Nurses' total score on the CCCT Tool increased from 58 (range 31–97; Cronbach's alpha = 0.883) in the pre intervention period to 64 (range 25–97; $p < 0.001$; Cronbach's alpha = 0.843) in the post intervention period. The subscales for nurse–physician communication and for collaboration changed in the same direction (Table 2).

3.2. Patient record analysis

The SBAR items were notated more frequently in patient records from mean 32% in the pre intervention period to 56% ($p < 0.005$) post intervention. Pre intervention only 4% of the SAE's all 4 SBAR elements were notated in the patient records and in the post intervention period this increased to 35% ($p < 0.001$).

3.3. Patient outcome

During the research periods with 210,074 inpatient days and 37,239 admissions there were 207 SAE's of which 81 (4.4/1000 admissions) in the pre intervention period and 126 (6.7/1000 admissions) in the post intervention period. Of the patients with SAE's 35% had a previous ICU episode during the same hospital stay. Compared to the pre intervention period patients with a SAE episode in the post intervention period were younger (from mean 68 to 63 years) and stayed shorter in the hospital (from mean 32 days to 46 days) (Table 3). Patients with SAE episodes were mainly male (54%) and were admitted to medical wards in 73%. In 88% of the SAE's vital signs were found in the patient record up to 8 h prior to the event. The number of unplanned ICU-transfers increased from 51 (13.1/1000 admissions) in the pre intervention period to 105 (14.8/1000 admissions) in the post intervention period (RRR = 50%, 95% CI = 30–64; $p = 0.001$). There was no significant difference in Cardiac Arrest Team calls (Table 3). The number of unexpected deaths decreased from 16 (0.99/1000 admissions) in the pre intervention period to 5 (0.34/1000 admissions) in the post intervention period (RRR = −227%, 95% CI = −793 to −20, NNT 1656; $p < 0.001$).

Table 2
Results of the "Communication, Collaboration and Critical Thinking Quality Patient Outcomes Survey Tool" questionnaire.

	Pre intervention $N = 245$	Post intervention $N = 18$	*p*	Cronbach's alpha[a]
Nurses				
Total score (48[b])	58.6 (31–97)	63.9 (25–97)	<0.001[c]	0.871
Subscales				
Collaboration (16[b])	56.2 (0–100)	62.2 (17–100)	<0.001[c]	0.795
Communication with physician (20[b]	62.9 (20–100)	68.9 (13–100)	<0.001[c]	0.872
Overall perception of communication (12[b])	55.3 (0–89)	58.4 (0–100)	0.042[c]	0.769

[a] Cronbach's alpha for the whole population.
[b] Independent samples *t*-test.
[c] Scores corrected to a 0–100 scale.

Table 3
Demographics of pre and post intervention period population and cases of SAE's.

		Total	Pre intervention period	Post intervention period
Included medical and surgical nursing units				
Admissions	*n*	37,239	18,405	18,834
In-patient days	*n*	210,074	105,694	104,380
Hospital length of stay in days	Mean	5.64	5.74	5.54
Mortality	/1000 admissions	10.45	10.29	10.60
SAE's	*n*	207	81	126[*]
Unexpected death	/1000 admissions	0.66	0.99	0.34[#]
Cardiac arrest team calls	/1000 admissions	3.06	3.15	2.97
Unplanned ICU admissions	/1000 admissions	13.99	13.13	14.85[#]
Severity of illness				
Level 1	%	37.5	37.8	37.2
Level 2	%	42.7	42.9	42.4
Level 3	%	13.7	13.4	14.3
Level 4	%	6.0	6.0	6.1
Risk of mortality				
Level 1	%	65.9	66.7	64.8
Level 2	%	18.0	17.5	18.6
Level 3	%	11.4	11.2	11.7
Level 4	%	4.7	4.6	4.8
In cases of a SAE				
Age	Mean (range)	65.1 (18–92)	68.2 (24–92)	63.1 (18–90)[§]
Gender (male)	%	53.6	53.1	54.0
Hospital length of stay in days	Mean (range)	37.9 (1–212)	46.2 (1–212)	31.7 (2–124)[§]
Hospital length of stay up to SAE in days	Mean (range)	10.5 (0–125)	13.0 (0–125)	8.8 (0–63)
Medical nursing unit	%	72.5	65.4	77.0
Surgical nursing unit	%	27.5	34.6	23.0
Previous ICU admission before SAE	%	35.3	34.6	35.7
Vital signs measurement in the 8 h before SAE	%	88.4	85.2	90.5

[*] Pearsons' chi-square = $p < 0.05$.
[#] Fishers' exact test = $p < 0.05$.
[§] Independent sample t-test = $p < 0.05$.

4. Discussion

To our knowledge, this is the first study to show a significant reduction in unexpected deaths after the introduction of SBAR.[22–34] A systematic review of the literature on nursing handoff communication concluded that negative consequences of inadequate nursing handoffs are well-known but that little research has been done to identify best practices.[35] The current study confirmed the Joint Commission Patient Safety Goal 2 (IPSG 2) statement regarding better effective communication in the context of deteriorating patients.[1] Because AUH is a teaching hospital, it is common that junior doctors and nurses have responsibility over hospital nursing unit patients. When on call, junior doctors need to make decisions about patients unknown to them and in specialties they are less familiar with. To help nurses in the use of SBAR they were educated in critical thinking in order to become more confident in the assessment of a patients' condition and in the formulation of a recommendation for treatment to a doctor. This education could in itself have contributed to the improvement in our study and it is a necessary step in our intervention. It has been shown that nurses sometimes are reluctant to call a doctor because they are uncertain or afraid of "looking stupid".[36] We found that SBAR helped nurses in this respect. Patient records showed that nurses were better prepared before calling a doctor and they scored higher on the perception of communication and collaboration in the post intervention period after the introduction of SBAR. In a previous study we showed that a standardised nurse observation protocol including MEWS after ICU discharge had a positive effect on observation frequency, and yielded an absolute risk reduction for SAE's within 120 h after ICU discharge.[11] In the current study, by introducing SBAR, we improved effective inter-professional communication and collaboration. Additionally this study shows an increase in unplanned ICU transfers and a decrease in unexpected deaths. RRS's aim to shift patient outcome from "unexpected death" over "cardiac arrest" and "unplanned transfer to ICU" to "planned transfer ICU" or "stabilized on the nursing unit".[20] To interpret our results we assume a shift from unexpected deaths to unplanned ICU admissions, because nurses detected patients earlier in the deterioration process and alerted actions of a higher level of care to rescue them. Therefore, patients could be treated on the nursing ward but if necessary they were transferred to an ICU. If this transfer happened in a timely manner it could be called a more predicted and controlled "unplanned ICU admission", if too late it is more a sudden and less controlled "unplanned ICU admission". The aim of this study was not to reduce LOS. However a relatively shorter LOS in the post intervention period may suggest improved care for deteriorating patients. In a recent study Shearer et al. found local informal cultural rules within the clinical environment and intra-professional hierarchies in clinical areas as the main contributing factor for failure to activate the RRS.[37] We believe that by introducing SBAR these factors can be neutralized to prevent failure to activate the RRS. Using SBAR, nurses are better prepared before calling a physician and to formulate a recommendation based on solid assessment. Nurses are more confident in their judgment and have better chances to convince the physician on call about the severity of the situation, that physicians will give orders promptly and that they come and see the patient as required. Our current study contributes to the debate of afferent limb failure. By using SBAR we believe that "lack of appreciation of urgency", "lack of calling for assistance" and "lack of insight into own limitations" can be tackled because better inter-professional communication and collaboration in deteriorating patients is achieved.[38,39]

4.1. Study limitations

The study design had the limitations of similar cohort studies with historical controls, it reflects only a single centre, and we cannot conclude that the effect solely resulted from our intervention. Therefore the results cannot be generalised. No conversations were recorded or analysed to verify if SBAR was really used. There was a drop in nurse survey participation. Doctors were not instructed or educated neither in the use of SBAR nor in critical thinking. This should be the next step for improvement and has to be investigated. In addition, we recommend future studies to clarify the factors that support the shift to more predicted and controlled "unplanned ICU admissions" and the effect on patient outcome.

5. Conclusion

The introduction of SBAR communication in our tertiary university referral hospital increased the perception of effective communication and collaboration in nurses. Nurses were better prepared to call a doctor after the introduction of SBAR by using SBAR items in patient records. The number of unplanned ICU admissions increased in the post intervention period and the number of unexpected deaths decreased. The number of Cardiac Arrest Team calls stayed the same. This means a shift in the direction of earlier detection, trigger and response potentially attributable to SBAR.

Conflict of interest statement

No conflicts of interest to declare.

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