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**Validation of a Modified Early Warning Score-linked Situation-Background-Assessment-Recommendation (SBAR) communication tool: a mixed methods study**

Concise title: Validation of a Situation-Background-Assessment-Recommendation (SBAR) communication tool incorporating early warning scores

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# Validation of a Modified Early Warning Score-linked Situation-Background-Assessment-Recommendation (SBAR) communication tool: a mixed methods study


## Abstract

**Aims and objectives**. The objective of this study was to develop and validate a modified Situation-Background-Assessment-Recommendation communication tool incorporating components of the Cape Town Modified Early Warning Score vital signs chart for reporting early signs of clinical deterioration.

**Background.** Reporting early signs of physiological and clinical deterioration could prevent 'failure to rescue' or unexpected intensive care admission, cardiac arrest or death. A structured communication tool incorporating physiological and clinical parameters allows nurses to provide pertinent information about a deteriorating patient in a logical order.

**Design**. Mixed methods instrument development and validation.

**Methods**: We used a sequential 3-phase method: cognitive interviews, content validation and inter-rater reliability testing to validate a self-designed communication tool. Participants were purposively selected expert nurses and doctors in government sector hospitals in Cape Town.

**Results**. Cognitive interviews with five experts prompted most changes to the communication tool: 15/42 (35.71%) items were modified. Content validation of a revised tool was high by a pre-determined ≥70% of 18 experts: 4/49 (8.2%) items were modified. Inter-rater reliability testing by two nurses indicated substantial to full agreement (Cohen's kappa 0.61-1) on 37/45 (82%) items. The 1 item achieving slight agreement (Cohen's Kappa 0.20) indicated a difference in clinical judgement. The high overall percentage agreement (82%) suggests that the modified items are sound. Overall, 45 items remained on the validated tool.

**Conclusion.** The first Modified Early Warning Score-linked Situation-Background-Assessment-Recommendation communication tool developed in South Africa was found to be valid and reliable in a local context.

**Relevance to clinical practice.** Nurses in South Africa can use the validated tool to provide doctors with pertinent information about a deteriorating patient in a logical order to prevent a serious adverse event. Our findings provide a reference for other African countries to develop and validate communication tools for reporting early signs of clinical deterioration.


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**Keywords:** Situation-Background-Assessment-Recommendation (SBAR), modified early warning score, MEWS, deterioration, failure to rescue, reliability, validity. (MeSH checked on 17 June 2016)

What does this study contribute to the wider global clinical community?

- A standard SBAR communication tool can be modified to incorporate an early warning score system for physiological parameters and clinical parameters for early response to signs of clinical deterioration.
- A modified SBAR communication tool can be validated by cognitive interviewing for face validity, by content indexing and inter-reliability testing.
- Doctors and nurses are end users of a SBAR communication tool therefore transdisciplinary collaboration improves validity and reliability testing of the tool.

## Introduction

Serious adverse events (SAEs) are untoward medical occurrences that result in death, are life-threatening, require hospitalization or prolongation of hospitalization or result in persistent or significant incapacity or a congenital anomaly (ICH 1996 p.7). Unexpected admission to intensive care units (ICU) or cardiac arrest fall within this definition (McGaughey *et al*. 2009). Early recognition of rapid clinical deterioration can make the difference between life and death (Mapp *et al.* 2013). Emergency response teams provide early intervention (Leonard *et al.* 2004) and can be activated by a staff member who is concerned about a patient or feels that something is not right (Klein 2000). Detecting and intervening to prevent SAEs are important criteria for evaluation of nursing care quality (Schmid *et al*. 2007). Expert nurses are able to make meaningful assessments from random bits of patient information and integrate their findings with knowledge of physiology and pathophysiology to guide their nursing actions, preventing 'failure to rescue' (Dracup & Bryan-Brown 2004); however, not all nurses are 'expert'. 'Failure to rescue' is the unexpected loss of life following a complication in hospital (AHRQ 2007) and is used as a patient safety indicator in initiatives to limit such deaths. It is sometimes attributed to infrequent and incomplete monitoring and recording of

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vital signs (Goldhill 2005), misinterpretation of clinical data and delays in reporting or escalating concerns (National Patient Safety Agency (NPSA) 2007).

The focus of this paper is validation of a standardized approach to calling for more skilled assistance for patients requiring review and at risk of SAEs. One such approach is the Situation-Background-Assessment-Recommendation (SBAR) communication tool which, in the present study, is enhanced by incorporation of a locally validated 'track-and-trigger' Modified Early Warning Score (MEWS) system. No such modified tool for adult patients was located in the published literature.

The SBAR communication structure is widely used in the USA and has been adopted by the UK's National Health Service for use by all health professionals as the standard structure for communication, as part of the Innovation and Improvement Initiative (NHS Institute for Innovation and Improvement 2008). Although most SBAR research is from the USA (Ardoin & Broussard 2011), other countries conducting SBAR research include Australia (Clark *et al.* 2009, Cunningham *et al.* 2012, Dawson *et al.* 2013, D' Agincourt-Canning *et al.* 2011, Street *et al.* 2011), Belgium (De Meester *et al.* 2013), Canada (Andreoli *et al.* 2010, Boaro *et al.* 2010, Ilan *et al.* 2012, Kotsakis *et al.* 2014, Velji *et al.* 2007), China (Wang *et al.* 2015), Germany (Flemming & Hübner 2013), UK (Hayes *et al.* 2014, Whittingham & Oldroyd 2014), Iran (Chaharsoughi *et al.* 2014), Sweden (Randmaa *et al.* 2014), the Netherlands (Ludikhuize *et al.* 2011, Poot *et al.* 2014) and South Africa (Raymond & Harrison 2014). However, to our knowledge, SBAR development and validation is rarely reported.

The SBAR communication tool provides a framework for relaying critical information between clinicians with a shared set of expectations (NHS Institute for Innovation and Improvement 2008), usually initiated by a nurse summoning the assistance of a doctor or emergency response team (Leonard *et al*. 2004) to prevent 'failure to rescue'. The SBAR tool comprises the following components allowing for brief descriptions of: the situation (who and where the patient is and the circumstances); the background including the patient's medical history, treatment and events leading up to the episode; an assessment of the situation; and recommendation for review of the patient and interim intervention measures. Components of the SBAR communication technique are described in Table 1.

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Table 1: Components of the SBAR communication technique and related questions

| | |
|---|---|
| **Situation:** | What is going on with the patient? What is the primary problem? |
| **Background**: | What are the clinical facts surrounding the problem? |
| **Assessment:** | What do I think the problem is? |
| **Recommendation:** | What should be done to correct the problem? |

(Leonard *et al.* 2004:86)

## Background

Traditional vital signs charts used in public sector hospitals in Cape Town, South Africa require graphic plotting of values, but do not provide guidelines for a nursing response if a patient's condition deteriorates (Kyriacos *et al.* 2011a). In contrast, Early Warning Score (EWS) Systems and Modified EWS (MEWS) are designed to track early signs of patient deterioration and trigger a response by trained nurses to seek assistance to improve patient safety and prevent unnecessary SAEs (Royal College of Physicians 2012). These systems incorporate physiological parameters, such as respiratory rate and heart rate, recorded in boxes with predefined ranges (Gao *et al*. 2006). Disturbed vital signs are allocated points with weightings with suggested interventions to recheck the patient or summon assistance (Smith *et al*. 2006).

Since publication of the USA Joint Commission's National Patient Safety Goal on handovers (2007), the use of SBAR has been widely reported (Dawson *et al* 2013, Staggers & Blaz 2013). SBARs have been tested in interdisciplinary daily rounds (Cornell *et al*. 2014a, Cornell *et al*. 2014b, Townsend-Gervis *et al.* 2014) and with diverse clinicians (Donahue et al. 2011, Field *et al.* 2011, Randmaa *et al.* 2014). They provide a vehicle for clinicians to communicate clearly and concisely, thereby enhancing professionals' satisfaction with communication (Ardoin & Broussard 2011, Renz *et al*. 2013) and the hospital's safety climate (Ardoin & Broussard 2011, Randmaa *et al.* 2014).

Accordingly, this paper reports on the design and validation of the Cape Town SBAR tool that incorporates physiological and clinical parameters on the revised Cape Town MEWS (Kyriacos *et al.* 2015). The study was undertaken in Cape Town, South Africa.

## Methods

### Ethical Considerations

The study was approved by the University of Cape Town's Human Research Ethics Committee (HREC REF: 900/2014). Principles of the Declaration of Helsinki (WMA 2013) were upheld. Written informed

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consent was obtained from each participant for the cognitive interviews and inter-rater reliability testing after explanations by the first author of the research aim and data collection methods. For determining the CVI of the prototype tool after the first author's explanation, the completed checklist was returned, implying informed consent; all participants returned the completed forms.

**Design**

A mixed methods design was used for development, validation and reliability testing of the prototype Cape Town MEWS-linked SBAR tool (Gabe & Jordan 2014, Grove *et al.* 2013). In research, epistemological and methodological pluralism is aimed at producing more effective research (Johnson & Onwuegbuzie 2004). To identify potential measurement or response error we undertook: cognitive interviews to explore the interpretation of the SBAR tool by future users (nurses and medical doctors), content validity analysis (Lynn 1986, Yaghmale 2003) and inter-rater reliability testing (Gabe & Jordan 2014).

**Participants and data collection**

Participants and the sampling method for the three validation processes are outlined in Table 2.

**Table 2: Summary of sampling methods and participants for validation processes**

| Research activity | Sampling method | Inclusion/exclusion criteria | Participants | Rationale |
|---|---|---|---|---|
| **Establishing cognitive form through cognitive interviewing (CI)** | Purposive sampling | **Inclusion criteria**<br>Doctors and nurses who have self-assessed expertise in adult clinical physiology and/or health sciences research (Kyriacos 2011b).<br>**Exclusion criteria**<br>Doctors or nurses who do not give written informed consent to take part in the study | Three Masters qualified nurses and two medical doctors (one with a PhD) (n=5) | Identify problem areas |
| **Internal validation of questionnaire using index of content validity (CVI) criteria** | Purposive sampling | **Inclusion criteria**<br>Nurses and doctors with self-assessed expert knowledge of adult clinical physiology and/or health sciences research and may have included participants who participated in the cognitive interviews.<br>**Exclusion criteria**<br>Nurses and doctors who do not return the CVI checklist | Five medical doctors, five medical/surgical Registered Professional Nurses (RPN's) and eight surgeons/surgical residents (n=18) | Expert knowledge |
| **Inter-rater reliability testing (IRR)** | Purposive sampling | **Inclusion criteria**<br>Nurses who did not participate in the content validity processes; and who have self-assessed specialist knowledge of adult physiology and experience in working in clinical | Two Registered Professional Nurses (n=2) | Measure agreement amongst raters |

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| Research activity | Sampling method | Inclusion/exclusion criteria | Participants | Rationale |
|---|---|---|---|---|
| | | settings.<br>**Exclusion criteria**<br>Nurses who do not give written informed consent to take part in the study | | |

Participants with appropriate expertise were recruited by purposive sampling from a range of health care facilities in Cape Town.

**Instrument**

**Prototype Cape Town SBAR tool**

The initial prototype SBAR tool (Appendix 1) was structured using the framework of the Magee-Women's Hospital SBAR telephonic checklist (Woodhall *et al.* 2008) to incorporate aspects of the Cape Town MEWS chart (Kyriacos *et al.* 2015) in a logical order.

**Data collection**

**A. Cognitive Interviews (CI)**

To validate the locally developed prototype SBAR tool, four data collection instruments were constructed for the cognitive interviews guided by the published literature: 1) a guide and questionnaire with instructions, 2) scenario, 3) a MEWS vital signs chart populated with clinical data from the scenario and 4) an informed consent form.

**Participants and process**

All those approached agreed to participate. Representatives of future user groups (Table 2) explored the cognitive form of the preliminary modified SBAR tool and its appropriateness, comprehensiveness, and intelligibility (Presser *et al.* 2004). Three nurses and two doctors who enjoyed reputations for erudition in adult clinical physiology and/or health sciences research were approached using purposive sampling (Beatty & Willis 2007). A small sample of cognitive interviews will reveal the most critical problems (Beatty & Willis 2007), although there is no established best practice for how many participants to interview or how many rounds of interviews should be conducted (Beatty & Willis 2007).

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Cognitive interviews were based on 'think aloud' techniques with concurrent impromptu and scripted probes, captured by audio recordings (Willis 2005; Willis & Artino 2013). Probes could be cognitive, such as 'What were you thinking?' or confirmatory as in repeating what a participant said and seeking confirmation or expansive, for example requesting more information (Presser *et al.* 2004).

Participants were asked to state their interpretation of items using the sequence as of the prototype Cape Town SBAR tool, reading each section then interpreting their understanding of each item to reveal thought processes involved in the interpretation of prompts on the tool (Presser *et al*. 2004). Thinking aloud has been found to potentially interfere with the process being reported (Conrad *et al.* 1999). Therefore, the modified Cape Town SBAR communication tool was tested by describing its direct interpretation plus its utility. Participants were provided with a written fictitious scenario along with a MEWS observations chart populated with data pertaining to the scenario. Participants were then asked to transfer the information they deemed relevant from the scenario and populated MEWS chart onto the SBAR tool and to comment on their completed SBAR tool and their experience of the exercise.

**Data analysis**

To make sense of the data from the CIs each section of the prototype SBAR tool was reviewed from audiotape recordings and field notes taken during the interview (Knafl *et al.* 2007, Willis 2005). Descriptive notes were taken, including problems identified and participants' subjective recommendations for corrections (Knafl *et al.* 2007, Willis 2005). Each problem was categorized according to a coding scheme of applicability, wording/tone and clarity (Knafl *et al.* 2007). We systematically compared the summarized data collected across participants (Knafl *et al.* 2007). Quantifiable trends were identified and problematic items were summarized based on the participants' actual statements. Decisions to keep, delete or modify an item were individually considered (Knafl *et al.* 2007).

**Results**

A summary of modifications made to the prototype SBAR tool (Appendix 1) is presented in Table 3.

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**Table 3: Summary of modifications following cognitive interviews (N=5 experts)**

| Items | Modified items [rewording/additions] | Items added | Removed items | Remaining items |
|---|---|---|---|---|
| 42 | 1. Problem called about [Situation]<br>2. Resuscitation status [Situation]<br>3. Admission time added [Background]<br>4. Medical history wording change [Background]<br>5. Medical history additions [Background]<br>6. Current treatment [Background]<br>7. Inspired oxygen OR room air [Assessment]<br>8. Capillary refill time [Assessment]<br>9. Pain scale [Assessment]<br>10. GCS – added AVPU [Assessment]<br>11. Pupils [Assessment]<br>12. Urine output [Assessment]<br>13. Any tests needed [Recommendation]<br>14. Second witness [Recommendation]<br>15. Notification [Recommendation] | 1. Pupils equal [Assessment]<br>2. Pupils dilated [Assessment]<br>3. Pupils reacting to light [Assessment]<br>4. Pedal pulses weak [Assessment]<br>5. Alert [Assessment]<br>6. Alert to voice [Assessment]<br>7. Alert to pain [Assessment]<br>8. Unresponsive [Assessment]<br>9. Lethargic [Assessment]<br>10. Confused [Assessment]<br>11. Agitated [Assessment] | 1. MEWS score [Situation]<br>2. IV Fluids [Assessment]<br>3. Any medication? [Recommendation]<br>4. Urine output [Assessment] | 49 |

Note to table: GCS, Glasgow Coma Scale; AVPU, alert, alert to voice, alert to pain or unresponsive

Data in Table 3 show that 15 (35.7%) of 42 items were modified: 11 items were added and four removed. Most changes were made to the Assessment component of the SBAR tool. Participants recommended changes to the wording that are more appropriate for language used in a South African context. Analysis of the five interviews identified types of problems including applicability, wording, tone or clarity.

For applicability, problems identified by all five participants related to, for example, having to inform a doctor in public sector hospitals of a patient's resuscitation status when there is clinical deterioration:

> Participant 2: "[the wording] '*For resuscitation' is confusing. It is not familiar language*".

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Participants reported that stating a patient's resuscitation status was not current practice in South Africa, but one participant reported that there were future plans to do so therefore the item was retained.

Participants had difficulty with the wording of certain items such as 'pain scale':

> Participant 1: *"What is meant by 'pain scale'? Is there a pain scale or is this asking the patient a Likert type scale on how bad is your pain? Is there a pain scale on the ward?"*
>
> Participant 3: *"'Pain scale' caused confusion. Wanted to use a pain scale from 0-10. This is not a pain scale commonly used. Say what the pain is out of or rather state the severity."*

This item was modified to: 'Pain experienced: No pain ☐ Mild pain ☐ Moderate pain ☐ Severe pain ☐'.

Participants highlighted aspects of the Assessment section of the tool that were not clear to them and that may not be relevant or applicable to a particular patient and may even cause confusion. These items were interpreted as lacking clarity. Examples of comments and suggestions include:

> Participant 1: *"Have a check box for items in assessment that are not applicable saying 'not done'."*
>
> Participant 4: *"This looks like a big long list. Nurses will require training to link up the MEWS with the SBAR."*
>
> Participant 2: *"Not all of these are relevant. I do not easily see your word applicable, maybe make it bolder."*

To enhance clarity the item was modified from 'Provide the following information if applicable' to' ONLY IF APPLICABLE complete and state the following'. Furthermore, the layout was changed and checkboxes were added to increase spaces between items and to decrease the appearance of a 'big long list.'

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**B. Content validity index (CVI) and expert review**

**Content Validity Index (CVI) criterion sheet, participants and process**

All those approached (n=18) agreed to participate. For pragmatic reasons determining the CVI was completed in two rounds. Five physicians, eight surgeons and five nurses with expert knowledge of adult physiology and/or health sciences research (Table 2) participated in content validity testing. A CVI (Lynn 1986, Yaghmale 2003) criterion sheet incorporating instructions and an informed consent form adapted with permission (Gabe & Jordan 2014, Kyriacos 2011a) was constructed around the 49 items remaining on the modified prototype SBAR tool following the cognitive interviews. Items were rated according to relevance from 1 to 4, ranging from 1 = irrelevant to 4 = extremely relevant; 3 = relevant but needing minor alteration and 2 = 'unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant' (Yaghmale 2003). Each item had space for recommendations of items not covered in the SBAR tool (Grove *et al*. 2013).

The CVI checklist was used to determine the perceived relevance, inclusivity and representativeness of the 49 items of the prototype SBAR tool (Gabe & Jordan 2014, Kyriacos 2011a). Each item had a space for recommendations (Grove *et al.* 2013). The CVI checklist with instructions for completion was provided in person and returned in the manner as instructed only if there was a voluntary decision to participate, implying informed consent.

**Data analysis**

The CVI was determined by how many experts rated each item at 3 or 4 (Lynn 1986) using a pre-set proportion of ≥70% agreement (Guttmann *et al.* 2006). Only items that achieved ≥70% agreement by the experts at a rating of 3 or 4 were retained on the modified SBAR tool and items scoring under 70% were discarded.

**Results**

The opinions of 18 experts (Table 2) on the index of content validity of each of the 49 items remaining on the modified prototype SBAR tool following the cognitive interviews are presented in Table 4.

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**Table 4: Summary of modifications following CVI Round One (N=10 experts) and Round Two (N=8 experts)**

| Initial number of items | Modified items | Items added | Removed items | Remaining items |
|---|---|---|---|---|
| **Round One: physicians (n=5) and nurses (n=5)** | | | | |
| 49 | 1. Resuscitation status<br>2. On Oxygen<br>3. Pupils equal<br>4. Pupils reacting to light | 1. Pupils not reacting to light | 1. Pupils pinpoint<br>2. Pupils normal size<br>3. Pupils dilated<br>4. Pedal pulses normal<br>5. GCS* | 45 |
| **Round Two: Surgeons (n=8)** | | | | |
| 45 | 0 | 0 | 0 | 45 |

Note to table: *GCS, Glasgow Coma Scale. The GCS and the Alert/Voice/Pain/Unresponsive (AVPU) system had been retained on the modified SBAR tool following cognitive interviews. For assessing the CVI four participants reported that assessment of level of consciousness using the AVPU system was easier than the GCS and that having both AVPU and GCS on the prototype SBAR tool could create confusion so although this item did not achieve ≥70% agreement, it was considered sufficiently important to make an exception and to remove GCS from the modified SBAR tool.

Data in Table 4 show that items scoring less than 3 or 4 by ≤70% of raters were removed (4/49, 8.2%) leaving 45 items. The final validated MEWS-linked SBAR communication tool is presented in Appendix 2.

### C. Inter-rater reliability (IRR)

#### Data instruments

Twenty-two datasets of realistic but fictitious vital signs' recordings were created (DB) and recorded on 22 different MEWS charts. Five experienced colleagues agreed that the fictitious datasets were not untypical of routine practice. For IRR testing, it was estimated that 22 blank SBAR tools (Appendix 2) completed independently by each rater by transcribing data from the 22 different MEWS charts would be sufficient to detect Cohen's kappa of 0.70 (substantial agreement or better), assuming a null hypothesis (or no relationship) value of 0.00 and 10-90% prevalence with 80% power (Sim & Wright 2005).

#### Participants and process

Participants (Table 2) were purposively selected from nurses with detailed knowledge of physiology and experience of working in acute adult clinical settings. All those approached agreed to participate. Inter-rater reliability testing of the prototype Cape Town SBAR tool measured agreement between two independent raters viewing the same clinical data (Gabe & Jordan 2014, Tooth & Ottenbacher 2004). Raters were blind to each other's recordings on the SBAR tool.

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**Data analysis**

Data were analysed in SPSS for MAC version 22 (SPSS Inc., Chicago, IL, USA). IRR was measured using Cohen's kappa statistic, which calculates agreement beyond that of chance (May *et al*. 2010). Kappa values were classified *a priori* as recommended (Gabe & Jordan 2014, May *et al.* 2010):

0.00-0.20: slight agreement
0.21-0.40: fair agreement
0.41-0.60: moderate agreement
0.61-0.80: substantial agreement
0.81-0.99: almost perfect agreement
1.0: perfect agreement

**Results**

The two nurse respondents were in close or full agreement on 37 of 45 items (82.2%) on the modified tool (Table 5).

**Table 5: Summary of inter-rater reliability (IRR) findings**

| Items: Total 45 | Cohen's kappa | Agreement | Comments<br>Percentage agreement (95% CI) |
|---|---|---|---|
| **Situation: 4 items** | | | |
| 3/4 items | Both variables constant | Full agreement | Unable to calculate Cohen's Kappa. 100% agreement |
| 'Calling from' | -0.05 | Below the level of chance | 91% agreement (CI: 71-99)<br>Range: <0 is less agreement than predicted by chance |
| **Background: 5 Items** | | | |
| 4/5 | Both variables constant | Full or almost full agreement | Unable to calculate Cohen's Kappa. 95-100% agreement: |
| 'This is a change from' | -0.07 | Below the level of chance | 86% agreement (CI: 65-97).<br>Range: <0 is less agreement than predicted by chance |
| **Assessment: 30 Items** | | | |
| 17/30 | Both variables constant | Full or almost full agreement | Unable to calculate Cohen's Kappa.<br>91-100%agreement |
| 5/30 | 1.00 | Perfect agreement | Range: 1.00* |
| 4/30 | 0.81-0.89 | Almost perfect agreement | Range: 0.81-0.99* |
| 4/30 | 0.63-0.79 | Substantial agreement | Range: 0.61-0.80* |
| **Recommendation: 6 Items** | | | |
| 2/6 | 0.09-0.20 | Slight agreement | Range: 0.00-0.20* |
| 4/6 | N/A | N/A | Unable to test, as this item requires a specific clinical judgement |

Data in Table 5 show that two items 'Calling from' (Cohen's Kappa -0.05) and 'this is a change from' (Cohen's Kappa -0.07) in the Situation section, represented 91% (95% CI: 71-99) and 86% (95% CI: 65-97) agreement respectively below the level of chance, indicating that these items are not reliable.

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Deciding whether a doctor should review the patient immediately or within the next 30 minutes in the Recommendation section achieved slight agreement, reflecting differences in clinical judgement about when to call for assistance. IRR testing was not possible for 4/45 items requiring a response from the person being called for assistance. Nevertheless, the high overall ~~percentage~~ agreement (82.2%; 37 of 45 items) suggests that the items were reliable.

**Discussion**

To our knowledge, this is the first report of the development and validation of a structured SBAR tool that includes components of a MEWS vital signs chart for nurses summoning skilled assistance. The multiple methods: cognitive interviews, CVI and inter-rater reliability use qualitative and quantitative data collection methods, complementing each other. Input from experts in the field provided valuable interpretation of the SBAR tool in the early stages of instrument development and improved the content validity and the reliability of the tool by suggesting modifications and highlighting potential additional problem areas.

The SBAR is appropriate for use by paraprofessional staff such as nurse aides (Donahue *et al.* 2010) and has been tested successfully in neonatal care in South Africa (Raymond & Harrison 2014). Using a MEWS observations chart plus a SBAR tool, nurses might be better able to rescue deteriorating patients (Ludikhuize *et al.* 2011). The addition of an early detection algorithm also reduces patient unexpected deaths as demonstrated in a tertiary teaching hospital (De Meester *et al.* 2013) where record review analysis showed an increase in unplanned Intensive Care admissions and a decrease in unexpected deaths.

Although there are many published developed or adapted SBAR tools, few have undergone rigorous validation. Mitchell *et al.* (2012) developed three versions of a SBAR tool but focused on internal consistency, using Cronbach's alpha (α 0.977). For the Cape Town SBAR validation, inter-rater reliability with Cohen's kappa gave a direct comparison between two raters, giving perfect agreement (1) for the majority of items. Initially inter-rater reliability in a study by Adams and Osborne McKenzie (2012) was low (45%) but later achieved 100% with 20 nurses. Whereas these researchers used seven nurses to determine content validity, our study involved 18 clinicians (nurses, physicians and surgeons) to determine content validity.

Velji *et al*. (2007) adapted a SBAR tool through a series of focus group interviews including former patients, families and staff. The Cape Town SBAR included adaptations to the tool based on input from participants with the majority of the adaptations occurring after cognitive interviews (15/42 modifications, 11 items were added and three removed). As in a study by Field *et al.* (2011) where a

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SBAR tool was modified for use in a warfarin protocol, this study modified a SBAR tool by incorporating components of a MEWS vital signs' chart.

Despite training, the SBAR is often not used (Ludikhuize *et al.* 2011) or is used incorrectly (Ilan *et al*. 2012, Joffe *et al*. 2013), particularly by nursing students (Cunningham *et al*. 2012, Lancaster *et al.* 2015). Potentially problematic reporting could occur outside the 9-5 working day. Primary physicians are often not available for their patients after hours and the sign out to the on-call provider, who knows little about the patient, may have been brief (Joffe *et al*. 2013). Suboptimal handover between physicians can result in serious adverse events (Ilan *et al*. 2012) which may not be ameliorated by use of an SBAR tool (Joffe *et al*. 2013). Joffe *et al.* (2013) assessed problem-specific SBAR tools for nurses to use when calling a doctor after hours. Their study demonstrated that nurses often omit important information when speaking to a doctor after hours and that an SBAR tool did not necessarily ensure accurate communication. By incorporating early warning scores into a SBAR tool for reporting early signs of deterioration, it is anticipated that nurses are more likely to summon early intervention and more successfully than if they had used the standard SBAR tool.

Studies (Beckett & Kipnis 2009, Donahue *et al.* 2011) describe a perceived improvement in patient safety using the SBAR communication tool. The SBAR tool reportedly enhances nurse and doctor satisfaction with nurse to doctor communication (Renz *et al.* 2013). Communication in general seems to improve reporting of errors (Ardoin & Broussard 2011, Haig *et al.* 2006, Randmaa *et al*. 2014). Few studies have evaluated actual patient outcomes associated with the use of SBAR for early reporting of patient deterioration and preventing unexpected deaths (De Meester *et al*. 2013, Ludikhuize *et al.* 2011). Introduction of the SBAR led to a reduction in sentinel events from 89.9 per 1000 (8.99%) patient days to 39.96 per 1000 (3.99%) patient days a year.

Ludikhuize *et al.* (2011) found that nurses trained to use the MEWS and SBAR tools in a simulated environment in an academic hospital in the Netherlands tended to perform an immediate patient assessment (77%) versus non-trained nurses (58%; P=0.056). Respiratory rate, the most sensitive indicator of acute deterioration (Subbe *et al*. 2003) was measured twice as often by the trained group (trained nurses 53%/non-trained nurses 25%, p=0.025). Physician reporting was also increased in the trained group (trained nurses 67%/non-trained nurses 43%) but disappointingly the SBAR was only used once. This was a single centre study and there was no real life patient for nurses to visualize (Ludikhuize *et al.* 2011).

De Meester *et al*. (2013) demonstrated that using the SBAR not only improved communication between nurses and physicians but also reduced patient unexpected deaths in a tertiary teaching

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hospital. Nurses received SBAR training including role-play and training in an early detection algorithm to assess airway, breathing, circulation, disability and exposure (ABCDE). Nurses were encouraged to use the MEWS vital signs chart, the ABCDE to perform a patient assessment and to complete SBAR documentation prior to calling for assistance. Results demonstrated perception of improved nurse-physician communication as well as better nurse preparation before calling for assistance. Record review analysis showed an increase in unplanned Intensive Care admissions (from13.1/1000 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).

**Limitations**

The scale of this study was limited by available resources, but is typical of similar nurse-led instrument development studies. Data reliability depended on participants' clinical knowledge and expertise, their co-operation and veracity. Due to restricted resources and ethical considerations, the modified SBAR tool was not tested or evaluated in a true clinical setting. Instead, testing was performed seeking expert opinion and using hypothetical patient scenarios. The examples used were representative of other work in Cape Town (Kyriacos *et al*. 2014a, b, 2015). The utility of the tool in environments beyond medical and surgical wards is not assessed.

There was potential for sampling bias as participants were purposively selected. However, none of the purposively selected participants refused to participate thereby reducing the potential for volunteer bias (Jordan *et al*. 2013, Toerien *et al*. 2009). Volunteer participants had more experience and expertise than the general workforce. Acknowledged experienced experts were recruited, which may affect the generalizability of the findings. Field-testing with less expert practitioners and real patients is needed.

From single site research in one city, we cannot assume that participants are representative of other populations. Findings cannot necessarily be generalized to settings where the prevalence of the conditions under consideration may differ. We cannot assume that respondents and response patterns are representative of other populations (Jordan *et al*. 2013).

Responses to fieldworkers may have been vulnerable to social desirability response biases, as participants constructed their answers around their preferred self-presentation images (Fowler & Cosenza 2008). All researchers viewed the data to reduce entrapment by prior expectation

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(Rosenthal & Jacobson 1963). The Hawthorne effect (Roethlisberger & Dickson 1939) may have been minimized in cognitive interviews and CVI's by explaining to participants that the purpose of these studies was not to test knowledge but to identify problem areas in the modified SBAR tool and suggestions for improvement were encouraged.

Further research is required to test the effectiveness of the modified SBAR when used in educational interventions for nurses, particularly to determine whether the modified SBAR is appropriate for all levels of nurses and nursing students (Kotsakis *et al*. 2014, Ozekcin *et al*. 2015, Wang *et al*. 2015).

Further research will be required to fully test the clinical effectiveness of the linked SBAR, its impact on accuracy of nurse-doctor communication, the safety climate (Ardoin & Broussard 2011, Randmaa *et al*. 2014), and patient outcomes (De Meester *et al*. 2013). In addition, research is required to evaluate the limitations of this tool in a clinical setting, such as if its use is negatively affected by factors such as distractions while calling for skilled assistance (Poot *et al*. 2014). Studies evaluating the MEWS-linked SBAR's performance in early reporting of patients showing signs of deterioration are needed to fully comprehend the value of this structured communication tool and its effect on patient outcomes.

**Conclusion**

A Situation-Background-Assessment-Recommendation (SBAR) communication tool modified by incorporating components of a revised Modified Early Warning Score (MEWS) vital signs chart was found to have a high content validity and inter-rater reliability. Cognitive interviews (CIs) enhanced the validity of the tool as problem areas were identified and corrected. The tool now needs field testing. It is limited by the requirement for simultaneous use of the MEWS vital signs observations chart. It is hoped that with the use of this structured communication tool in conjunction with the revised MEWS, there will be earlier reporting of signs of clinical or physiological deterioration and a decrease in failure to rescue, sudden adverse events, including cardiac arrest or death.

**Relevance to clinical practice**

In addition to improving the accuracy of communication amongst clinicians the MEWS-linked SBAR tool provides a potential safety checklist by requiring a nurse to gather pertinent information (Randmaa *et al*. 2014). The MEWS vital signs chart is not a substitute for clinical judgement. Accordingly, the Cape Town MEWS observations chart (Kyriacos 2011b) incorporated in the modified SBAR tool includes clinical parameters that require clinical judgement. Our findings provide a

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reference for other African countries to develop and validate communication tools for reporting early signs of clinical deterioration.

**Contributions**

Conception, study design, data analysis and data interpretation: DB; Supervision, data analysis, data interpretation, critical review of manuscript: UK, SJ.

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**Conflict of interest**

All authors declare that have no conflict of interest.

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**References**

Adams JM & Osborne-McKenzie T (2012) Advancing the evidence base for a standardized provider handover structure: using staff nurse descriptions of information needed to deliver competent care. *Journal of Continuing Education in Nursing*. 43(Suppl 6), 261-266.

Agency for Healthcare Research and Quality. 2007. Guide to Patient Safety Indicators version 3.1. Rockville, MD. Available at: http://www.qualityindicators.ahrq.gov/Downloads/Software/SAS/V31/psi_sas_documentation_v31.pdf. [2016, April 06].

Andreoli A, Fancott C, Velji K, Baker GR, Solway S, Aimone E & Tardif G (2010) Using SBAR to communicate falls risk and management in inter-professional rehabilitation teams. *Healthcare Quarterly* (Toronto, Ont.). 13, 94-101.

Ardoin KB & Broussard L (2011) Implementing handoff communication. *Journal for Nurses in Staff Development: JNSD: Official Journal of the National Nursing Staff Development Organization*. 27(Suppl 3), 128–35.

This article is protected by copyright. All rights reserved.

Accepted Article

Beatty PC & Willis GB (2007) Research synthesis: the practice of cognitive interviewing. *Public Opinion Quarterly.* 71(Suppl 2), 287–311.

Beckett CD & Kipnis G (2009) Collaborative communication: integrating SBAR to improve quality/patient safety outcomes. *Journal for Healthcare Quality*. 31(Suppl 5), 19-28.

Boaro N, Fancott C, Baker R, Velji K & Andreoli A (2010) Using SBAR to improve communication in interprofessional rehabilitation teams. *Journal of Interprofessional Care*. 24(1), 111-114.

Chaharsoughi NT, Ahrari S & Alikhah S (2014) Comparison the effect of teaching of SBAR technique with role play and lecturing on communication skill of nurses. *Journal of Caring Sciences.* 3(Suppl 2), 141–147.

Clark E, Squire S, Heyme A, Mickle ME & Petrie E (2009) The PACT Project: improving communication at handover. *Medical Journal of Australia*. 190(11), S125-S127.

Conrad F, Blair J & Tracy E (1999) Verbal reports are data! A theoretical approach to cognitive interviews. In Proceedings of the Federal Committee on Statistical Methodology Research Conference (pp. 11-20). Tuesday B Sessions.

Cornell P, Townsend Gervis M, Yates L & Vardaman J M (2014a) Impact of SBAR on Nurse Shift Reports and Staff Rounding. *MEDSURG Nursing*. 23(Suppl 5), 334-342.

Cornell P, Townsend-Gervis M, Vardaman JM & Yates L (2014b) Improving situation awareness and patient outcomes through interdisciplinary rounding and structured communication. *Journal of Nursing Administration*. 44(Suppl 3), 164-169.

Cunningham NJ, Weiland TJ, van Dijk J, Paddle P, Shilkofski N & Cunningham NY (2012) Telephone referrals by junior doctors: a randomised controlled trial assessing the impact of SBAR in a simulated setting. *Postgraduate Medical Journal.* 88(Suppl 1045), 619-626.

d'Agincourt-Canning LG, Kissoon N, Singal M & Pitfield AF (2011) Culture, communication and safety: lessons from the airline industry. *The Indian Journal of Pediatrics*. 78(6), 703-708.

Dawson S, King L & Grantham H (2013) Review article: Improving the hospital clinical handover between paramedics and emergency department staff in the deteriorating patient. *Emergency Medicine Australasia*. 25(Suppl 5), 393-405.

De Meester K, Verspuy M, Monsieurs KG & Van Bogaert P (2013) SBAR improves nurse-physician communication and reduces unexpected death: a pre and post intervention study. *Resuscitation*. 84(Suppl 9), 1192–6.

Donahue M, Miller M, Smith L, Dykes P & Fitzpatrick JJ (2011) A leadership initiative to improve communication and enhance safety. *American Journal of Medical Quality*. 26(Suppl 3), 206-11.

Dracup K & Bryan-Brown CW (2004) From novice to expert to mentor: shaping the future. *American Journal of Critical Care*. 13(Suppl 6), 448-450.

Flemming D & Hübner U (2013) How to improve change of shift handovers and collaborative grounding and what role does the electronic patient record system play? Results of a systematic literature review. *International Journal of Medical Informatics*. 82(7), 580-592.

Field TS, Tjia J, Mazor KM, Donovan JL, Kanaan AO, Harrold LR, Reed G, Doherty P, Spenard A & Gurwitz JH (2011) Randomized trial of a warfarin communication protocol for nursing homes: an SBAR-based approach. *The American Journal of Medicine*. 124(Suppl 2), 179-e1.

Fowler F & Cosenza C (2008) Writing effective questions pp.136-160 In: de Leeuw E, Dillman D, Hox J, (eds) International Handbook of Survey Methodology. Mahwab, NJ, Erlbaum.

This article is protected by copyright. All rights reserved.

Accepted Article

Gabe ME & Jordan SE (2014) Development and clinical gains of nurse-led medication monitoring profiles. *Journal of Nursing Management*. 22(Suppl 3), 331–349.

Gao H, Harrison D, Adam S, Daly K, Goldhill D, Parry G, Rashidian A, Subbe C & Harvey S (2006) Evaluation of available data on physiological track and trigger warning systems. *Critical Care*. 10 (Suppl. 1), 415.

Goldhill DR, McNarry AF, Mandersloot G & McGinley A (2005) A physiologically based early warning score for ward patients: the association between score and outcome. *Anaesthesia.* 60(Suppl 6), 547–553.

Grove SK, Burns N & Gray J (2013) *The practice of nursing research: appraisal, synthesis, and generation of evidence*. [Kindle]. 7th ed. St Louis, Saunders.

Guttmann A, Razzaq A, Lindsay P, Zagorski B & Anderson GM (2006) Development of measures of the quality of emergency department care for children using a structured panel process. *Pediatrics.* 118(Suppl 1), 114-23.

Haig KM, Sutton S & Whittington J (2006) SBAR: A shared mental model for improving communication between clinicians. *Joint Commission Journal on Quality and Patient Safety.* 32(Suppl 3), 167-175.

Hayes AJ, Roberts P, Figgins A, Pool R, Reilly S, Roughley C, Salter T, Scott J, Watson S, Woodside R & Patel V (2014) Improving awareness of patient safety in a peer-led pilot educational programme for undergraduate medical students. *Education for Health*. 27(2), 213.

Ilan R, LeBaron CD, Christianson MK, Heyland DK, Day A & Cohen MD (2012) Handover patterns: an observational study of critical care physicians. *BMC Health Services Research.* 12(Suppl 1), 1-10.

International Conference on Harmonisation (1996) ICH Harmonised Tripartite Guideline for Good Clinical Practice E6(R1), [Online], Institute of Clinical Research, Marlow, Buckinghamshire. Available at: http://www.ich.org/products/guidelines/efficacy/efficacy-single/article/good-clinical-practice.html. [2016, April 07].

Joffe E, Turley JP, Hwang KO, Johnson TR, Johnson CW & Bernstam EV (2013) Evaluation of a problem-specific SBAR tool to improve after-hours nurse-physician phone communication: a randomized trial. *Joint Commission Journal on Quality and Patient Safety.* 39(Suppl 11), 495-501.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher, 33(7), 14-26.

Jordan S, Watkins A, Storey M, Allen SJ, Brooks CJ, Garaiova I, Heaven ML, Jones R, Plummer SF, Russell IT, Thornton CA & Morgan G (2013) Volunteer bias in recruitment, retention, and blood sample donation in a randomised controlled trial involving mothers and their children at six months and two years: a longitudinal analysis. *PLoS ONE*. 8(Suppl 7), e67912.

Klein G (2000) Sources of power. Cambridge, Mass: MIT Press.

Knafl K, Deatrick J, Gallo A, Holcombe G, Bakitas M, Dixon J & Grey M (2007) The analysis and interpretation of cognitive interviews for instrument development. *Research in Nursing & Health.* 3(Suppl 2), 224–234.

Kotsakis A, Mercer K, Mohseni-Bod H, Gaiteiro R & Agbeko R (2014) The development and implementation of an inter-professional simulation based pediatric acute care curriculum for ward health care providers. *Journal of Interprofessional Care*. (0), 1-3.

This article is protected by copyright. All rights reserved.

Accepted Article

Kyriacos U, Jelsma J, James M & Jordan S (2015). Early warning scoring systems versus standard observations charts for wards in South Africa: a cluster randomized controlled trial. Trials. 16(Suppl 1), 103(1-15).

Kyriacos U, Jelsma J, James M & Jordan S (2014a) Monitoring vital signs: development of a modified early warning scoring (Mews) system for general wards in a developing country. *PLoS ONE.* 9(Suppl 1), e87073 DOI: 10.1371/journal.pone.0087073 [published Online First: Epub Date].

Kyriacos U & Jordan S (2014b) Record review to explore the adequacy of post-operative vital signs monitoring using a local modified early warning score (Mews) chart to evaluate outcomes. PLoS ONE. 9(Suppl 1), e87320 DOI: 10.1371/journal.pone.0087320 [published Online First: Epub Date].

Kyriacos U (2011a) The development, validation and testing of a vital signs monitoring tool for early identification of deterioration in adult surgical patients {PhD], University of Cape town.

Kyriacos U, Jelsma J, James M & Jordan S (2011b). Monitoring vital signs using early warning scoring systems: a review of the literature. *Journal of Nursing Management.* 19(Suppl 3), 311-330.

Lancaster RJ, Westphal J & Jambunathan J (2015) Using SBAR to Promote Clinical Judgment in undergraduate nursing students. *The Journal of Nursing Education.* 54(Suppl 3), S31-4.

Leonard M, Graham S & Bonacum D (2004) The human factor: the critical importance of effective teamwork and communication in providing safe care. *Quality and Safety in Health Care.* 13(suppl 1), i85–i90.

Ludikhuize J, de Jonge E & Goossens A (2011) Measuring adherence among nurses one year after training in applying the Modified Early Warning Score and Situation-Background-Assessment-Recommendation instruments. *Resuscitation*. 82(Suppl 11), 1428-1433.

Lynn MR (1986) Determination and quantification of content validity. *Nursing Research.* 35(Supp 6), 382-386.

Mapp ID, Davis LL & Krowchuk H (2013) Prevention of unplanned intensive care unit admissions and hospital mortality by early warning systems. *Dimens Crit Care Nurs*, 32, 300-9.

May S, Chance-Larsen K, Littlewood C, Lomas D & Saad M (2010) Reliability of physical examination tests used in the assessment of patients with shoulder problems: a systematic review. *Physiotherapy.* 96(Supp 3), 179–90.

McGaughey J, Alderdice F, Fowler R, Kapila A, Mayhew A & Moutray M (2009) Outreach and Early Warning Systems (EWS) for the prevention of intensive care admission and death of critically ill adult patients on general hospital wards. *The Cochrane Library*. 1:1-24.

Mitchell E., Lee DY, Arora S, Kwong KL, Liem TK, Landry GL, Moneta GL & Sevdalis N (2012) SBAR M&M: a feasible, reliable, and valid tool to assess the quality of, surgical morbidity and mortality conference presentations. *The American Journal of Surgery.* 203(Supp 1), 26-31.

NHS NPSA. Recognising and responding appropriately to early signs of deterioration in hospitalised patients, 2007.

NHS Institute for Innovation and Improvement (2008) *SBAR Situation-Background-Assessment-Recommendation.* Available at: http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/sbar_-_situation_-_background_-_assessment_-_recommendation.html (accessed 7 May 2016).

This article is protected by copyright. All rights reserved.

Accepted Article

Ozekcin L R, Tuite P, Willner K & Hravnak M (2015) Simulation education: early identification of patient physiologic deterioration by acute care nurses. *Clinical Nurse Specialist.* 29(Suppl 3), 166-173.

Poot EP, Bruijne MC, Wouters MG, Groot CJ & Wagner C (2014) Exploring perinatal shift-to-shift handover communication and process: an observational study. *Journal of Evaluation in Clinical Practice.* 20(Suppl 2), 166-175.

Presser S, Couper MP, Lessler JT, Martin E, Martin J, Rothgeb JM & Singer E (2004). Methods for testing and evaluating survey questions. *Public Opinion Quarterly.* 68(Suppl 1), 109–130.

Randmaa M, Mårtensson G., Swenne CL & Engström M (2014) SBAR improves communication and safety climate and decreases incident reports due to communication errors in an anaesthetic clinic: a prospective intervention study. *BMJ Open*. 4(Suppl 1), e004268.

Raymond M & Harrison MC (2014) The structured communication tool SBAR (Situation, Background, Assessment and Recommendation) improves communication in neonatology. *South African Medical Journal*. 104(Suppl 12), 850-852.

Renz SM, Boltz MP, Wagner LM, Capezuti EA & Lawrence TE (2013) Examining the feasibility and utility of an SBAR protocol in long-term care. *Geriatric Nursing.* 34(Suppl 4), 295-301.

Riesenberg LA, Leitzsch J & Little BW (2009) Systematic review of handoff mnemonics literature. *American Journal of Medical Quality*. 24(Suppl 3), 196-204.

Roethlisberger FS & Dickson WJ (1939) *Management and the Worker*. Cambridge, Massachusetts: Harvard University Press.

Rosenthal R & Jacobson L (1963) Teachers' expectancies: Determinants of pupils' IQ gains. *Psychological Reports*, 19, 115-118.

Royal College of Physicians (2012) *National early warning score (NEWS): Standardising the assessment of acute- illness severity in the NHS. Report of a Working Party*. London: RCP: Royal College of Physicians.

Schmid A, Hoffman L, Happ MB, Wolf GA & DeVita M (2007). Failure to rescue: a literature review. *Journal of Nursing Administration.* 37(Suppl 4):188-198.

Sim J & Wright C (2005) The kappa statistic in reliability studies: use, interpretation, and sample size requirements. *Physical Therapy*. 85(Suppl 3), 257–268.

Smith GB, Prytherch DR, Schmidt P, Featherstone PI, Knight D, Clements G & Mohammed MA (2006) Hospital-wide physiological surveillance–a new approach to the early identification and management of the sick patient. *Resuscitation*. 71(Suppl 1), 19-28.

Staggers N & Blaz JW (2013) Research on nursing handoffs for medical and surgical settings: an integrative review. *Journal of Advanced Nursing*. 69(Suppl 2), 247-262.

Street M, Eustace P, Livingston PM, Craike MJ, Kent B & Patterson D (2011) Communication at the bedside to enhance patient care: a survey of nurses' experience and perspective of handover. *International Journal of Nursing Practice*. 17(2), 133-140.

Subbe CP, Davies RG, Williams E, Rutherford P & Gemmell L (2003) Effect of introducing the modified early warning score on clinical outcomes, cardio-pulmonary arrests and intensive care utilisation in acute medical admissions. Anaesthesia. 58(8). 797-802.

This article is protected by copyright. All rights reserved.

Accepted Article

The Joint Commission. National patient safety goals, 2007, national patient safety goals hospital version manual chapter, including implementation expectations. http://www.mypvh.org/DocumentCenter/Home/View/44 [2016, July 25].

Toerien M, Brookes ST, Metcalfe C, De Salis I, Tomlin Z, Peters TJ, Sterne J & Donovan JL (2009) A review of reporting of participant recruitment and retention in RCTs in six major journals. *Trials*. 10(Suppl 1), 52.

Tooth L R & Ottenbacher KJ (2004) The kappa statistic in rehabilitation research: an examination. *Archives of Physical Medicine and Rehabilitation*. 85(Suppl 8), 1371–1376.

Townsend-Gervis M, Cornell P & Vardaman JM (2014) Interdisciplinary rounds and structured communication reduce re-admissions and improve some patient outcomes. *Western Journal of Nursing Research*. 36(Suppl 7), 917-28.

Velji K, Baker GR, Fancott C, Andreoli A, Boaro N, Tardif G, Aimone E & Sinclair L (2007) Effectiveness of an adapted SBAR communication tool for a rehabilitation setting. *Healthcare Quarterly* (Toronto, Ont.). 11(3 Spec No.), 72-79.

Wang W, Liang Z, Blazeck A & Greene B (2015) Improving Chinese nursing students' communication skills by utilizing video-stimulated recall and role-play case scenarios to introduce them to the SBAR technique. *Nurse Education Today*. 35(Suppl 7), 881-887.

Whittingham KA & Oldroyd LE (2014) Using an SBAR - keeping it real! Demonstrating how improving safe care delivery has been incorporated into a top-up degree programme. *Nurse Education Today*. 34(6), e47-e52.

Willis GB (Ed.) (2005) *Cognitive Interviewing*. Thousand Oaks, CA: SAGE Publications, Inc. doi: http://dx.doi.org.ezproxy.uct.ac.za/10.4135/9781412983655. [2016, April 07 ].

Willis GB, Artino AR Jr. What Do Our Respondents Think We're Asking? Using Cognitive Interviewing to Improve Medical Education Surveys. *J Grad Med Educ.* 2013 Sep;5(Suppl 3), 353-6. doi: 10.4300/JGME-D-13-00154.1

Woodhall LJ, Vertacnik L & McLaughlin M (2008) Implementation of the SBAR communication technique in a tertiary center. *Journal of Emergency Nursing*. 34(Suppl 4), 314–317.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. Jama, 310(20), 2191.

Yaghmale F (2003) Content validity and its estimation. *Journal of Medical Education*. 3(Suppl 1), 25-27.

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**Appendix 1: The developed prototype SBAR communication tool**

Time Dr. alerted: _____Time Dr. responded: _____Date: _____

| | |
|---|---|
| **S**<br>Situation | • This is _____ calling from _____<br>_____(State your name, title and location)<br>• I am calling about patient _____ (State patients name)<br>• The problem I am calling about is MEWS score of _____(Provide triggered MEWS score) and/or my patient does not look right because of _____<br>(Pallor, sweating, pain or poor perfusion)<br>• My patient's resuscitation status is _____<br>(State 'for resuscitation' or 'not for resuscitation') |
| **B**<br>Background | • The patient was admitted on _____ (Date)<br>• Admission diagnosis is _____<br>• Pertinent medical history for this patient is _____<br>_____<br>(Provide a brief summary of relevant history including procedures/ operations or investigations/allergies)<br>• Current treatment includes _____<br>(Provide relevant current treatment such as intravenous fluids given, medications given, oxygen therapy and oral intake)<br>• This is a change from _____<br>(Describe briefly what previous condition was) |
| **A**<br>Assessment | • Current vital signs are: Respiratory rate_____ Oxygen saturation % _____<br>Temperature _____ Heart rate _____ Blood Pressure _____<br>**Provide the following information if applicable:**<br>• On oxygen: Yes_____ No _____<br>• Perfusion- Capillary refill time >2 seconds: Yes____ No_____<br>• Skin colour: Pale _____ Cyanosis _____<br>• The patient is complaining of_____<br>• Pain scale: No pain ____ Mild pain_____ Moderate pain _____ Severe pain_____<br>• Sweating: Yes____ No _____<br>• Wound ooze: Yes____ No_____<br>• Pedal pulses: Yes____ No_____<br>• Blood glucose _____<br>• Finger prick HB _____<br>• Glasgow-coma scale ( __/15)<br>• Pupil size: Right_____ Left _____<br>• Intravenous fluids: Yes _____ (Provide detail of IV fluids given) No____<br>• Urine output: _____ (ml/hr) |
| **R**<br>Recommendation | • I would like you to see the patient now ____ in the next 30 minutes____<br>• Any tests needed? _____<br>• Any medications? _____<br>• While I have you on the phone may I get a second witness: Yes____ No ___<br>• Do you want to be notified for any reason? _____<br>_____<br>If no improvement, when should I call again? _____ |

Compiled by Debora Burger MSc RN UCT Division of Nursing and Midwifery (Supervisor Dr. Una Kyriacos, UCT/ Co-Supervisor Dr. Sue Jordan, Swansea University) based on SBAR report to a physician, Magee-Women's Hospital of UPMC © 2008 (Woodhall *et al.* 2008).

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## Appendix 2: Final Modified SBAR Communication tool following Cognitive Interviews and Content Validity

***Instructions:***

*Please obtain a complete set of vital signs.*
*Complete the SBAR communication document quickly before calling the doctor by filling in:*
*the required information or using tick box* ✔*(Yes)* **X** *(NO) or* **ND** *(Not done).*
*Keep your descriptions brief and relevant to why you are calling.*
*Ensure you have the patient's 'OBS' chart and medication charts at hand when calling the doctor.*
*Be prepared for a second witness if medications are ordered.*

Time Dr. alerted:_____Time DR. responded _____ Date: _____

| | |
|---|---|
| **S**<br>Situation | This is _____ calling from _____(State your name, title and location).<br>I am calling about patient _____(State patients name).<br>*The problem I am calling about is* _____<br>_____<br>_____<br>(*Provide disturbed vital signs,* ***OR*** *the reason why you are concerned about the patient).*<br>*The* patient's resuscitation status is 'for resuscitation' ☐ or 'not for resuscitation' ☐ or unsure ☐ |
| **B**<br>Background | The patient was admitted on_____ (Admission date and time if known).<br>Admission diagnosis is _____<br>*A* ***brief*** *relevant history for this patient is* _____<br>(*Provide current age, weight* ***and*** *a quick summary of any secondary diagnosis such as diabetes, hypertension* ***as well as*** *procedures/ operations / tests related to the current problem* ***and*** *if the patient has any allergies).*<br>Current treatment includes _____<br>(Provide a **brief** summary of current treatment such as intravenous access, intravenous fluids given, medications recently given or of importance, oxygen therapy and oral intake).<br>This is a change from _____<br>_____Describe briefly what the previous condition was). |
| **A**<br>Assessment | **Current vital signs are**: Respiratory rate _____ Oxygen saturation %_____ *On oxygen %/L/min* _____ **or**<br>*Room air* ☐/Temperature _____ Heart rate _____ Blood pressure _____/_____<br>Alert ☐ Responds to Verbal ☐/Pain ☐is Unresponsive ☐<br>**ONLY IF APPLICABLE complete and state the following:**<br>***Skin colour****: Pale* ☐*Cyanosis* ☐ ***Periphery****: Warm (Capillary refill time <2 seconds)* ☐*or Cool (CRT>2 seconds)* ☐<br>***Pupils****: Equal: Yes* ☐ ***or*** *No* ☐/*Reacting to light* ☐*Not reacting to light* ☐<br>***Mood****: Lethargic* ☐*Confused* ☐*Agitated* ☐<br>The patient is **complaining** of _____<br>_____<br>***Pain experienced****: No pain* ☐*Mild pain* ☐*Moderate pain* ☐*Severe pain* ☐<br>***Sweating****:* ☐***/Wound ooze****:* ☐***/Pedal pulses****: Weak* ☐*or Absent /* ☐<br>**Blood glucose**: _____ **/Finger prick Hb**:_____ |
| **R**<br>Recommendation | *I would like you to see the patient now* ☐*in the next 30 minutes* ☐<br>*Is there anything you would like me to do in the meantime?* _____<br>(***If medications are ordered****): While I have you on the phone may I get a second witness?* ☐<br>(***If not coming to see the patient now****): Do you want to be notified for any reason?* _____<br>If no improvement, when should I call again?<br>_____ |

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