The development and validation of a modified Situation-Background-Assessment-Recommendation (SBAR) communication tool for reporting early signs of deterioration in patients

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ABSTRACT

Background: Errors in communication are prevalent in healthcare and affect patient safety and cause unnecessary patient deaths. Reporting early signs of physiological or clinical deterioration could improve patient safety and prevent 'failure to rescue' or unexpected intensive care admissions, cardiac arrest or death. The structured Situation-Background-Assessment-Recommendation (SBAR) communication tool enables nurses to provide doctors with pertinent information about a deteriorating patient in a logical order, based on a complete assessment. In addition nurses have increased confidence in their findings and are better able to initiate a call and to convince a doctor to provide orders promptly or see a patient.

Aim: The aim of this sub-study of a randomized controlled trial was to develop and validate a modified SBAR communication tool incorporating components of a local Modified Early Warning Score (MEWS) vital signs observations chart.

Methods: The modified SBAR communication tool was developed following a review of available published examples and validated by employing a mixed methods approach: 1) cognitive interviews (n=3 nurses, 2 doctors), 2) determining the index of content validity with nurses (n=5), physicians (n=5) and surgeons (n=8) and 3) inter-rater reliability testing, with calculation of kappa values (n=2 nurses each rated 22 patient scenarios).

Results: Cognitive interviews (CI's) prompted more changes to the modified SBAR communication tool than determined by the content validity index (CVI). For cognitive interviews, there were 15/42 (35.71%) modifications: 11 items were added (26.19%) and three removed, (7.14%) resulting in 49 items whereas for content validity index there were 4/49 (8.16%) modifications, 5/49 (10.20%) items removed and one item added (2.04%). Four of 49 items (8.16%) rated as relevant by <70% of nurses and doctors were revised or deleted. No additional modifications were needed following review by surgeons, as all items were rated as relevant by the pre-determined ≥70% of experts. Inter-rater reliability (IRR) of the SBAR tool was established by two nurses who were mostly in substantial to full agreement on 37/45 items on the modified tool. The exceptions were: 'Calling from' (Cohen's Kappa -0.05) and 'this is a change from' (Cohen's Kappa -0.07), representing agreement below the level of chance. However the high percentage agreement and nature of the questions suggest that the questions are sound. Percentage agreement amongst participants for these items was 91% (95% confidence interval (CI): 71 to 99)

and 86% (95% CI: 65 to 97) respectively. Deciding whether a doctor should see the patient now (Cohen's Kappa 0.09) or in the next 30 minutes, achieved fair agreement (Cohen's Kappa 0.20). This reflects a difference in clinical judgement as the decision when to call for assistance depended on the individual nurse's clinical judgement. IRR was not possible to test on 4/45 items, as those items required a response by the person being summoned. Overall nine of 42 items were removed, 12 were added and 19 substantially modified, leaving 45 items.

Conclusion: The modified SBAR communication tool was valid and reliable for use in a local context in conjunction with the Cape Town Modified Early Warning Score (MEWS) vital signs chart.

Keywords: Situation Background Assessment Recommendation (SBAR); Modified Early Warning Score (MEWS); National Early Warning Score (NEWS).

Conceptual definitions

Adverse event: an unexpected medical event in a patient or research subject following pharmaceutical administration of a product and is not a normal outcome for that treatment (International Conference on Harmonisation, 1996:2). It could be any unfavourable and unintended sign (abnormal laboratory finding), symptom or disease (International Conference on Harmonisation, 1996:2).

Handover: or 'handoff' refers to the exchange of information between health care professionals regarding a patient, either in the transfer of patients from one care area to another or the control over the patient's care by transferring patient information from one care provider to another (Ilan et al., 2012:1).

Interdisciplinary Daily Rounds (IDR): refers to the daily physician patient rounds where patients are presented, discussed and care is planned (Cornell et al., 2014b:335).

Patient safety: according to the World Health Organization (2015) is the prevention of errors and adverse effects on patients with regards to health care.

Resident physicians: hold medical degrees and are now licensed to practice medicine. They are in training to learn to become specialists. They work under the supervision of an attending physician (Accreditation Council for Graduate Medical Education, 2003:1).

Root Cause: is examining the reasons for a failure or inefficacies occurring in a process or processes (The Joint Commission 2004-2014 Sentinel Event Data:3).

Sentinel event: an incident or event that could have or did result in harm to the patient not primarily related to the patient's illness or underlying condition that can result in death, permanent harm or severe temporary harm (Joint Commission, 2015).

Serious adverse event (SAE): any medical occurrence that results in death, is life threatening and requires hospitalization or prolongation of hospitalization, results in persistent or significant disability/incapacity or a birth defect (International Conference on Harmonisation, 1996:7).

Shift report: a form of handover which takes place between nurses: from a nurse ending a shift to the nurse receiving the patient at the beginning of their shift (Cornell et al., 2013:422).

Situation awareness: the ability to formulate a plan based on the degree of understanding (Cornell et al., 2014a:165).

Situation-background-assessment-recommendation (SBAR): a standardized communication tool providing a framework for relaying critical information between clinicians (Thomas, Bertram & Johnson, 2009:176).

Tracking: the periodic observation of selected basic physiological signs (National Institute for Health and Clinical Excellence, 2007).

Trigger: the predetermined calling or response criteria for requesting the assistance of competent staff in the management of acute illness and/or critical care (National Institute for Health and Clinical Excellence, 2007).

Track-and-trigger system: the periodic observation of selected basic physiological signs (tracking) with predetermined calling or response criteria (trigger) for requesting the assistance of competent staff in the management of acute illness and/or critical care (National Institute for Health and Clinical Excellence, 2007).

Operational Definitions

Clinical deterioration: subtle changes detected in a patients' appearance such as colour or mood and assessment by feel, observation (Kyriacos, 2011b:xxxix) or sensing something is 'just not right' (Cioffi, 2000:113).

Early warning score (EWS) system (EWSS): a 'track-and-trigger' system to identify and respond to patients presenting with or developing acute illness (Royal College of Physicians, 2012:1).

Modified early warning score (MEWS) system (MEWSS): includes EWS parameters but modified to include more parameters such as urine output (Stenhouse et al., 2000:663).

Physiological deterioration: worsening of a patient's condition detected by changes in vital signs such as respiratory rate, oxygen saturation level, heart rate, systolic blood pressure, temperature, level of consciousness and urine output (Kyriacos, 2011b:xl).

General Definitions

Cohen's Kappa: calculates agreement between two independent observers beyond that of chance (Sim & Wright, 2005:261).

Inter-rater reliability (IRR): the agreement between two or more raters assessed by examining the agreement between ratings obtained from independent observers and can use Cohen's kappa for dichotomous scales (Hobart, Lamping & Thompson, 1996:128).

Abbreviations

AVPU - A = alert, V = responding to verbal commands, P= responding to painful stimuli, U = unresponsive

BP - blood pressure

CI - cognitive interview

CRT - capillary refill time

CV - content validity

CVI - content validity index

EWS - early warning score

EWSS - early warning score system

GCS - Glasgow Coma Scale

ICU - intensive care unit

IDR – inter disciplinary daily rounds

IRR - inter-rater reliability

MEWS - modified early warning score

MEWSS – modified early warning score system

OR - odds ratio

PPS - paraprofessional staff

RNAs - registered nursing auxiliaries

RPNs - registered professional nurses

RSNs - registered staff nurses

SAE - serious adverse event

SANC - South African Nursing Council

SBAR - situation, background, assessment, recommendation

RCT - randomized controlled trial

UPMC - University of Pittsburgh Medical Center

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1 INTRODUCTION

This study is about patient safety and specifically about escalating the management of a patient showing signs of clinical and physiological deterioration by using a standard reporting system: the Situation-Background-Assessment-Recommendation (SBAR) tool. The SBAR communication tool provides a framework for relaying critical information between clinicians (Leonard, Graham & Bonacum, 2004:86), usually initiated by a nurse summoning the assistance of a more skilled medical doctor to prevent 'failure to rescue'.

Serious adverse events (SAE's) are medical occurrences that can result in death, or could be life threatening requiring hospitalization or prolongation of hospitalization (International Conference on Harmonisation, 1996:7) including unexpected admission to the intensive care unit (ICU) or cardiac arrest (McGaughey et al., 2009:3). Detecting and intervening for preventable events is becoming increasingly important in evaluating quality of nursing care (Schmid et al., 2007:194). 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, 2004:449).

Failure to rescue is the unexpected loss of life following a complication in a hospital (Agency for Healthcare Research, 2007:18). Failure to rescue is an indicator that is used to identify patients who die as a consequence to a complication (Department of Health and Human Services Agency, 2010:143). The United States of America (USA) 2010 National Healthcare Quality Report states that many complications that occur in hospitals may not be preventable but early identification and treatment may prevent death. Hospital complications that may cause 'failure to rescue' include pneumonia, thromboembolic events, sepsis, acute renal failure, gastrointestinal bleeding or acute ulcer, shock or cardiac arrest (Department of Health and Human Services Agency, 2010:143).

Patient safety, failure to rescue and mortality are associated with patient characteristics, hospital structural characteristics (size, teaching status, level of technology), nurse staffing, nurse experience, surgeons' certified competence as well as nurses having baccalaureate or higher qualifications (Aiken et al., 2003:1619). The South African Department of Health (2013) has acknowledged a nursing crisis due to critical shortages (The National Strategic Plan for nurse education, training and practice 2012/13-2016/17:14). Although nurse registrations and enrolments with the South African Nursing Council (SANC) are on the rise, only 16% are for registered professional nurses (RPNs). Of the RPNs 43.7% are over 50 years of age and a retirement rate of 3000 a year is

expected to continue for the next 10-15 years (The National Strategic Plan 2012/13-2016/17:30). As a result of dwindling numbers of registered nurses, the responsibility of patient monitoring falls to registered staff nurses (RSNs) and registered nursing auxiliaries (RNAs), (Kyriacos, 2011b:3).

Aiken et al. (2003:1620) reported that surgical patients had better outcomes with degree or higher trained nurses. A 10% increase in the number of degree trained registered nurses was associated with a 5% decrease in mortality within 30 days of admission and in mortality related to complications experienced during hospitalization within 30 days of admission (Odds ratio (OR) 0.95; 95% Confidence Interval (CI), 0.91-0.99) for both. Despite international trends to train all nurses at degree level, approximately 20% of RNs in South Africa are trained at universities while 80% receive training from nursing colleges (The National Strategic Plan 2012/13-2016/17:30-31).

1.1 Background

Various versions of early warning score (EWS) systems have been incorporated into vital signs monitoring tools in the United Kingdom (UK) (Hogan, 2006) and Australasia (Green & Williams 2006, Chaboyer et al., 2008), replacing the traditional vital signs run charts. A review of published validation studies on early warning score (EWS)/modified early warning score (MEWS) systems and evaluation of their performance by Kyriacos, Jelsma and Jordan (2011a:325-236) revealed an absence of experimental studies.

The traditional vital signs chart requires graphic plotting of vital signs values, but does not provide guidelines for a nursing response if a patient's condition deteriorates (Kyriacos, Jelsma & Jordan, 2011a:312). Conversely, EWS systems (EWSS) are designed to track signs of patient deterioration and trigger a response (Royal College of Physicians, 2012:1). MEWS systems (MEWSS) incorporate physiological parameters, such as respiratory rate or heart rate, recorded in boxes with predefined ranges (NHS 2003:8, Gao et al., 2006:174). Disturbed vital signs are allocated points with weightings with suggested interventions to recheck the patient or summon assistance (Stenhouse et al., 2000:663; Hodgetts et al., 2002:130; Goldhill et al., 2005:552; Smith et al., 2006:20; Subbe et al., 2001:525).

EWS vital signs observations charts that incorporate a response algorithm designed to 'track' early signs of deterioration in a patient and 'trigger' a response by trained nurses to seek assistance should improve patient safety and prevent unnecessary SAEs (Royal College of Physicians, 2012:1). Changes in respiratory rate have been shown to be the

most sensitive indicator of physiological deterioration (Subbe et al., 2003:801). MEWS vital signs charts 'tracks' early recognition of patients at risk and the algorithm prompts consistent reporting (Subbe et al., 2003:801). Once the algorithm has been triggered, nurses should report the triggered response by using a structured communication tool such as the SBAR, which provides a standardized framework for nurse reporting.

A doctoral thesis (Kyriacos, 2011b) developed a MEWS vital signs observations chart (Cape Town MEWS) for use in a middle-income, developing country (Kyriacos et al., 2014a) and investigated nurses' recordings of postoperative vital signs to establish a baseline prior to a trial (Kyriacos & Jordan, 2014b). Trial data indicated a statistically significant increase in recording, but not reporting, of physiological deterioration in post-operative adult patients (Kyriacos et al., 2015:13). Recommendations of the 2011 study included revision of the Cape Town MEWS and implementation of a SBAR communication tool (Kyriacos, 2011b:294-296).

This study is about the development and validation of a SBAR communication tool, fit for purpose with the use of a MEWS vital signs observations chart. It is a sub-study of a larger multi-site cluster randomized trial (RCT) (Kyriacos & Jordan, UCT HREC REF: 825/2014). The trial is aimed at testing the effectiveness of a revised MEWS observations chart (Appendix A1) and validated SBAR communication tool for improved recognition and reporting of deterioration in patients.

1.2 Communication in health care

In Australia 25%-41% of medical errors are attributed to communication errors between the years of 2004 and 2005, reported by the Australian Institute of Health and Welfare and the Australian Commission on Safety and Quality in Health Care (2007:13). The UK Department of Health (2000:viii) estimated that adverse events are experienced by approximately 10% of inpatients. Of the adverse events experienced, 50% were avoidable and 1% caused serious harm. The estimated annual cost amounts to £2 billion a year.

Communication accounted for 64% (489/764) of root causes of sentinel events in health care in the USA in 2014 (Joint Commission Root Cause Analysis 2004-2014:8). Root cause is examining the reasons for a failure or inefficacies occurring in a process or processes. In addition it locates a place in the process where an implemented intervention could possibly change the outcome and prevent undesirable outcomes (The Joint Commission 2004-2014 Sentinel Event Data:3).

The national patient safety goal two of The USA Joint Commission (2015:2) is to improve the effectiveness of communication among caregivers. Included in international initiatives to improve communication, the South African Department of Health Core Standards are aimed at minimizing risk and improving patient safety through reporting, analysis and prevention of medical errors and adverse events (Department of Health - Core Standards, 2011:23). The South African Department of Health is faced with numerous challenges including a quadruple burden of disease: HIV and AIDS and TB, High Maternal Child Mortality, Non-communicable Diseases and Violence and Injuries. (Department of Health - Annual Performance Plan, 2012/13-2014/15:17).

1.2.1 The SBAR communication tool in healthcare

Following its successful implementation in the navy where errors in communication can have disastrous consequences, including loss of life, (Doucette, 2006:50; Vardaman et al., 2012:89) the civilian healthcare environment adopted the SBAR to use in standardizing communication in critical environments (Doucette, 2006:53; Baker, Day & Salas, 2006:1588).

First introduced into the USA healthcare setting in 2003 by Kaiser Permanente, the SBAR tool was initially designed for critical conversations between doctors and nurses (Thomas, Bertram & Johnson, 2009:176; Vardaman et al., 2012:89; Doucette, 2006:53). The SBAR technique provides a framework for communication for healthcare team members when a patient's condition requires urgent attention and communication must be delivered quickly and concisely (Thomas, Bertram & Johnson, 2009:176; Vardaman et al., 2012:89; Doucette, 2006:53; Leonard, Graham & Bonacum, 2004:86). The components of the SBAR communication technique are described in Table 1.1.

Table 1.1: 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, Graham & Bonacum, 2004:86)

Magee Women's Hospital of the University of Pittsburgh Medical Center (UPMC) and its sister hospital UPMC Shadyside Hospital teamed up to standardize communication within both hospitals: a SBAR telephonic checklist was used by staff members when reporting to a physician in all patient care areas (Woodhall, Vertacnik & McLaughlin, 2008:314).

Survey results from select inpatient care areas including female oncology, labour and delivery units, the emergency department, cardiac unit, radiology department and the outpatient clinic indicated the SBAR technique was well received based on its simplicity and being easy to understand. Later surveys indicated dramatic improvements in communication after the SBAR technique was introduced into all nursing units for shift report and nurse-to-doctor report (Woodhall, Vertacnik & McLaughlin, 2008:316). The Magee Women's Hospital SBAR telephonic checklist comprised the following:

Situation - Identify yourself, unit, patients name and the situation you are calling about.
Background - State admission diagnosis, pertinent medical history, a brief synopsis of treatment so far and describe the change in condition.
Assessment - State current vital signs, if patient is receiving oxygen, patient complains, pain scale as well as description.
Recommendation - Provide your recommendation for the problem or request assistance from the physician to either see the patient or recommend changes in care (Woodhall, Vertacnik & McLaughlin, 2008:315).
Improving communication techniques not only improves patient safety but also enhances relationships by bridging communication gaps between nurses and physicians. Comparative studies indicate that nurses communicate information in a descriptive, narrative style while physicians are trained to summarize important details in a patient's history or diagnosis (Groff & Augello, 2003:11; Leonard, Graham & Bonacum, 2004:85). Physicians express frustration when limited patient information is provided during telephone conversations or during rounds but also report difficulties when nurses give lengthy explanations rather than quick, concise reports as indicated by physician satisfaction surveys from a community hospital (Ardoin & Broussard 2011:128). Nurses play a vital role within the multidisciplinary team in transferring important information for optimal patient safety. Efficient communication by nurses and strong leadership is needed to demonstrate reliability; this often requires a degree of assertive behaviour from the nurse (Miller, Riley & Davis, 2009:253).

Use of the SBAR communication tool has demonstrated improved physician satisfaction with less reported waiting time for information retrieval and less prompting or instructing the charge nurse to assist with information gathering (Ardoin & Broussard, 2011:133). Better quality of information is provided using this tool, resulting in new perceptions of nurses being reliable in their communication (Ardoin & Broussard, 2011:133). From a nursing perspective, SBAR reporting leads to greater confidence in reporting ability, improved nurse/physician coordination within the team and in general, improved organization of content that is reported (Ardoin & Broussard 2011:133). Study findings

suggest that the SBAR provides structure, consistency, prioritization, accuracy and comprehensiveness and is easy to learn but requires effort and persistence to execute as nurses may revert to previous reporting styles under pressure (Cornell et al., 2014b:168).

System failures result in patient safety errors that can rarely be blamed on the individual. Health care providers often work in environments with poor communication networks. If more than 60% of adverse events are caused by poor communication, it could be assumed that communication methods between members of the healthcare team are grossly inadequate (Hohenhaus, Powell & Hohenhaus, 2006:72).

1.3 Problem statement

Early recognition of deterioration could prevent unexpected admission to the intensive care unit (ICU), cardiac arrest or death (McGaughey et al., 2009:3). A doctoral thesis by Kyriacos (2011b:263) reported improved recording of vital signs following the implementation of a locally developed MEWS vital signs observations chart but reporting of physiological deterioration by nurses was poor. Patient survival often depends on the nurse's response to early signs of deterioration (Cioffi, 2000:109). There is a countrywide shortage of RPNs (The National Strategic Plan 2012/13-2016/17) so less educated nurses monitor patients' vital signs in South Africa. Use of the SBAR tool could assist nurses at all levels of training, working under pressure to deliver clear and concise information on early signs of abnormal physiology using MEWS scores to benchmark concerns.

1.4 Research Question

What level of validity and reliability will a modified SBAR communication tool that incorporates components of a local MEWS vital signs observations chart achieve through cognitive interviewing, index of content validity and inter-rater reliability testing?

1.5 Aim

The aim of this sub-study was to develop and validate a modified SBAR communication tool that incorporates components of a local MEWS vital signs observations chart.

1.6 Objectives

The objectives of the study were to:

1.6.1 identify a best practice SBAR communication tool from available published literature;

1.6.2 construct a prototype modified SBAR communication tool for use in a local context by incorporating components of the revised MEWS and items for recognizing early signs of clinical deterioration from the Cape Town MEWS observations chart**;**

1.6.3 use cognitive interviewing with future users (nurses and doctors) to establish if the cognitive form of the preliminary prototype modified SBAR tool is appropriate, comprehensive, and understandable including interpretation of its prompts for accuracy and consistency and to make changes if needed;

1.6.4 if changes are needed use the refined prototype SBAR tool and a structured checklist with known experts in the field to establish the index of content validity (CVI) of a final modified SBAR; and

1.6.5 establish reliability of the modified SBAR tool through inter-rater reliability testing.

1.7 Significance of the study

The South African Department of Health Core Standards are aimed at minimizing risk and improving patient safety through reporting, analysis and prevention of medical errors and adverse events (Department of Health - Core Standards, 2011:23). The SBAR communication tool modified to include components of a MEWS vital signs chart is aimed at minimizing risk and improving patient safety by early reporting of physiological and clinical signs of deterioration and thereby decreasing adverse events. This pilot work also foregrounds the clinical opportunities afforded by the SBAR.

1.8 Summary

In this chapter the outline of this sub-study was described: the background to the Situation-Background-Assessment-Recommendation (SBAR) tool and the problem that, in a doctoral study undertaken in 2011 nurses using a MEWS observations chart did not always report abnormal physiology. The aim of the present study was to develop and validate a SBAR tool that incorporates the MEWS by the achievement of the study objectives. In this way errors in communication in healthcare that affect patient safety and incidents of 'failure to rescue' or unexpected admission to intensive care, cardiac arrest or death might be reduced. The SBAR structured tool used in conjunction with a MEWS observations chart is intended to enable nurses to seek more skilled assistance

confidently by being better prepared to provide doctors or registered professional nurses (RPNs) with the necessary information based on a complete patient assessment.

2 LITERATURE REVIEW

2.1 Introduction

The published literature was searched with a view to describing the need for and development of a prototype Situation-Background-Assessment-Recommendation (SBAR) tool that incorporates components of Modified Early Warning Score (MEWS) vital signs chart. First the evidence pertaining to use of the SBAR tool was reviewed, followed by a search for evidence of the SBAR tool used in conjunction with a MEWS.

2.2 Literature review strategy

Research papers, journal articles and case studies were included if in English and if full texts were available, including hand searches of reference lists. Searches covered the year 2005 to June 2015 using CINAHL, PubMed, Scopus and Africa Wide databases. Hand searches of reference lists yielding original relevant articles pre-dating 2005 were included. Search terms used were SBAR OR situation background assessment recommendation AND MEWS OR modified early warning score OR early warning score system OR national early warning score OR NEWS. Conducting a MeSH search for keywords produced no results. Search results are tabulated in Table 2.1.

Table 2.1: Databases searched

Data base searched	Search terms	Full text unavailable or abstract only	Minimal SBAR reference	Only minor description of SBAR use	N/A*	Results	Relevant items
CINAHL	SBAR OR Situation-Background-Assessment-Recommendation Limited to 2005-2015 and English	38	9	13	4	111	47
MeSH	SBAR OR Situation-Background-Assessment-Recommendation AND MEWS OR modified early warning score OR early warning score system OR national early warning score OR NEWS					0	0
SCOPUS (Excluding previously found in PubMed and CINAHL)	SBAR OR Situation-Background-Assessment-Recommendation. Limited to English, areas of medicine, nursing and social science. Search by Article, Title, Abstract and keywords 2005-2015	1	2		129	190 (Previously retrieved in CINAHL: 40; PubMed: 16) = 134	2
PubMed (Excluding previously found in CINAHL)	SBAR OR Situation-Background-Assessment-Recommendation. Last 10 years in English	5	7		31	117 (Previously retrieved in CINAHL: 51) = 66	23
PubMed or CINAHL	SBAR OR Situation-Background-Assessment-Recommendation. AND MEWS OR modified early warning score OR early warning score system OR national early warning score OR NEWS					0	0
Africa Wide Excluding previously found in CINAHL, PubMed and Scopus	SBAR OR Situation-Background-Assessment-Recommendation.	1				5 (Previously retrieved: 4) = 1	0
Total		45	18	13	164	312	72

*Article retrieved had no reference to the SBAR communication tool or referred to the evaluation of an electronic SBAR.

Relevant publications dated between 1996 and 2005 and therefore not within the stated search dates were included. These include earlier primary studies of particular relevance,

frequently referenced citations concerning the popularity of SBAR research or trends related to use of the SBAR tool as in research related to handover and use of the MEWS to limit serious adverse events and texts for statistical tests. Articles mentioning but not pertaining to SBAR were excluded from the review. Research articles including rigorous studies such as RCTs were given priority over case studies and articles written based on author opinion.

2.3 Literature review results

Data in Table 2.1 show that a review of the literature yielded 72 research articles related to SBAR used in a variety of situations and applications. The major subject areas that emerged from a review of the available published literature were:

- Handoff or handover
- Interdisciplinary patient rounds
- Diverse settings for use of the SBAR
- Adaptations to the SBAR tool
- Developed and Validated SBAR tools
- SBAR training and role-play
- Countries involved in SBAR research.

2.4 Major subject areas of SBAR research

2.4.1 'Handoff' or 'handover'

Handoff or handover is defined as the exchange of information between health care professionals regarding a patient, either in the transfer of patients from one care area to another or the control over the patients care by transferring patient information from one care provider to another (Ilan et al., 2012:1). 'Handoff' appears to be a term used more frequently in published articles from the USA (Ardoin & Broussard, 2011) where as the term 'handover' was found in published articles from other countries such as Australia (Street et al., 2011; Clark et al., 2009), Canada (Ilan et al., 2012) the Netherlands (Poot et al., 2014) and Germany (Flemming & Hübner, 2013). For this study the term 'handover' will be used except when 'handoff' is in the title of a publication.

The USA Joint Commission's National Patient Safety Goal on handover (2007) is to implement a standardized approach to handover, including making provision to ask questions and provide a response to questions (Arora & Johnson, 2006:647). The

structure of choice in the USA for a standardized approach to handover is the SBAR (Staggers & Blaz, 2013:257). As the SBAR was initially designed to report patient care issues between nurses and doctors, using the SBAR for nursing handover requires great modification to the tool (Staggers & Blaz, 2013:257).

Handover's can take place during nursing change of shift report, doctor to doctor report or during patient transfer, providing report to temporary relief staff, peri-operative patient transfer, emergency room patient transfer to inpatient units, transfer to other hospitals, nursing homes, home health care and laboratory and imaging results called into doctors' offices (Arora & Johnson, 2006:647). Shift report is a form of handover which takes place between nurses: from a nurse ending a shift to the nurse receiving the patient at the beginning of their shift (Cornell et al., 2013:422). Providing accurate patient information was the primary objective of the National Safety Goal (Arora & Johnson, 2006:647).

Since the USA Joint Commission's National Patient Safety Goal on handover's 2007, numerous research articles are available pertaining patient handover. Articles related to electronic handover tools (Wentworth et al., 2012; Flemming & Hübner, 2013; Freitag & Carroll, 2011) and the effects of online simulation training to improve team handover performance (Daniel & Donamarie, 2014; Shin & Kim, 2014) were retrieved but excluded from the literature review as not relevant to the current study.

An evaluation of studies related to performance of the SBAR for handover for nurse-shift to-shift handover and doctor-to-doctor handover in terms of hierarchy of evidence is presented in Table 2.2.

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Table 2.2 Evaluation of the performance of the SBAR for handover

Note: papers are grouped by study design and ordered by date.

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations described by authors
Systematic and integrative literature reviews					
Riesenberg, Leitzsch and Little, 2009	A systematic review of handoffs conducted from 1987 to 2008.	Identify and describe all handoff mnemonics and review outcomes from studies using them.	Trained reviewers identified 46 articles describing 24 handoff mnemonics.	The majority of articles found were published between 2006-2008 and the most frequently cited mnemonic is the SBAR (69.6%). Only seven research articles on handoff were found of which only four studied mnemonics. Studies yielded small sample sizes (10-100) and a lack of validated instruments.	Literature review focused on literature from the USA and failed to include international research.
Staggers and Blaz, 2013	An integrative literature review on research outcomes on handoffs in order to create a computerized process for medical and surgical wards.	Synthesize the outcomes of nursing handover research on medical and surgical units.	Peer reviewed journals were reviewed 1980 to 2011, for studies related to handoffs handovers in medical and surgical wards.	Of 81 articles retrieved, 30 were relevant and met the criteria. No studies on handoff handover addressed SBAR's efficiency or effectiveness when used on medical or surgical wards.	The literature review was limited by poor quality qualitative studies and few experimental studies.
Dawson, King and Grantham, 2013	An integrative literature review of transfer of care of a deteriorating patient.	Assess which aspects of handover regarding a deteriorating patient can be improved between paramedics and emergency room staff.	The literature was reviewed in 2011 and July 2012.	A structured handover tool such as ISBAR (Introduction, Situation, Background, Assessment, Recommendation) would provide a solution to the need to provide clear and concise handovers, respectful and effective communication and identify emergency room staff.	The literature review appeared to favour literature from Australia with only one study from the USA.
Randomized control trial					
Cunningham et al., 2012	Evaluating the use of SBAR for telephonic referrals by junior doctors.	If exposure to an SBAR educational intervention could improve junior doctor telephonic referral.	A randomized control trial evaluated 66 hospital interns using simulated scenarios requiring telephonic referrals. Communication elements including 'critical data' were measured. Qualitative global	Results demonstrated no improvement of communication elements presented. Objective rating scores for the SBAR group were 8.5 (IQ 7.0-9.0) and control 8.0 (IQ 6.5-8.0); (p=0.051). Higher global rating scores measuring 'call impact' were	A single site study that may limit the generalizability of the findings to other areas.

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations described by authors
			rating scores and self-ratings on performance were evaluated pre and post SBAR training as well as six months and one year later. The time taken by interns to verbally refer 'time to first pitch' was also recorded.	achieved after SBAR training. SBAR group were 3.0 (IQR 2.0-4.0) and control 2.0 (IQR 1.0-3.0); (p=0.001). Time to 'first pitch' did not improve with SBAR exposure.	
Observational studies					
Cornell et al., 2013	Evaluating if the SBAR can improve shift report focus and consistency in medical and surgical units.	Assess the impact of SBAR on shift report by decreased shift report time. Improved time on task, increased consistency in shift reporting including more time on tasks related to report and less transcribing of information. Increased electronic SBAR use and decreased use of personalized hand written notes.	Qualitative direct observation on four 48-bed medical and surgical wards including an average of eight to nine nurse tasks, tools and locations recorded per shift. Baseline paper SBAR and paper and electronic SBAR reports were observed over eight months.	There was no decrease in shift report time between the three observation periods (ANOVA F=1,08; P=0.34). Nurse's time on tasks related to giving shift report were increased significantly (baseline 54.6% and 62.7% and 66.4%; F=3.67, P<0.03) and there was more dialogue (baseline 29.5% and 49.3% and 42.1%; F=11.48, P<.01) and less writing using paper SBAR from 21.1% to 11.2% but increased to 22.9% with an electronic SBAR (F=5.54, P<.01). Time on computer was low (4.1%, 2.2% and 1.4% and use of hand written notes decreased (Baseline 35% and 1.5% and 5.8%).	Patient outcomes including length of stay were not considered in this study. Staff and patient perceptions of satisfaction were not considered. Study results are not generalizable outside of the medical surgical environment.
Poot et al., 2014	An observational study exploring handover communication in a perinatal nursing setting.	Evaluating current handover practices as well as receivers opinion of the handover presentation, clarity and completeness.	Mixed methods observational study conducted in a six-bed labour unit in a tertiary hospital. Medical and nursing handovers were observed for one month. Written opinions of handover were collected at handover meetings by the researcher and workload-preceding handover was assessed.	A total of 70 handovers were observed for the presence and order of SBAR components. Of these 43% were medical handovers (n=30) and 57% nursing (n=40). Complete SBAR components were only used in 7% of handovers and in the majority of handovers (77%) background came first. Distractions (52%), poor eye contact (32%) and lack of read back (97%) or active inquiry (32%)	Findings are specific to a perinatal setting that may not be generalizable to other settings.

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations described by authors
			Handover practices were measured by observing the presence and order of SBAR elements.	indicated risk for poor communication although opinion of handover was high at 4.1 on a scale of 1-5, with 5 ranking excellent. (Standard deviation +/- 0.7).	
Pre and post implementation studies					
Ardoin and Broussard, 2011	Implementation of standardized handoff communication in a community hospital using SBAR.	A description of the process of implementing standardized handoff communication in order to reduce errors and improve patient safety.	An evidence based approach pilot tested the implementation of the SBAR for handoff on a 17-bed rehabilitation-nursing unit. Nurse and physician satisfaction surveys, chart audits regarding medication reconciliation and case examples of communication failures were examined pre and post implementation.	Improved doctor and nurse satisfaction with the use of SBAR and 100% compliance for reconciling home medications in a random sample of chart audits of admissions during the pilot study. (25% of admissions were randomly selected). A decrease in errors related to patient communication was reported. Following this pilot study the SBAR was implemented hospital wide.	Results of the pilot study described three doctors and three nurses experience of being satisfied with the SBAR. A decrease in errors related to communication was obtained from risk management reports. There is no detail of the reports or the actual errors and whether a reduction was directly linked to SBAR implementation.
Street et al., 2011	Evaluation of current handover practice and implementation and evaluation of a standardized bedside handover using SBAR.	Identify current strengths and limitations with handover practice and improve patient safety by implementing a new standardized process.	A cross sectional survey was completed by 259-nurses in 18 wards in a large public hospital on one day during shift report. Nurses from all units were included in the survey except nurses working on the adolescent ward, medical imaging and outpatient wards. Results of the pilot implementation were audited examining the handover process by randomly selecting ten patients per unit per week.	Survey results demonstrated large differences in handover time, location and method. Experience varied amongst nurses working part-time compared to nurses working full time. Following implementation nurses demonstrate increased patient involvement, made use of the SBAR and performed patient and documentation checks.	The handover recipient captured the data. No data was collected on factors affecting handover such as interruptions.

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations described by authors
Moseley et al., 2012	Improving inpatient neurology handovers by using a standardized sign out.	Improved perceived accuracy and completeness of communicated information.	A predesign survey was performed on 33 neurology residents followed by the creation and implementation of a structured sign out based on the SBAR. The structured sign out was piloted on a general neurology, stroke and neurologic intensive care unit over three months. Post-implementation surveys were completed by 20 residents.	Residents using the structured sign out were more likely to disclose results with patients and families (p=0.037). They were more likely to update an electronic patient service list (p=0.045). Transmitted data during sign out increased from 49% to 80% (p=0.041) and satisfaction over all increased from 6.2(±1.6) to 7.4 (±1.3) on a satisfaction scale from 1-10. (p=0.002).	Of the 33 residents who completed the pre-implementation survey only 20 (39%) completed the post-implementation survey. Low sample size in the study limited the statistical relevance.
Action Research					
Clark et al., 2009	Describing and evaluating a project aiming at handover communication between hospital staff.	Improved structure and content of nursing handover and increased confidence in communicating with doctors.	Action research was used to conduct the project that developed two tools using SBAR in a medium sized private hospital during a 9-month study. One tool was used in nurse shift-to-shift report and the second was used for nurse to doctor communication. All nurses were invited to participate and qualitative pre and post implementation questionnaires were collected.	Pre implementation 85% of nurses felt as if handover was not optimal. Following implementation 68% of nurses perceived an improvement and 80%of nurses perceived increased confidence with reporting to a doctor.	Post implementation questionnaire rate was only 28% as only 25/49 nurses responded. Findings may not be generalizable to other sites.

2.4.1.1 Evaluation of nurse shift-to-shift handover

Riesenberg, Leitzsch and Little (2009:2) described a lack of validated instruments for handover in a literature review of handovers conducted between the years 1987 to 2008 in the USA but failed to include international research. Staggers and Blaz (2013:258) extended the literature review to include international studies. A handover tool was subsequently developed and validated by Adams and Osborne-McKenzie (2012:263) called the "D-BANQ" (**D**emographics and stability, **B**efore care was provided, **A**s care was provided, **N**ext care provider information transfer and **Q**uestions), which incorporates the SBAR and another handover structure called the "TJC-CDPH" ("The Joint Commission Communication During Patient Handover"). The '"TJC-CDPH" consists of information such as diagnosis and current condition, recent and anticipated changes in condition, what to look out for and an opportunity to ask questions. Modified SBAR tools are covered in Section 2.4.4 'Adaptations of the SBAR tool'.

Staggers and Blaz reported that no studies on handover addressed the SBAR's efficiency or effectiveness when used on medical or surgical wards between the years 1980 and 2011 (2013:257) and that the majority of these studies included mostly qualitative studies and only a few quantitative studies (Staggers & Blaz, 2013:259). Subsequently, Cornell et al. (2013) measured the efficacy of the SBAR for shift report in four medical and surgical units as described in Table 2.2 further adding to qualitative studies.

2.4.1.2 Evaluation of nurse to nurse handover to another unit

The benefits of introducing the SBAR technique in nurse handover from one unit to another include studies by Landau and Wellman (2014:S49), Eberhardt (2014:17-20) and Wycoff et al. (2009:12). Landau and Wellman (2014:S49) described a simple process improvement project of a revised handover transfer template to include the SBAR communication tool for handover from a labour unit to a birthing unit. There was increased satisfaction between both units with communication and improved direct and timely communication. Eberhardt (2014:17-20) illustrated a handover process between medical-surgical wards and the operating room resulting in increased nurse adherence and satisfaction with the new practice. Wycoff et al. (2009:12) described an effort by oncology nurses to improve the handover process during urgent patient admissions from outpatient areas. The group adapted an SBAR communication tool in order to have better outcomes with vulnerable neutropenic patients. Outcomes demonstrated improved nurse satisfaction with SBAR use and improved quality of information communicated.

2.4.1.3 Evaluation of doctor to doctor handover

In the USA, the Accreditation Council for Graduate Medical Education limited resident working hours to 80 hours a week, averaged over a four-week period as of July 1, 2003 in order to improve patient safety (Accreditation Council for Graduate Medical Education, 2003:18). This decrease created an increase in daily resident handovers by 40% making a standardized form of communication essential (Telem et al., 2011:90). The majority of medical studies regarding medical handover are of resident handover and not of experienced doctor handover (Riesenberg, Leitzsch and Little, 2009:5). Ilan et al. (2012) filled the gap by examining handover practice amongst experienced doctors. Results indicated that critical care physicians do not adhere to structured communication. When used, the recommendation portion of the SBAR and past medical history were not present in 22 (55%) and 20 (50%) respectively (Ilan et al., 2012).

The SBAR has been chosen as the preferred communication framework for surgical resident handover that also empowers the user by allowing questions, formulates a plan of care and enhances clarity (Telem et al., 2011:90). Prior to SBAR implementation surgical residents expressed frustration with their handover communication, especially between nurse-to-resident handover (Telem et al., 2011:91). Articles depicting the incorporation of handover into a curriculum are presented in Table 2.7. Despite SBAR training, exposure does not necessarily improve the relay of critical information when used by junior doctors for telephonic referral but does improve the ability to convey the point of the message in the referral (Cunningham et al., 2012:623).

2.4.2 Interdisciplinary patient rounds (IDR)

Interdisciplinary Daily Rounds (IDR) refers to the daily physician patient rounds where patients are presented, discussed and care is planned (Cornell et al., 2014b:335). IDR's are attended by members of the multidisciplinary team, which typically include the staff nurse, charge nurse, pharmacist, dietician and case managers (Cornell et al., 2014b:337).

The literature search demonstrated a shortage of research available on IDR and SBAR. Townsend-Gervis, Cornell and Vardaman (2014:1-10) demonstrate the value of IDR and patient presentation with SBAR as well as the improved situation awareness and emphasis of important patient information. Situation awareness is described as the ability to formulate a plan based on the degree of understanding (Cornell et al., 2014a:165). Using SBAR during IDR's reduces patient review times and empowers newer nurses to present their patients competently (Cornell et al., 2014a:166-167). Data in Table 2.3

shows the evaluation of performance of the SBAR for IDR in three linked studies in one hospital setting including a combined study on shift report and IDR.

Table 2.3 Evaluation of the performance of the SBAR for interdisciplinary patient rounds in three linked studies

Authors	Study Objective	Outcome measure	Method and sample size	Findings
Cornell et al., 2014a	The impact of SBAR on shift reports and Interdisciplinary Daily Rounds (IDR).	**Shift report**: Shorter report's, decreased use of paper charting, improved consistency in the information reported and improved quality of information reported. **IDR's**: Improved consistency decreased transcribing, decreased review times, less paper usage and information handling.	Qualitative direct observation on three 48-bed medical and surgical wards. Following the collection of baseline observation of shift reports and IDR, paper and electronic SBARS were introduced following second and third rounds of observation. Subsequently an electronically supported protocol was introduced, followed by a third observation.	Shift report: Baseline shift report was 53 minutes, paper SBAR 45.1 and electronic SBAR 38.1. Decreased paper handling and increased nurse focus on task at hand. IDR: Shorter patient reviews post-SBAR from 199 to 58 seconds. Reduced transcribing and increased dialogue.
Cornell et al., 2014b	Using interdisciplinary patient rounds and structured SBAR communication to improve situation and awareness and patient outcomes. The impact of two interventions was explored relating to communication on medical and surgical wards. The first was to utilize IDR to review patients and care plans. The second was to use the SBAR to facilitate patient presentation.	Outcome measures included an impact on Length of stay with the use of both IDR and SBAR. Daily IDR using SBAR potentially increases communication frequency and consistency and improves speed and clarity between members of the multidisciplinary team.	Qualitative direct observation on three 48-bed medical and surgical wards of four patient review situations: baseline, mobile IDR, paper and electronic SBAR over a nine-month span including 960 patient reviews.	The IDR decreased patient review times from 102 to 69 seconds. The addition of the SBAR did not reduce these times further. Patient satisfaction remained the same or slight improvement and length of stay was unchanged.
Townsend-Gervis, Cornell, Vardaman, 2014	Reduced admissions and improved patient outcomes through IDR's and structured communication using the SBAR.	The study aim was to measure if structured communication in the form of SBAR during IDR's improved patient outcomes including patient satisfaction, foley catheter removal and thirty day readmission rates.	Direct observation on three 48-bed medical and surgical wards including 111 nurses from 2010 to 2012. Staff nurses each presented their patients during IDR's by using paper and electronic SBAR's. Patient satisfaction rates were determined by patient survey questions.	Compliance with foley catheters improved (78% to 94%), re-admissions were lower (14.5% to 2.1%) and improving patient satisfaction noted on patient survey questionaires.

2.4.3 Diverse settings for use of the SBAR

The Institute of Medicine (IOM) reports (2001:1-2; 2003:24,53) illustrate the value of standardized communication in all health care areas in order to improve patient safety and reduce errors. As a result the SBAR has been adopted by a variety of clinicians, other than the traditional nurse-to-physician communication in urgent situations (Leonard, Graham & Bonacum, 2004:i86).

Numerous journal articles are available describing the potential benefit of the SBAR technique in various settings and are presented in Table 2.4.

Table 2.4 Evaluation of expert or consensus opinion describing the potential benefit of the SBAR technique in various settings

Author	Setting	Potential benefit of SBAR use
Sibbald & Ayello, 2007	Wound care	SBAR could aid appropriate information transfer and collaboration amongst clinicians to improve patient outcomes.
Markley & Winbery, 2008; Narayan, 2013	Home health care	Improving communication between health care providers with the SBAR could avoid unnecessary re-hospitalisations.
Pronk, 2008	Health promotion teams in the workplace	Using the SBAR could improve collaboration and encourage freedom of speech among team members.
Gordon et al., 2010	Incorporated into post fall decision guidelines	SBAR use could ensure appropriate care for patients who have fallen by improving communication between teams of health care providers.
D' Agincourt-Canning, et al., 2011:705	Paediatric Intensive Care Unit	The SBAR could enhance communication and help build a successful team.
Jenerette & Brewer, 2011	Emergency department (ED)	Using the SBAR could help patients with sickle cell disease communicate in a common language and could place them on equal footing with health care providers.
Shannon, Long-Sutehall & Coombs, 2011	Critical care	The addition of SBAR could aid in end of life care conversations in critical care.

Note: papers are ordered by date.

The few examples of case studies depicting the SBAR's actual use in various settings are presented in Table 2.5.

Table 2.5 Case study examples depicting the use of the SBAR technique in various settings

Author	Setting	Case study description of SBAR use
Edwards & Woodard, 2008	Maternal transport	SBAR was used in the form of a handoff report. Results demonstrated an increase in communication between facilities involved in maternal care.
Amato-Vealey, Braba & Vealey, 2008	Peri-operative setting	SBAR was used in handoff where it was found that with SBAR use there was increased communication of data related to surgery between clinicians.
Montgomery & Mitty, 2008	Assisted living	SBAR was used as the framework in a communication model used for assisted living residents to recognize change in condition.

Besides the acute care environment, the SBAR has been adapted for other settings such as rehabilitation (Velji et al., 2007; Boaro et al., 2010, Andreoli et al., 2010) where an adapted and validated SBAR tool was found to enhance individual and team communication and had influence over staff perceptions of safety climate (Velji et al., 2007; Andreoli et al., 2010). Studies related to performance of the SBAR by a variety of clinicians and in settings other than nurse shift-to-shift and doctor-to-doctor handover (Table 2.2) are presented in Table 2.6 in terms of hierarchy of evidence and ordered by date.

Table 2.6 Evaluation of SBAR use by various clinicians

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations
Randomized Control Trial					
Field et al., 2011	Evaluation of improved warfarin management by using structured communication in nursing homes	Evaluating if a warfarin communication protocol incorporating SBAR would improve the quality and safety of anticoagulation management in nursing home residents.	A randomized controlled trial including 26 nursing homes between 2007-2008. A total of 435 residents received warfarin therapy during the trial period.	The intervention group demonstrated longer therapeutic international normalized ratio (INR) ranges between 2.0-3.0 (4.5%) than the control group (95% confidence interval, 0.31%-8.69%). Follow up INR checks following a value of 4.5 or greater were the same for both groups and the rate of preventable adverse events related to warfarin were slightly lower in the intervention group (41) compared to the comparison group (42) but not significantly. The incident rate ratio was 0.87 (95% confidence interval, 0.54-1.4).	The study did not demonstrate a significant difference in adverse events.
Quasi-experimental study					
Randmaa et al., 2014	SBAR use by multidisciplinary team in an anaesthetic clinic	Would introducing the SBAR enhance staff perceptions of communication, safety climate and psychological empowerment and reduce incident reports related to communication.	A prospective intervention study was performed with an intervention group (n=100) and a comparison group (69) in two hospitals using pre and post implementation assessments up to six months after implementation and pre and post incident reporting one year before and after implementation. Included were all nurses and doctors working in operating theatres, intensive care units and recovery units.	The intervention group demonstrated significant improvement in accuracy of communication ($p=0.039$) and perceptions of an enhanced safety climate ($p=0.011$). The intervention group also had a significantly reduced number of incident reports related to communication ($p<0.0001$) from 31% (n=36) to 11% (n=23).	The comparison group had over all fewer reported incidents and a decrease from 25%(n=24) to 19% (n=6).

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations
Pre and Post Implementation studies					
Haig, Sutton and Whittington, 2006	The SBAR technique was implemented in a hospital to be used by all healthcare providers as a framework for communication.	Increased use of SBAR to 90% by all staff. Better communication would improve medication reconciliation as well as decrease adverse events.	Randomly collected pre-implementation surveys assessed staff understanding of what SBAR meant. Implementation of the SBAR in multiple areas within a hospital including intensive care, post intensive care, respiratory, cardiac rehabilitation and catheter lab, medical and surgical wards, paediatrics, interventional radiology and transitional care unit. Float and supervisory staff included.	Pre-implementation surveys indicated that at baseline 60% of staff surveyed understood what SBAR stood for. Post implementation mean rose to 96%. Admission medication reconciliation improved from a mean of 72% to 88% and at discharge from a mean of 53% to 89%. 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 per year.	It is unknown how many staff members were involved in the project as well as how many charts were evaluated for medication reconciliation. In addition the cause of the adverse events is unknown and if they were linked to communication.
Donahue et al., 2011	The SBAR technique was implemented to improve and encourage reporting by paraprofessional staff (PPS).	The study objective was for an appropriate translation of the SBAR for PPS to use, reduce communication barriers and to examine the effects of the intervention on PPS communication and patient safety.	A program evaluation design was used in all patient care areas in a large hospital. Pre-implementation surveys were completed by 182 PPS and post implementation surveys were completed by 111 PPS and post implementation focus group interviews were evaluated.	Initial surveys indicated that only 39% of the 65% of PPS who completed the survey reported patient safety issues. The initial pre-implementation survey indicated 18.6% of the PPS reported patient concerns to doctors more than five times in the last week, the second survey at the end of the study period saw an increase to 30%. PPS demonstrated a decreased perception of reporting patient conditions as having negative consequences from 33% to 21.7%. In addition PPS perception of hospital management's focus being on patient safety increased from 78% to 86%.	Additional findings from the study illustrate a decrease in the rapid response events leading to code events from 29% to 22%. The change is small and does not highlight an actual improved patient outcome.
Renz et al., 2013	The feasibility and utility of the SBAR was evaluated in order to communicate and evaluate clinical changes in long term	Increased nurse satisfaction. Improved doctors perception of nurse to doctor communication and adherence to SBAR	A quality improvement project using a repeated measures design. All nurses in a 137-bed skilled nursing home were invited to participate. Implementation period was	Results demonstrated slight but not significant improvement in nurse satisfaction with communication to a doctor as well as improved physician satisfaction with communication with nurses. The majority (78%; n=51) of the completed SBAR tools (total of 65	There was a small sample size and the study was conducted at a single site.

Authors	Study Objective	Outcome measure	Method and sample size	Findings	Limitations
	care patients	utility.	3 months. Of the nurses 40 agreed to participate in pre and post implementation questionnaires and seven doctors provided feedback.	completed SBAR tools) had no missing documentation and documentation was competed by the nurses before shift end.	

2.4.4 Adaptations of the SBAR tool

The tool has been adapted and in some instances combined with other mnemonics, and used in training for preparation for working in specialized settings such as improving paediatric intern hand-offs in simulated critical patient scenarios using the "ABC-SBAR" (McCrory et al., 2012:539). "ABC-SBAR" training resulted in improved timely communication of essential information (McCrory et al., 2012:540).

As reported in Section 2.4.1.1, a nursing handover tool "D-BANQ" was developed and validated aligning with SBAR and another handover structure called the "TJC-CDPH" (Adams & Osborne-McKenzie, 2012:263). Another modified version of the SBAR is the ISBAR (Identify, Situation, Background, Assessment, Recommendation) that was used by final year medical students to make telephonic referrals in a simulated clinical scenario (Marshall, Harrison & Flanagan, 2009:138-139). Following training the ISBAR group communicated higher content than before from a mean of items communicated increasing from 10.2 to 17.4 items ($P<0.001$) and greater clarity in the delivery (rho = 0.903, $P<0.001$).

A nurse-to-nurse reporting tool called the SBAP (Situation, Background, Assessment, Plan) was developed but not validated to increase the safety climate at a hospital that reported communication as a root cause of the majority of its medical errors (Stevens et al., 2011:48). A transition tool was developed by Singh et al. (2011:4) to be used by staff who first encounter patient information in an inpatient and affiliated outpatient settings. The tool incorporates SBAR components and had multiple applications such as a hand over checklist, an audit tool as well as a teaching tool. The tool can be used for communication related to a patient transferring from another hospital or to another hospital, or a patient transferred from another healthcare setting to an office or from the office to another health care setting (Singh et al., 2011:4).

2.4.5 Developed and Validated SBAR tools

The literature search revealed no validated SBAR instrument incorporating components of a MEWS for use in nurse-to-doctor or senior nurse call for assistance. Although numerous SBAR tools were developed and implemented, few SBAR tools had been validated. Evaluation of developed and validated SBAR tools is presented in Table 2.7.

Table 2.7: Evaluation of developed and validated SBAR tools

Author(s)	Developed tool	Methods and sample size	Results
Developed and validated SBAR tools			
Mitchell et al., 2012	Developed and validated an assessment tool using the SBAR for surgical morbidity and mortality conference presentations	A prospective observational study with literature review and expert consensus for tool development. The tool was refined by assessor feedback and assessed for internal consistency and inter-assessor reliability as well as construct validity. Three versions of the tool were developed. The first: 27 assessments completed by nine residents and three independent raters in a four-week period. Second: 33 assessments and nine residents and four faculty raters and the third: 45 assessments from nine residents and four independent raters.	Three versions of the tool were developed demonstrating improved internal consistency and inter-assessor reliability from the first (Cronbach α of .801 for internal consistency and moderate agreement amongst raters) to the third version (Cronbach α of .977 and good agreement amongst raters) as well as improved construct validity from the first to the third (P=0.068).
Adams and Osborne McKenzie, 2012	A nursing handover tool was developed and validated (D-BANQ) incorporating the SBAR and another handover structure called the “TJC-CDPH” (“The Joint Commission Communication During Patient Handover”).	Participants (20) were recruited across five nursing units and were each provided a questionnaire regarding what information is required at shift report in order to provide adequate care. Verbal responses were recorded and transcribed and analysed with directed content analysis. Concepts (146) of the SBAR and TJC-CDPH formed the directed content analysis categories. Inter rater reliability was established by comparing the concepts categorization amongst three researchers	Initial inter rater reliability was low (45%). Further analysis of the data and discussion yielded new themes and achieved 100% inter-rater reliability. Content validity was additionally performed on seven nurses with the addition of an item consisting of an opportunity to ask questions or clarify information.

2.4.6 Evaluation of SBAR training and role-play

2.4.6.1 SBAR training

Fassett (2011:5) recommended that the SBAR communication technique be taught early and practiced frequently and not rushed into single course teachings. Education in SBAR has been considered a valuable addition to curriculum for master's nursing students (Wang et al., 2015), nurses (Ozekcin et al., 2015; Kotsakis et al., 2014), nursing students (Hamilton et al., 2006), pharmacists (Fassett, 2011:2), medical students (Hayes et al., 2014), surgical (Telem et al., 2011), and emergency medical residents (Tews, Liu & Treat, 2012).

According to Ascano-Martin (2008:190) Shift report and SBAR are an appropriate method for students to present patients instead of the previously used case study formats. Studies related to performance of the SBAR when introduced into curricula are ordered by date and presented in Table 2.8.

Table 2.8 Evaluation of the performance of the SBAR when introduced into curricula

Authors	Curriculum	Outcomes measure	Setting and sample size	Findings	Limitations
Hamilton et al., 2006	Undergraduate nursing student's	Nurses would have a heightened awareness of communication in relation to patient safety and quality patient care following a training intervention. Evaluated were nurses communication skills and satisfaction with communication, perceived safety climate on the unit, response to errors as well as plans to remain in present hospital for a year.	A convenience sample of ten registered professional nurses training for in a bachelor of science program and 13 labour and delivery nurses participated in an educational intervention. Training lasted four hours in a single session. Survey questionnaires and pre test and post-test were collected. Outcome data was collected post intervention and a month later.	Although there were no differences in pre and post-test measurements of key outcomes, there appeared to be an improvement in reported errors on the unit studied as well as an effect on the number of critical events identified during the study (d=0.15 for 'Number of critical events identified') and improvement in nurses' confidence when reporting to a doctor over the telephone.	There was a small sample size and a single site study. There was no control group.
Telem et al., 2011	Surgical residents	The implementation of SBAR was evaluated in a surgical curriculum in order to provide a structure for daily surgical resident handover in an academic department of surgery.	A curriculum was established lasting two and a half hours during a single session including 45 general surgery residents. Evaluated were: perceptions of handover, areas of poor communication and early outcomes.	Results of the resident's perception of handover included residents' expressing that the current form of handover results in poor communication, especially between nurse-to-resident handover. Following implementation of the SBAR results demonstrated that sentinel events remained unchanged and errors related to doctors orders decreased by 2.5% from pre- to post-training on the SBAR (14.5% versus 12.2%) and results were statistically significant (P=0.003). The control group demonstrated no statistically significant difference (12.9% versus 13.6%; P=0.47).	Sentinel events are rare occurrences and a longer study period would be required to fully assess safety related outcomes.
Tews, Liu & Treat, 2012	First year emergency medicine residents	Would teaching the SBAR technique be suitable for use as a handover tool by first year emergency medicine residents?	A one-hour educational intervention was performed on 25 emergency room residents. Pre-tests were followed up at 4 months with post-tests to evaluate retention of training. Surveys were collected after	Pre- (mean, 10.2; SD, 2.7) and post-test scores (mean, 15; SD, 1.6) indicated improvement in the use of applying the SBAR to simulated case presentations (P=0.001) and that training was retained, residents expressed	There was a small sample size and the study was limited to a single site. Findings may not be generalizable.

Authors	Curriculum	Outcomes measure	Setting and sample size	Findings	Limitations
			each session.	increased comfort with patient presentation and willingness to use SBAR. There was significantly increased perception of effective communication with SBAR use (P<0.001).	
Kotsakis et al., 2014	Paediatric acute care simulation education	Assessing if an education intervention can teach providers to identify and manage a deteriorating paediatric patient as part of a team.	A large children's hospital implemented an educational intervention including 38 doctors and 51 nurses who were trained on SBAR, recognizing deteriorating patients, crisis management and basic life support skills. Participants evaluated the course by survey questionnaires.	Of the 76 returned survey questionnaires, 100% of the respondents rated the training as excellent/very good. Increase confidence and improved communication skills and better understanding of roles were amongst the feedback received.	There was no evaluation of knowledge gained by the course in the form of pre and post training evaluation.
Hayes, et al., 2014	Undergraduate medical student's	A peer-led pilot educational program for undergraduate medical students to raise awareness of patient safety and enhance skills.	An educational intervention including hand washing for surgery, patient handover, identifying clinical errors and MEWS and SBAR training. The total attendance was 86 with 79(92%) pre and post seminar evaluations.	Over all the evaluations indicated that 53 participants (63%) made negative comments or recommended changes to the training program. Specific to the MEWS and SBAR satisfaction scores on finding MEWS and SBAR training useful were Neither agree or disagree 10% (n=8), agree 39% (n=30%) and strongly agree 51%(n=40).	There was no control group and knowledge gained from the course was not evaluated.
Lancaster, Westphal & Jambunathan, 2015	Undergraduate nursing students	Undergraduate nursing students who received SBAR training in their curriculum were tested on their ability to recognize and understand various cues in a case study and reveal the findings using SBAR.	A descriptive design was used with an 80 second semester students in pharmacology theory course.	Results demonstrated that 77.5% (n=62) of the students were unable to use clinical judgement between recognizing and interpreting clinical cues.	The nursing students participating in the study were only second semester students still in the process of developing the analytical skills required to interpret and comprehend a case study.

Authors	Curriculum	Outcomes measure	Setting and sample size	Findings	Limitations
Ozekcin et al., 2015	Acute care simulation education	Assessing if online learning and simulation training with SBAR improve acute care nurses ability to identify early physiologic deterioration.	A quality improvement project tested an educational intervention on 35 nurses working on an inpatient cardiac surgical telemetry/ step down/ critical care unit. Pre education and post education knowledge surveys and time measurements from scenario to an action were taken.	Results illustrated that an education intervention improved the recognition of instability (pre-test score of 56.5%; SD, 17% and post test scores 84.6%, SD, 10% which was an increase of 27.9%, $p<0.0001$) and enhanced communication and resulted in increased knowledge and swifter critical actions (time to initiate care decreased from 66% to 61%).	A convenience sample was obtained in a specialized work setting so findings may not be generalizable.
Wang et al., 2015	Master's degree nursing students	Evaluate Chinese nurses knowledge of the SBAR technique and their attitudes towards using the tool in a clinical setting.	A quasi-experimental design including an educational intervention on the SBAR communication tool was tested on 19 master's degree nurses by convenience sampling. Pre and post questionnaires assessed student's ability to utilize the SBAR.	Results demonstrated significant improvements of knowledge of the SBAR from pre-test (14.0 ±2.9) to post-test (16.6± 2.2, $p=0.009$). The majority of the students agreed they would use the SBAR in their practice (93.8%).	There was a small sample size and no control group.

2.4.6.2 SBAR role-play and training

The use of role-play during SBAR training is an effective method for educating nurses in a teaching hospital (Chaharsoughi, Ahrari & Alikhah, 2014) and senior nursing students (Kesten, 2011). Studies related to performance of the SBAR when role-play is used in addition to didactic training are presented in Table 2.9.

Table 2.9 Evaluating role-play when used in addition to didactic training compared to didactic training alone in SBAR training

Authors	Curriculum	Setting and sample size	Findings
Kesten, 2011	Senior nursing students	Experimental study with pre-test and post-test design. Experimental group were randomly assigned.	Resulted in students receiving role-play in addition to SBAR training performed significantly better when communicating with the SBAR than students receiving SBAR instruction only (t=-.26, p=0.005).
Chaharsoughi, Ahrari, & Alikhah, 2014	Nurses (All nurses working in a teaching hospital. Author does not specify levels of qualification)	Quasi- experimental design with a post test only design following education on the SBAR technique to nurses with an experimental group (n=40) teaching with role play and control group (n-38) teaching without role play.	Results demonstrated significant differences by independent samples t-test between the two groups (P=0.001). Didactic group mean= 1.193(SD, 1.11) and role-play group mean=2.928 (SD, 1.20; p=0.001; CI -2.28-1.19).

2.4.7 Countries participating in SBAR research

The SBAR communication structure is not only widely used in the USA but has been adopted by the UK's National Health Service to be used by all health professionals as the standard structure for communication (Fassett, 2011:4). Although most SBAR research is from the USA (Ardoin & Broussard, 2011), other countries conducting SBAR research include Australia (Street et al., 2011; Clark et al., 2009; Cunningham et al., 2012; Dawson, King and Grantham, 2013), Belgium (De Meester et al., 2013), Canada (Velji et al., 2007; Boaro et al., 2010; Andreoli et al., 2010; Ilan et al., 2012; Kotsakis et al., 2014; D' Agincourt-Canning et al., 2011), China (Wang et al., 2015), Germany (Flemming & Hübner, 2013), UK (Whittingham & Oldroyd, 2014; Hayes et al., 2014), Iran (Chaharsoughi, Ahrari, & Alikhah, 2014), Sweden (Randmaa et al., 2014), the Netherlands (Poot et al., 2014; Ludikhuize, de Jonge and Goossens 2011) and South Africa (Raymond & Harrison, 2014).

2.5 Design Criteria

Vardaman et al. (2012) examined the influence of the SBAR on the day to day experience of nurses and findings suggest that the SBAR goes beyond standardizing communication between doctors and nurses but in addition may aide in schema development which is intuitive decision making or the ability to make decisions quickly. In addition findings suggested that using the SBAR aids in the development of legitimacy as it provides credibility in nursing practice and a sense of competence, as well as the development of social capital, which provides a sense of self-efficacy by building a platform of trust between nurses and physicians. The study suggests using the SBAR provides a reinforcement of dominant logics, which refer to logic shifts in nursing practice such as a shift from flexible communication to a standardized structured format (Vardaman et al., 2012:88-96).

Goal two of The Joint Commission Hospital National Patient Safety Goals (2015:2), is to improve the effectiveness of reporting critical test results as well as other diagnostic procedures in a timely manner. Findings suggest that nurses trained to use both SBAR and MEWS are more likely to perform an immediate patient assessment and call for assistance sooner than nurses who did not receive training (Ludikhuize, Jonge & Goossens, 2011). With the addition of early detection algorithms to assess airway, breathing, circulation, disability, and exposure (ABCDE), the MEWS and SBAR are shown to decrease patient deaths (De Meester et al., 2013).

Raymond and Harrison (2014) determined the effectiveness of using the SBAR communication tool in a local setting in South Africa. Nurses and doctors in a large neonatal unit received SBAR training to standardize communication by telephone and patient handover. Following implementation, telephone audits assessing SBAR use by registrars calling senior doctors for assistance demonstrated an increase in SBAR use from 29% to 70%. Both doctors and nurses perceived an improvement in communication including asking for help. Doctors and nurses reported increased confidence with communication structure and making recommendations. Both groups perceived an improvement in patient care. Qualitative findings suggested that patients received swifter care and timelier senior doctor review.

2.6 Barriers to designing a SBAR tool

Despite training the SBAR may not always be used (Ludikhuize, Jonge & Goossens, 2011:1431) or used correctly (Ilan et al., 2012:5; Joffe et al., 2013:495-501). Findings by

Lancaster, Westphal and Jambunathan, (2015) raise concern that undergraduate nursing students may still be in the process of developing the analytical skills required to interpret and comprehend early signs of patient deterioration and may therefore not respond by calling for assistance. These findings along with Cunningham et al. (2012:622) raise the question of SBAR use in general by junior under-graduate students.

Potentially problematic reporting could occur after hours. The primary physician is often not available for their patient after hours and the sign out to the on call provider, who knows little about the patient, may have been brief (Joffe et al., 2013:495). The handover process between physicians can result in adverse events and is in itself in need of further research (Ilan et al., 2012:9). Joffe et al. (2013:495) assessed problem-specific SBAR tools for nurses to use when calling a doctor after hours. This 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.

2.7 The benefits of SBAR use for early reporting of patient deterioration and preventing unexpected deaths

Numerous studies such as by Beckett and Kipnis (2009) describe the perceived improvement in patient safety by using the SBAR communication tool. In addition some studies describe a change in reported errors related to communication in general (Haig, Sutton & Whittington, 2006; Ardoin and Broussard, 2011; Randmaa, et al., 2014). There are few rigorous studies, which evaluate actual patient outcomes with the use of SBAR alone for early reporting of patient deterioration and preventing unexpected deaths. Relevant studies retrieved from the literature search included studies by Ludikhuize, Jonge & Goossens (2011) and De Meester et al. (2013).

Ludikhuize, Jonge and Goossens (2011) conducted a study to see if a nurse trained to use the MEWS and SBAR tools would be more able to detect a deteriorating patient. A quasi-experimental trial was conducted in an academic hospital in the Netherlands where nurses were evaluated for their interpretation and response of a deteriorating patient in a simulated environment. Outcomes demonstrated that nurses trained to use MEWS and SBAR tools (77%) tended to perform an immediate patient assessment versus non-trained nurses (58%; P=0.056). Respiratory rate, which is the most sensitive indicator of acute deterioration (Subbe et al., 2003:801) was measured double the amount of times to 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. Limitations to this study

include it being a single centre study as well as there was no real life patient for nurses to visualize (Ludikhuize, Jonge & Goossens, 2011:1432).

De Meester et al. (2013) demonstrated that using the SBAR not only improves communication between nurses and physicians but also reduces patient unexpected deaths in a tertiary teaching 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 sign chart, the ABCDE to perform a patient assessment 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 and a decrease in unexpected deaths.

2.8 Summary

The available published literature on search terms from databases between 2005 and 2015 yielded major subject areas particularly relating to handover. In addition, hand searches of references produced useful primary sources some of which pre-dated 2005. The SBAR has been tested for interdisciplinary daily rounds and used by a variety of clinicians. The SBAR tool provides a vehicle for clinicians to learn how to communicate clearly and concisely and therefore to enhance nurse and doctor satisfaction with communication and to increase a hospital's safety climate. Educational interventions prior to the implementation of a structured communication tool are beneficial especially with the addition of role-play and education on the SBAR is appropriate for all levels of nurses and nursing students.

The SBAR has been tested successfully in South Africa. By incorporating a MEWS with a reporting algorithm into the SBAR tool it should be easier for nurses to detect and report a deteriorating patient to reduce adverse events. The literature search revealed no validated SBAR instrument incorporating components of a MEWS for use in nurse-to-doctor or senior nurse call for assistance.

3 METHODS

3.1 Introduction

This study is about the development and validation of a Situation-Background-Assessment-Recommendation (SBAR) communication tool, fit for purpose with the use of a Modified Early Warning Score (MEWS) vital signs observations chart. It is a sub-study of a larger multi-site cluster randomized trial (RCT) (Kyriacos & Jordan, UCT HREC REF: 825/2014). The trial is aimed at testing the effectiveness of a revised MEWS observations chart (Appendix A1, A2) and validated SBAR communication tool for improved recognition and reporting of deterioration in patients.

In this chapter the design and construction of the SBAR communication tool are described, followed by a description of a mixed methods approach employed to validate the tool: cognitive interviewing, determining the index of content validity of all items on the tool and inter-rater reliability testing. Thereafter, data management and analysis are described.

3.2 Research design

A descriptive study design was employed for the development and validation of a prototype modified SBAR tool (Appendix B1) incorporating selected aspects of a revised MEWS vital signs observations chart (Appendix A1, A2).

A flow diagram of the location of the sub-study within the larger trial is shown in Figure 1.1, which also depicts the development and validation of the prototype modified SBAR communication tool.

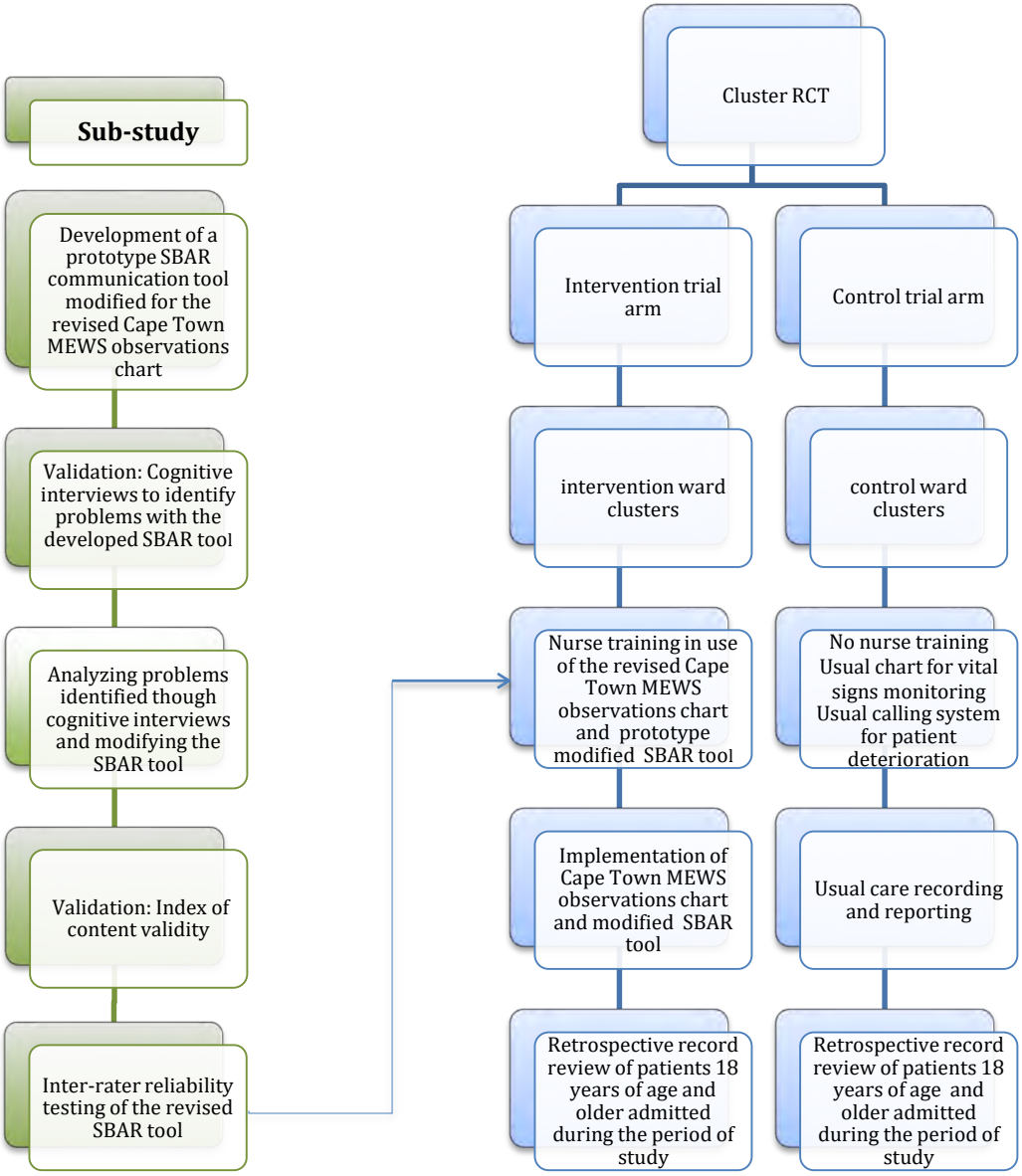

Figure 1.1: Flow diagram depicting the location of the sub-study within the larger trial and the development and validation of a prototype modified SBAR communication tool incorporating components of the revised Cape Town MEWS vital signs observations chart.

3.3 Instrument construction: Phase 1

This section describes the construction of three research instruments: 1) a locally developed prototype modified SBAR Communication Tool, 2) a Cognitive Interview (CI) Guide and 3) an Index of Content Validity (CVI) criterion sheet.

3.3.1 Construction of a prototype modified SBAR Communication Tool

The **first objective of the study** was to identify a best practice SBAR communication tool from available published literature. The Magee-Women's Hospital SBAR telephonic

checklist (Table 3.1) was considered to be the most suitable framework for a description of pertinent patient information to be reported within a SBAR communication framework due to its simplicity and relevance.

Table 3.1 The Magee-Women's Hospital SBAR telephonic checklist

Situation	State your name, unit and patient name as well as the problem identified
Background	State admission diagnosis, admission date, pertinent medical history, a brief synopsis of treatment up until now and the change in condition from previous condition
Assessment	Provide the following vital signs: Blood pressure, pulse, respiration and temperature. State whether the patient is receiving oxygen and if there are patient complaints. Provide a pain scale rating and a description of what the change is from the previous assessment. (Options provided to choose from such as a change in mental status, skin colour or respiratory rate.
Recommendation	Recommend remedial actions required or request immediate assessment. Ask if any testing or medication is required and if the doctor wishes to be notified for any reason. If there is no improvement request when to call back

(Woodhall, Vertacnik & McLaughlin, 2008)

The **second objective of the study** was to construct a prototype modified SBAR communication tool for use in a local context by incorporating physiological components of the revised MEWS and items for recognizing early signs of clinical deterioration from the Cape Town MEWS observations chart (Appendix A1). The initial prototype SBAR tool (Appendix B1) was structured using the framework of the Magee-Women's Hospital SBAR telephonic checklist to incorporate aspects of the MEWS chart in a logical order. As the SBAR chart is used to summon assistance when a patient's condition deteriorates, the process of summoning assistance should be simple and expeditious. The four components of the structure of the SBAR tool are situation, background, assessment and recommendation.

3.3.1.1 Situation

This section of the prototype SBAR tool was amended to include a MEWS score and clinical signs of deterioration when reporting the problem that the patient is experiencing.

3.3.1.2 Background

The decision was made to keep the **Background** section similar to the original Magee-Women's Hospital SBAR telephonic checklist and to subject it to cognitive interviews for analysis of its interpretation and in a local context.

3.3.1.3 Assessment

As the MEWS chart aids in the recognition of early signs of physiological and clinical deterioration, both physiological and clinical aspects were incorporated under the **Assessment** portion of the prototype modified SBAR tool. As the goal of the SBAR tool is to only provide pertinent information for reporting, the **Assessment** portion comprised physiological parameters: respiratory rate, oxygen saturation, temperature, heart rate and blood pressure and parameters indicating clinical signs of deterioration including patient perfusion, skin colour, patient complaints, pain, sweating, wound ooze, pedal pulses, blood glucose, finger prick HB, Glasgow coma scale, pupil size and urine output.

3.3.1.4 Recommendation

The Magee-Women's Hospital SBAR telephonic checklist suggests recommending remedial actions in the section **Recommendation**, which is appropriate for the clinical judgement expected of an RPN. As the prototype modified SBAR tool will not only be used by RPN's, but all levels of nursing, modifications were made to prevent miscommunication and reduce the potential for error when used by nurses other than RPN's. The **Recommendation** was changed from stating what action the nurse would like to see to a request for the doctor or registered professional nurse to see the patient now or in the next thirty minutes. In addition, a reminder prompt was included to obtain a second witness if medications were prescribed.

3.3.2 Construction of the Cognitive Interview (CI) guide

To validate the locally developed prototype SBAR tool (Appendix B1), four instruments were constructed for the cognitive interviews guided by the published literature: 1) a guide and questionnaire with instructions (Appendix C1), 2) scenario (Appendix C2), 3) MEWS vital signs chart populated with clinical data from the scenario (Appendix C3) and an informed consent form (Appendix C4). Beatty and Willis' (2007:288) extensive analysis of the literature indicates that the purpose of CI's is to identify and correct problems with survey questions. For the purpose of this study, cognitive interviewing was conducted to identify and correct problems with the prototype SBAR tool and to include additional verbal information if provided by participants. Components of the SBAR tool include **Situation,** which describes who and where the patient is and what the circumstances are. **Background** describes what has led up to the event and includes the patient history and a brief description of the patient's medical treatment. **Assessment** includes current vital signs as well as clinical signs of deterioration. **Recommendation** provides an opportunity for a nurse to seek assistance by asking the medical doctor of registered professional

nurse to see the patient now or in the next 30 minutes, as well as necessary treatments that may be required in the interim.

3.3.3 Construction of the Index of Content Validity (CVI) criterion sheet

An index of content validity (CVI) criterion sheet incorporating instructions and an informed consent form (Appendix D1) was constructed to determine the comprehensiveness and representativeness of 49 content items of the prototype SBAR tool (Appendix B1) by known experts in the field to establish whether the content was valid (Lynn, 1986:382; Yaghmale, 2003:21). 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, 2003:26). Each item had space for recommendations of items not covered in the SBAR tool (Grove, Burns & Gray, 2013:395). An extract of the CVI criterion sheet is presented in Table 3.2.

Table 3.2 Extract of the CVI criterion sheet

Index of content validity (CVI)					
Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
	Item A1:	SITUATION			
Item A1.1 Identifying self and ward calling from					
Item A1.2 Identifying patient					
Item A1.3 The problem called about					
Item A1.4 Patients resuscitation status					

A second round of validation by CVI was conducted with surgeons, using a revised version of the CVI (Appendix D2) aligned with the revised SBAR tool (in preparation for use with the trial) and comprising 45 items. Following construction of the research instruments, data were collected for validating the tools.

3.4 Data collection to validate instruments: Phase 2

A mixed methods approach (Grove, Burns & Gray, 2013:29), characterised by its "methodological pluralism or eclecticism" which frequently results in superior research (compared to single method research) (Johnson & Onwuegbuzie, 2004:14), was employed to validate the prototype MEWS-linked SBAR tool (Appendix B1). This approach was used to identify potential measurement or response error: cognitive interviews for exploring the interpretation of the SBAR tool by future users (nurses and medical doctors) (Appendices C1, C2, C3, C4), determining and quantifying content validity (Lynn, 1986:382; Yaghmale, 2003:25) (Appendix D1 for CVI round one and Appendix D2 for CVI round two) and inter-rater reliability testing (Gabe & Jordan 2014:9) (Appendices E1, E2).

3.4.1 Participants and recruitment procedure

Participants in the validation processes are presented in a summary Table 3.3.

Table 3.3: Summary of participants and sampling methods for validation processes

Research activity	Sampling method	Inclusion/exclusion criteria	Participants	Rationale
Establishing cognitive form through cognitive interviewing (CI)	Purposive sampling	**Inclusion criteria** Doctors and nurses who have self-assessed expertise in adult clinical physiology and/or health sciences research (Kyriacos, 2011b). **Exclusion criteria** Doctors or nurses who do not give written informed consent to take part in the study	Three masters qualified nurses and two doctors (one of whom has a PhD)	Identify problem areas
Internal validation of Questionnaire using index of content validity (CVI) criteria	Purposive sampling	**Inclusion criteria** 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. **Exclusion criteria** 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	Expert knowledge
Inter-rater reliability testing (IRR)	Purposive sampling	**Inclusion criteria** Nurses who did not participate in the content validity processes; and who have self-assessed specialised knowledge of adult physiology and experience in working in clinical settings. **Exclusion criteria** Nurses who do not give written informed consent to take part in the study	Two RPN's	Measure agreement amongst raters

3.4.1.1 Recruitment and procedure for cognitive interviews (CI)

The third objective of the study was to use cognitive interviewing (Appendices C1, C2, C3 and C4) with future users outlined in Table 3.3 to establish if the cognitive form of the preliminary prototype modified SBAR tool was appropriate, comprehensive, and understandable including interpretation of its prompts for accuracy and consistency and to make changes if needed (Presser et al., 2004:112).

Cognitive interviews were conducted through purposive sampling (Beatty & Willis 2007:295), by seeking out nurses and physicians who met inclusion criteria, that is, who had self-assessed knowledge of adult clinical physiology and/or health sciences research. Doctors and nurses were recruited at individual meetings following a presentation of the study. As the SBAR tool is designed for nurses to initiate communication with doctors, both were included for cognitive interviews. It is assumed that a small sample size can reveal the most critical problems found in a questionnaire (Beatty & Willis, 2007:296) although there is no established best practice for how many participants to interview or how many rounds of interviews should be conducted (Beatty & Willis, 2007:296).

For this study cognitive interviews were conducted with three Master's qualified nurses and two doctors (one with a PhD). Guided by the published literature on how to perform cognitive interviews and after practicing the technique, all of the interviews were conducted at settings chosen by the participants. Three participants were met at their workplace and two participants requested to meet at an off-site venue. The informed consent process was explained and agreed upon and participants had an opportunity to ask questions about the process. It was explained that the purpose of the cognitive interviews was to identify and correct problem areas with the prototype modified SBAR tool and that the process was not intended to cause discomfort or to test clinical knowledge. Each participant was encouraged to view the cognitive interview process as picturing a house and describing it as it is viewed such as the number of doors or windows as suggested by Willis (2005:44).

The five cognitive interviews conducted in this study made use of 'think aloud' techniques (Fathi, Schooler & Loftus, 1984:19; Willis, Royston & Bercini, 1991:253) with concurrent impromptu and scripted probes, captured by audio recordings (Willis, Royston & Bercini, 1991:253). Probes could be cognitive, such as 'What were you thinking' or confirmatory as in repeating what a participant said and asking for confirmation, or probes could be expansive such as requesting more information (Presser et al., 2004:114). Participants were asked to state their interpretation of items in the same sequence as on the SBAR

tool through reading the SBAR tool section by section. Participants then interpreted their understanding of the meaning of each item to reveal the thought process involved in the interpretation of prompts on the SBAR tool (Presser et al., 2004:114).

Thinking aloud has been found to potentially interfere with the process being reported (Conrad, Blair & Tracy, 1999:14). The process reported in this study is the participant's interpretation of a modified SBAR tool. It was decided to test the interpretation of this modified communication tool by not only describing its direct interpretation but the additional interpretation of the utility of the tool. Participants were provided with a written scenario along with a MEWS chart populated with data pertaining to the scenario. Participants were then asked to arrange the information from the scenario and populated MEWS chart onto the SBAR tool and feed back their completed SBAR tool and verbalize their experience.

3.4.1.2 Recruitment and procedure for Content Validity (CV)

Experts in clinical practice determined the index of content validity (CVI) of the criterion sheet (Appendix D1). Returning the completed CVI implied informed consent form to participate voluntarily in the study.

Ten professionals in total, five doctors and five nurses (Table 3.3) with self-assessed expert knowledge of adult physiology and/or health sciences research participated in content validity testing of the modified SBAR tool by the process of purposive sampling and this did not include participants who participated in the cognitive interviews. Participants were recruited from a hospital where gatekeepers were willing for staff to participate in the study. It has been established that a minimum of five experts can produce a sufficient level of control for chance agreement (Lynn, 1986:383). A total of five medical doctors were recruited at a medical clinical meeting arranged by the head of department of medicine at a local level two government hospital. The medical doctors attending the meeting included medical officers, registrars and consultants. Following a presentation of the study, each doctor received a CVI checklist and were given time to read it over and ask questions. It was explained that participation in the study was voluntary and confidential and that returning the completed CVI checklist implied informed consent.

Nurses working in either adult medical or surgical wards were recruited by nurse managers at the same government hospital. The five participants each completed and returned a completed CVI checklist. I met with the study participants on an individual basis and provided each participant with a CVI checklist and an explanation of the study

and that participation in the study was voluntary and confidential and that returning the completed CVI checklist implied informed consent. Each participant was provided with an opportunity to ask questions.

At this point surgeons had not yet participated in the study so a second round of content validity testing was conducted involving eight surgeons/surgical residents from a second government hospital willing to participate in the study. The CVI checklist was revised prior to this second round following revision to the SBAR tool after the first round of CVI's. Participants were recruited through purposive sampling while attending a surgical meeting following a presentation of the study. Each surgeon or surgical resident received a CVI checklist and were given time to read it over and ask questions. It was explained that participation in the study was voluntary and confidential and that returning the completed CVI checklist implied informed consent.

The content validity index (CVI) checklist (Appendix D1 for CVI round one and Appendix D2 for CVI round two) was constructed to survey participants' opinions on the modified SBAR tool (Gabe & Jordan, 2014:7), using a 4-point scale (Table 3.2) from 1 being irrelevant to 4 extremely relevant (Lynn, 1986:384). The CVI checklist with instructions for completion and return (Appendix D1 for CVI round one and Appendix D2 for CVI round two) was provided in person and only returned in the manner as instructed if there was a voluntary decision to participate, implying informed consent. As recommended by Berk (1990), a group discussion on the specifications was arranged at the request of the doctors and surgeons following completion of the CVI at medical meetings (Grove, Burns & Gray, 2013:395). Strengths and limitations of the SBAR tool were then evaluated.

3.4.1.3 Recruitment and procedure for inter-rater reliability (IRR) testing

Inter-rater reliability testing of the SBAR tool was conducted to measure agreement amongst raters to increase confidence in information obtained from the SBAR tool (Gabe & Jordan, 2014:9; Tooth & Ottenbacher, 2004:1371-1372). For purposes of this sub-study, realistic but fictitious vital signs recordings, based on current clinical experience of a critical care nurse researcher, rather than actual patient vital signs readings were recorded on the MEWS observations charts (Appendix E2). Although data on the MEWS charts were fictitious, experienced colleagues agreed that they were not untypical of routine practice.

Two independent raters were purposively selected by seeking out nurses who did not participate in the content validity checklist and who had specialised physiology knowledge and experience in working in clinical settings. Nurses who were deemed to be experts in

the field by co-workers and who agreed to participate voluntarily following a presentation of the study were successfully recruited.

For the IRR testing, it was estimated that 22 blank SBAR tools completed independently by each rater by transcribing data from 22 MEWS charts each populated with sets of fictitious recordings of observations would be sufficient to detect Cohen's kappa of 0.70 (substantial agreement or better), assuming a null hypothesis value of 0.00 and 10-90% prevalence with 80% power (Sim & Wright, 2005:261). Each SBAR tool was completed by the two independent raters simultaneously (Hobart, Lamping & Thompson, 1996:128) resulting in a sample size of 44 completed SBAR tools (22 pairs) to explore IRR. Both independent raters were blind to each other's recordings on the SBAR tool.

3.5 Data management and analysis

3.5.1 Cognitive interview data management

The expert participants provided valuable information on their interpretation of the prototype SABR tool and its utility, so data reduction techniques in the form of coding were found to be less useful as the subjective identification of problems manifested itself in quantifiable trends. The participants in the study not only described their interpretation of the SBAR tool, but also provided their expert opinion and made suggestions to improve the preliminary prototype SBAR tool thereby strengthening the content validity and reliability (Knafl et al., 2007:232) of the tool.

The analysis of the cognitive interviews for this study was guided by work by Knafl et al. (2007) and Willis (2005:151-176). Each section of the SBAR tool was reviewed from audiotape recordings and field notes taken during the interview. In order to avoid contamination by applying personal subjectivity, descriptive notes were taken based on the participant's actual comments as advised by Knafl et al. (2007:227). Problem areas were identified and highlighted and in some instances included the participants subjective recommendations to correct the problem. These observations were then compared across the other interviews (Willis, 2005:161; Knafl et al., 2007:230). During this process quantifiable trends were identified and the problematic items were summarized based on the participants' actual statements.

Each problem was further categorized according to a coding scheme including applicability, wording / tone and clarity (Knafl et al., 2007:228). The preferred method for the analysis of the data was that of Knafl et al., (2007:229-230) which entailed systematic comparison of the summarized data collected across participants (Miles & Huberman,

1994:282). Decisions to keep, delete or modify an item were individually considered (Knafl et al., 2007:230). Identified problems were then sorted by item and described as problem, interpretation of the problem, problem type (clarity, wording, tone or applicability) and decision to keep, delete or modify the item (Knafl et al., 2007:228, 230).

Both Knafl et al. (2007) and Willis (2005:151) indicate that there are few guidelines for analysing or interpreting the results of cognitive interviews. According to Willis (2005:151) "*the journey between the cognitive lab and the final outcome report typically involves a significant degree of judgment and interpretation. Put another way, the application of cognitive interviewing procedures does not in itself provide precise direction in question design. To borrow a report title from Conrad et al. (2000), 'Verbal Reports are Data' to be used in making decisions-but do not in themselves supply us with the answers we seek. The nature of the steps that cognitive interviewers take between data collection and decision making is largely unchartered territory*."

A general recommendation by Willis (2005:156-158) for the analysis of cognitive interview 'think-aloud' techniques is to either analyse them informally or by using coding schemes. Willis (2005:161) states that the informal approach of analysing survey questions consists of reviewing each question and recording descriptive notes. The problems identified during this process are individually described and the recommended changes are suggested. These observations are then compared across the other interviews (Willis, 2005:161) During this process trends are identified and comments made can either be both qualitative and quantitative. The problem areas identified are then systematically and objectively defined by the analyst and recommendations are made to correct the problems identified. The drawback to this approach according to Willis (2005:164) is the analysis is at risk of appearing subjective or imprecise.

The more formal approach, which includes rigorous coding schemes, do not necessarily reflect problems in survey questions as they mostly target cognitive processes (Willis, 2003:164). In addition, further limitations to coding include a lack of diagnosing problems requiring expert judgement (Bolton, 1993:301). The informal approach to analysing 'think-alouds' appears to be the preferred method (Willis, 2005:167) as the coding process requires data reduction and provides less information of an existing problem. To fully understand the existing problem one is required to return to the original description making the coding process futile (DeMaio & Landreth, in press). The qualitative written comments can therefore be more suitable (Willis, 2005:167) and found to be most valuable in this study.

The suggested coding for cognitive interviews by Conrad and Blair (1996:6) evaluates items such as recall. Once the participant is provided with the question, memory retrieval on how to the question is answered is examined (Conrad & Blair, 1996:6). The developed modified SBAR communication prompt is designed to gather patient information and provide it to a doctor or registered professional nurse in an accurate structured format. The cognitive processes involved in summarizing important details are less to do with memory and recall than an ability to organize the provided information according to relevance and clinical judgement. Therefore, for this study, the informal analysis was found to be most appropriate.

3.5.2 Content validity index (CVI) data management

The CVI for each item on the prototype SBAR tool was quantified using a 4-point ordinal rating scale to determine relevance. Irrelevant items were rated as a 1, and extremely relevant items were rated a 4 (Lynn, 1986:384). As this is ordinal level data no more than a median for central tendency and proportion (Jamieson, 2004:1217) of each rating will be reported but a mean will be recorded for the overall ratings for the 49 items. The CVI was determined by how many experts rated each item at 3 or 4 (Lynn, 1986:384) and accepted as valid at a pre-set proportion of ≥70% agreement (Guttmann, et al., 2006:116).

Data from the initial round of CVI's performed on nurses and medical doctors were placed into SPSS for MAC using version 22 (SPSS Inc., Chicago, IL, USA). An additional variable was included for each item with the options of the attached variable scoring less than three or between three and four in order to determine by how many experts rate it as valid pre-set at a rating of 3 or 4 (Lynn, 1986:384). 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 (Guttmann et al., 2006:116). An additional item was added (Resuscitation status added 'unsure') based on a recommendation (Appendix B3).

3.5.3 Data management for Inter-rater reliability (IRR) testing

Items transcribed by participants onto the SBAR tool from the fictitious MEWS vital signs charts were entered onto SPSS for MAC version 22 (SPSS Inc., Chicago, IL, USA) spread sheets to calculate the IRR. The IRR was measured using Cohen's kappa, which is the preferred method as it calculates agreement beyond that of chance (Moult, Franck & Brady, 2004:173; Sim & Wright, 2005:261; Brown et al., 2008:46; May et al., 2010:3). Interpretation of the Cohen's kappa is presented in Table 3.4.

Table 3.4: Classification of Cohen's kappa

0.00-0.20	Slight agreement
0.21-0.41	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

(May et al., 2010).

3.6 Ethical considerations

3.6.1 General Principles

No patients were required to participate in the development and validation of the modified SBAR communication tool; instead, a survey of nurses' and doctors' opinions was conducted. National and international ethical, legal and regulatory norms and standards were upheld as set forth in the Declaration of Helsinki (2013).

3.6.2 Risks, Burdens and Benefits

There was no direct risk or burden to participants as information gathered from individuals was entirely their opinion and their assessment of the developed SBAR communication tool for validity and reliability. Although there was a potential burden that participants may have found it time consuming to give their opinions, none reported this.

The anticipated benefits outweigh possible burdens and it was explained that the purpose of the SBAR communication tool is to improve reporting of early signs of clinical and physiological deterioration in patients and therefore was designed to benefit patient care by preventing unwanted sudden adverse events (SAE's). Participants agreed voluntarily to participate in the study despite receiving no personal benefit or funding.

Hypothetical patient information in the scenarios and on the MEWS vital signs charts was checked by a critical care nurse researcher but was not validated during the study due to limited resources and time. This is recommended for further studies to strengthen the methodological rigour of the study.

` 3.6.3 Privacy and Confidentiality

Every precaution was taken to protect the privacy of participants and the confidentiality of their personal information by using code numbers. Participants selected the venue for data collection. No personal, identifiable data were recorded. Responses were not of a personal nature.

3.6.4 Informed consent

Participants who voluntarily agreed to assist with cognitive interviews (Appendices C1, C2 and C3), content validation (Appendices D1 and D2) and inter-rater reliability testing (Appendix E2) were informed of the aims, methods, sources of funding, institutional affiliations of the researcher as well as anticipated benefits and possible burdens of the study. Participants were informed of their right to refuse to participate in the study or to withdraw consent to participate at any time without reprisal after which all voluntarily gave written informed consent for cognitive interviews (Appendix C4) and inter-rater reliability testing (Appendix E1). Participants returning a completed CVI provided implicit informed consent to participate in the study.

3.7 Summary

The modified SBAR tool was developed following a review of available published literature and validated by employing a mixed methods approach: (1) cognitive interviews (n=3 nurses, 2 doctors), (2) determining the index of content validity involving nurses (n=5) physicians (n=5) and surgeons (n=8) and (3) inter-rater reliability testing (n=2 nurses each scored 22 MEWS scores). Cognitive interviews established if the modified SBAR was appropriate, comprehensive and understandable by testing its cognitive form. The index of content validity was established to see if changes were necessary and reliability was established by inter-rater reliability testing.

Hypothetical patient information in the scenarios and on the MEWS vital signs charts was checked by a critical care nurse researcher but was not validated during the study due to limited resources and time. This is recommended for further studies to strengthen the methodological rigour of the study.

4 Results

4.1 Introduction

The aim of this sub-study of a randomized controlled trial was to develop and validate a modified Situation-Background-Assessment-Recommendation (SBAR) communication tool incorporating components of a local Modified Early Warning Score (MEWS) vital signs observations chart. This has been achieved. In this chapter the results of the validation processes (Cognitive Interviews (CI), Content Validity Index (CVI) and Inter-rater reliability (IRR)) employed for the modified SBAR tool are presented.

4.2 Main Findings

4.2.1 Cognitive Interview principal findings

A total of three Masters qualified nurses and two medical doctors were approached to participate in cognitive interviews and all responded. The nurses were recognized by their peers as having broad experience in adult nursing in different health institutions as well as health sciences research experience. Doctors approached were working in a large tertiary academic hospital in an adult acute care setting one of whom had a PhD. Identifying demographics have been removed.

Verbal comments from participants during CI's showed there was little understanding related to the use of the SBAR acronym and/or the entire SBAR tool before it was explained. Two out of five participants had heard of the SBAR and understood it to be a communication framework but did not know exactly what it stood for.

Of the 42 items on the modified SBAR (Appendix B1), 15 were modified, 11 items were added and four items were removed totalling 49 items following revisions (Appendix B2).

*4.2.1.1 Problem areas in the **SITUATION** section of the modified SBAR communication tool*

The two main problems areas in the section **situation** related to clarity and applicability. The first problem raised was confusion about how to interpret the actual problem being called about (Table 4.1). All the participants (n=5) in the cognitive interviews struggled with 'The problem I am calling about' as the MEWS score and the additional clinical signs of deterioration detracted from the actual patient problem. The decision was to remove the MEWS score and clinical signs of deterioration and return to the original SBAR

language, which is 'The problem I am calling about is (X) (Provide disturbed vital signs, OR the reason why you are concerned about the patient)'.

Table 4.1: Problem areas identified in the 'Situation' section of the prototype modified SBAR communication tool (Appendix B1) are highlighted in red

S Situation	**Wasted space** • This is _____ calling from _____ _____(State your name, title and location) • I am calling about patient _____ (State patients name) • The problem I am calling about is MEWS score of (Mews score is confusing) (Provide triggered MEWS score) and/or my patient does not look right because of (What is the problem I am calling about?)_____ _____(Pallor, sweating, pain or poor perfusion) • My patient's resuscitation status is (Resuscitation is unfamiliar language in South Africa) (State 'for resuscitation' or 'not for resuscitation'). The word "My" indicates possession. **Font is too small and there is very little space to write**

The term 'resuscitation' was problematic for all the participants (n=5) as resuscitation is not a term or concept used often in South African public hospitals. The general consensus was that it is important and there are plans to introduce a 'do not resuscitate' form in public hospitals in the future and should therefore remain on the SBAR. The decision was made to keep resuscitation but make it easier to use by providing check boxes.

One participant (n=1, 20%) objected to the use of the word 'My' patient as 'my' indicates possession. As the person calling the doctor may be the charge nurse and not the actual nurse caring for the patient, indicating possession may create confusion or be inappropriate. Modifications made to this portion of the SBAR tool are presented in Table 4.2.

Table 4.2: Changes to the 'Situation' section of the modified SBAR communication tool following analysis of the Cognitive Interviews (Appendix B2)

S Situation	This is _____ calling from _____ (State your name, title and location). I am calling about patient _____(State patients name). The problem I am calling about is _____ _____ _____ _____ (Provide disturbed vital signs, **OR** the reason why you are concerned about the patient). My patient's resuscitation status is 'for resuscitation' ☐ or 'not for resuscitation' ☐

*4.2.1.2 Problem areas in the **BACKGROUND** section of the modified SBAR communication tool*

Major problem areas identified with the 'Background' portion of the developed prototype SBAR tool included wording that may not be understood in the South African context as well as additional required information (Table 4.3).

Table 4.3: Problem areas identified in the 'Background' section of the modified SBAR communication tool (Appendix B1) are highlighted in red

B Background	• The patient was admitted on _____. (Date) Time is missing. • Admission diagnosis is _____ • Pertinent medical history for this patient is ('Pertinent' may not be understood) Missing information includes: patients age and weight or secondary diagnosis such as diabetes or hypertension) _____ _____ _____ (Provide a brief summary of relevant history including procedures/ operations or investigations/allergies (Missing information includes: patients age and weight or secondary diagnosis such as diabetes or hypertension)) • Current treatment includes _____ _____ (Provide relevant current treatment such as intravenous fluids given, medications given, oxygen therapy and oral intake) ('Relevant current' may be misunderstood) • This is a change from _____ _____ (Describe briefly what previous condition was)

Four participants (n=4, 80%) considered the word 'pertinent' to be problematic when stating 'Pertinent medical history for this patient is.' The wording was changed to 'A brief relevant history for this patient is.' Additional items requested under history included age, weight (n=1, 20%) and secondary diagnosis such as diabetes or hypertension (n=2, 40%), which were included. Additional minor changes included adding the admission time (n=1, 20%) as well as improving the wording for 'Provide relevant current treatment' to 'Provide a brief summary of current treatment' (n=1, 20%). Modifications made to this portion of the SBAR tool are presented in Table 4.4.

Table 4.4: Changes to the 'Background' section of the modified SBAR communication tool following analysis of the Cognitive Interviews (Appendix B2)

B Background	The patient was admitted on _____(Admission date and time if known). Admission diagnosis is _____ A **brief** relevant history for this patient is _____ _____ _____ (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). Current treatment includes _____ _____ (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). This is a change from _____ _____ (Describe briefly what the previous condition was).

*4.2.1.3 Problem areas in the **Assessment** section of the modified SBAR communication tool*

The 'Assessment' portion of the developed prototype SBAR appeared confusing to most of the participants in the cognitive interview as all the participants commented that it was either not clear what was required (n=5, 100%) or that it appeared to be a 'big long list' (n=1, 20%) of required information. Problem areas of the 'Assessment' portion of the modified SBAR are presented in Table 4.5.

Table 4.5: Problem areas identified in the 'Assessment' section of the modified SBAR communication tool (Appendix B1) are highlighted in red

A Assessment	Looks like a long list! • Current vital signs are: Respiratory rate_____ Oxygen saturation % _____ Temperature _____ Heart rate _____ Blood Pressure _____ **Provide the following information if applicable: Not clear what is applicable** • On oxygen: Yes_____ No _____Inspired percentage of oxygen is required • Perfusion- Capillary refill time >2 seconds: Yes____ No_(Not often performed / why not an option to say CRT <2 and should be with cardiovascular (HR and B/P)) • Skin colour: Pale _____ Cyanosis _____ (Potential for incorrect reporting) • The patient is complaining of_____ _____ • Pain scale (?): No pain ____ Mild pain_____ Moderate pain _____ Severe pain_____ • Sweating: Yes___ No _____ • Wound ooze: Yes___ No_____ • Pedal pulses: Yes___ No_____ • Blood glucose _____ • Finger prick HB _____ • Glasgow-coma scale (__/15) (Important and needs to be placed higher. Potential for errors in reporting if a nurse is untrained) • Pupil size: Right_____ Left _____(Size is less important, rather equal, pinpoint, dilated or normal) • Intravenous fluids: Yes _____ (Provide detail of IV fluids given) No__ • Urine output: _____ (ml/hr) (Trends in urine output is more useful)

The appearance of a 'long list' was minimized by making use of check boxes and the areas which are required was more clearly separated from what is only required if applicable by commencing the instructions in bold capitals with '**ONLY IF APPLICABLE.'**

Additional areas of concern included 'on oxygen: yes or no' as two of the participants (n=2, 40%) requested an actual oxygen percentage and it was felt as if oxygen should be placed along side saturation (n=1, 20%). These changes were made as requested and modifications made to this portion of the SBAR tool are presented in Table 4.6.

Table 4.6: Changes to the 'Assessment' section of the modified SBAR communication tool following analysis of the Cognitive Interviews (Appendix B2)

A Assessment	**Current vital signs are**: Respiratory rate _____ Oxygen saturation %_____ On oxygen % _____ **or** Room air ☐ Temperature _____ Heart rate _____ Blood pressure _____/_____ Glasgow-coma scale (____/15) **or** Alert ☐ Responds to Verbal ☐ / Pain ☐ is Unresponsive ☐ **ONLY IF APPLICABLE complete and state the following:** **Skin colour**: Pale ☐ Cyanosis ☐ **Periphery**: Warm (Capillary refill time <2 seconds) ☐ or Cool (CRT>2 seconds) ☐ **Pupils**: Equal ☐ / Pinpoint ☐ Normal size ☐ Dilated ☐ Reacting to light ☐ / **Mood**: ☐ Lethargic ☐ Confused ☐ Agitated ☐ The patient is **complaining** of _____ _____ **Pain experienced**: No pain ☐ Mild pain ☐ Moderate pain ☐ Severe pain ☐ **Sweating**: ☐ / **Wound ooze**: ☐ / **Pedal pulses**: Normal ☐ Weak ☐ or Absent / ☐ **Blood glucose**: _____ /**Finger prick Hb**:_____ **Urine output** (ml/hr): _____ **or** urine output has decreased over the last few hours ☐

Capillary refill time was felt to be relevant but possibly problematic as two participants (n=2, 40%) mentioned it is not frequently performed on adults and two participants (n=2, 40%) suggested adding the peripheral temperature instead. As capillary refill time is populated on the MEWS chart, the item was modified to include both the temperature as well as the capillary refill time. An additional request was accommodated to include CRT<2 in addition to CRT>2 (n=1, 20%).

Minor problem areas included one participants' concern over the value of reporting skin colour (n=1, 20%) as this may be difficult with certain ethnicities to determine pallor or cyanosis and that saturations and haemoglobin are more useful. As the skin colour appears on the MEWS chart it was decided to keep it on the SBAR in order prevent losing aspects of the MEWS clinical signs of deterioration. Use of the word 'pain scale' was amended to 'pain experienced' due to confusion over which pain scale was used (n=2, 40%), as the required pain reporting on the MEWS was not an actual recognized pain scale.

Glasgow-coma scale (GCS) was reported as important (n=4, 80%) but possibly difficult to use by inexperienced nurses (n=2, 40%). Recommendations were to use AVPU instead which stands for 'alert, alert to voice, pain or unresponsive' or general mental status (n=2, 40%). As AVPU is on the MEWS vital signs chart in addition to the GCS, the plan was to modify this item to include both GCS and AVPU for a nurse to be able to choose which one to use. At the recommendation of two participants (n=2, 40%) GCS was moved up and placed with required information along with the vital signs. One participant indicated that a change in a patient's condition such as 'agitation or confusion' may be an important sign of deterioration and was added to the developed prototype SBAR tool.

Minor areas of correction included removing the requested pupil size and replacing it with equal, pinpoint, dilated or normal (n=1, 20%) and urine output was modified to include trends and not only hourly urine output (n=1, 20%).

Subsequent to the cognitive interviews, the MEWS chart underwent changes in preparation for the larger study: urine output was removed and reference to the GCS, leaving only the AVPU. As a result, the SBAR tool was changed accordingly.

*4.2.1.4 Problem areas in the **Recommendation** section of the modified SBAR communication tool*

The only problem area that emerged from the 'Recommendation' portion of the developed prototype SBAR tool was the use of 'Any tests needed?' as two participants (n=2, 40%) found this to be potentially problematic reporting that nurses on wards may not necessarily perform tests at the ward level and nursing actions were thought to be more appropriate. Problem areas to 'Recommendation' are presented on Table 4.7.

Table 4.7: Problem areas identified in the 'Recommendation' section of the modified SBAR communication tool (Appendix B1) are highlighted in red

R Recommendation	• I would like you to see the patient now ____ in the next 30 minutes____ • Any tests needed? (Nurses seldom perform tests on the ward. Nursing actions versus tests would be more appropriate such as raising the head of the bed) • Any medications? _____ • While I have you on the phone may I get a second witness: Yes____ No ___ • Do you want to be notified for any reason? _____ • If no improvement, when should I call again? _____

Clarification was required over the use of a second witness (n=1, 20%). The purpose of the second witness is if a telephonic order for a medication is provided, the nurse can request a second witness while she has the doctor on the phone. Obtaining a second witness is a legal requirement for verbal medication orders. In order to decrease confusion the following prompt was placed in bold '(**If medications are ordered**)' before "While I have you on the phone may I get a second witness?' The same prompt was used to clarify the following sentence 'Do you want to be notified for any reason' by placing prompts in bold before '**(If not coming to see the patient now).'** Changes to 'Recommendation' are presented in Table 4.8.

Table 4.8: Changes to the 'Recommendation' section of the modified SBAR communication tool following analysis of the Cognitive Interviews (Appendix B2)

R Recommendation	I would like you to see the patient now ☐ in the next 30 minutes ☐ Is there anything you would like me to do in the meantime? _____ _____ _____ _____ **(If medications are ordered)**: While I have you on the phone may I get a second witness? ☐ **(If not coming to see the patient now)**: Do you want to be notified for any reason? _____ _____ _____ If no improvement, when should I call again?_____

4.2.1.5 Additional problem areas of the modified SBAR communication tool

Participants commented on a lack of space to write on the developed prototype SBAR tool (n=4, 80%) in all the sections. Corrections were made to maximize the amount of space allocated for writing and making the SBAR tool more legible by altering the formatting to reduce wasted space as well as the addition of check boxes. The font size remained the same as increasing the font size pushed the form over onto two pages. In general there appeared to be a need for clear instructions on how to use this structured tool (n=5, 100%). As the developed prototype SBAR tool is designed to become part of a patient's permanent record, space for a patient label was also needed (n=1, 20%). Table 4.9 depict these additions.

Table 4.9: The addition of instructions as well as a patient label to the modified SBAR communication tool (Appendix B2)

SBAR Communication document:

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.

Patient label

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

4.2.2 Summary of findings from the CI and conclusion

Input from experts in the field provided valuable interpretation of the developed prototype SBAR tool in the early stages of instrument development and potentially improved the content validity and the reliability of the tool by suggesting modifications and highlighting potential additional problem areas. The study participants provided their interpretation of items on the modified SBAR tool by using 'think aloud' techniques requiring little concurrent prompting and scripted probes. Modifications made (15 out of 42 items were modified, eleven items added and four removed) based on the results of the analysis of

the cognitive interviews included adapting the language and application of the SBAR tool to be appropriate in a local setting for use in an acute adult ward environment as recommended by these experts. Conducting cognitive interviews on a communication tool versus a questionnaire appeared to yield valuable modification to the prototype SBAR tool and further research is required to evaluate the use of cognitive interviews in this application. A summary of modifications following CI are presented on Table 4.10

Table 4.10: Summary of modifications following CI

Items	Modified items	Items added	Removed items	Remaining items
42	1. Problem called about 2. Resuscitation 3. Admission time 4. Medical history wording change 5. Medical history additions 6. Current treatment 7. Inspired oxygen 8. Capillary refill time 9. Pain scale 10. GCS 11. Pupils 12. Urine output 13. Any tests needed 14. Second witness 15. Notification	1. Pupils equal 2. Pupils dilated 3. Pupils reacting to light 4. Pedal pulses weak 5. Alert 6. Alert to voice 7. Alert to pain 8. Unresponsive 9. Lethargic 10. Confused 11. Agitated	1. MEWS score 2. IV Fluids 3. Any medication? 4. Urine output	49

4.2.3 Content Validity Principal findings

4.2.3.1 Sub-objective: Content Validity participants' demographic characteristics

Of the five Registered Professional nurses (RPNs) who were approached and completed and returned the index of content validity, only four returned a demographic questionnaire. The number of years worked since qualifying ranged from 18 to 35 (mean 23.25, SD 7.89). The number of years worked in the current position ranged from 4 to 20 years and four months (Mean 14.10, SD 7.77). All nurses were RPNs and most had additional qualifications.

Five physicians were approached and all returned a completed index of content validity. The range of years worked since qualifying was from 8 to 15 (Mean 11.20, SD 2.59). The number of years in the current position ranged from 1 to 11 (Mean 4.6, SD 3.91). All had a MBChB but positions included medical consultants and registrars.

Amongst the eight surgeons and surgical registrars/interns who were approached and completed the index of content validity, the time qualified ranged from 2 to 17 years

(Mean 9.6, SD 5.78) and time in the current position ranged from two months to eight years (Mean 2.6, SD 2.38). Identifying factors of all the participants had been removed.

4.2.3.2 Establishing the index of content validity (CVI) of a final modified SBAR communication tool

Further modification to the prototype SBAR (Appendix B2) was required following an initial round of CVI's completed by nurses and physicians. Only items that achieved scores of 3 or 4 from at least 7 of 10 raters were retained on the modified prototype SBAR tool (Appendix B3) and items scoring below 3 by at least 3 of 10 raters were discarded (Guttmann, et al., 2006:116). A second round of CVI's was undertaken with surgeons on the modified prototype SBAR tool (Appendix B3) and no further adjustments were required.

4.2.3.2.1 Refinement of the modified prototype SBAR communication tool following an initial round of CVI

Ten raters each scored 49 items. Four of the 49 items did not achieve a score of at least 3 from at least 7 of 10 raters, and were discarded ('Pupils pinpoint', 'Pupils normal size', 'Pupils dilated' and 'Pedal pulses normal'). Twenty-five of 49 items were scored as either 3 or 4 by all raters. Across the 49 items, a score of 4 was awarded by a mean of 7.9 raters, and a median of 9 raters. The median for the number of raters assigning a score of either 3 or 4 was 10 with a mean of 9.0.

Items falling below the median and mean were reviewed individually along with comments made by the raters. Some of these items were modified based on input from the raters (4/49) or removed (1/49) in addition to the 4 removed above. Modified items ('Patients resuscitation status', 'On oxygen', 'Pupils equal', Pupils reacting to light) and removed item (Glasgow-coma scale) are discussed section-by-section in 4.2.3.2.2. Findings from the first round of CVI's are presented on Table 4.11.

Table 4.11: Results of CVI (1): Expert opinion on index of content validity (CVI) of each item on the SBAR tool

Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor alteration	4=extremely relevant	Items ranking 3 and 4	Median score for this item	Comments
A1: SITUATION							
Item A1.1 Identifying self and ward calling from	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A1.2 Identifying patient	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A1.3 The problem called about	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A1.4 Patients resuscitation status	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes, addition of 'Unsure'
A2: BACKGROUD							
Item A2.1 Admission date	0	1 (10%)	0	9 (90%)	9 (90%)	4.0	No changes
Item A2.2 Admission diagnosis	0	1 (10%)	0	9 (90%)	9 (90%)	4.0	No changes
Item A2.3 Brief relevant history	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A2.4 Current treatment	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A2.5 'This is a change from'	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
A3: ASSESSMENT							
Item A3.1 List of current vital signs	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A3.2 Respiratory rate	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A3.3 Oxygen Saturations	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A3.4 On oxygen	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	Addition of 'L/min'
Item A3.5 Room air	1 (10%)	0	0	9 (90%)	9 (90%)	4.0	No changes
Item A3.6 Temperature	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A3.7 Heart rate	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A3.8 Blood Pressure	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item A3.9 Glasgow-coma scale	0	1 (10%)	2 (20%)	7 (70%)	9 (90%)	4.0	Removed*
Item A3.10 Alert	1 (10%)	0	2 (20%)	7 (70%)	9 (90%)	4.0	No changes
Item A3.11 Responds to verbal	1 (10%)	0	2 (20%)	7 (70%)	9 (90%)	4.0	No changes
Item A3.12 Responds to pain	1 (10%)	0	2 (20%)	7 (70%)	9 (90%)	4.0	No changes
Item A3.13 Is unresponsive	1 (10%)	0	1 (10%)	8 (80%)	9 (90%)	4.0	No changes
Item A3.14 Periphery skin colour pale	0	0	2 (20%)	8 (80%)	10 (100%)	4.0	No changes
Item A3.15 Skin colour cyanosis	3 (30%)	0	2 (20%)	5 (50%)	7 (70%)	3.5	No changes**
Item A3.16 Periphery warm (CRT<2 seconds)	1 (10%)	1 (10%)	3 (30%)	5 (50%)	8 (80%)	3.5	No changes**
Item A3.17 Periphery Cool (CRT>2	1 (10%)	1 (10%)	2 (20%)	6 (60%)	8 (80%)	3.5	No changes**

Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor alteration	4=extremely relevant	Items ranking 3 and 4	Median score for this item	Comments
seconds)							
Item A3.18 Pupils equal	2 (20%)	0	1 (10%)	7 (70%)	8 (80%)	4.0	Changed to 'Pupils Equal: 'Yes or No'
Item A3.19 Pupils pinpoint	3 (30%)	2 (20%)	1 (10%)	4 (40%)	5 (50%)	2.5	Removed*
Item A3.20 Pupils normal size	3 (30%)	2 (20%)	1 (10%)	4 (40%)	5 (50%)	2.5	Removed*
Item A3.21 Pupils dilated	2 (20%)	2 (20%)	1 (10%)	5 (50%)	6 (60%)	3.5	Removed*
Item A3.22 Pupils reacting to light	1 (10%)	2 (20%)	1 (10%)	6 (60%)	7 (70%)	4.0	Changed to 'Pupils Reacting to light' or 'Not Reacting to Light'
Item A3.23 Mood lethargic	1 (10%)	1 (10%)	1 (10%)	70 (70%)	8 (80%)	4.0	No changes
Item A3.24 Mood confused		0	2 (20%)	8 (80%)	10 (100%)	4.0	No changes
Item A3.25 Mood agitated	1 (10%)	0	1 (10%)	8 (80%)	9 (90%)	4.0	No changes
Item A3.26 Patient complaints	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A3.27 Pain	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A3.28 Sweating	0	0	3 (30%)	7 (70%)	10 (100%)	4.0	No changes
Item A3.29 Wound ooze	1 (10%)	0	2 (20%)	7 (70%)	9 (90%)	4.0	No changes
Item 3.30 Pedal pulses normal	3 (30%)	1 (10%)	1 (10%)	5 (50%)	6 (60%)	3.5	Removed*
Item 3.31 Pedal pulses weak	2 (20%)	1 (10%)	2 (20%)	5 (50%)	7 (70%)	3.5	No changes
Item 3.32 Pedal pulses absent	2 (20%)	0	1 (10%)	7 (70%)	8 (80%)	4.0	No changes
Item 3.33 Blood glucose	0	0	0	10 (100%)	10 (100%)	4.0	No changes
Item 3.34 Finger prick Hb	0	1 (10%)	1 (10%)	8 (80%)	9 (90%)	4.0	No changes
Item A4: RECOMMENDATION							
Item A4.1 See the patient now	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A4.2 In the next 30 minutes	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A4.3 'Anything you would like in meantime'		0	0	10 (100%)	10 (100%)	4.0	No changes
Item A4.4 Second witness	2 (20%)	0	1 (10%)	7 (70%)	8 (80%)	4.0	No changes
Item A4.5 Notification	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes
Item A4.6 Call again?	0	0	1 (10%)	9 (90%)	10 (100%)	4.0	No changes

Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor alteration	4=extremely relevant	Items ranking 3 and 4	Median score for this item	Comments
Total numbers of items with this score amongst 10 raters of 49 items	33	17	51	389	440		
Median of items with this score	0 IQR 1	0 IQR 1	1 IQR 1	9 IQR 2	10		
Mean of items with this score	0.7 SD 0.97	0.3 SD 0.63	1.0 SD 0.79	7.9 SD 1.75	9 SD 1.39		
Count: 100% of all participants within 3 and 4 = 25/49							
Count: all participants where 1+2 are 4 or more = 4/49							

Note: A total of ten raters each scored 49 items.

* *Item was removed from the final MEWS chart (Appendix A2).*

** *Meets predetermined ≥70% agreement on items ranked between 3 and 4. This item is present on the final MEWS chart (Appendix A2).*

SD = standard deviation, IQR = interquartile range.

- Refinement of the modified SBAR tool following an initial round of CVI: Modifications to the **Situation** section

All items were scored 3 or 4 by all 10 raters. No items were removed. An addition was made to 'patients resuscitation status' to include a checkbox for 'unsure' at the recommendation of one expert (Table 4.11).

- Modifications to the **Background** section

All items were scored 3 or 4 by all 10 raters. Modification to the **Background** section was not required.

- Modifications to the **Assessment** section

Expert opinion recommended the addition of 'L/min' to 'on oxygen' to include an option for flow rate in addition to oxygen percentage.

Participant's commented that AVPU is easier to use than GCS and that having both AVPU and GCS together on the prototype SBAR tool could create confusion. As a result GCS was removed.

'Pupils equal' was scored 3 or 4 by 8 of 10 raters but was modified to 'Pupils equal: yes or no' based on expert suggestion. 'Pupils pinpoint' (Median 2.5, 5 of 10 raters scored this 3 or 4) 'pupil's normal size' (Median 2.5, 5 of 10 raters scored this 3 or 4), and 'pupils dilated' (Median 3.5, 6 of 10 raters scored this 3 or 4) failed to achieve agreement amongst raters and were removed. 'Pupils reacting to light' (Median 4.0, 7 of 10 raters scored this 3 or 4) was changed to 'Pupils reacting to light' or 'Not reacting to light' based on expert suggestion.

'Pedal pulses normal' was removed (Median 3.5, 6 of 10 raters scored this 3 or 4).

- Modifications to the **Recommendation** section

All items were scored at least 3 or 4 by 8 of 10 raters. No changes were made to the recommendation section of the prototype SBAR tool 'Second witness' was scored 1 by 2 raters, but field notes indicated that this stemmed from misunderstanding as to what a second witness is and why it is required.

4.2.3.2.2 Refinement of the modified prototype SBAR communication tool following a second round of CVI

Of the 45 items on the CVI checklist for round two, 8 items were rated by seven participants and 37 items were rated by eight participants, totalling 352 (56+296). 42/45 items were

scored 3 or 4 by all raters. Seven of 10 raters scored the remaining 3 items 3 or 4. For CVI round two the median item score was 8; the mean item score was 7.7.

Only one item was assigned a score of either 1 or 2 by two raters and two items received a score of either 1 or 2 by one rater each, ‘Identifying patient’ (1/8; 12.5%)’, ‘Admission date’ (1/8; 12.5%) and ‘Temperature’ (2/8, 25%). No changes were required following CVI completion by surgeons and surgical residents (Appendix B3) as all items were scored 3 or 4 by at least 7 of 10 raters (Table 4.12).

Table 4.12: Results of CVI (2): Expert opinion on index of content validity (CVI) of each item on the SBAR tool

Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor alteration	4=extremely relevant	Items ranking 3 and 4	Median	Comments
Item A1: SITUATION							
Item A1.1 Identifying self and ward calling from	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A1.2 Identifying patient	0	1/8 (12.5%)	0	7/8 (87.5%)	7/8 (87.5%)	4.0	Keep item
Item A1.3 The problem called about	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A1.4 Patients resuscitation status	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A2: BACKGROUND							
Item A2.1 Admission date	0	1/8 (12.5%)	2/8 (25%)	5/8 (62.5%)	7/8 (87.5%)	4.0	Keep item
Item A2.2 Admission diagnosis	0	0	2/8 (25%)	6/8(75%)	8/8 (100%)	4.0	Keep item
Item A2.3 Brief relevant history	0	0	0	7/7 (100%)	7/7 (100%)	4.0	Keep item
Item A2.4 Current treatment	0	0	2/8 (25%)	5/7 (87.5%)	7/7 (100%)	4.0	Keep item
Item A2.5 ‘This is a change from’	0	0	0	7/7 (100%)	7/7 (100%)	4.0	Keep item
Item A3: ASSESSMENT							
Item A3.1 List of current vital signs	0	0	1/7 (14.3%)	6/7 (85.7%)	7/7 (100%)	4.0	Keep item
Item A3.2 Respiratory rate	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.3 Oxygen Saturations	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.4 On oxygen	0	0	1/8 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A3.5 Room air	0	0	0	7/7 (100%)	7/7 (100%)	4.0	Keep item
Item A3.6 Temperature	0	2/8 (25%)	0	6/8 (75%)	6/8 (75%)	4.0	Keep item
Item A3.7 Heart rate	0	0	1 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A3.8 Blood Pressure	0	0	1 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A3.9 Alert	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.10 Responds to verbal	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.11 Responds to pain	0	0	2/8 (25%)	6/8 (75%)	8/8 (100%)	4.0	Keep item
Item A3.12 Is unresponsive	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.13 Periphery skin colour pale	0	0	4/8 (50%)	4/8 (50%)	8/8 (100%)	3.5	Keep item
Item A3.14 Skin colour cyanosis	0	0	3/8 (37.5%)	5/8 (62.5%)	8/8 (100%)	4.0	Keep item
Item A3.15 Periphery warm (CRT<2 seconds)	0	0	3/8 (37.5%)	5/8 (62.5%)	8/8 (100%)	4.0	Keep item
Item A3.16 Periphery Cool (CRT>2 seconds)	0	0	3/8 (37.5%)	5/8 (62.5%)	8/8 (100%)	4.0	Keep item
Item A3.17 Pupils equal	0	0	3/7 (42,9%)	4/7 (57.1%)	7/7 (100%)	4.0	Keep item
Item A3.18 Pupils reacting to light	0	0	2/8 (25%)	6/8 (75%)	8/8 (100%)	4.0	Keep item
Item A3.19 Pupils not reacting to light	0	0	2/8 (25%)	6/8 (75%)	8/8 (100%)	4.0	Keep item
Item A3.20 Mood lethargic	0	0	1/8 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item

Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor alteration	4=extremely relevant	Items ranking 3 and 4	Median	Comments
Item A3.21 Mood confused	0	0	1/8 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A3.22 Mood agitated	0	0	1/8 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A3.23 Patient complaints	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A3.24 Pain	0	0	2/8 (25%)	6/8 (75%)	8/8 (100%)	4.0	Keep item
Item A3.25 Sweating	0	0	3/8 (37.5%)	5/8 (62.5%)	8/8 (100%)	4.0	Keep item
Item A3.26 Wound ooze	0	0	4/8 (50%)	4/8 (50%)	8/8 (100%)	3.5	Keep item
Item 3.27 Pedal pulses weak	0	0	5/8 (62.5%)	3/8 (37.5%)	8/8 (100%)	3.0	Keep item
Item 3.28 Pedal pulses absent	0	0	4/8 (50%)	4/8 (50%)	8/8 (100%)	3.5	Keep item
Item 3.29 Blood glucose	0	0	1/7 (14.3%)	6/7 (85.7%)	7/7 (100%)	4.0	Keep item
Item 3.30 Finger prick Hb	0	0	0	7/7 (100%)	7/7 (100%)	4.0	Keep item
Item A4: RECOMMENDATION							
Item A4.1 See the patient now	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A4.2 In the next 30 minutes	0	0	1/8 (12.5%)	7/8 (87.5%)	8/8 (100%)	4.0	Keep item
Item A4.3 ‘Anything you would like In meantime’	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A4.4 Second witness	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A4.5 Notification	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Item A4.6 Call again?	0	0	0	8/8 (100%)	8/8 (100%)	4.0	Keep item
Total numbers of this score amongst 352 ratings of 45 items	0	4	55	293	348		
Median number of items with this score	0 IQR 0	0 IQR 0	1 IQR 2	7 IQR 3	8 IQR 1		
Mean number of items with this score	0.0 SD 0.00	0.09 SD 0.36	1.22 SD 1.41	6.51 SD 1.41	7.73 SD 0.5		
Count: 100% of all participants within 3 and 4 = 42/45							
Count: all participants where 1+2 is 1 = 2/45							
Count: all participants where 1+2 is 2 = 1/45							

Note: Of 45 items, eight were rated by seven participants and 37 items were rated by eight participants, total 352 (56+296).

4.2.4 Summary of findings from CVI's

Doctors and nurses working in both medical and surgical wards rated each item on the prototype SBAR communication tool (Appendix B2) and provided valuable comments for improvement. Items scored less than 3 or 4 by <70% by raters were removed (4/49). Input from experts plus modifications to the MEWS lead to further revisions (4/49 modifications, one item added and one further item removed – a total of five items removed). Surgeons and surgical registrars and interns further rated the revised SBAR tool (Appendix B3), which required no additional modification as all items were scored 3 or 4 by at least 7 of 10 raters. A summary of modifications following CI are presented on Table 4.13.

Table 4.13: Summary of modifications following CVI round one and two

Initial items	Modified items	Items added	Removed items	Remaining items
CVI Round one				
49	1. Resuscitation status 2. On Oxygen 3. Pupils equal 4. Pupils reacting to light	1. Pupils not reacting to light	1. Pupils pinpoint 2. Pupils normal size 3. Pupils dilated 4. Pedal pulses normal 5. GCS	45
CVI Round two				
45	0	0	0	45

4.2.5 IRR Principal findings

Two nurses were recruited for IRR testing and both agreed to participate. Each nurse completed a prototype SBAR for 22 fictitious case scenarios. Most items reached full or close to full agreement. The two nurses did not participate in the CVI and were recommended by their peers for having self assessed specialized knowledge of adult physiology and greater than ten years experience working in clinical settings. Inter-rater principal findings are presented on Table 4.14.

Table 4.14: Modified SBAR communication tool: Inter-rater reliability

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Interpreted 'State your name' (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted 'Calling from location' (n=22)		Participant 2 correct	Participant 2 incorrect	-0.05	0.034	-0.11-0.02	0.823	91(71-99)
	Participant 1 correct	20	1					
	Participant 1 incorrect	1	0					
Interpreted 'State patient name' (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted problem called about (n=22)		Participant 2 Correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted 'Resuscitation status' (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Interpreted 'date of admission' (n=22)		Participant 2 correct	Participant 2 incorrect	0.00. One variable a constant***	NA	NA	NA	95 (77-100)
	Participant 1 correct	21	0					
	Participant 1 incorrect	1	0					
Interpreted 'admission diagnosis' (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted brief relevant history (n=22)		Participant 2correct	Participant 2 incorrect	0.00. One variable a constant***	NA	NA	NA	95(77-100)
	Participant 1 correct	21	1					
	Participant 1 incorrect	0	0					
Interpreted current treatment (n=22)		Participant 2 correct	Participant 2 incorrect	0.00. One variable a constant***	NA	NA	NA	95(77-100)
	Participant 1 correct	21	1					
	Participant 1 incorrect	0	0					
Interpreted 'this is a change from' (n=22)		Participant 2 correct	Participant 2 incorrect	-0.07	0.046	-0.16-.0.03	0.746	86(65-97)
	Participant 1 correct	19	2					
	Participant 1 incorrect	1	0					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Interpreted current vital signs (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted Respiratory rate (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted Oxygen saturations (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Stated patient ‘on oxygen’ (n=22)		Participant 2 no	Participant 2 yes	0.88	0.117	0.65-1.12	<0.001	95(77-100)
	Participant 1 no	16	1					
	Participant 1 yes	0	5					
Stated patient ‘on room air’ (n=22)		Participant 2 no	Participant 2 yes	0.79	0.141	0.51-1.07	<0.001	91(71-99)
	Participant 1 no	6	1					
	Participant 1 yes	1	14					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Interpreted temperature (n=22)		Participant 2 incorrect	Participant 2 correct					
	Participant 1 incorrect	0	0	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	0	22					
Interpreted heart rate (n=22)		Participant 2 incorrect	Participant 2 correct					
	Participant 1 incorrect	0	0	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	0	22					
Interpreted blood pressure (n=22)		Participant 2 incorrect	Participant 2 correct					
	Participant 1 incorrect	0	0	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	0	22					
Stated patient alert (n=22)		Participant 2 no	Participant 2 yes					
	Participant 1 no	3	1	0.83	0.163	0.51-1.15	<0.001	95(77-100)
	Participant 1 yes	0	18					
Stated patient responsive to voice (n=22)		Participant 2 no	Participant 2 yes					
	Participant 1 no	21	0	1.00	0.00	NA	<0.001	100
	Participant 1 yes	0	1					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Stated patient responsive to pain (n=22)		Participant 2 no	Participant 2 yes	1.00	0.00	NA	<0.001	100
	Participant 1 no	20	0					
	Participant 1 yes	0	2					
Stated patient is unresponsive (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					
Stated skin colour is pale (n=22)		Participant 2 no	Participant 2 yes	1.00	0.00	NA	<0.001	100
	Participant 1 no	16	0					
	Participant 1 yes	0	6					
Stated skin colour is cyanosis (n=22)		Participant 2 no	Participant 2 yes	1.00	0.00	NA	<0.001	100
	Participant 1 no	20	0					
	Participant 1 yes	0	2					
Stated periphery is warm (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Stated periphery is cool (n=22)		Participant 2 no	Participant 2 yes	0.90	0.098	0.07-1,09	<0.001	95(77-100)
	Participant 1 no	14	1					
	Participant 1 yes	0	7					
Stated pupils equal (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					
Stated pupils reacting to light (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					
Stated pupils not reacting to light (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					
Stated mood lethargic (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Stated mood confused (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	95(77-100)
	Participant 1 no	21	0					
	Participant 1 yes	1	0					
Stated mood agitated (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	95(77-100)
	Participant 1 no	21	0					
	Participant 1 yes	1	0					
Interpreted 'patient is complaining of' (n=22)		Participant 2 correct	Participant 2 incorrect	0.63	0.165	0.30-0.95	0.003	82(60-95)
	Participant 1 correct	11	3					
	Participant 1 incorrect	1	7					
Stated pain experienced (n=22)		Participant 2 no	Participant 2 yes	0.81	0.123	0.57-1.06	<0.001	91(71-99)
	Participant 1 no	12	0					
	Participant 1 yes	2	8					
Stated sweating (n=22)		Participant 2 no	Participant 2 yes	0.78	0.214	0.36-1.19	<0.001	95(77-100)
	Participant 1 no	19	0					
	Participant 1 yes	1	2					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Stated wound ooze (n=22)		Participant 2 no	Participant 2 yes	0.00. One variable a constant***	NA	NA	NA	91(71-99)
	Participant 1 no	20	0					
	Participant 1 yes	2	0					
Stated pedal pulses weak (n=22)		Participant 2 no	Participant 2 yes	1.00	0.00	NA	<0.001	100
	Participant 1 no	21	0					
	Participant 1 yes	0	1					
Stated pedal pulses absent (n=22)		Participant 2 no	Participant 2 yes	Both variables constant**	NA	NA	NA	100
	Participant 1 no	22	0					
	Participant 1 yes	0	0					
Interpreted blood glucose (n=22)		Participant 2 correct	Participant 2 incorrect	Both variables constant**	NA	NA	NA	100
	Participant 1 correct	22	0					
	Participant 1 incorrect	0	0					
Interpreted finger prick HB (n=22)		Participant 2 correct	Participant 2 incorrect	0.65	0.324	0.01-1.28	0.001	95(77-100)
	Participant 1 correct	20	1					
	Participant 1 incorrect	0	1					

SBAR Prompt	Observer notes			Kappa	Standard error*	95% confidence interval (CI) of agreement amongst two raters	P value	Percent agreement % (95% CI)
Stated 'I would like you to see the patient now (n=22)		Participant 2 no	Participant 2 yes					
	Participant 1 no	6	1	0.09	0.130	-0.16-0.34	0.519	45(24-68)
	Participant 1 yes	11	4					
Stated I would like you to see the patient in the next 30 minutes (n=22)		Participant 2 no	Participant 2 yes					
	Participant 1 no	6	9	0.20	0.150	-0.10-0.49	0.228	55(32-76)
	Participant 1 yes	1	6					

Note to table:
Where only one correct interpretation is possible for an item it is listed as 'correct/incorrect'. Items requiring a response of either yes or no are listed as such. Confidence interval (CI) computed in DAG Stat™.

** Not assuming the null hypothesis.*

*** For each specified item, ratio of number of answers interpreted correctly between two raters.*

****SPSS did not compute statistics because one variable was a constant/ gave constant values.*

*4.2.5.1 IRR findings for the **Situation** section*

The majority of items reached full or almost full agreement (3/4) except 'Calling from' achieved a negative kappa value (Cohen's Kappa -0.05) representing agreement below the level of chance. However the high percentage agreement and nature of the question suggest that the question is sound. Percentage agreement amongst participants for this item was 91% (95% confidence interval (CI): 71-99).

*4.2.5.2 IRR findings for the **Background** section*

Of the five items in this section, four achieved full or almost full agreement and one item achieved a negative kappa value 'This is a change from' (Cohen's Kappa -0.07). However the high percentage agreement and nature of the question suggest that the question is sound. Percentage agreement amongst participants for this item was 86% (95% CI: 65-97).

*4.2.5.3 IRR findings for the **Assessment** section*

Out of 30 items in assessment, 17 achieved full or close to full agreement but were unable to measure Cohen's Kappa as items agreed on was measured as a constant, five achieved perfect agreement (Cohen's Kappa 1.00), four almost perfect agreement (Cohen's Kappa 0.81-0.89) and four achieved substantial agreement (Cohen's Kappa 0.63-0.79).

*4.2.5.4 IRR findings for the **Recommendation** section*

Interestingly, the participants failed to reach agreement when making a clinical decision on whether to call the doctor now (Cohen's Kappa 0.09) or in the next thirty minutes (Cohen's Kappa 0.20) based on each scenario as well as completed MEWS vital signs chart corresponding with each scenario. As this response required individual clinical judgment, further research may be required in order to evaluate differences in clinical judgment. The remaining items in this section were not suited for IRR testing as they elicited a response from a doctor or a registered professional nurse.

4.2.6 Summary of findings from IRR

Two nurses were mostly in close or full agreement on 37 of 45 items on the modified tool. The exceptions were: 'Calling from' (Cohen's Kappa -0.05) and 'this is a change from' (Cohen's Kappa -0.07), representing agreement below the level of chance. However the high percentage agreement and nature of the questions suggest that the questions are sound. Percentage agreement amongst participants for these items was 91% (95% CI: 71-99) and 86% (95% CI: 65-97) respectively. Deciding if a doctor should see the patient now (Cohen's Kappa 0.09) or in the next 30 minutes achieved fair agreement (Cohen's Kappa 0.20). This

reflects a difference in clinical judgement as the decision when to call for assistance depended on the individual nurse's clinical judgement. IRR was not possible to test on 4/45 items, as those items required a response by the person being called for assistance. A summary of findings from IRR is presented on Table 4.15.

Table 4.15: Summary of IRR findings

Items: Total 45	Cohen's kappa	Agreement	Comments
Situation: 4 items			
3/4 items	Both variables constant	Full agreement	Unable to calculate Cohen's Kappa. Percent agreement%: 100.
'Calling from'	-0.05	Below the level of chance	Percent agreement%: 91 (95% CI: 71-99). 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. Percentage agreement 95%-100%.
'This is a change from'	-0.07	Below the level of chance	Percent agreement%: 86 (95% CI: 65-97). 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. Percent agreement %: 91-100.
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 a response is required from the clinician called.

Note to table:
*Cohen's Kappa level of agreement determined by May et al., 2010:3.

5 DISCUSSION, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

Errors in communication are prevalent in healthcare and affect patient safety and cause unnecessary patient deaths. Reporting early signs of physiological or clinical deterioration could improve patient safety and prevent 'failure to rescue' or unexpected intensive care admissions, cardiac arrest or death. The structured Situation-Background-Assessment-Recommendation (SBAR) communication tool enables nurses to provide doctors with pertinent information about a deteriorating patient in a logical order, based on a complete assessment. In this study a modified SBAR communication tool was developed and tested and found to be valid and reliable for use in a local context in conjunction with the Cape Town Modified Early Warning Score (MEWS) vital signs chart.

The SBAR is appropriate for use by paraprofessional staff (Donahue et al., 2011) and has been tested successfully in South Africa (Raymond & Harrison, 2014). By combining MEWS with SBAR nurses would be more able to detect a deteriorating patient (Ludikhuize, Jonge & Goossens, 2011) and the addition of an early detection algorithm also reduces patient unexpected deaths (De Meester et al., 2013). The literature search revealed no validated SBAR instrument incorporating components of a MEWS for use in nurse-to-doctor or senior nurse call for assistance. More studies evaluating the 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.

The tool was developed following a review of available published examples and validated by employing a mixed methods approach: 1) cognitive interviews, 2) determining the index of content validity and 3) inter-rater reliability testing, with calculation of kappa values.

Cognitive interviews prompted more changes to the modified SBAR communication tool than determined by the content validity index (CVI). No additional modifications were needed following a second round of CVI by surgeons, as all items were rated as relevant by the pre-determined ≥70% of experts. Inter-rater reliability (IRR) of the SBAR tool was established by two nurses who were mostly in substantial to full agreement on the majority of items on the modified tool. The exceptions were: 'Calling from' and 'this is a change, representing agreement below the level of chance. However the high percentage agreement and nature of the questions suggest that the questions are sound. Deciding whether a doctor should see the patient now or in the next 30 minutes, achieved fair agreement. This reflects a difference in clinical judgement as the decision when to call for assistance depended on the individual

nurse's clinical judgement. Overall nine of 42 items were removed, 12 were added and 19 substantially modified, leaving 45 items.

5.1 Comparing the findings of the study with the existing literature

There are many published developed or adapted SBAR tools but few have undergone rigorous validation. In this section, developed and validated SBAR tools as well as examples of developed SBAR tools implemented without validation are compared with study findings of the present study.

Mitchell et al. (2012) also developed three versions of the SBAR tool but used a Cronbach's alpha test in the last test which showed good agreement amongst raters (α 0.977). In the present study a Cohen's kappa was used and this demonstrated a range of slight (0.00 – 0.20) to perfect agreement (100%) for the majority of items. Initially inter-rater reliability in the study by Adams and Osborne McKenzie (2012) was low (45%) but later achieved 100%. Whereas these researchers used seven nurses to determine content validity, the present study used a total of 18 participants and in both studies one item was added.

Baseline staff understanding of what the SBAR stood for was 60% in a study by Haig, Sutton and Whittington (2006). Verbal comments from participants during CI's in this study showed little understanding of what SBAR stood for before it was explained.

Velji et al. (2007) adapted a SBAR tool through a series of focus group interviews including former patients, families and staff. The present study 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 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.

5.2 Limitations and strengths of the study methods

5.2.1 Strengths and limitations of cognitive interviews (CI)

5.2.1.1 Strengths

Purposive sampling was used and participants in this portion of the study had previous or current work experience in different hospitals and represented both private and large public health care settings potentially increasing the generalizability of the findings. In addition to identifying problem areas with the modified SBAR communication tool, experts in the field

(doctors and nurses) potentially improved the content validity and the reliability of the tool (Knafl et al., 2007:323). Miles and Huberman (1985:278) advise researchers in qualitative research to consider additional evidence even if it opposes existing evidence. In the present study each individual suggestion made by participants was found to be useful and potentially strengthened the findings by testing their generalizability and assisted in preventing bias to build a better structure for the tool.

5.2.1.2 Limitations of cognitive interviews

A potential limitation to this study is the lack of a second round of cognitive interviews as well as a small sample size (Section 3.4.1.1) although there is no established best practice for how many participants to interview for cognitive interviews or how many rounds of interviews should be conducted (Beatty & Willis, 2007:296). A barrier to the design of the cognitive interview guide and analysis of the results was that there is no available research describing the use of cognitive interviews for a communication tool. The process of organizing the relevant patient information should be guided by the use of the tool. The purpose of cognitive interviews in this study was to evaluate if the participants interpreted the tool in the way it was intended and the findings seemed to suggest that cognitive interviews were appropriate for this task.

Although It is assumed that a small sample size of cognitive interviews can reveal the most critical problems found in a questionnaire (Beatty & Willis, 2007:296) Miles and Huberman (1985:278) warn that patterns which emerge in qualitative research are constructed from our personal observation of phenomena which occur repeatedly. Cognitive interviews generate qualitative data in the form of text. As numbers are "*more economical and manipulable than words, you 'see' the general drift of the data more easily and rapidly by looking at distributions*" (Miles & Huberman, 1985:283). In identifying the significance patterns of problem areas, each problem was assessed for how many times problem areas occurred across interviews (Miles & Huberman, 1985:282). In the present study data reduction techniques in the form of coding were found to be less useful as the subjective identification of problems manifested itself in quantifiable trends.

5.2.2 Strengths and Limitations of content validity index (CVI)

5.2.2.1 Strengths

There was good representation of physicians, surgeons, registrars, surgical interns and nurses from both medical and surgical backgrounds, contributing to potential for use in both medical and surgical ward settings. Sampling occurred across two facilities potentially further

strengthening the generalizability of the results. Doctors discussed items on the modified SBAR tool in group meetings and reached agreement, which may have further strengthened the findings (Grove, Burns & Gray, 2013:395). In addition to rating items, experts identified areas that were omitted from the modified SBAR further strengthening instrument development (Lynn, 1986:384).

A second round of CVI confirmed the findings from the first round where problem items were identified and removed. The second round confirmed that the remaining content required no further modification, thereby strengthening the findings and provided an adequate sample size in total, which is required when seeking expert opinion on item relevance in instrument development (Beckstead, 2009:1282).

5.2.2.2 Limitations

Purposive sampling was used to obtain known experts in the field and obtain an appropriate sample of doctors, surgeons and nurses working in both medical and surgical wards although it is not assumed that this limited the findings. Content Validity has been criticized for not allowing for chance agreement amongst raters therefore Inter-rater reliability was performed using Cohen's Kappa to compensate (Beckstead, 2009:1282).

5.2.3 Strengths and limitations of inter-rater reliability (IRR)

5.2.3.1 Strengths

Although the participants were selected by purposive sampling, they were not known to each other and were blind to each other's ratings therefore it can be assumed that contamination of the results was minimised. The analysis was able to account for chance agreement.

5.2.3.2 Limitations

Due to limited resources, ethical and pragmatic considerations, limitations of this study method include unvalidated hypothetical patient information in the scenarios and on the MEWS vital signs charts without an actual patient to assess. Tanner (2006:206) reports that '[S]ound clinical judgement rests to some degree on knowing the patient and his or her typical pattern of responses, as well as engagement with the patient and his or her concerns.' The only portion of the study requiring clinical judgment was asking for skilled assistance now or in the next thirty minutes, which achieved fair agreement amongst raters reflecting a difference in clinical judgement. Although data on the MEWS charts were fictitious, experienced colleagues agreed that they were not untypical of routine practice. Field-testing with less expert practitioners and real patients is needed.

5.3 Strengths and limitations of the study

5.3.1.1 Strengths

This appears to be the first study of the development and validation of a structured tool to include components of a MEWS vital signs chart for nurses to use when summoning skilled assistance. The multiple methods: CI's, CVI's and IRR complement each other, which is demonstrated by a problem item (oxygen percentage) which was identified during CVI after CI's and was corrected and further tested.

The impact of recall bias should be minimal as most of the data was collected straight after a presentation. The exception was with the nurses completing the CVI where the nurses (n=5) handed in the completed CVI at a later date. Participants involved in testing worked in several hospitals in Cape Town, which could potentially increase the generalizability and utility of this tool in medical and surgical wards.

5.3.1.2 Limitations

The scale of this study was limited by available resources, but is typical of similar nurse-led instrument development studies (Gabe & Jordan, 2014). Data reliability depended on participants' clinical knowledge and expertise, their co-operation and veracity of their statements.

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. Furthermore, the utility of the tool in environments beyond medical and surgical wards is not known and needs to be 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., 2013:2; Toerien et al., 2009:9). Nevertheless, having recruited a volunteer sample, 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. However, the examples used were representative of other work in Cape Town (Kyriacos et al., 2014a,b, 2015). We cannot

assume that respondents and response patterns are representative of other populations (Jordan et al., 2013).

Responses to questionnaires were vulnerable to recall bias. Information collected from respondents may suffer from recall bias and, if collected more than 2 weeks after the event, forgetfulness (Stewart et al., 2004). With the exception or IRR all data in this study were collected within two weeks. Respondents may omit minor points, failing to understand the saliency of the questions (McColl et al., 2001) although in the present study the use of prompts and not questions was evaluated.

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). In the present study the cognitive interviews and CVI scores may be vulnerable to social desirability response. To reduce the Rosenthal effect (Grove, Burns & Gray, 2013:201) by observers assessing as they expect and entrapment by prior expectation (Sackett et al., 1991:266), data were reviewed by the researcher as well as supervisors. The Hawthorne effect (Grove, Burns & Gray, 2013:38) may have been minimized in cognitive interviews and CVI's by explaining to participants that the purpose of these studies were not to test knowledge but to identify problem areas in the modified SBAR tool and suggestions for improvement were encouraged.

The reliability and validity work reported in this study excluded:

- Patients with a head injury or a reduced level of consciousness, where a Glasgow Coma Scale and a MEWS will be necessary.
- Pregnant patients
- Children under 16 years of age.

5.4 Wider Implications

5.4.1 Meaning of the study: Possible mechanisms and implications for clinicians or policymakers

This validated modified SBAR communication tool can be used to provide quantitative measures of the ability of nurses in general medical and surgical wards to summon skilled assistance appropriately and competently when a patient's condition deteriorates. Informal feedback and discussion with participants indicated that the modified SBAR tool could potentially reduce current communication deficiencies and improve patient outcomes. Further research is required to assess these possibilities. Input from participants further enhanced

the construction of the tool to be used for all patients in both medical and surgical wards ideally where the MEWS chart is used.

5.4.2 Unanswered questions and future research

It is not known if an SBAR tool incorporating components of a MEWS vital signs chart would aid in early reporting of clinical and physiological signs of patient deterioration. There are no validation MEWS linked SBAR patient outcomes' studies. Problem specific SBAR tools by Joffe et al. (2013) demonstrated that using a modified SBAR to incorporate problem specific items did not necessarily guarantee that nurses would not omit information or provide accurate information. A trial is needed to determine the impact of a MEWS linked SBAR tool on patient outcomes. If positive, this should be followed by stepped roll-out with evaluation of ward-level data.

5.4.3 Recommendations

5.4.3.1 Recommendation for education

The modified SBAR tool could provide a vehicle for clinicians to learn how to communicate clearly and concisely and therefore to enhance nurse and doctor satisfaction with communication (Ardoin and Broussard, 2011; Renz et al., 2013) and a hospital's safety climate (Randmaa et al., 2014). As evidenced in the published literature, educational interventions prior to the implementation of a structured communication tool are beneficial (Fassett, 2011:5) especially with the addition of role-play (Chaharsoughi, Ahrari, & Alikhah, 2014; Kesten, 2011). 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 (Lancaster, Westphal & Jambunathan, 2015; Ozekcin et al., 2015; Kotsakis et al., 2014; Hamilton et al., 2006; Wang et al., 2015; Donahue et al., 2011).

5.4.3.2 Recommendation for clinical practice

In addition to improving the accuracy of communication amongst clinicians, the SBAR tool with the addition of components of the MEWS provides a potential safety checklist by requiring a nurse to gather pertinent information that may have not been considered. Improving the accuracy of patient information and using a safety checklist should enhance the patient safety climate in general (Randmaa et al., 2014). The MEWS vital signs chart however is not a substitute for clinical judgement.

Accordingly, clinical judgement will be required if using the modified SBAR if any of these conditions exist (Kyriacos, 2011b).

5.4.3.3 Recommendation for research

Further research is required to evaluate the performance of the SBAR in a clinical environment. As the modified SBAR tool incorporates the revised MEWS vital signs chart, it is recommended that both these tools be used together.

Further research will be required to fully test the clinical effectiveness such as the accuracy of nurse and doctor communication as well as its impact on safety climate (Randmaa et al., 2014; Ardoin and Broussard, 2011) and patient outcomes (De Meester et al., 2013) within South Africa on adult patients (Raymond & Harrison, 2014). 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).

The impact of training for all levels of nurses (Donahue, et al., 2011) and nursing students (Lancaster, Westphal & Jambunathan, 2015) would require further research. It's application for use outside nurse to doctor or senior nurse communication could also be evaluated such as junior doctor to senior doctor call for assistance (Cunningham et al., 2012) or its use by residents (Tews, Liu & Treat, 2012; Telem et al., 2011:89-92) or experienced doctors (Ilan et al., 2012). It may be possible to adapt this tool further and possibly incorporate other mnemonics to use in handover of patient information such as nurse shift-to-shift report (McCrory et al., 2012:539; Adams & Osborne-McKenzie, 2012:263; Stevens et al., 2011: 48) or during handover of patient information from one facility to another (Singh et al., 2011:4).

5.4.4 New knowledge

This study contributes a validated structured communication tool incorporating components of a MEWS for nurses to use when summoning skilled assistance. It also highlights the fact that the Recommendation portion of the SBAR tool may be problematic as a section requires clinical decision-making of which is found to vary amongst nurses (Twomey, Wallis & Myers, 2007:478; Subbe, Gao & Harrison, 2007:623). This is the first published study to develop and validate a SBAR tool for use in adult medical and surgical areas in South Africa.

5.5 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 index of content validity and inter-rater reliability. Cognitive interviews (CIs) enhanced the validity of the tool as problem areas were identified and corrected. The tool is appropriate for use in a local context but it will have to be tested for use beyond this. The locally designed SBAR tool 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.

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7 Appendices

Appendix A1: Cape Town Modified Early Warning Score (MEWS) observations chart

SCORING KEY for single MEWS

0	1	2	3
No action	Re-check after 1/2 hour/report if no improvement	Check after 5 min/report immediately if no improvement	Single RED score of 3 = Medium risk but still report immediately

SCORING KEY for TOTAL MEWS

0, Total 1-4 = Low risk Re-check after 1/2 hr /report if no improvement	Total 5-6 = Medium risk Check after 5 min/report immediately if no improvement	Total score 7 or more = High risk Report immediately

MODIFIED EARLY WARNING SCORING (MEWS) VITAL SIGNS CHART

PATIENTS' NORMAL BP

PATIENT'S IDENTIFICATION & HOSPITAL NUMBER STICKER

		SCORE										SCORE	
	POST-OPERATIVE DAY												
	DATE												
	TIME												
RESPIRATORY RATE	25 or more	3										3	25 or more
Write in full if outside the range eg. 7 or 26	21-24	2										2	21-24
	12-20	0										0	12-20
	9-11	1										1	9-11
	≤8	3										3	≤8
O_2 Saturation %	96+	0										0	96+
	94-95	1										1	94-95
	92-93	2										2	92-93
	91 or less	3										3	91 or less
Inspired O_2	YES % / NO												YES % / NO
Temperature °C	39.1 or higher	2										2	39.1 or higher
Write in full if outside the range eg.	38.1-39.0	1										1	38.1-39.0
	36.1-38.0	0										0	36.1-38.0
	35.1-36.0	1										1	35.1-36.0
	35 or lower	3										3	35 or lower
HEART RATE	131 or more	3										3	131 or more
Write in full if outside the range eg. 39 or 132	111-130	**2**										**2**	111-130
	91-110	1										1	91-110
	51-90	0										0	51-90
	41-50	1										1	41-50
	40 or less	3										3	40 or less
SYSTOLIC BP	220 or more	3										3	220 or more
Write in full if outside the range eg. 90 or 221	111-219	0										0	111-219
	101-110	1										1	101-110
	91-100	2										2	91-100
	90 or less	3										3	90 or less
DIASTOLIC BP write in full eg. 80													
PERFUSION - capillary refill <2 sec													Perfusion
SKIN COLOUR	Pale/Cyanotic												Pale/Cyanotic
PAIN Severe	3												Pain 3
Moderate	2												2
Mild	1												1
No pain	0												0
HAD PAIN MEDICATION	YES/NO												YES/NO
Sweating	YES/NO												YES/NO
Wound oozing	YES/NO												YES/NO
Other: write													
Pedal pulses	YES/NO												YES/NO
Blood glucose													
Finger prick Hb													
LEVEL OF CONSCIOUSNESS													
Alert (A)	(GCS 15)	0										0	A
Reacting to voice (V) / Pain (P) / Unresponsive (U)	(GCS 14 or less)	3										3	V/P/U
Pupil size:													
Right	Size												Right: Size
	Reaction												Reaction
Left	Size												Left: Size
	Reaction												Reaction
Intravenous fluid	YES/NO												IV YES/NO
URINE OUTPUT	more than 300ml/hr for 2	1										1	more than 300ml/hr for 2
[Indicate if normally anuric]	60ml/hr	0										0	60ml/hr
C=Catheter	less than 60ml/hr	1										1	less than 60ml/hr
	less than 30ml/hr	2										2	less than 30ml/hr
	No output	3										3	**No output**
Looks unwell	YES/NO												YES/NO
	TOTAL SCORE												**TOTAL SCORE**
	Initials												

Appendix A2: Revised Cape Town MEWS observations chart

CAPE TOWN MODIFIED EARLY WARNING SCORE (MEWS) VITAL SIGNS CHART

SCORING KEY for single MEWS

0	1	2	3
No action	Re-check after 30 min/report if no improvement	Check after 5 min/report immediately if no improvement	Single RED score of 3 = Medium risk but still report immediately

SCORING KEY for TOTAL MEWS

0, Total 1-4 = Low risk Re-check after 30 min/ report if no improvement	Total 5-6 = Medium risk Check after 5 min/report immediately if no improvement	Total score 7 or more = High risk Report immediately

PATIENTS' NORMAL BP:

PATIENT IDENTIFICATION NUMBER

		SCORE										SCORE	
	POST-OPERATIVE DAY												
	DATE												
	TIME												
RESPIRATORY RATE	25 or more	3										3	25 or more
Write in full	21-24	2										2	21-24
	12-20	0										0	12-20
	9-11	1										1	9-11
	≤8	3										3	≤8
O_2 Saturation %	96+	0										0	96+
	94-95	1										1	94-95
	92-93	2										2	92-93
	91 or less	3										3	91 or less
Inspired O_2 [add score of 2]	YES %/ NO												YES %/ NO
Temperature °C	39.1 or higher	2										2	39.1 or higher
Write in full	38.1-39.0	1										1	38.1-39.0
	36.1-38.0	0										0	36.1-38.0
	35.1-36.0	1										1	35.1-36.0
	35 or lower	3										3	35 or lower
HEART RATE	131 or more	3										3	131 or more
Write in full	111-130	2										2	111-130
	91-110	1										1	91-110
	51-90	0										0	51-90
	41-50	1										1	41-50
	40 or less	3										3	40 or less
SYSTOLIC BP	220 or more	3										3	220 or more
Write in full	111-219	0										0	111-219
	101-110	1										1	101-110
	91-100	2										2	91-100
	90 or less	3										3	90 or less
DIASTOLIC BP write in full eg. 80													
LEVEL OF CONSCIOUSNESS	Alert (A)	0										0	Alert
Reacts to voice (V)/Pain (P)/Unresponsive (U)		3										3	V/P/U
TOTAL SCORE													**TOTAL SCORE**

PERFUSION - capillary refill <2 sec												Perfusion
SKIN COLOUR	Pale/Cyanotic											Pale/Cyanotic
PAIN (tick)	Severe											Severe
	Moderate											Moderate
	Mild											Mild
	No pain											No pain
HAD PAIN MEDICATION	YES/NO											YES/NO
Sweating	YES/NO											YES/NO
Wound oozing	YES/NO											YES/NO
Other: write												
Pedal pulses	YES/NO											YES/NO
Blood glucose												
Finger prick Hb												
Intravenous fluid	YES/NO											IV YES/NO
Looks unwell	YES/NO											YES/NO
	INITIALS											INITIALS

Appendix B1: The developed prototype SBAR communication tool

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

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

Compiled by Debora Burger R/N 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

Appendix B2: Modified SBAR Communication tool following Cognitive interviews

SBAR Communication document:

Patient label

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 Situation	This is _____ calling from _____(State your name, title and location). I am calling about patient _____(State patients name). The problem I am calling about is _____ _____ _____ _____ (Provide disturbed vital signs, **OR** the reason why you are concerned about the patient). My patient's resuscitation status is 'for resuscitation' ☐ or 'not for resuscitation' ☐
B Background	The patient was admitted on_____(Admission date and time if known). Admission diagnosis is _____ A **brief** relevant history for this patient is _____ _____ _____ _____ (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). Current treatment includes _____ _____ _____ _____ (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). This is a change from _____ _____ _____Describe briefly what the previous condition was).
A Assessment	**Current vital signs are**: Respiratory rate _____ Oxygen saturation %_____ On oxygen % _____ **or** Room air ☐/Temperature _____ Heart rate _____ Blood pressure _____/_____ Glasgow-coma scale (___/15) **or** Alert ☐ Responds to Verbal☐/Pain ☐is Unresponsive☐ **ONLY IF APPLICABLE complete and state the following:** **Skin colour**: Pale ☐Cyanosis ☐ **Periphery**: Warm (Capillary refill time <2 seconds) ☐or Cool (CRT>2 seconds) ☐ **Pupils**: Equal ☐/Pinpoint ☐Normal size ☐Dilated ☐Reacting to light ☐ **Mood**: Lethargic ☐Confused ☐Agitated ☐ The patient is **complaining** of _____ _____ **Pain experienced**: No pain ☐Mild pain ☐Moderate pain ☐Severe pain ☐ **Sweating**: ☐/**Wound ooze**: ☐/**Pedal pulses**: Normal ☐Weak ☐or Absent /☐ **Blood glucose**: _____ /**Finger prick Hb**:_____
R Recommendation	I would like you to see the patient now ☐in the next 30 minutes ☐ Is there anything you would like me to do in the meantime? _____ _____ _____ _____ (**If medications are ordered**): While I have you on the phone may I get a second witness? ☐ (**If not coming to see the patient now**): Do you want to be notified for any reason? _____ _____

	_____ If no improvement, when should I call again?_____

Compiled by Debora Burger R/N 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

Appendix B3: Modified SBAR Communication tool following Content Validity

SBAR Communication document:

Patient label

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

Appendix C1: Cognitive interviewing questionnaire
Analysing the SBAR communication tool incorporating components of a MEWS vital signs observations chart

Introduction

Hello, my name is Debora Burger. I am working on modifying a standardized communication tool to incorporate components of a Modified Early Warning Score (MEWS) vital signs observations chart that nurses will use to communicate early signs of physiological and/or clinical signs of deterioration in a patient to prevent serious adverse events (SAE's) occurring. SAE's include unexpected admission to intensive care units, cardiac arrest or death. You have been requested to take part, as you are a nurse/doctor with expert knowledge of adult clinical physiology and/or health sciences research and can provide valuable information on the usefulness of this communication tool. At the completion of this explanation you will be given an opportunity to give written informed consent.

Background

A MEWS observations chart has been developed, validated and tested for use in Cape Town in a doctoral thesis by Una Kyriacos, in a single centre cluster randomized controlled trial (RCT). The study showed increased recording of vital signs by nurses but not reporting of early signs of physiological deterioration. The National Research Foundation (NRF) has provided funding for the larger study to test the hypothesis that nurses' recording and response behaviour will improve with training and use of the MEWS. The intention is to adopt a standardized communication tool called the SBAR. The SBAR communication tool stands for situation, background, assessment and recommendation. It is used in healthcare to relay critical information between health care members. Examples of the SBAR tool found in the published literature have been adapted to incorporate components of the local MEWS chart. The intention of implementation of the SBAR tool is that nurses will have competence in early recognition and reporting of signs of physiological and clinical deterioration.

The aim of the prompt situation is to identify yourself, where you are calling from and a brief reason for calling. The background prompt is for additional information such as the patients' date and reason for admission and brief medical history. Assessment includes current vital signs and current treatment. Recommendation provides an opportunity for the nurse to state what he/she thinks is going on with the patient and/or requesting assistance such as immediate assistance or, for example, within the following 30 minutes.

The revised MEWS vital signs chart (Appendix A2) provides for the recording of 6 physiological parameters (vital signs). Once the reading for each parameter is inserted into the appropriate range, a score for that parameter is produced. Following completion of all recordings for each parameter, the total score is calculated. The pocket guide produced for nurses explains how to interpret a scoring key for a single MEWS or total MEWS for eliciting a response. While it would be unreasonable to prescribe at what point the SBAR tool should be used to call for more skilled assistance from a medical doctor as this will be an institutional ruling, it is recommended that a call should be made for early signs of deterioration (MEWS of 2 for a single score; medium risk of a total MEWS of 5-6) but nurses have to use clinical judgement when calling for a lower score than this.

The purpose of this interview is to evaluate your interpretation of the SBAR communication tool and to identify and correct problems. It is not a test and the interview is not intended to cause you any discomfort. The interview will be recorded, if you agree, with the understanding that you can stop the interview at any time, for any reason and the information obtained will be kept strictly confidential and your name will not appear in the study.

Do you agree to continue?

(Commence audio- recording)

Interview design

Stage one

Participant is provided with Appendix A1 (a blank copy of an earlier version of the Cape Town MEWS vital signs chart) and Appendix B (the developed prototype SBAR communication tool incorporating the MEWS).
The participant is then asked to read aloud the text on the SBAR tool, section by section. The following questions are then asked to determine the participants' interpretation:

1. Can you please describe what you think **SITUATION** is asking for?
2. (Anticipated probes to the above response if problems identified):
    - How did you get to that answer (Cognitive probe)?
    - So what you are saying is…….(Confirmatory probe)?
    - Tell me more about….(Expansive probe).
3. Can you please describe what **BACKGROUND** is asking for?
4. (Anticipated probes to the above response if problems identified):

- How did you get to that answer (Cognitive probe)?
- In other words BACKGOUND to you means…….(Confirmatory probe)?
- Tell me more about..(Expansive probe).

5. What do you understand of what is asked for in the **ASSESSMENT**?
6. (Anticipated probes to the above response if problems identified):
    - How did you get to that answer (Cognitive probe)?
    - From what I understand your interpretation of assessment is….(Confirmatory probe)?
    - Tell me more about…(Expansive probe).
7. What do you understand of what is asked for in **RECOMMENDATION**?
8. (Anticipated probes to the above response if problems identified):
    - How did you get to that answer (Cognitive probe)?
    - In other words what you are saying is.. (Confirmatory probe)…?
    - Tell me more about..(Expansive probe).
9. (Emergent probes to explore further problems that may arise).
10. Tell me what you think of the SBAR tool's readability.
11. What difficulties or challenges do you anticipate with the use of this tool?
12. Is there anything missing that you think should be added to the SBAR tool?

Stage two

Participant is provided with Appendix C2, which includes a scenario of a patient in an acute care ward in a hospital and Appendix C3, which includes a completed MEWS vital signs chart with fictitious data pertaining to the scenario.
The participant is then asked to enact activation verbally of a SBAR communication tool including information from the scenario as well as information from the completed MEWS vital signs chart.
Minimal probing will occur during this process in order to assess the cognitive process involved. Following completion, problem areas will be explored further with cognitive, confirmatory or expansive probes.

Summary

In summarizing the problems you have identified, my understanding of the problems is (_____) would you agree with my summary or would you like to change or add to it?
In summarizing suggestions made, you recommended (_____), am I correct in saying this? Or would you like to clarify what you meant?
The areas of the SBAR communication tool that work well are (_____), did I interpret this correctly or would you like to change or add anything?
Anything further you would like to add?

Conclusion

Thank you for your time and input. A reminder that this interview is confidential and information shared will remain anonymous.
Do you have any questions?
I will now end the recording.

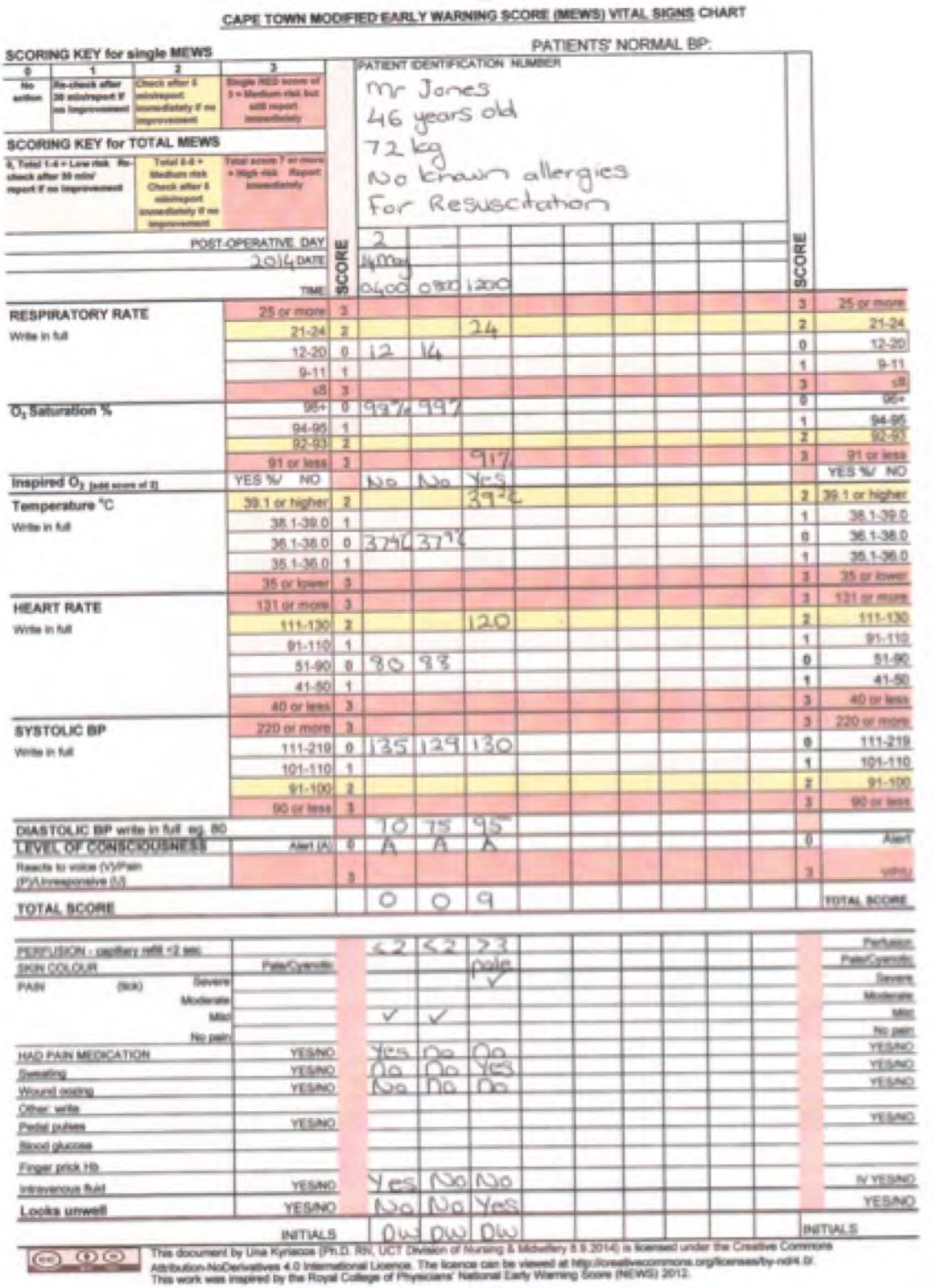
.

Appendix C2: Scenario for cognitive interviews

Scenario:

Mr Jones, age 52, is your patient on a general surgical ward (ward A) at Groote Schuur Hospital. He was admitted on the 12th of May 2014, with a diagnosis of a small bowel obstruction. He has no known allergies and has a code status of 'for resuscitation'.
He underwent surgical repair of volvulus on the evening of the 12th and had a relatively uneventful post-operative course. Vital signs remained within normal limits and Mr. Jones required no oxygen, his pain was well controlled with intramuscular Pethidine injections of 50 mg Q 4 hourly prn of which he had refused a dose at 0800.
This morning, 14th of May 2014, Mr. Jones began clear oral liquids and as a result his intravenous drip was discontinued and his intravenous catheter heparin locked. At 1200 Mr. Jones began complaining of severe abdominal pain. His abdomen on examination is rounded but without distension and he is pale and sweating and generally looks unwell. Recent vital signs have been taken and recorded on the revised MEWS vital signs chart. Based on findings Mr. Jones is placed on 2 litres nasal cannula oxygen and the decision is made to call the doctor using the SBAR communication tool.
Please make use of the information that you obtain from the scenario above (Appendix C2) as well as the modified early warning scoring (MEWS) vital signs chart with fictitious data (Appendix C3) to inform the doctor of your patient's change in condition using the developed SBAR communication tool (Appendix B1).

Appendix C3: MEWS Vital signs chart for cognitive interview scenario (Appendix C2)



CAPE TOWN MODIFIED EARLY WARNING SCORE (MEWS) VITAL SIGNS CHART

PATIENTS' NORMAL BP:

SCORING KEY for single MEWS

0	1	2	3
No action	Re-check after 30 min/report if no improvement	Check after 15 min/report immediately if no improvement	Single RED score of 3 = Medium risk but still report immediately

SCORING KEY for TOTAL MEWS

0, Total 1-4 = Low risk Re-check after 30 min/ report if no improvement

Total 5-6 = Medium risk Check after 15 min/report immediately if no improvement

Total score 7 or more = High risk Report immediately

PATIENT IDENTIFICATION NUMBER

Mr Jones
46 years old
72 kg
No known allergies
For Resuscitation

		SCORE										SCORE	
POST-OPERATIVE DAY			2										
2014 DATE			14 May										
TIME			0400	0800	1200								
RESPIRATORY RATE Write in full	25 or more	3										3	25 or more
	21-24	2			24							2	21-24
	12-20	0	12	14								0	12-20
	9-11	1										1	9-11
	≤8	3										3	≤8
O_2 Saturation %	96+	0	99%	99%								0	96+
	94-95	1										1	94-95
	92-93	2										2	92-93
	91 or less	3			91%							3	91 or less
Inspired O_2 (add score of 3)	YES % NO		No	No	Yes %								YES % NO
Temperature °C Write in full	39.1 or higher	2			39.2							2	39.1 or higher
	38.1-39.0	1										1	38.1-39.0
	36.1-38.0	0	37.4	37.1								0	36.1-38.0
	35.1-36.0	1										1	35.1-36.0
	35 or lower	3										3	35 or lower
HEART RATE Write in full	131 or more	3										3	131 or more
	111-130	2			120							2	111-130
	91-110	1										1	91-110
	51-90	0	80	93								0	51-90
	41-50	1										1	41-50
	40 or less	3										3	40 or less
SYSTOLIC BP Write in full	220 or more	3										3	220 or more
	111-219	0	135	129	130							0	111-219
	101-110	1										1	101-110
	91-100	2										2	91-100
	90 or less	3										3	90 or less
DIASTOLIC BP write in full eg. 80			70	75	95								
LEVEL OF CONSCIOUSNESS	Alert (A)	0	A	A	A							0	Alert
Reacts to voice (V)/Pain (P)/Unresponsive (U)		3										3	V/P/U
TOTAL SCORE			0	0	9								TOTAL SCORE
PERFUSION - capillary refill <2 sec			<2	<2	>3								Perfusion
SKIN COLOUR	Pale/Cyanotic				pale ✓								Pale/Cyanotic
PAIN (tick) Severe													Severe
Moderate													Moderate
Mild			✓	✓									Mild
No pain													No pain
HAD PAIN MEDICATION	YES/NO		Yes	No	No								YES/NO
Sweating	YES/NO		No	No	Yes								YES/NO
Wound oozing	YES/NO		No	No	No								YES/NO
Other: write													
Pedal pulses	YES/NO												YES/NO
Blood glucose													
Finger prick Hb													
Intravenous fluid	YES/NO		Yes	No	No								IV YES/NO
Looks unwell	YES/NO		No	No	Yes								YES/NO
	INITIALS		DW	DW	DW								INITIALS

Appendix C4: Informed consent for Cognitive Interviews

Participant Code Number:_____
Title of study:
Cognitive Interviewing for identifying and correcting problems with the prototype SBAR communication tool.

INFORMATION SHEET

Why is this study being done?

The SBAR (Situation- Background- Assessment-Recommendation) communication tool is designed to standardise and improve nurses' telephonic/verbal reporting of clinical deterioration in patients to medical doctors. The **purpose** of the study is to evaluate and identify problem areas or concerns related to an adapted prototype standardised SBAR communication tool. I have adapted the tool to include components of a local MEWS vital signs chart, with the expectation that early recognition of clinical and physiological signs of deterioration should result in improved reporting to prevent unwanted patient outcomes, such as unplanned intensive care admissions or death.

Does the study have ethics approval?

Ethics approval (HREC REF: 900/2014) has been obtained from the UCT Faculty of Health Sciences' Human Research Ethics Committee.

Why am I being asked to take part?

You have been requested to take part, as you are a nurse/ medical doctor with expert knowledge of adult clinical physiology and/or health sciences research and can provide valuable information on the usefulness of this communication tool. Any information provided by you will remain confidential and anonymous. Your name will not be used during the interview and will not be linked to your audio recording. Audiotape recordings will be recorded on an iPad using HT Recorder, Copyright (c) 2009 Applied Voices LLC, and then stored directly on a password protected computer but not transcribed. Following completion of the study I will remove all information from my computer after copying the information onto a CD. The CD will be kept in my locked metal safe for three years (a legal rule) then I will destroy then CD.

What will happen if you decide to take part in the study?

If you agree to participate in this study you will be provided with reading material to review prior to the interview. The material will include the adapted prototype SBAR communication tool and the modified MEWS observations flow sheet chart. An interview date, time and location will be agreed upon. During the interview, questions will be asked about the SBAR communication tool and you are encouraged to speak out your thoughts aloud as they arise. The interview will be audiotape recorded for analysis and to guide me in making the necessary changes to the tool.

How long will this study last?

It should take about 45 minutes to 1 hour.

What are the risks and discomforts of this study?

This study does not have any foreseeable adverse effects, risks or hazards for participants. The questions asked are not intended to test your clinical ability but to provide us with valuable information on your thought processes involved in answering questions about the feasibility of the prototype SBAR tool to be used in conjunction of the MEWS observations chart.

To whom do I speak to (or contact) if I have any questions about the study?

Please feel free to ask questions during any part of the study. If you have any further questions regarding the study you may contact me, my supervisor or the University of Cape Town, Faculty of Health Sciences, Human Research Ethics Committee for more information about your rights and welfare as a research participant at telephone number 021- 4066338. Details are provided at the bottom of the page.

What if I decide not to take part?

You have a choice to not participate or exit the study at any time without penalty or obligation.

Are there any benefits to you for being in this study?

There may be no direct benefits to you for participating in this study other than an understanding of how to communicate important information in a standardised format, which could improve confidence in reporting and result in improved organisation of content reported. No financial benefits are payable for participating in the study.

What will happen when the study is over?

Following completion of this sub-study, information gained from the interviews will be analysed and improvements made to the SBAR tool.

Who you can contact if you have questions:

Researcher: Debora Burger (MSc candidate, Division of Nursing & Midwifery, University of Cape Town)
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Hout Bay
7806

Telephone Number: 079 8133134 e-mail: gchdeb001@myuct.ac.za

Supervisor: Dr Una Kyriacos
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Human Research Ethics Committee
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OBSERVATORY
7925
Professor Marc Blockman (Chairman)

Telephone number: 021 406 6338 e-mail: marc.blockman@uct.ac.za

Participant consent form for cognitive Interviewing of the SBAR communication tool adapted to incorporate components of a local Modified Early Warning Score (MEWS) chart.

Research team: Debora Burger R/N, Supervisor: Una Kyriacos PhD, Co-supervisor: Sue Jordan, PhD, Swansea University, Wales, UK.

	Initial
1. I (the participant) confirm that I have read and understand the information sheet for the above study (dated 2014) and have had the opportunity to ask questions and have them answered to my satisfaction.	
2. I give my permission for the interview to be audio-recorded.	
3. I understand that my participation in the study will not affect the conditions of my employment.	
4. I am aware that I can withdraw from the study at any time without penalty.	
5. I am aware that all my details on this consent form and in the interview process are confidential.	
6. I am aware that there are no physical risks involved. Information offered by me is confidential and protected. There are no known or anticipated risks.	
7. I am aware that there may be no direct benefit to me for participating in this study other than knowledge about standardised communication. Potential broad benefits of the study for the health care industry may include reducing errors related to poor communication.	
8. I consent to take part in the above study and have reached this decision without coercion or undue pressure.	

Print name of participant	Signature	Date
Print name of researcher	Signature	Date

This study is being conducted by the University of Cape Town in collaboration with Swansea University, College of Human and Health Sciences. This work is based on the research supported in part by the National Research Foundation of South Africa for the Grant, Unique Grant No. 90295.

Any opinion, finding and conclusion or recommendation expressed in this material is that of the author(s) and the NRF does not accept any liability in this regard.

When complete: original copy to be kept with transcript documents with a second copy for the researcher. Please offer a third copy to the participant for own records.

Appendix D1: Content Validity (Round one) Participant Code Number:

Informed Consent and Checklist

for Content Validity of the SBAR tool

Title of study: **The development and validation of a locally designed Situation-Background-Assessment-Recommendation (SBAR) communication tool for reporting early signs of clinical deterioration**

INFORMATION SHEET:

Why is this study being done?

The SBAR (Situation- Background- Assessment-Recommendation) communication tool (Appendix B2) is designed to standardise and improve nurses' telephonic/verbal reporting of clinical deterioration in patients to medical doctors. The **purpose** of the study is to evaluate and identify problem areas or concerns related to an adapted prototype standardised SBAR communication tool. I have adapted the tool to include components of a Modified Early Warning Score (MEWS) vital signs chart (Appendix A2), with the expectation that early recognition of clinical and physiological signs of deterioration should result in improved reporting to prevent unwanted patient outcomes, such as unplanned intensive care admissions or death.

This is a sub-study of a larger study that will test the effectiveness of the MEWS chart and the SBAR communication tool. The MEWS provides for the recording of 6 physiological parameters (vital signs). Once the reading for each parameter is inserted into the appropriate range, a score for that parameter is produced. Following completion of all recordings for each parameter, the total score is calculated. You will not evaluate the MEWS chart.

Does the study have ethics approval?

Ethics approval (HREC REF: 900/2014) has been obtained from the UCT Faculty of Health Sciences' Human Research Ethics Committee for this sub-study.

Why am I being asked to take part?

You have been selected to validate the content of the SBAR communication tool because you have self-assessed expert knowledge of adult clinical physiology and/or health sciences research whether or not you participated in other aspects of this study.

Information provided by you in this study will remain confidential and anonymous as your name will not be linked to the study data, the dissertation or in any publications or conference presentations linked to this study. Data that link your name with your code number are known only to me and will be stored on a password protected hard drive of my laptop.

What will happen if you decide to take part in the study?

If you agree to participate in this study you, the expert, will establish the index of content validity (CVI) [1-3] for each item on this checklist using a 4-point ordinal rating scale. The purpose of this checklist is to ensure uniform evaluation by all experts using a structured approach. It should take about 45 minutes to complete the exercise.

How long will this study last?

The study should be completed within 6 months.

What are the risks and discomforts for taking part in this study?

This study does not have any foreseeable adverse effects, risks or hazards for participants. The questions asked are not intended to test your clinical ability but for you to use your knowledge and clinical experience to provide us with valuable information about the validity of the content of the prototype SBAR tool when used in conjunction of the MEWS observations chart.

To whom do I speak to (or contact) if I have any questions about the study?

Please feel free to ask questions during any part of the study. If you have any further questions regarding the study you may contact me, my supervisor or the University of Cape Town, Faculty of Health Sciences, and Human Research Ethics Committee for more information about your rights and welfare as a research

participant at telephone number 021- 4066338. Details are provided at the bottom of the page.

What if I decide not to take part?

You have a choice to not participate or exit the study at any time without penalty or obligation.

Are there any benefits to you for participating in this study?

There may be no direct benefits to you for participating in this study other than an understanding of how to communicate important information in a standardised format, which could improve confidence in reporting and result in improved organisation of content reported. No financial benefits are payable for participating in the study.

What will happen when the study is over?

Following completion of this sub-study, a valid and reliable communication tool will be available for testing in a clinical setting.

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CONSENT TO PARTICIPATE IN THE STUDY

Thank you for responding to the recruitment drive at the clinical meeting at which this study was explained. Please e-mail or post the completed checklist to me at the above address/or in the enclosed pre-addressed envelope. If I do not receive the completed form within 2 weeks of delivery to you, I will assume you have declined to participate in the study. Returning this form implies informed consent.

There are no penalties for deciding to not participate in this study or for withdrawing from the study at any point.

If there are any questions about this checklist or the study please contact the researcher or supervisor at the number(s) provided.

Appendix D1: Content Validity (continued)

Round One: Expert opinion on index of content validity (CVI) of EACH ITEM on the SBAR tool

SECTION A: VARIABLES

Index of content validity (CVI)					
Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
	Item A1:	**SITUATION**			
Item A1.1 Identifying self and ward calling from					
Item A1.2 Identifying patient					
Item A1.3 The problem called about					
Item A1.4 Patients resuscitation status					
	Item A2:	**BACKGROUND**			
Item A2.1 Admission date					
Item A2.2 Admission Diagnosis					
Item A2.3 Brief relevant history					
Item A2.4 Current treatment					
Item A2.5 'This is a change from'					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
	Item A3:	**ASSESSMENT**			
Item A3.1 List of current vital signs					
Item A3.2 Respiratory rate					
Item A3.3 Oxygen Saturations					
Item A3.4 On oxygen					
Item A3.5 Room air					
Item A3.6 Temperature					
Item A3.7 Heart rate					
Item A3.8 Blood Pressure					
Item A3.9 Glasgow-coma scale					
Item A3.10 Alert					
Item A3.11 Responds to verbal					
Item A3.12 Responds to pain					
Item A3.13 Is unresponsive					
Item A3.14 Periphery Skin colour pale					
Item A3.15 Skin colour cyanosis					
Item A3.16 Periphery warm (CRT<2 seconds)					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
Item A3.17 Periphery Cool (CRT>2 seconds)					
Item A3.18 Pupils equal					
Item A3.19 Pupils pinpoint					
Item A3.20 Pupils normal size					
Item A3.21 Pupils dilated					
Item A3.22 Pupils reacting to light					
Item A3.23 Mood lethargic					
Item A3.24 Mood confused					
Item A3.25 Mood agitated					
Item A3.26 Patient complaints					
Item A3.27 Pain					
Item A3.28 Sweating					
Item A3.29 Wound ooze					
Item 3.30 Pedal pulses normal					
Item 3.31 Pedal pulses weak					
Item 3.32 Pedal pulses absent					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
Item 3.33 Blood glucose					
Item 3.34 Finger prick Hb					
	Item A4:	**RECOMMENDATION**			
Item A4.1 See the Patient now					
Item A4.2 In the next 30 minutes					
Item A4.3 'Anything you Would like In meantime'					
Item A4.4 Second witness					
Item A4.5 Notification					
Item A4.6 Call again?					

Omissions: (if more space is needed mark as 1. and write at the back of the page)

1. **Demographic information:**

What is your professional qualification?	
In what year was your professional qualification obtained?	
How long have you worked in your present position?	

THANK YOU VERY MUCH

References

1. Lynn, M. R. Determination and quantification of content validity. *Nursing Research* 1986;35 (6 November/December):382-85.

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

3. Adapted with permission from: Kyriacos, U. 2011. The development, validation and testing of a vital signs monitoring tool for early identification of deterioration in adult surgical patients. PhD thesis. Cape Town: University of Cape Town.

Appendix D2: Content Validity Round Two

Participant Code Number:

Informed Consent and Checklist

for Content Validity of the SBAR tool

Title of study: **The development and validation of a locally designed Situation-Background-Assessment-Recommendation (SBAR) communication tool for reporting early signs of clinical deterioration**

INFORMATION SHEET:

Why is this study being done?

The SBAR (Situation- Background- Assessment-Recommendation) communication tool (Appendix B3) is designed to standardise and improve nurses' telephonic/verbal reporting of clinical deterioration in patients to medical doctors. The **purpose** of the study is to evaluate and identify problem areas or concerns related to an adapted prototype standardised SBAR communication tool. I have adapted the tool to include components of a Modified Early Warning Score (MEWS) vital signs chart (Appendix A2), with the expectation that early recognition of clinical and physiological signs of deterioration should result in improved reporting to prevent unwanted patient outcomes, such as unplanned intensive care admissions or death.
This is a sub-study of a larger study that will test the effectiveness of the MEWS chart and the SBAR communication tool. The MEWS provides for the recording of 6 physiological parameters (vital signs). Once the reading for each parameter is inserted into the appropriate range, a score for that parameter is produced. Following completion of all recordings for each parameter, the total score is calculated. You will not evaluate the MEWS chart.

Does the study have ethics approval?

Ethics approval (HREC REF: 900/2014) has been obtained from the UCT Faculty of Health Sciences' Human Research Ethics Committee for this sub-study.

Why am I being asked to take part?

You have been selected to validate the content of the SBAR communication tool because you have self-assessed expert knowledge of adult clinical physiology and/or health sciences research whether or not you participated in other aspects of this study.
Information provided by you in this study will remain confidential and anonymous as your name will not be linked to the study data, the dissertation or in any publications or conference presentations linked to this study. Data that link your name with your code number are known only to me and will be stored on a password protected hard drive of my laptop.

What will happen if you decide to take part in the study?

If you agree to participate in this study you, the expert, will establish the index of content validity (CVI) [1-3] for each item on this checklist using a 4-point ordinal rating scale. The purpose of this checklist is to ensure uniform evaluation by all experts using a structured approach. It should take about 45 minutes to complete the exercise.

How long will this study last?

The study should be completed within 6 months.

What are the risks and discomforts for taking part in this study?

This study does not have any foreseeable adverse effects, risks or hazards for participants. The questions asked are not intended to test your clinical ability but for you to use your knowledge and clinical experience to provide us with valuable information about the validity of the content of the prototype SBAR tool when used in conjunction of the MEWS observations chart.

To whom do I speak to (or contact) if I have any questions about the study?

Please feel free to ask questions during any part of the study. If you have any further questions regarding the study you may contact me, my supervisor or the University of Cape Town, Faculty of Health Sciences, and Human Research Ethics Committee for more information about your rights and welfare as a research participant at telephone number 021- 4066338. Details are provided at the bottom of the page.

What if I decide not to take part?

You have a choice to not participate or exit the study at any time without penalty or obligation.

Are there any benefits to you for participating in this study?

There may be no direct benefits to you for participating in this study other than an understanding of how to communicate important information in a standardised format, which could improve confidence in reporting and result in improved organisation of content reported. No financial benefits are payable for participating in the study.

What will happen when the study is over?

Following completion of this sub-study, a valid and reliable communication tool will be available for testing in a clinical setting.

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CONSENT TO PARTICIPATE IN THE STUDY

Thank you for responding to the recruitment drive at the clinical meeting at which this study was explained. Please e-mail or post the completed checklist to me at the above address/or in the enclosed pre-addressed envelope. If I do not receive the completed form within 2 weeks of delivery to you, I will assume you have declined to participate in the study. Returning this form implies informed consent.
There are no penalties for deciding to not participate in this study or for withdrawing from the study at any point.
If there are any questions about this checklist or the study please contact the researcher or supervisor at the number(s) provided.

Appendix D2 (continued)

Round two: Expert opinion on index of content validity (CVI) of EACH ITEM on the SBAR tool

SECTION A: VARIABLES

Index of content validity (CVI)					
Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
	Item A1:	**SITUATION**			
Item A1.1 Identifying self and ward calling from					
Item A1.2 Identifying patient					
Item A1.3 The problem called about					
Item A1.4 Patients resuscitation status					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
	Item A2:	**BACKGROUND**			
Item A2.1 Admission date					
Item A2.2 Admission diagnosis					
Item A2.3 Brief relevant history					
Item A2.4 Current treatment					
Item A2.5 'This is a change from'					
	Item A3:	**ASSESSMENT**			
Item A3.1 List of current vital signs					
Item A3.2 Respiratory rate					
Item A3.3 Oxygen saturations					
Item A3.4 On oxygen					
Item A3.5 Room air					
Item A3.6 Temperature					
Item A3.7 Heart rate					
Item A3.8 Blood Pressure					
Item A3.9 Alert					
Item A3.10 Responds to verbal					
Item A3.11 Responds to pain					
Item A3.12					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
Is unresponsive					
Item A3.13 Periphery Skin colour pale					
Item A3.14 Skin colour cyanosis					
Item A3.15 Periphery warm (CRT<2 seconds)					
Item A3.16 Periphery cool (CRT>2 seconds)					
Item A3.17 Pupils equal					
Item A3.18 Pupils reacting to light					
Item A3.19 Pupils not reacting to light					
Item A3.20 Mood lethargic					
Item A3.21 Mood confused					
Item A3.22 Mood agitated					
Item A3.23 Patient complaints					
Item A3.24 Pain					
Item A3.25 Sweating					
Item A3.26 Wound ooze					
Item 3.27 Pedal pulses					

Item	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant	Comments
weak					
Item 3.28 Pedal pulses absent					
Item 3.29 Blood glucose					

Item 3.30 Finger prick Hb					
	Item A4:	**RECOMMENDATION**			
Item A4.1 See the Patient now					
Item A4.2 In the next 30 minutes					
Item A4.3 'Anything you Would like In meantime'					
Item A4.4 Second witness					
Item A4.5 Notification					
Item A4.6 Call again?					

Omissions: (if more space is needed mark as 1. and write at the back of the page)

1. **Demographic information:**

What is your professional qualification?	
In what year was your professional qualification obtained?	
How long have you worked in your present position?	

THANK YOU VERY MUCH

References

1. Lynn, M. R. Determination and quantification of content validity. *Nursing Research* 1986;35 (6 November/December):382-85.

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

3. Adapted with permission from: Kyriacos, U. 2011. The development, validation and testing of a vital signs monitoring tool for early identification of deterioration in adult surgical patients. PhD thesis. Cape Town: University of Cape Town.

Appendix E2: IRR Scenarios

Analysing Inter-rater reliability of the SBAR communication tool incorporating components of a MEWS vital signs observations chart

Introduction

Thank you for agreeing to participate. The study involves modifying a standardized communication tool, the Situation-Background-Assessment-Recommendation (SBAR), to incorporate components of a Modified Early Warning Score (MEWS) vital signs observations chart. Nurses will use the SBAR tool to communicate early signs of physiological and/or clinical signs of deterioration in a patient to prevent serious adverse events (SAE's[1]) occurring. You have been requested to take part in establishing the reliability of the SBAR tool, as you are a nurse who has specialised physiology knowledge and experience in working in clinical settings.

Background

A MEWS observations chart has been developed, validated and tested for use in Cape Town in a doctoral thesis by Una Kyriacos (2011), in a single centre cluster randomized controlled trial (RCT). The study showed increased recording of vital signs by nurses but not reporting of early signs of physiological deterioration. Subsequently a larger multi-site RCT has been funded by a National Research Foundation (NRF) grant to test the effectiveness of the revised 2014 Cape Town MEWS vital signs observations chart (Appendix A2) and SBAR communication tool on hospital nurses' performance in early identification and reporting of clinical and physiological deterioration in adult patients The SBAR communication tool is used in healthcare to relay critical information between health care members. Examples of the SBAR tool found in the published literature have been adapted to incorporate components of the local MEWS chart. The intention of implementation of the SBAR tool is that nurses will have competence in early recognition and reporting of signs of physiological and clinical deterioration.
The aim of the prompt **situation** is to identify yourself, where you are calling from and a brief reason for calling. The **background** prompt is for additional information such as the patients' date and reason for admission and brief medical history. **Assessment** includes current vital signs and current treatment. **Recommendation** provides an opportunity for the nurse to state what he/she thinks is going on with the patient and/or requesting assistance such as immediate assistance or, for example, within the following 30 minutes.
The revised MEWS vital signs chart (Appendix A2) provides for the recording of 6 physiological parameters (vital signs)[2]. Once the reading (value) for each parameter is inserted manually within the appropriate range, a score (0 to 3) for that parameter is reflected on the chart. Following completion of all recordings for each parameter at one observation time-point, a total score is calculated. The training pocket guide for nurses (Kyriacos & Burger, 2014) explains the algorithm for interpreting the scoring key for a single MEWS or total MEWS for eliciting a response. While it would be unreasonable to prescribe at what point the SBAR tool should be used to call for more skilled assistance from a medical doctor as this will be an institutional ruling, it is recommended that a call should be made for early signs of deterioration (a MEWS of 2 for a single score; medium risk of a total MEWS of 5-6) but nurses have to use clinical judgement when calling for help for a score lower than this.
This study is not intended to cause discomfort or harm. Information obtained will be kept strictly confidential and your name will not appear in the study.

Instructions

Please refrain from conversing with others about this portion of the study until I have informed you that the other experts have submitted their completed forms to avoid contamination of the results.
You have been provided with 22 scenarios, 22 corresponding completed MEWS charts and 22 blank SBAR communication tools for each scenario. Please read each scenario carefully and refer to the corresponding completed MEWS vital signs chart. Please note that the scenarios are fictitious and serve as examples only for purposes of this exercise.
Complete a separate SBAR communication tool for each scenario giving only information that is relevant and appropriate from information provided in the scenario and the corresponding MEWS chart.
To establish reliability of the SBAR tool, all 22 SBAR sheets have to be completed. Please ensure that you take breaks in between, as this may be a lengthy process.

---

[1] Serious Adverse Event (SAE) or Serious Adverse Drug Reaction (Serious ADR). Any untoward medical occurrence that at any dose:
- results in death,
- is life-threatening,
- requires inpatient hospitalization or prolongation of existing hospitalization,
- results in persistent or significant disability/incapacity,
or
- is a congenital anomaly/birth defect
(see the ICH Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting). ICH 1996 p.7 Glossary

[2] not all of which may have to be recorded at one observation time-point (eg. 10h00) as this depends on institutional policy

If you have any questions after commencing the study, please contact me directly at 079 8133134.

Scenario 1

Mr Brown is 27 years old and has no previous medical history or allergies.
He was admitted to Ward A from the trauma unit, following a motor vehicle crash on January 8, 2015.
Injuries sustained include a Splenic Laceration.
Current treatment includes 6 hourly Finger prick Hb and intramuscular Pethidine 50mg Q4 hourly prn for pain. He is nil per mouth and receiving maintenance intravenous fluids.
On arrival to the ward at 0930 his initial vital signs were within normal limits (Refer to the MEWS vital signs chart).
At 1130 the nursing auxiliary calls you to the bedside as she is having difficulty arousing Mr Brown and she is concerned about the vital signs she obtained (Refer to the MEWS vital signs chart).
Based on findings on the MEWS chart and this scenario, you decide to call the doctor using the SBAR communication tool.

Scenario 2

Mrs Oaks is 23 years old and suffers from allergies to bee stings and peanuts.
She was admitted to Ward B following an umbilical hernia repair on January 5, 2015.
Current treatment includes Tramadol 50mg orally every four hours as needed for moderate pain and Paracetamol 650mg orally every four hours as needed for mild pain. Her intravenous fluids have already been discontinued as she is on a regular diet.
This morning at breakfast, January 6, 2015, you note that Mrs Oaks is complaining of tingling lips and feels as if her throat is scratchy. You are concerned that her food may have contained a peanut component. Her breathing is rapid. You recorded her vital signs on the MEWS chart for 0900. You decide to call the doctor using the SBAR communication tool.

Scenario 3

Mr Waterson is 64 years old and has a history of Type 2 diabetes. He was admitted to Ward A with a diagnosis of a septic right lower leg ulcer.
On arrival at the ward you notice that his right leg is swollen and red. Mr Waterson feels very hot to the touch and generally looks unwell. There are no existing orders for antibiotics and you are concerned that Mr Waterson has a more generalised infection. You know that the MD will only be coming around in 4 hours' time so you decide to call the doctor using the SBAR communication tool based on your findings on the MEWS chart and the above scenario.

Scenario 4

Miss Resch is 24 years old and has no previous medical history. She was admitted to Ward B this morning at 0300, January 8, 2015, with an admission diagnosis of Bacterial Pneumonia.
Current treatment includes albuterol nebulizers every 4 hours and intravenous Ceftriaxone 1 gram daily.
Today, January 8, 2015, at 0900 you notice that she is short of breath and her saturations are lower than before.
Based on your findings on the MEWS chart you decide to call the doctor using the SBAR communication tool.

Scenario 5

Mr Patsy is 50 years old and has a history of Hypertension.
He was admitted to Ward A, January 8, 2015 at 1100 with a suspected Small Bowel Obstruction. Mr Patsy's recent history includes nausea and vomiting for one week and abdominal distension. Vital signs on admission are all within normal limits.
Current treatment includes maintenance intravenous fluids, intravenous Zofran for nausea prn Q6, intravenous antibiotics including Clindamycin, Metronidazole and Cefoxitin and is nil per mouth. Radiology has completed abdominal x-rays and you have sent specimens for a full blood count and electrolytes to the lab.
At 1500 Mr Patsy is complaining of severe abdominal pain and is sweating. You take a set of vital signs and record it on the MEWS chart and decide to call the doctor using the SBAR communication tool.

Scenario 6

Mrs Payne is 37 years old and was admitted to ward B with an acute asthma exacerbation on January 2, 2015 at 0800. She is a known asthmatic.
Current treatment includes salbutamol 5 mg nebulizers every three hours and Solumedrol 60 mg intravenously every 6 hours. She is receiving 35% Oxygen by facemask oxygen.
At 1200 on the same day as admission, you are measuring her vital signs and notice that she is sitting forward and working very hard to breath.
Using her current MEWS chart and this scenario you decide to call the doctor using the SBAR communication tool.

Scenario 7

Mrs Silver is 70 years old and suffers from severe dementia and is unable to communicate reliably with you.
She has been admitted to Ward B with a Urinary Tract Infection.
Current treatment includes intravenous Zithromax and maintenance intravenous fluids.
Admission date: January 8, 2015 at 0900.
On January 8, 2015 while you are doing your 1200 assessment you note a change in Mrs Silvers' vital signs. You decide to call the doctor using the SBAR communication tool based on findings on the MEWS chart.

Scenario 8

Mr Plaatijies is 48 years old and was admitted to Ward A following a motorbike accident. He suffered a mild concussion following the accident and CT scan revealed a small Right Temporal Lobe Haemorrhage. He was admitted for overnight observation on January 8, 2015 at 0400. No previous medical history.
Current treatment includes Paracetamol 1000 mg intravenously for pain if necessary every six hours and maintenance intravenous fluids.
At 0900 you are measuring his vital signs but cannot rouse Mr Plaatijies. He awakes to painful stimulation and his response is not coherent.
Using the MEWS chart and this scenario you decide to call the doctor using the SBAR communication tool.

Scenario 9

Mrs Smith was admitted to Ward B on January 8, 2015 after having an appendectomy for appendicitis. She was previously well and developed pain in her right lower abdomen and nausea and vomiting. She was admitted at 1100 from theatre and vital signs were documented on the MEWS vital signs chart and are within normal limits.
Current treatment includes postoperative vital signs monitoring, maintenance intravenous fluids, and Pethidine 50mg Q4 hourly prn for pain.
At 1200 you notice a change in Mrs Smith's total MEWS score. You are not sure what is going on but you decide to call the doctor based on the score using the SBAR communication tool.

Scenario 10

Mr Adams is 70 years old and has a history of hypertension and angina.
He was admitted to Ward A with angina including ST elevation. His chest pain was resolved on admission at 1200 on January 8, 2015 but now at 1500 he appears pale, sweating with poor perfusion and a capillary refill time of 4 seconds. Clinically he generally looks unwell although his vital signs appear within normal limits and he is not complaining of pain. You are concerned and decide to call the doctor using the SBAR communication tool.
Current treatment includes 2 litres nasal cannula oxygen, aspirin 81 mg orally daily and valsartan/ hydrochlorothiazide 160/12.5mg orally daily.

Scenario 11

Mr Biggs is 42 years old and was admitted to Ward A from the trauma unit with a stab wound to his left chest resulting in a haemothorax. He was admitted on January 8, 2015 at 0200 am. He has a history of high cholesterol.
In the trauma unit a left sided chest tube was placed and current treatment includes mobilization and pain medication including Tramadol 50mg orally every four hours as needed for moderate pain and Paracetamol 60 mg orally every 4 hours if needed for mild pain and 2 litres nasal cannula oxygen.
While admitting Mr Biggs, you notice he is short of breath and has low saturations. The triggered MEWS score obtained is 6. After 5 minutes you recheck his vital signs and see no improvement. You decide to call the doctor using the SBAR communication tool.

Scenario 12

Mrs Fortune was admitted to Ward B on January 8, 2015. She is 52 years old and has a history of alcohol abuse. She has a recent history of nausea and vomiting and is unable to keep any food or fluid down. She was admitted to your ward for investigations and hydration.
Current treatment includes orders to draw blood for a complete metabolic analysis including lipase and amylase, a fluid bolus of 1000mls normal saline over one hour and then maintenance intravenous fluids.
On admission at 1500 you notice Mrs Fortune is shifting around in her bed and guarding her abdomen. She is complaining of severe abdominal pain. Her vital signs trigger a total MEWS score of 4 but after rechecking in 30 minutes there is no improvement and you decide to call the doctor using the SBAR communication tool based on information you have gathered from this scenario as well as the MEWS chart.

Scenario 13

Mr Burger is 20 years old and was admitted to Ward A with multiple stab wounds to his legs, arms and face. He was admitted via the trauma unit where all of his wounds were cleaned and dressed and he is now awaiting plastic surgery. He has no previous medical history.
He was admitted on January 8, 2015 at 0200 in the morning. With your morning assessment at 0800 you note a change in his vital signs including shortness of breath.
Current treatment includes nil per mouth, maintenance intravenous fluids and medication for pain including Morphine Sulphate 2mg intramuscularly Q 4hourly prn.
Based on his total MEWS score and shortness of breath you call the doctor using the SBAR communication tool.

Scenario 14

Mrs Nel is 62 years old and has been on ward B following a Right Total Knee Replacement. She is day 6-post op and is getting ready to be discharged home. Her past medical history includes hypertension and high cholesterol. Admission date was January 2, 2015. Current treatment includes only Paracetamol for pain, which she has not taken in the last 12 hours. While doing your last assessment you notice oozing from her wound and she has an elevated temperature, which is new. Based on your assessment and the vital signs documented on the MEWS chart for 0800, January 8, 2015, you decide to call the doctor using the SBAR communication tool.

Scenario 15

Mr Steenkamp is 72 years old and is admitted to Ward A with Pneumonia. He has a history of COPD and smoking.
He was admitted today, January 8, 2015 at 0200. At 0800 you notice he is having difficulty walking and appears short of breath. You take a set of vital signs and document them on the MEWS vital signs chart.
Current treatment includes 2 litres nasal cannula oxygen, Albuterol nebulizers every 4 hours and intravenous Ceftriaxone 1 gram daily.
Based on your findings on the MEWS chart and this scenario you decide to call the doctor using the SBAR format.

Scenario 16

Mrs Heyns is 32 years old and was admitted to Ward B from theatre following an Open Reduction and Internal Fixation of a Fractured Right Tibia/Fibula.
On admission to your ward on January 8, 2015, at 1230, you notice she is difficult to rouse. You take a set of vital signs on the MEWS chart and based on findings you decide to call the doctor.
She has no previous medical history and was admitted with maintenance intravenous fluids and orders for pain medication and intravenous antibiotics, which have not yet been started.

Scenario 17

Mr Kleine is 79 years old and is admitted to ward A and has a history of alcohol abuse and COPD. Admission diagnosis is a Fractured Right Neck of Femur, which he sustained from a fall. He is waiting to go to surgery.
Current treatment includes maintenance intravenous fluids, Morphine Sulphate 2mg intramuscularly Q 4 hourly prn for pain and is nil per mouth.
Mr Klein was admitted at 0200 on January 8, 2015. With your current assessment at 0800 on January 8, 2015 you notice that Mr. Kleine is complaining of severe chest pain and has tachycardia and shortness of breath.
Based on your findings and the recording on the MEWS chart, you decide to call the doctor using the SBAR communication tool.

Scenario 18

Mrs Theron is a 65-year-old who was admitted to ward B with Bronchitis. She has a history of COPD and Hypertension.
On admission today, January 8, 2015, at 1100 you obtain a set of vital signs. Mrs Theron was admitted via casualty where the handover report indicated she was in a stable condition and all of her vital signs were within normal limits. Current treatment includes 2 litres nasal cannula oxygen, Albuterol nebulizers every 4 hours and intravenous Ceftriaxone 1 gram daily and maintenance intravenous fluids.
She appears to be very short of breath. Based on your findings on the MEWS chart you decide to call the doctor using the SBAR communication tool.

Scenario 19

Mr Clark is a 42 year old admitted to Ward A following a right inguinal hernia repair. He has no previous medical history and was admitted on January 8, 2015 at 1600. Initial vital signs on arrival from theatre show tachycardia and rapid breathing. You are unsure what is going on but you heard from the recovery room nurse that his vital signs were within normal limits and he was not complaining of pain or discomfort. You decide to call the doctor using the information obtained from this scenario as well as the MEWS chart using the SBAR communication tool.
He has arrived with maintenance intravenous fluids and glancing at his orders only intravenous Paracetamol 1000mg Q6 hourly for 24 hours has been prescribed.

Scenario 20

Miss Jackson is 22 years old and was admitted to ward B with a Fractured Right Radius and Ulnar on January 8, 2015. She is on the surgical schedule for tomorrow morning.
Current treatment includes maintenance intravenous fluids and Morphine Sulphate 2mg intramuscularly every 3 hours as needed for severe pain and Paracetamol 1000mg intravenously every 6 hours for mild pain. While obtaining a set of vital signs at 1500 you notice that Miss Jackson is in severe pain despite the administration of morphine an hour ago. She is sweating and appears pale. Based on your clinical findings and the most recent recordings on the MEWS chart, you decide to call the doctor using the SBAR communication tool.

Scenario 21

Mr Spencer is 72 years old and was admitted to ward A on January, 8, 2015 at 1600. He is scheduled for a Transurethral Resection of Prostrate tomorrow. Mr Spencer suffers from Benign Hypertrophy of the Prostrate, Hypertension and Atrial Fibrillation.
You heard at change of shift report that Mr Spencer's vital signs are within normal limits and that his atrial fibrillation and hypertension are normally well controlled with his home medication. At 2000 you are busy with your initial assessment and you notice that Mr Spencer's pulse is irregular and his blood pressure is elevated. Looking at his medication administration chart you notice that his home medications have not being ordered. Current treatment only includes nothing by mouth orders for after midnight.
Based on your findings on the MEWS chart and this scenario, you decide to call the doctor using the SBAR communication tool.

Scenario 22

Mrs Du Toit is 41 years old and was admitted to ward B via trauma after being hit by a motor vehicle while riding her scooter. Injuries sustained include a Fractured Right Humerus. Initially on admission on January 8, 2015 at 1000 her vital signs were all within normal limits. Current treatment includes maintenance intravenous fluids and splinting of her right arm and medication for pain including Morphine Sulphate 2mg intramuscularly every 3 hours as needed for severe pain and Paracetamol 1000mg intravenously every 6 hours for mild pain. She is on the surgical schedule for repair. At 1200 with your assessment you notice she is pale and appears drowsy. Her heart rate is elevated and her blood pressure is lower than before. You obtain a finger prick Hb, which indicates a drop from 11gm/dL to 8gm/dL. You decide to call the doctor using the information you obtained on the MEWS chart and this scenario using the SBAR communication tool.

References:

1. Kyriacos, U. & Burger, D. 2014. Guidelines for using the Modified Early Warning Score (MEWS) vital signs observations chart for the recognition of early signs of physiological and clinical signs of deterioration and the Situation-Background-Assessment-Recommendation (SBAR) tool for reporting concerns. Unpublished.

Appendix F1: Findings Cognitive Interviews

Comparison of the summarized problems identified in cognitive interviews across participants

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
Situation	**What is the problem I am calling about?** ***CI****: "What is the problem I am calling about? It is difficult to decide where to put information such as the problem I am calling about. I was trying to figure out the pallor sweating and perfusion but I am also trying to figure out where to put the problem I am calling about (severe abdominal pain) and that should be here." (Could not put her finger on where to put the problem onto the SBAR).* ***CI2****: "I am confused about the problem I am calling about? Is it the patient diagnosis? The doctor would need to understand what the MEWS score means."* ***CI3****: "The MEWS score is confusing, as most doctors do not know what a MEWS score is. If you are called out of the blue you need to know the just of the problem. Words are better than a number. Make MEWS secondary and descriptive first."* ***CI4****: "The Mews score will be a problem. Stating that patient does not look right needs rephrasing but link it with more detail in '**Assessment**'. Say what the problem is and keep it short and sweet. Have to convey problem immediately to the doctor The tool was strange in this way and maybe better to go back to the original."* ***CI5****: "Giving a MEWS score will not be useful as not many people will not understand. Prefer problematic vital signs reporting or an actual patient problem*."	**Unclear** if calling about a MEWS score or a problem (N=5, 100%). The clinical signs of deterioration add to further confusion (N=1, 20%).	**Clarity**	**Modified item from:** 'The problem I am calling about is MEWS score of (X) (Provide triggered MEWS score) and /or my patient does not look right because of (X) (Pallor, sweating, pain or poor perfusion)' **to** 'The problem I am calling about is (X) (Provide disturbed vital signs, OR the reason why you are concerned about the patient)'.
	Resuscitation ***CI1****: "'Resuscitation is poorly documented in South Africa but important."*	**Resuscitation is not familiar language in South Africa** (N=4, 80%) but will be	**Applicability**	**Keep**

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
	***CI2**: "'For resuscitation' is confusing. It is not familiar language"* ***CI3**: "Resuscitation status is not used at our hospital but a do not resuscitate form is being introduced into the Western Cape so will be coming"* ***CI4**: "Place 'resuscitation' in background or recommendation."* ***CI5**: "'For resuscitation' is not deemed yes or no on the ward."*	introduced into hospitals in the Western Cape (N=1, 20%).		
	'**My** patient's resuscitation status' *CI2: "I do not like the use of 'MY' patient as it indicates possession. It may be the charge nurse calling and the patient may not belong to her."*	Use of the word 'my' **indicates possession** (N=1, 20%).	**Wording/tone**	**Modified item to** 'The patients resuscitation status is 'for resuscitation ☐ or 'not for resuscitation' ☐'.
Background	**Admission time is missing** ***CI1**: "What time was the patient admitted if a recent admission?"*	**Missing information:** time of admission (N=1, 20%).	**Applicability**	**Modified item from**: 'The patient was admitted on (x). (Date) **to** 'The patient was admitted on (X). (Admission date and time if known).
	Pertinent medical history ***CI1**: "Rather change to relevant or previous? Word pertinent is confusing."* ***CI2**: "Maybe use 'past' medical history."* ***CI3**: "The nurse will need training to get to important detail as quickly as possible. Will be variable information from patient to patient. Training will help to achieve a problem-focused background."* ***CI4**: "Pertinent medical history can be a long list. Use 'relevant' instead or pertinent."*	Word **'pertinent' may not be understood (N=4, 80%).**	**Wording/ tone**	**Modified item to** 'A brief relevant history for this patient is (X)'.
	Missing information under history ***CI1**: "How old is the patient? A geriatric versus a young adult? What is the height and weight? With some adults, if they are emaciated or obese, drug doses need to be considered."* *"If the patient is diabetic and hypertensive you need a secondary diagnosis."* ***CI2**: "What happens if the patient is diabetic or an asthmatic?"*	**More information is required** under history such as weight and age (N=1, 20%) and secondary diagnosis (N=2, 40%).	**Applicability**	**Modified item from** '(Provide a brief summary of relevant history including procedures/ operations or investigations/allergies)' **to** '(Provide current 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)'.

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
	'**Provide relevant current treatment such as,'** ***CI?*** *"'Relevant' and 'current' are big words if English is a second language. Needs to be more colloquial."*	**Potential for misinterpretation or misunderstanding** when using the words 'relevant and current' together (N=1, 20%).	**Wording**	**Modified item from** '(Provide relevant current treatment such as intravenous fluids given, medications given, oxygen therapy and oral intake)' **to** '(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)'.
Assessment	**Not clear what is applicable or non applicable** ***CI1****: "Have a check box for items in assessment that are not applicable saying 'not done'. More relevant than saying 'not applicable'."* ***CI2****: "Not all of these are relevant. I do not easily see your word applicable, maybe make it bolder."* ***CI3:*** *"Avoid saying things just for the sake of saying things. Leave out what is irrelevant as long as it is not relevant and make it clearer what is relevant."* ***CI4****: "This looks like a big long list. Nurses will require training to link up the MEWS with the SBAR."* ***CI5****: "The wording is not clear that the requirement is to only state what is relevant."*	**Potential for misunderstanding** about what is required information and what is only required if necessary. (N=5, 100%). It has the appearance of a long list (N=1, 20%).	**Clarity**	**Modified item from** 'Provide the following information if applicable:' **to**' **ONLY IF APPLICABLE** complete and state the following:' Layout changed and check boxes placed to enhance clarity, increase space and to decrease the appearance of a 'big long list.' Increased spacing before and after the above directions.
	Inspired oxygen ***CI1****: "Need type of oxygen and percentage such as 21%, 35% or 40%."* ***CI2****: "Need to say how much inspired oxygen the patient is on."* ***CI3****: "Oxygen is in the wrong place. Make sure it is with saturation."*	Stating 'On oxygen: Yes or No' is **unclear,** a percentage is preferred (2, 40%) and oxygen should preferably be positioned with saturation (N=1, 20%).	**Clarity**	**Modified item to** 'On oxygen %' and brought up to be alongside oxygen saturations.
	Skin colour ***CI5****: "Pale or cyanotic are difficult to assess with different skin colours. Omit because you have finger prick HB as well as saturations."*	**Potential for incorrect reporting** of skin colour (N=1, 20%).	**Relevance**	**Keep** and reassess during content validity study, as these values are found on the MEWS.

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
	Capillary refill time ***CI1****: "Capillary refill time is not often performed in adults but useful. I suggest adding a peripheral temperature as an alternative?"* ***CI2****:"Why is there not an option for CRT less than 2 seconds and only an options for greater than 2 seconds?"* ***CI3****: "CRT should be with cardiovascular, but if you cannot change the MEWS form then it is OK where it is. Not many people report CRT. Rather say periphery is cold or warm."*	**Capillary refill time** is not often reported in adults, rather state the temperature of the periphery (N=2, 40%) and include the option of CRT<2 seconds (N=1, 20%).	**Relevance**	**Modified item from** 'Perfusion- Capillary refill time >2 seconds: Yes_____ No_____' **to** 'Periphery: Warm (Capillary refill time <2 seconds) ☐or Cool (CRT>2 seconds) ☐'.
	Pain scale ***CI1****: "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? Pain scales are useful."* ***CI3****: "'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."*	**Confusion with wording** regarding pain and pain scale (N=2, 40%).	**Wording**	**Modified item from** 'Pain scale: No pain _____ Mild pain_____ Moderate pain _____ Severe pain_____' **to** 'Pain experienced: No pain ☐Mild pain ☐Moderate pain ☐Severe pain ☐'.
	Glasgow coma scale (GCS) ***CI1****: "'GCS' can have interesting interpretations in South Africa.* *If a staff member is not able to give a GCS such as an ENA, maybe state the patients mental status."* ***CI3****: "'GCS' is important and should be near the top."* ***CI3****: "GCS is difficult for nurses to do. AVPU is easier to use."* ***CI5****: "Bring 'GCS' up."*	**GCS** is important (N=4, 80%) and needs to be placed closer to vital signs (N=2, 40%) but there is a potential for error in reporting if a nurse is untrained on how to measure a Glasgow coma scale (N=2, 40%). Rather use AVPU or patients mental status (N=2, 40%).	**Relevance and clarity**	**Modified item from** 'Glasgow-coma scale (__/15)' **to include** AVPU: 'Glasgow coma scale (_____/15) or Alert ☐ Responds to Verbal☐/Pain☐ is Unresponsive☐'. Item moved up to fall directly below current vital signs.
	Pupils ***CI2****: "Pupils should rather be 'equal' than stating a size and include options for pupils 'pinpoint',' dilated' or 'normal'."*	**Pupil size is less important** than if they are equal, pinpoint, dilated or normal (N=1, 20%).	**Clarity**	**Modified item from** 'Pupil size: Right_____ Left _____' **to** 'Pupils: Equal ☐/Pinpoint☐ Normal size☐ Dilated☐/Reacting to light ☐'.
	Urine output ***CI1****: "Need a weight for urine output."* ***CI5****: "What was the urine output trend?*	**Is hourly urine output more useful** versus trends in urine output? (N=1, 20%).	**Relevance/ Clarity**	Modified item from 'Urine output: _____ (ml/hr)' to 'Urine output (ml/hr): _____'

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
	Hourly urine output not hugely useful. Depends how it will progress."	and for urine output a patient weight is required (N=1, 20%).		or urine output has decreased over the last few hours ☐'.
	Missing items in 'ASSESSMENT' ***CI3**: 'Agitation is an important sign of deterioration or confusion if it is a new sign.'*	**Require an additional item under assessment to include** 'agitation or confusion' as an important sign of deterioration.	**Relevance**	**Modified item to include** 'Mood: ☐ Lethargic ☐Confused ☐Agitated ☐'.
Recommendation	**'Any tests needed?'** ***CI1**: "'Any tests needed?' Nurses seldom perform tests on ward level. The consultant (SHO) or intern may perform the task with the nurse assisting or organizing."* ***CI3**: "Is there anything you would like me to do in the mean time that may not be a test or a medication such as raise the foot of the bed?"*	**Nursing actions versus tests would be more appropriate** (N=2, 40%).	**Relevance/ clarity**	**Modified item from** 'Any tests needed?' **to** 'Is there anything you would like me to do in the meantime?' and item 'Any medication' deleted.
	Second witness ***CI2**: 'Need the MAR present for second witness. Don't want to transcribe twice as mistakes could occur.'*	**Clarification** about the second witness process (N=1, 20%).	**Clarity**	**Modified item to increase clarity from** 'While I have you on the phone may I get a second witness: Yes_____ No ____' **to** '(If medications are ordered): While I have you on the phone may I get a second witness? ☐ Nursing training will be required to ensure the second witness is transcribed correctly on the medication administration record as usual.
	Additional changes to: 'Do you want to be notified for any reason?'	The researcher added an additional item to enhance clarity (**If not coming to see the patient now**).	**Clarity**	**Modified item** 'Do you want to be notified for any reason?' changed **to** '(If not coming to see the patient now): Do you want to be notified for any reason?'

Category	Problem identified	Interpretation of the problem	Problem type: applicability, wording, tone or clarity	Decision: Keep, delete, or modify the item
General for all four sections (Situation, background, Assessment and Recommendation)	**Need more space for writing** ***CI1****: "Increase the font and formatting to incorporate room for writing. Keep on one page. Need more space."* ***CI2****: "Not much space and lines are close together."* ***CI3****: "Space is an issue. The font is small and there is not a lot of space to write. There are gaps on the form so spread it out and include place for a patient identification or sticker."* ***CI4****: "There is not enough space to write especially under background. The font size is ok."*	**More space is required** to fill in a response in all four sections (Situation, background, assessment and Recommendation) (N=4, 80%).	**Clarity**	**Form was redesigned to maximize space and remove wasted space**. Patient sticker and instructions were added to the top of the form. Font size for instructions was increased. For all other sentences spacing was increased between sentences.

Appendix F2: Human Research Ethics Committee approval

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

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17 December 2014

HREC REF: 900/2014

Dr U Kyriacos
Health & Rehab
F-Floor, OMB

Dear Dr Kyriacos

PROJECT TITLE: THE DEVELOPMENT AND VALIDATION OF A LOCALLY DESIGNED SITUATION - BACKGROUND - ASSESSMENT - RECOMMENDATION (SBAR) COMMUNICATION TOOL FOR REPORTING EARLY SIGNS OF CLINICAL DETERIORATION (Sub-study linked to 825/2014) Masters candidate D Whitaker

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Two minor technical issues need to be amended, but should not hold up approval. They are:

- The time schedule will need to be altered in view of the approval being granted in December 2014.
- The citation for the National Strategic Plan referred to on page 1 of the main proposal should read Department of Health (2013).

Approval is granted for one year until the 30th December 2015.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Debora Whitaker will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

pp T Burgess
PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

HREC 900/2014