Delay in safe motherhood

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Chapter 6
Validation of a skills assessment method for shoulder dystocia and postpartum haemorrhage

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Abstract

Introduction: Skills training for emergency onstetric careis considered important and is increasingly popular. Establishing the clinical skills of practitioners may play an important role in quality assurance programs. The purpose of this study is te determine the validity of a skills assessment method for the treatment of shoulder dystocia and posrpartum haemorhage using a simulation setup.

Methods: The performances during simulation of a group of “trainees” and “experts” were compared using a score list and quality rating scale. Perception regarding face validity was measured with a questionnaire.

Results: Findings were supportive of construct validity for overall quality of the performance on both scenarios: on a 5 point scale residents scored 2.85 for shoulderdystocia and 3.15 for postpartum haemorrhage versus 3.93 and 4.19, respectively, for specialists (p=0.008 and p=0.000). Findings did not support construct validity for individual actions, showing no differences between groups. Interrater agreement was poor for overall quality ratings and insufficient for summative use. This practical method has moderate to strong perceived face validity.

Conclusions: Performance rating using a checklist during simulation of shoulder dystocia and postpartum haemorrhage has poor construct validity. Overall quality rating has good construct validity but interrater agreement is insufficient for it to be used as a summative method.

Introduction

Shoulderdystocia and postpartum haemorrhage are two important obstetric emergencies that need immediate and skillfull intervention by the birth attendant. When evaluating these emergencies substandard care factors are often identified.[1-3] Assessing clinical competency of labor ward staff can contribute to quality assurance of care and may be important for insurance purposes.[4;5] However observation of staff's performance during obstetric emergencies is often not feasible as these emergencies mostly occur unexpectedly.

With the aim to assess clinical skills of medical practitioners in the treatment of shoulder dystocia and severe postpartum haemorrhage we designed a method consisting of a simulated case scenario combined with a standardised observation and scoring instrument. For the design of the simulation we used a pragmatic approach. We aimed for a method that would be cheap and easy to use and would require a limited amount of time.

The purpose of this study is to evaluate whether this method of skills assessment with simulated obstetrical emergencies is reliable and valid. In other words: is performance during simulation a reliable predictor of performance in clinical practice? If the proposed assessment is valid we would expect experienced practitioners to score better because we assume that practitioners with longer training and more clinical experience will have better clinical skills and better knowledge.

Methods

Participants were recruited between March 2006 and February 2007 amongst the residents and obstetricians working in a university teaching hospital and its four affiliated hospitals. In all hospitals more than 1,500 births per year occur. Participants were recruited on the basis of their availability on the day of testing. Participants were forewarned about the testing but were not informed about the condition they were expected to treat and they were told that preparation was not required. Participants were separated in two groups based on their experience level:
Trainees: Residents with a maximum of four years clinical experience in obstetrics, some of whom had just started specialist training.
Experts: Specialist gynaecologists/obstetricians and residents in the second half of their specialist training with at least five years clinical experience in obstetrics. In this stage of their clinical training residents are expected to be sufficiently skilled to independently treat postpartum haemorrhage and shoulder dystocia.

Informed consent was obtained and prior participation in formal training in obstetric emergencies was recorded.

To assess clinical skills in the treatment of shoulderdystocia and postpartum haemorrhage we designed a method consisting of two standard simulated case scenarios that were presented to the participants in random order (Supplemental Digital Content 1: simulation case scenarios for postpartum haemorrhage and shoulder dystocia and scoring forms). The scenarios were staged in a delivery room in the participant's own hospital. Participants were assisted by a nurse who was instructed to only passively act on orders voiced by the participant and to refrain from active participation in solving the problem at hand.

Pertaining to the shoulderdystocia scenario, a pelvic obstetric mannequin with fetus doll in combination with a life size resuscitation mannequin was used. The caput of the fetus was born but shoulders did not follow. Participants were expected to demonstrate the appropriate maneuvers and actions to resolve this obstetric problem.

Pertaining to the postpartum haemorrhage scenario, participants were presented with a life size standard resuscitation mannequin which, they were told, represented a woman who had just given birth and who now suffers from active bleeding. Additional clinical data were supplied by the simulation leader depending on the actions taken by the participant. (Appendix 1)

Performances during both simulations were rated using a scoring form containing different items: First a checklist for the individual actions required for the treatement of the emergency. Actions on the shoulderdystocia form were based on the key treatment points as described in the managing obstetric emergencies and trauma (MOET) course manual and the RCOG guideline shoulderdystocia.[6;7] Items on the postpartum haemorrhage checklist were partly based on the MOET course manual.[6] Each performed action was ticked of (Appendix 1). Secondly, quality of performed actions during treatment of shoulderdystocia were rated on a five point scale ranging from bad (=1) to excellent (=5). Thirdlythe overall quality of the total treatment and the communication with nurse and simulated patient were rated on the same five point scale.

Lastly an overall pass/fail rating was given. Pass meaning the rater was confident the trainee would be able to handle a shoulderdystocia or haemorrhage in case it occurred in the labour room. Data were collected by one of three different gynecologists from outside institutions who were unaware of the level of experience of the participant. To allow for assessment of interrater reliability in some cases a second rater, from within the institution was involved (four gynecologists). After both scenarios were completed structured feedback was

provided by the raters and simulation leader to maximise the learning opportunity.

To assess face validity participants were asked whether they felt the scenarios represented a true reflection of reality. Answers were given on a 5 point Likert scale ranging from strongly disagree (=1) to strongly agree (=5).

Finding better performance for more experienced participants is supportive for the construct validity of the assessment method. To assess construct validity we compared performance as expressed by the percentage of people in both groups who did perform each of the actions on the checklist. Chi-square test was used to compare groups. If more then 25% of cells had an expected frequency of less than five Fisher exact test was used. Bonferroni correction was applied to adjust the significance level for multiple comparisons of the observed actions in both scenarios. The dichotomous outcomes were considered statistically significant if the obtained two-tailed p-value was less than 0.002 (α-level 0.05 divided by the number of tested outcomes n=25; 0.05/25=0.002).
Ordinal variables (5-point scale) describing the quality of actions for shoulder dystocia and the overall quality, team and patient communication were compared using the Mann-Whitney U test.
Interrater reliability was assessed in the 25 cases in which the participant was scored by two independent raters by calculating kappa scores. For the continuous variables scores were combined in case of empty cells to allow for the calculation of kappa. To use this tool as a summative measure interrater reliability of 0.8 or more is considered adequate.
For statistical analysis SPSS 16.0 statistical package was used.

Results

Twenty-one participants were recruited in the trainees group and 23 in the experts group. Trainees had a mean experience of 1.6 year (sd 1.3) compared to 15.1 years (sd 8.9) for experts. One of the trainees (4.8%) had ever taken part in a course in acute obstetrics versus seven of the experts (30.4%). Three specialists refused to take part as they were not willing to be assessed by their peers.

Low fidelity models were used in existing labour rooms which enabled easy transfer of the simulation equipment between hospitals. Costs were limited to the mannequins, the use of the labour room, and the time consumed by the people involved. Each simulation scenario including introduction and feedback lasted 15 minutes.

Tabel 1. Proportion of participants performing specific maneuvres-actions during simulation of shoulderdystocia

	Trainees N=21		Experts N=23		Difference Experts-Trainees	
Call for help	15	71.4	14	60.9	-10.5	0.460
Buttocks to edge of bed	11	52.4	20	87.0	34.6	0.020[F]
Episiotomy	10	47.6	10	43.5	-4.1	0.783
Mc Roberts	19	90.5	22	95.7	5.2	0.599[F]
Suprapubic pressure	18	85.7	21	91.3	5.6	0.658[F]
Rubin	19	90.5	18	78.3	-12.2	0.416[F]
Woods screw	14	66.7	17	73.9	7.2	0.599
Delivery posterior arm	17	81.0	22	95.7	14.7	0.176[F]
All fours	8	38.1	4	17.4	-21.0	0.124
Knowledge of:						
Cleidotomy	9	42.9	7	30.4	-12.5	0.392
Symphysiotomy	12	57.1	17	73.9	16.8	0.241
Zavanelli	10	47.6	18	78.3	30.7	0.035

[F] Fisher's Exact test

Face validity was assessed with the question whether the participant agreed that simulation was a true reflection of reality. Mean scores were 3.68 for shoulder dystocia and 3.93 for postpartum haemorrhage with five meaning strongly agree and one meaning strongly disagree.

For an assessment tool with good construct validity we would expect the experts to perform better: we would expect a larger proportion of experts to perform the different actions on our checklist as compared to trainees. However, when comparing the number of participants that performed the different maneuvres as scored by the primary rater, no significant difference was demonstrated between both groups for the treatment of shoulderdystocia (table 1) and postpartum haemorrhage (table 2). Differences between groups appeared in both directions.

Secondly, when comparing the quality of the different maneuvers no difference was found between the two groups except for the delivery of the posterior arm which was more often of good quality when performed by experts (table 3). However although raters were thorougly instructed they failed to record the quality in a quarter of the shoulderdystocia maneuvres. Also the quality of team and patient communication did not differ between groups. For the "overall quality" experts scored better in both scenarios (table 3). This last observation is in concordance with the pass/fail decision for shoulderdystocia. Of the trainees, 66.7% passed for shoulderdystocia versus 91.3% of experts, but this difference

failed to reach significance. For postpartum haemorrhage both groups performed well, 85.7% of trainees passed as compared to 87% of experts. Therefore, the findings for the overall quality scores were supportive for the construct validity of the method but those for the individual actions were not.

Tabel 2. Proportion of participants performing specific maneuvres-actions during simulation of postpartum hemorrrhage

	Trainees N=21		Experts N=23		Difference Experts-Trainees	
Postpartum Haemorrhage	N	%	N	%	%	p
Call for help	18	85.7	13	56.5	-29.2	0.034
Massaging of Uterus	16	76.2	18	78.3	2.1	1.00[F]
Empty bladder	10	47.6	16	69.6	22.0	0.139
intravenous access	21	100	22	95.7	-4.3	1.00[F]
draws blood for grouping and x-match	12	57.1	14	60.9	3.8	0.802
administers fluid bolus (1ltr fast)	4	19.0	6	26.1	7.1	0.724[F]
Checks vital signs	16	76.2	19	82.6	6.4	0.716[F]
Checks Uterus	21	100	21	91.3	-8.7	0.489[F]
Checks Placenta	14	66.7	18	78.3	11.6	0.388
Checks Cervix and Vagina	18	85.7	22	95.7	10	0.335[F]
Starts Oxytocine	17	81	17	73.9	-7.1	0.724[F]
Starts Prostaglandins	14	66.7	14	60.9	-5.8	0.690
Orders Blood	3	14.3	3	13.0	-1.3	1.00[F]

[F] Fisher's Exact test

To assess interrater reliability 25 participants were scored by two observers and kappas were calculated. Interrater reliability was substantial to almost perfect (kappa> 0.6) for most dichotomous outcomes. Only for treatment of shoulder dystocia agreement was slight to poor for performance of rotational maneuvers (Rubin, kappa 0.13; Woods, kappa 0.33) and moderate for the pass/fail score (kappa 0.41) and for treatment of postpartum haemorrhage agreement was moderate for massaging of uterus (kappa 0.48) and administration of oxytocin (kappa 0.46).
For both scenarios agreement on the quality of actions was fair or less (kappa<0.4). Except for shoulderdystocia in which agreement was moderate for overall performance (kappa 0.58) and patient communication (kappa 0.43).

Tabel 3. Quality of performance rated on a five point scale (1=bad to 5=excellent) during simulation of shoulderdystocia and postpartum haemorrhage compared between trainees and experts

Quality of performance	Trainees N=21		Eperts N=23		
Shoulderdystocia	Mean	sd	Mean	sd	P-value
Mc Roberts	3.87	0.743	4.33	0.796	0.075
Suprapubic pressure	3.31	0.947	4.00	1.000	0.074
Rubin	3.33	0.985	3.58	0.900	0.620
Woods screw	3.08	0.996	3.45	1.036	0.430
Delivery posterior arm	2.85	1.068	3.93	0.884	**0.008**
Team communication	2.94	1.088	3.52	1.209	0.097
Patient communication	2.65	0.931	3.35	1.424	0.087
Overall performance	3.15	0.813	4.19	0.680	**0.000**
Postpartum Haemorrhage					
Team communication	3.33	0.900	3.50	0.707	0.186
Patient communication	2.93	1.100	3.11	1.269	0.153
Overall performance	3.53	0.743	3.90	0.738	**0.005**

Discussion

This study investigates the validaty of a method to assess clinical skills in two important obstetric emergencies by using low-tech, practical and low cost simulation scenarios. It relates the participant's performance during the simulation to the participant's level of experience in clinical practice.

The method demonstrates good construct validity for the overall performance rating but poor construct validity for the individual items on the checklists and the pass/fail decisions. Interrater agreement was found to be good for most dichotomous outcomes. The interrater reliability of the overall quality assessment was insufficient for these to be used as a summative method.The global rating scores describing the quality of the shoulder dystocia actions were difficult to ascertain as evidenced by the number of missing observations.

Simulation of shoulderdystocia has been described by several authors but only in the context of training programs. Participants showed improved performance in simulated case scenarios having been trained with the same simulated scenarios.[8-10] However, it was recognised that validation of these simulation tools is important.[11] Unfortunately, how performance during simulation is related to actual behaviour in practice and how well it is related to outcome for patients and

their newborns is yet to be established.[12] Indication that performance in training is related to clinical outcome can be derived from a study in UK which demonstrated a decrease in the number of infants born with an APGAR score of less than seven and a reduction in hypoxic-ischaemic encephalopathy after the introduction of an Obstetrics Emergency Training.[13] In addition management of shoulderdystocia improved with a reduction in neonatal injury from 30/324 (9.3%) to 6/262 (2.3%).[14]
Simulation of postpartum haemorrhage has been used to identify management mistakes and to improve accuracy of bloodloss estimation.[15;16] Management mistakes occured frequently amongst residents with less than 4 years experience and midwifes but construct validity might have been poor as no difference was found between groups with different length of training.[15]

We choose shoulderdystocia and postpartum haemorrhage for our evaluation as they represent two important obstetric emergencies that every birth attendant should be able to handle as they will usually occur unexpectedly. Both scenarios require a different set of skills. Whereas shoulder dystocia requires manual maneuvers that may be difficult to perform, the management of haemorrhage relies more on the conceptual ability to assess and reassess the clinical signs and symptoms and make management decisions on the basis of this information. The second important difference between both scenarios is the way they are simulated: In case of postpartum haemorrhage considerable interaction is required between the participant and simulation leader. The simulation leader needs to provide additional information during the simulation as bloodloss continues and clinical signs and symptoms change and develop. In shoulderdystocia the main interaction is between the participant and the model.

There are several limitations to our study: Participants were recruited without randomisation as the main aim was to create two groups with a difference in expertise. The fact that 3 experts refused to participate is not likely to have influenced our results. Their experience was moderate so their inclusion was not expected to substantially affect the between-group differences.

No clear relation was found between the individual actions performed by the participants and the overall performance as assessed by the raters. Bias as a cause for this discrepancy can not be excluded. Allthough we did not inform the rater to the experience level of the participants, for most participants their experience could be easily deduced from their age. Yet another aspect may also have played a role. The expertise of experienced practitioners may not be optimally captured by a checklist with individual actions. A trainee may benefit from a memorised fixed set of actions to treat an emergency that he or she has not encountered before. An expert can also rely on his previous experience. For instance one expert told us during feedback that after the Mc Robberts procedure

he always continued with delivery of the posterior arm with which he always had been succesfull. When assessing the overall quality our assesors may have used additional observations that were not part of our score list, e.g. pacing of the different actions, confidence expressed by the participant, situational awareness and decision making, and attributes that are often used when assessing teamwork. However from the number of missing quality observations we might also conclude that deciding on the quality of actions may be difficult. Observers failed to rate the quality of the shoulderdystocia maneuvers in 25% of the cases.

The third limitation of our study is the fact that we limited our checklist to the actions of an individual practitioner. Quality of care, however, will also depend on other factors that were not part of the simulation. The availability of help at short notice, organisation of care and last but not least team cooperation probably play an equally important role.[17] We used only two questions to assess communication between the participant and the assisting nurse. This resulted in fair to moderate interrater reliabilty. Construct validity might be improved by adding more comprehensive teamwork parameters but how this will effect the ability to also score and observe the direct clinical parameters remains to be seen.[18;19] Valid communication assessment has been described but it required extensive analysis of video recordings which is not practical.[20]

Lastly it should be considered that we may have failed to demonstrate a difference while a difference actually excist between both groups (type II error). But differences between groups were found to be positive as well as negative which most likely will not change with increased power. Power analysis was not performed beforehand due to the uncertainty about expected differences between groups and the limitations of available participants in our region.

While raters were able to reliably observe and record most actions performed by the participants during the simulation they did not agree with eachother about the quality of the actions and the overall performance. These findings implicate the need for a clear definition of quality that is based on subsequent clinical outcome. In trauma departments and with neonatal resuscitation the use of videocaputure in order to identify areas for quality improvement and to provide feedback to providers has been successful. To assist in the definition of quality, observation of clinical practice using video evaluation might play a future role.[21-23]

While simulation of obstetric emergencies such as shoulderdystocia and postpartum haemorrhage may be a good way to train and instruct health care providers simulation is insufficient to reliably predict performance during clinical practise.

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Appendix 1.

Simulated Case Shoulder dystocia

Environment:
In the simulation room a pelvic mannequin will be placed on a delivery bed. No leg supports are attached yet. A foetus will be placed in the mannequin, with the head just outside the vulva, an assistant will prevent the baby from being born while delivery procedures are being performed.

Case:
A 27 year old G2P1 41+3 was referred for poor progress of labour.
Labour was augmented with oxytocin
She had been pushing for an hour when the head was born. The shoulders did not follow and you are called by the attending midwife.

Foetus will be born only after all procedures have been performed correctly excluding the emergency procedures. This will be the end of the simulation.
It will also end when the subject gives up or mentions one of the emergency procedures.
The subject will then be asked what emergency procedures can be performed.

The simulation leader will give additional information as requested.

A “non obstructive” nurse will be present. She will perform procedures as requested and will ask for additional information if instructions are not clear. She will not break her role.
If there is a call for more help the simulation leader will assist
Supervisor and paediatrician are one the way but will not arrive before the end of the procedure]

Time will be recorded from the moment the subject enters the delivery room until the simulation finishes.
Subject will be asked how long it took him to deliver the fetus.

Simulated Case Postpartum Haemorrhage

Environment:
In the delivery room a full body mannequin will be placed in a bed. A non obstructive nurse will be present to assist. The simulation leader will provide patient data when the proper action is taken. (eg she will give the bloodpressure when it is measured on the mannequin or will describe the height of the uterus when the abdomen of the mannequin is palpated.)

Case:
A 25 year old G1 AD 39+2 gave birth as an outpatient. She pushed for 1 ½ hr. after which a healthy daughter with Apgar score 8-9-10 was born weight 4150 gr. 5iE oxytocine were given intra muscular and placenta was born after 20 minutes. It appeared complete but came with a lot of clots.
After 25 minutes there is still some active bleeding, the estimated blood loss is 700 ml. At this time you are called.

Clinical findings

Time	Resp	Sat.%	Heart	RR	Estimated Bloodloss	Uterus
Start	16	98	98	130/85	700	Poorly contracted, N+4
5’	18	96	104	120/80	1100	Depending on med.
10’	22	94	112	100/65	1600	Contracted

On massaging the uterus will contract
Catheterisation of bladder will give 400 ml. of Urine
After 10 iE oxytocine the uterus will contract.

After the uterus is properly contracted depending on the medication given, massage and catheterisation, bleeding will continue. Inspection of the cervix and vaginal wall will yield a cervical tear.

All actions will be recorded in the sequence in which they are performed. Simulation will end when decision is taken to take patient to theatre or when suturing will be performed in delivery room

Scoring form shoulder dystocia

Task	Sequence	1=Bad 5=Excellent
Call for Help		
Extra Nurse		
Supervisor		
Paediatrician		
Draw buttocks to edge of the bed		
Episiotomy		
Mc Roberts Maneuvre		
Grade		1 – 2 – 3 – 4 – 5
Suprapubic pressure		
Grade		1 – 2 – 3 – 4 – 5
Rubin, pressure behind post. or ant.shoulder		
Grade		1 – 2 – 3 – 4 – 5
Woods screw, pressure on front of post. shoulder through 180° then other shoulder		
Grade		1 – 2 – 3 – 4 – 5
Deliver posterior arm and shoulder		
Grade		1 – 2 – 3 – 4 – 5
Change position (all fours)		
If all fail try emergency procedures (tick when mentioned by the subject)		
Cleidotomy (breaking of clavicle)		
Symphysiotomy		
Zavanelli manouvre		
Overall performance		1 – 2 – 3 – 4 – 5
Communication with team		1 – 2 – 3 – 4 – 5
Communication with patient		1 – 2 – 3 – 4 – 5
Are you comfortable this trainee handling a shoulder dystocia when it occurs		Pass/Fail
Time from start till delivery		sec
Time as estimated & mentioned by trainee		Min
Remarks:		

Scoring form postpartum haemorrhage

Task	Sequence	
Calls for Help		
Extra Nurse		
Supervisor		
Massaging of Uterus		
Empty bladder		
Places large bore IV line		
Takes blood for typing and crossmatching		
Starts adequate iv infusion (at least 1 ltr fast)		
type		Colloid/Cristaloid
amount		l/time
Checks RR and Pulse at 10 min. interval		
Checks if uterus is properly contracted		
Checks if placenta is complete		
Checks for cervical and vaginal damage		
Starts Oxytocine		
Dose used		iU
Starts Nalador		
Dose used		µg/time
Orders Blood		
No of Units		
		1=Bad 5=Excellent
Overall performance		1 – 2 – 3 – 4 – 5
Communication with team		1 – 2 – 3 – 4 – 5
Communication with patient		1 – 2 – 3 – 4 – 5
Are you comfortable this trainee handling a HPP when it occurs		Pass/Fail
Remarks:		