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2014

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citation for published version (APA)

van der Lee, N. (2014). *Tailoring CanMEDS for training in Obstetrics and Gynaecology in the Netherlands*. [PhD-Thesis – Research external, graduation internal, Vrije Universiteit Amsterdam].

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Chapter 4

VALIDATING THE MEASUREMENT OF THE PROCESS AND EFFECTIVENESS OF “HOSPITAL-COMMUNITY COLLABORATION”.

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Journal of Interprofessional Care, *under review*

Abstract

Many hospital services have been shifted into the community and care has been transferred from physicians to other health care professionals. These so-called Hospital-Community-Collaborations (HCC's) are thought to provide for a better quality of care and cost reductions. However, their effectiveness has not been well evaluated from the perspective of the professionals involved and questionnaires evaluating collaboration have not been validated for this HCC setting.

This study validates two questionnaires on the 'process' and 'outcome' of HCC, in the context of a Dutch obstetrical care HCC between physicians and midwives. The questionnaires were distributed to 103 hospital-based obstetric residents and 100 community midwives. In a confirmatory factor analysis the fit with the underlying theoretical models was evaluated.

There were 174 respondents (86%), 86 (84%) residents and 88 (88%) midwives. The confirmatory factor analysis showed a good to acceptable fit. Scores on the process and outcome of the HCC indicated a modest level of collaboration. Both professions perceived the sharing of activities and coordination of the joint care as suboptimal and 'team awareness' was low.

Validated evaluations of HCC's are desirable to optimize collaboration and adhering quality of care. Within Dutch obstetrical care, important areas for improving the collaboration were found.

Introduction

In health care, many care services have shifted from the hospital to the community. This deinstitutionalization is thought to benefit healthcare providers and patients by improving quality and effectiveness of care (Hansson et al., 2008; Robinson & Cottrell, 2005) as well as lowering costs as duplication of care between providers is reduced (van Eyk & Baum, 2002).

More recently, this process has been taken a step further by the transfer of care to other care professionals. This means care services provided by hospital-based physicians are delegated to other care professionals in the community, with the goal of further lowering costs and more efficient and integrated care for patients (KNMG, 2010; Yong, 2006). This approach requires an enhanced collaboration between hospital-based and community-based care professionals.

In the literature, collaboration between care professionals in different settings is known as inter-sector or interagency teamwork and include hospital and community collaboration (HCC) (Poland et al., 2005). Already existing and well-researched HCC's cover several care domains and predominantly comprise an extension of hospital services into the community or the deinstitutionalization of hospital care. In most of these, hospital-based professionals partner up with community-based professionals to synchronize care for a certain patient. For example, in the domains of palliative care (Vickridge, 1998) and mental health (Kunitoh, 2013), the HCC is focused on providing continuity of care outside the hospital walls after patient discharge.

Evaluations of HCC's predominantly focus on the organizational level of these collaborations and evaluate barriers and facilitators to the process of organizing care between hospitals and community centers (Poland et al., 2005; van Eyk & Baum, 2002).

On the individual teamwork level of HCC, it is well studied how physicians perceive the process of care and the effectiveness of the collaboration. Studies have evaluated the attitudes and perceptions of hospital consultants and general practitioners in the community towards HCC and have identified several barriers and facilitators (Berendsen et al., 2010; Marshall, 1998; Martinussen, 2013).

Yet, theory-based empirical research on the process of care and effectiveness of HCC at the individual teamwork level between physicians and other professionals is lacking. Also, instruments evaluating how professionals perceive the process and effectiveness of their collaboration have not been validated for collaborations other than in a given setting (such as a hospital or a community health center).

It is important to evaluate how involved professionals perceive a HCC, as this provides an insight into problems that might greatly influence the quality of both the teamwork and the care provided. Mathieu et al. demonstrated that, absence of shared mental models and trust can negatively influence teamwork (Mathieu et al., 2000). Moreover, ineffective teamwork is often linked to adverse events and incidents in patient care and thus endangers the quality of care provided (Pronovost et al., 2006; Suresh et al., 2004; White et al., 2005). The use of validated instruments for these evaluations is key to be able to correctly interpret results and draw conclusions from evaluation.

In this study, we explore the validity of questionnaires measuring the process and effectiveness of collaboration within the HCC context of Dutch obstetrical care using a confirmatory factor analysis. In this context, the HCC between hospital-based obstetricians and community midwives has developed over centuries (van der Lee et al., 2013).

We hypothesize that:

1. The questionnaires measuring collaboration show construct validity for the HCC setting;
2. The long existing HCC between Dutch obstetric care professionals provides for effective and well perceived teamwork.

Methods

Setting

This study was performed in the Dutch obstetrical care system. In the Netherlands, almost all obstetricians are hospital-based and provide complex obstetrical care, while Dutch community midwives are concerned with the physiology of normal pregnancy and provide obstetrical primary care. Obstetricians and midwives collaborate extensively. Midwives consult obstetricians if pathology is suspected, and when indicated, transfer care to the obstetrician if pregnancy or labor becomes complicated. During labor, the midwives bring women to the hospital labor ward and consult the on-call physician, who is generally a resident in Obstetrics and Gynecology (ObGyn) authorized to provide care on the labor ward and is (at a distance) supervised by a senior clinical supervisor. To capture the primary collaborators, we therefore chose midwives and ObGyn residents as participants for studying collaboration in the setting of the labor ward.

Measures

In teamwork research, a frequently used model is the input-process-output model that derives from organizational theory on group effectiveness (Gladstein, 1984). In this model, the characteristics of the context in which a team works (input) combined with the factors that influence how the group delivers their services (intragroup process) result in a team performance (output). Moderating the effects of the intragroup process, and thus the output, is the nature of the task of the team. In this study, we focused on the 'process' and 'output' part of this model to evaluate the obstetrical HCC focusing on the collaboration task on the labor ward.

We found no validated, theory-based questionnaires in the literature for measuring the process and output on the individual teamwork level within a HCC setting and extended our search to other healthcare settings. Two questionnaires of the authors Patterson and Sicotte on respectively the 'process' and 'output' of collaboration were judged applicable for measurements within the HCC setting. Combined they will result in a more encompassing measurement of HCC.

PATTERSON 'PROCESS' QUESTIONNAIRE

Background of the questionnaire: To measure 'process', we used the short form version of the questionnaire designed by Patterson to measure teamwork and conflict validated for the hospital setting among emergency room personnel (EMT-TEAMWORK_SF)(Patterson et al., 2012). This questionnaire is based on the premise that effective teamwork (output) requires the intragroup process to contain five core components (team orientation, team leadership, back-up behaviour, adaptability, and performance monitoring) which are melded together by three coordinating mechanisms (shared mental models, achievement of mutual trust, and engagement in closed loop communication) (Salas et al., 2005).

Properties of the questionnaire: The EMT-TEAMWORK_SF questionnaire includes validated constructs about teamwork and conflict and consists of 30 items divided into 9 subscales; Team orientation (TO)(3 items), Team Structure and Leadership(TSL)(3 items), Partner Communication, Team Support and Monitoring (PCTSM)(6 items), Partner Adaptability and Backup Behaviour (PABUB)(3 items),Partner Trust and Shared Mental Models (PTSMM) (3 items), Mild Task Conflict (MTC)(3 items) , Strong Task Conflict (STC)(3 items), Process Conflict (PC)(3 items), Interpersonal Conflict (IC)(3 items).

To allow aggregate scoring, the items of the latter 5 scales were rescaled because these items were negatively formulated. An overall teamwork score was obtained by calculating the mean of all subscales combined.

SICOTTE 'EFFECTIVENESS' QUESTIONNAIRE

Background of the questionnaire: To measure perceptions on the effectiveness (output), we used the 'Intensity of interdisciplinary collaboration' questionnaire which was originally developed and validated by Sicotte for the community care setting (Sicotte et al., 2002). The effectiveness of teamwork can be determined by several parameters. One of these is the 'achieved intensity of interdisciplinary collaboration amongst health workers' which can be determined by measuring 1. the amount of interdisciplinary co-ordination (the way the collaboration is coordinated) and 2. the amount of care sharing activities (the amount of activities shared among the team in the provision of care) within the team of health care workers (Sicotte et al., 2002).

Properties of the questionnaire:The questionnaire includes 17 items divided into 2 subscales measured on a 5 point Likert scale ranging from very negative (1) to very positive (5), with 3 representing a neutral score.

The first subscale 'interdisciplinary coordination' (10 items) is based on organizational theory on work group coordination. The second subscale 'care sharing activities' (7 items) is rooted in the perspective that interdisciplinary collaboration is based on the sharing of activities that encompass shared roles among disciplines.

In our study, we added 3 demographic questions about the profession, working region and amount of years in training or midwifery practice of the participant to the two questionnaires.

The wording of the original 'Patterson' items was focused on the Emergency Room. This was slightly modified to make the items suitable for the labor ward. Also, the original 7 point Likert scale was modified to a 5 point scale to make it congruent with the Sicotte scale to avoid confusion among the participants.

The modified questionnaires were translated into Dutch and then, face validity of the wording of the items was checked in a pilot using two midwives and three residents and adjustments in wording were made when required. Midwives and residents received the same questionnaires, except for the use of specific words such as 'midwife' and 'resident'. The final version of the questionnaires can be obtained from the corresponding author.

Participants and data collection

Between March and September 2011, ObGyn residents and community midwives were approached to participate in this study. To ensure adequate diversity, participants were purposively sampled from three training regions in the Netherlands, one urban and two suburban/rural regions, equally distributed across the Netherlands.

RESIDENTS

The residents were in their first to sixth year of training. Residents from the three selected regions were personally invited to participate in this study upon completion of an annual national Obstetrics and Gynecology exam. Participating residents then signed the informed consent form and completed the questionnaires.

MIDWIVES

One hundred community midwifery practices practicing within the training regions of the residents were randomly selected based on postal code. Each practice received a paper version of the questionnaires, information about the aim and procedure of the study and an informed consent form. After three weeks, a paper reminder was sent. In each midwifery practice only one midwife was allowed to participate.

Analysis

To ensure anonymity, coding was used categorizing participants on profession (resident or midwife) and training region (R1, R2 or R3). Data were imported into a database that was analyzed using SPSS version 18. Data of negatively worded items were reverse-coded.

MISSING DATA

Missing values were assessed and if data for over 50% of the items were missing, the respondents were excluded. For the remaining respondents, we imputed missing data using expectation maximization (EM) algorithms (van Buuren, 2011).

CONFIRMATORY FACTOR ANALYSIS

Confirmatory factor analysis (CFA) was used to evaluate the fit of our data with the theoretical models and subscales used in the original Patterson and Sicotte questionnaire. In the CFA, a variance-covariance matrix was specified and the generalized least squares

(GLS) method was used to estimate the model. The models were evaluated by both global and local fit parameters. We assessed the global fit using the comparative fit index (CFI), Tucker-Lewis index (TLI) (CFI and TLI values >0.95 indicate good fit, >0.90 indicate acceptable reasonable fit), the root mean square error of approximation (RMSEA, < 0.06 - good fit, <0.10 - acceptable fit) and the standardized root mean square residual (SRMR, <0.08 -good fit, <0.12 - acceptable fit). To evaluate the local fit of the model, the factor loading of the items (loadings > 0.30 were desirable) and the standardized residuals (z-values > 1.96 indicated good fit) were inspected. The CFA was performed using the structural equation modeling (sem) package (Fox, 2006) in R version 3.0.

DATA ANALYSIS

After the CFA, a reliability analysis was performed for each of the subscales (a Cronbach's alpha coefficient of >0.70 was considered to reflect a good interrelation of the items within a subscale). When below 0.70, we checked if the deletion of an item resulted in an Cronbach's alpha coefficient >0.70 . If so, the CFA was repeated with the exclusion of the deleted item.

We then collated the descriptive statistics of the participants. Following the analysis suggested by the developers of the original questionnaires, the mean score for each subscale was calculated, equally weighing the items of both midwives and residents.

Finally, an 'Overall teamwork score' was calculated from the Patterson questionnaire, by calculating the mean score of the subscales combined.

According to the authors of the Patterson questionnaire, a higher score on a subscale represents a more positive perception about that specific aspect of collaboration. The authors of the Sicotte questionnaire state that a score between 3 and 4 on a subscale represents a modest achievement of interdisciplinary collaboration when a 5-point Likert scale is used. In our analysis, we adapt the Sicotte's interpretation of the results for both questionnaires. Consequently, a score between 3 and 4 on the 5 point Likert scale represents a perception of modest achievement within that specific aspect of collaboration, and scores of 4 and higher reflect a well-established collaboration between the professionals involved. Scores below 4 indicate improvements have to be made to achieve the full potential of the collaboration.

COMPARISON BETWEEN GROUPS

To compare the scores of the midwives and the residents, we first calculated the individual scores of the two groups on each of the subscales. Next, we performed a Mann-Whitney U test on all the subscales. The p-value was adjusted for multiple testing using a Bonferoni correction. The influence of the years of experience (midwives) and year of training (residents) on the scores of the subscales were examined using a Kruskal Wallis test.

Ethical considerations

The Ethical Review Board of the Netherlands Association for Medical Education (NVMO) ethically approved this study, file number 214, 2012.

Results

The results of the confirmatory factor analysis are presented below, followed by the descriptive statistics of the respondents, the scores of the respondents on the subscales of the questionnaires and the results of the between group comparison.

Confirmatory factor analysis

The confirmatory factor analysis of the questionnaires showed a good to acceptable fit of our data with the theoretical models used in the original questionnaires. In table 1, the scores on the global goodness of fit parameters are presented.

The SRMR (0.15) of the Patterson questionnaire can indicate a suboptimal fit. The factor loadings of the individual items of Patterson's questionnaire showed 6 items had a factor loading of (slightly) below 0.30 of which 4 were situated within the subscale 'Partner communication, team support and monitoring'. Additionally, all standardized residuals (SR) had z-values exceeding 1.96. For the Sicotte items, all factor loadings were above 0.30 and all SR z-values were above 1.96.

In table 2, Cronbach's alpha coefficients show acceptable homogeneity for most subscales, with the exception of Patterson's TO, PTM, PB, MTC and Sicotte's CSA subscale. The coefficient of the latter subscale was raised to >0.70 by deleting item number 10 of that subscale. Consequently, also the global fit parameters for the Sicotte questionnaire changed.

Table 1. Confirmatory factor analysis- Global fit parameter estimates for the Patterson and Sicotte questionnaire.

	Patterson questionnaire	Sicotte questionnaire	Sicotte questionnaire after excluding 1 item
Number analyzed (N)	172	172	172
Comparative fit index (CFI) §	0.98	0.93	0.94
Tucker-Lewis index (TLI) §	0.98	0.92	0.93
Standardized root mean square residual (SRMR)*	0.15	0.09	0.10
Root mean square error of approximation (RMSEA)#	0.04	0.06	0.06

§ CFI and TLI: values >0.95 indicate good fit, >0.90 indicate acceptable fit.

* SRMR: values <0.08 indicate good fit, <0.12 indicate acceptable fit.

RMSEA: values < 0.06 indicate good fit, <0.10 indicate acceptable fit.

Table 2. Cronbach's alpha coefficient calculated for each of the subscales.

Subscales Patterson	Cronbach's alpha
TO	0.633
TSL	0.813
PTM	0.447
PB	0.660
PS	0.765
MTC	0.688
STC	0.716
PC	0.777
IC	0.702
Subscales Sicotte	
Sicotte_CSA (after excluding 1 item)	0.603 (0.714)
Sicotte_CO	0.791

Descriptive statistics

A total of 174 participants (86%) returned the questionnaires including 84% of residents (86/103) and 88% (88/100) of the midwives. Table 3 groups the responses by profession (resident or midwife) and by training region (region 1, 2 or 3). Table 4 shows the distribution of the years of experience in midwifery practice of midwives and the distribution of years of training for the residents.

Table 3. Participants grouped by profession and training region.

	Region 1	Region 2	Region 3	Total
Residents	29	35	22	86
Midwives	32	21	35	88
Total	61	56	57	174

Table 4. Distribution of the participating midwives and residents over the years of practice in midwifery practice and year of training.

Years of training	Frequency (Residents)	Years in midwifery practice	Frequency (Midwives)
1	18	0-5	12
2	15	6-10	36
3	18	11-16	15
4	15	Over 16 years	25
5	10		
6	10		
Total	86		88

In table 5, the scores on the subscales are presented. First, the scores and standard deviations of the whole group are shown on the subscales of the questionnaires. Next, the scores and standard deviations of the residents and midwives are presented separately. The scores on the Patterson subscales are presented in descending order. In the last column, the p values of the Mann-Whitney U tests are presented, to indicate differences in the scores of the subscales between residents and midwives.

Table 5. The subscales of the questionnaires and the scores of the respondents and accompanying standard deviation (SD).

	Residents and Midwives together		Residents		Midwives		P value ° difference between groups
<i>Patterson subscales</i> <i>(Process of collaboration)</i>	<i>Score</i>	SD	<i>Score</i>	SD	<i>Score</i>	SD	
Interpersonal conflict	3.98*	0.64	3.98*	0.61	3.98*	0.64	0.80
Team structure and leadership	3.81	0.75	3.68	0.76	3.94	0.70	0.02
Process conflict	3.31 *	0.77	3.24*	0.74	3.38*	0.79	0.22
Partner trust and Shared mental models	3.27 ◇	0.81	3.18◇	0.67	3.36◇	0.93	0.14
Strong task conflict	3.21 *	0.72	3.11*	0.68	3.32*	0.75	0.05
Partner adaptability and Backup behavior	3.13	0.76	3.31	0.64	2.96	0.83	0.01
Mild task conflict	3.12 *	0.67	3.06*	0.62	3.19*	0.71	0.12
Partner communication, team support and monitoring	3.06	0.45	3.12	0.41	3.00	0.47	0.05
Team orientation	3.06	0.70	3.14	0.64	2.98	0.75	0.11
Overall teamwork score	3.33	0.39	3.31	0.33	3.35	0.44	0.65
<i>Sicotte subscales</i> <i>(Effectiveness of collaboration)</i>							
Care share activities	3.57	0.34	3.54	0.32	3.60	0.36	0.32
Interdisciplinary coordination	3.37	0.55	3.29	0.49	3.46	0.59	0.04

*This score is reverse coded to reflect the positive nature of the scale. A score close to 5 means there is little conflict between team members. ◇ This score is reverse coded to reflect the positive nature of the scale. A score close to 5 means there is much trust and mental models are well shared between team members. Score= the score on the 5 point

Likert scale, SD= the standard deviation of the score. ° p value cut-off for significance with Bonferoni correction is $p < 0.005$.

Comparison between groups

The Mann-Whitney U test of the subscales of the questionnaires showed no statistically significant differences (p value < 0.005) between both groups.

In the group of midwives, the in-group-comparison in years of experience, made no significant difference in the scores of the subscales of the questionnaire. In the group of the residents, the comparison in years of training showed significant difference on the Sicotte subscale 'Interdisciplinary coordination'. In this subscale, the first year residents scored significantly higher than the third ($p=0.025$) and fourth ($p=0.006$) year residents.

Discussion

In this study, two questionnaires measuring collaboration in healthcare were validated for the setting of Hospital-Community-Collaboration (HCC) in the context of in Dutch obstetrical care.

The literature revealed a limited number of theory-based questionnaires designed to differentiate between several aspects of the complex phenomenon of interprofessional collaboration and applicable for the context of HCC collaboration between physicians and other care professionals. To be able to draw conclusions from our data, we first assessed the validity of two questionnaires for measuring the process (Patterson) and outcome (Sicotte) of collaboration in our HCC setting. The confirmatory factor analysis showed an acceptable global fit of the data to the theoretical models of the original questionnaires allowing us to assess how specific components are perceived by those involved. Yet, the Patterson subscale 'partner communication, team support and monitoring' as well as one of the Sicotte items was found to be invalid for scientific research and thus we discourage their use for future research. Moreover, we recommend replacement of three Patterson subscales with their 'long version' equals of the Patterson questionnaire (Patterson et al., 2012) as those subscales contain more items and will therefore probably result in Cronbach's alpha coefficients of >0.70 .

Within Dutch obstetrical care, sub optimal collaboration between midwives and obstetricians is thought to contribute to the higher perinatal morbidity in comparison to other European countries (Adviesgroep Zwangerschap en geboorte, 2009; Europeristat project, 2008). The results of our study confirm that the HCC in Dutch obstetrical care has it troubles and specifies them. The scores on Sicotte 'effectiveness' subscales of 3.57 and 3.37 reflect the achievement of only a modest level of collaboration. Both midwives and residents perceive the sharing of activities and the coordination of the joint care they provide as suboptimal and affording room for improvement. Moreover, of the nine Patterson 'process' subscales, only two have a score close to 4 indicating respondents experience little interpersonal conflict in the collaboration between midwives and residents (score of 3.98) and that team structure and leadership are clear (score of 3.81). All other subscales have scores below 3.5 and some even close to 3.00. These scores are surprisingly low as the HCC in Dutch obstetrical care between obstetricians and community midwives has a history spanning many centuries and is governed by well evolved regulations (van der Lee et al., 2013). Given this history and regulations, one would expect that the contemporary collaboration between the professions has overcome its issues and that it has become embedded in the culture of the professions involved (Schuitmaker, 2012). Consequently, this collaboration should be perceived as a second nature by those involved, resulting in a score of 4 or higher on the process and effectiveness of the collaboration.

The scores below 3.5 on the Patterson subscales of process and task conflict suggest both professions experience conflict in the process of collaboration and the division of tasks between the professions. Clarity of roles and responsibilities seems to be lacking leading to sub-optimal coordination of collaboration. This is similar to the problem in cross-sector collaboration in psychiatry (Mikkelsen et al., 2013) leading to ineffective coordination of services between hospital and community care providers.

Moreover, the scores of below 3.5 on the subscales of team orientation, partner trust, adaptability, monitoring, shared mental models, team support, communication and

monitoring suggest that midwives and residents neither act well as a team nor perceive themselves as being an integral part of a team, suggesting poor conceptualization of what constitutes the team and what their respective roles and responsibilities are. This so-called lack of 'situation awareness' results in not knowing who needs to be involved, how, when and why (Hall et al., 2013) and can negatively influence team performance and patient care.

In this study, we questioned residents instead of obstetricians as the residents are the physicians collaborating with midwives on the labor ward. However, as the collaboration between the professions extends beyond the labor ward, the resident's perspective might have limited and biased the physician's perspective we gained on the process and outcome of the HCC. Therefore research is needed that explores the causes of the sub-optimal collaboration from multiple perspectives, including that of the obstetricians.

The questionnaires validated in this study and the underlying theoretical constructs, provide us with framework to investigate collaboration between different healthcare professionals in different settings. Moreover, this study gives us important clues on how to improve the HCC within Dutch obstetrical care and hopefully also improve related quality of care. The results show action is required on several levels. At the team level, a clear delineation of roles and responsibilities should be established. Moreover, professional boundaries should be defined to structure and improve the process of collaboration. At the level of the individual midwife and resident, team awareness and the responsibilities and scope of practice of other team members should be increased, perhaps by introducing interprofessional education. Such initiatives are presently absent in the curriculum of both Dutch midwives and obstetricians. On the organizational level, Dutch obstetrical care might be improved by clarifying the preferred coordination of care and arranging accompanying logistical structures and protocols.

As the deinstitutionalisation and transfer of care into the community progresses throughout healthcare, evaluating the effectiveness of hospital–community-collaboration is pivotal in ensuring good quality patient care. Future research should focus on gaining insight into the causes underlying troubled collaborations from multiple perspectives, preferably with the incorporation of already well researched theoretical models on healthcare collaboration.

As for the sub- optimal HCC in Dutch obstetrical care, it has to improve rapidly and significantly as it is unacceptable to have collaborative issues so harmfully impact the obstetrical care provided. Future research should focus on ways to optimize collaboration. This will require an extensive, in-depth exploration of the problems in current practice from not only an organizational viewpoint, but also from the perspective of the individual professionals involved.

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