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DEVELOPMENT AND VALIDATION OF COMPETENCY GAP ASSESSMENT TOOL FOR REPRODUCTIVE HEALTH CURRICULUM FOR RESOURCE-POOR SETTINGS

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ABSTRACT

Background:: To construct an integrated tool serving the dual purpose of establishing specific competencies to be attained in reproductive health for Undergraduate students and to measure the extent of exposure pertaining to set competencies. **Methods:** A listing of potential competencies in reproductive health was done through the Delphi technique in the background of the theoretical framework. The refined competencies list (39 items) was shared with 29 experts for assessing the content validity. Items with Content Validity index [CVI] <0.80 were removed. The structured questionnaire with 34 items was distributed among 140 faculties from 12 medical colleges. Responses were analyzed for normality and suitability for Principle Component Analysis. Reliability of the questionnaire was ascertained by split-half reliability and Chroanback Alfa. **Result:** Total 34 items finalized through consensus, Suitability for Principle Component Analysis was checked by R-matrix determinate value(R=0.045) and by Kaiser –Meyer-Olkin (KMO) test (0.634). Five factors emerged namely- exposure to theoretical knowledge for decision making, demonstration of relevant skills, exposure to Health activism, exposure to personal attributes and advocacy to evidence-based practices. Promax rotation methods were used for factor loading (component co-relation matrix value of 0.40 between factor-1 and factor-2). Internal consistency value was determined as 0.907. The correlation between the sums of each item was computed as 0.545. The spearman-brown coefficient value was detected as 0.705. **Conclusion:** A reliable and valid tool has been developed which can measure the curricular exposure to reproductive health competencies at primary care level.

Keywords: Competency, Principle Component Analysis, competency-based education, validity, reliability

INTRODUCTION

Reproductive health care is one of the prime focuses of the National Health Policy of India **(1)**. It consists of the whole gamut of services offered for a smooth functioning of reproductive processes, functions, and systems during all the stages of life. It also encompasses the dimensions of physical as well as societal and psycho-intellectual issues affecting and affected by the reproductive health. Hence its scope is clearly inclusive of but not limited to the bio-medical management offered through obstetrics and gynecology services. One of the established strategies to attain the reproductive health goals is effective and efficient primary health care deliverance. **(2, 3)** The quality of such services depends largely on the competency of the service provider, this fact coupled with pressing demands from increasing population in Indian scenario necessitates reviewing constantly the quality of Indian medical graduates as well as the

curricular process they undergo **(4)**. Medical Council of India(MCI)on the policy level considers the core purpose of the undergraduate medical curriculum to transform a medical student into an effective primary health care physician. **(5)** All the reforms recently made by MCI like early clinical exposure, the inclusion of the competency-based curriculum and emphasis on soft skills also endorse the above statement. **(5)**

From this perspective, medical colleges and departments of Obstetrics and Gynecology, in particular, may serve as centers where all the essential primary health care competencies related to reproductive health may be cultivated and consolidated. To fulfill this responsibility, two prerequisites need to be addressed by our educational system-first, is to identify competencies required for an undergraduate medical trainee, attainment of which will enable him to deliver primary care in reproductive health and second, up to what extent these competencies are addressed by present curricular practices. Therefore the necessity of a validated and reliable structured tool was felt to quantify these two ' felt-needs' This tool may serve a dual purpose - structuring the essential reproductive health competencies and a tool for 'gap-assessment' in current teaching-learning practices.

METHODS:

A conceptual framework was developed and refined by the investigators addressing the broad domains in reproductive health for inclusions. The concept-diagram for the same is shown as figure-1. Two investigators separately prepared the comprehensive listing of potential competencies as per this conceptual framework.

This extensive list of competencies (consisting of 58 items) was reviewed by the faculty members of Obstetrics and Gynecology and Community Medicine of two teaching institutions. This group worked in accordance with Delphi techniques **(6)**. The final refined and reframed competency list (with suggested changes) was converted into 39 items. A structured questionnaire was constructed with these 39items; it had two parts exposure of students to relevant competency on a five-point psychometric scale and a respective subjective weighted score on competency value in the undergraduate curriculum. This draft questionnaire with 39 items was shared with 29 experts (faculties of Obstetrics and Gynecology). They were asked to comment (quantitatively on a scale of 0-4) on each item on the following parameter- structure, ease to understand and, the relevance of particular item(competency) for undergraduate. All the items which had received mean score <_2 were considered for reframing. Content validity of the items was calculated in two directions- Item level Content Validity Index (I-CVI) and scale Content Validity index (S-CVI). Scale Content Validity Index-Universal Agreement (S-CVI/UA) was computed as the proportion of items of this questionnaire achieving a rating of 3or 4 by experts. It was decided at the design phase to remove the five questions having I-CVI ≤) 0.80. This questionnaire with 34 items was circulated among 140 teaching faculties of Obstetrics and Gynecology in 12 Indian medical colleges of repute for filling the responses related to exposure to particular items. The responses were entered into Epi-Info™ (CDC, Atlanta USA) and further analyzed with Microsoft Excel 2007™ (Washington, USA). A pairwise deletion was done for the missing data. After deletion, responses from 137 participants were analyzed. A Principal Component Analysis was done at next step for summarization and identifying of underlying construct. The aim of the analysis was to classify the items into minimum factors capable to explain the maximum amount of variance. The explanation of ≥60% of cumulative variance by factors was considered suitable for this model. Factors were extracted subjected to an agreement with two criteria out of three –first, factors should be able to explain at least 5% of variances. Second, Eigenvalue of ≥1 for extracted factor and third, factors at or below the level of flattening out of the slope of Scree plot. Dependence of multiple rules for factors inclusions is in accordance with experts views on factor analysis **(7, 8, 9).**

All the factors were assumed correlated with each

other (assumption proved at later stages) so an oblique rotation method (Promax) was used for principal component analysis. At the later stage when factor co-relation matrix was examined we detected two co-relation values over the threshold value of ±0.32. Moreover, theoretical reasons were also not in favor of orthogonal rotation(varimax) as to better performance in one competency (background knowledge) may increase the probability of superior performance to another competency (translational practices) up to an extent. The items which had a loading of 0.30 or higher were considered as a significant loader for the factor. Data for PCA was assumed to be normally distributed and having a linear relationship which was checked for deviation of homoscedasticity (if any) and presence of multi-colinearity by determinates of R-matrix, Kaiser – Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Further, the reliability of the questionnaire was ascertained by two methods- Cronbach alfa and split half reliability**.**

The project was approved by the Research Review Board of All India Institute of Medical Sciences Bhopal (code AIIMS/BPL/14/09 on 23rd June 2014). The Institutional Human Ethics Committee also approved the project (Code IM00032) with the waiver for written consent as the project required the participants to express their perceptions only without their personal identity being disclosed and that it did not involve any intervention. Administrative permission from each participating institution was taken before sending the postal questionnaire

RESULTS:

Three questions were related to demonstration of skills of cervical biopsy (I-CVI=0.62), endometrial biopsy(I-CVI= 0.52) and colposcopy (I-CVI= 0.45) by undergraduate students. Rest of the two removed questions were related to diagnostic and prognostic management of sub-fertile couple (I-CVI= 0.76) and demonstration of effective internet-based tools for self-directed learning (I-CVI =0.76). Computed S-CVI /Avg before removal of these questions was 0.86which increased to 0.90 after the removal. The S-CVI/UA was computed as 0.40 for the questionnaire.

The principal component analysis (PCA) was done in a sequential manner. Missing values were chosen to remove in a pair-wise manner. Data were first analyzed to detect its degree of suitability for PCA. Multicollinearity was ruled out by R-matrix determinant value(=0.045 which is greater than threshold value 0.00001), maximum correlation between two items (maximum detected co-relation 0.63 through correlation matrix) and by KMO (0.634) test. Bartlett's test of sphericity showed that there was some relationship between variables (χ^2=3.807E3, p=0.00,df=561). An inference was drawn that data were suitable for factor analysis.

Table 1 shows the component extraction with variance explained by those factors. It is clear from the table, that 5 factors were fulfilling both conditions set beforehand (explanation of at least 5% variance and Eisen value>1) Hence 5 factors were in accordance to set rules for factor extractions. Principle Component Analysis was rerun at this stage with a number of the desired factor as 5.Table 2 shows the pattern matrix consist of 5 extracted factors with item loading>0.40. The table-3 shows the component correlation matrix for the extracted factors. This table shows a correlation value of 0.40 between factor -2 and factor-1 (which is greater than the threshold value of 0.32) so factor 1 and factor2were significantly correlated. This result is as per the prior assumption of shared variance among factors and choosing Promax (oblique) rotation for the factor.

Component plots in rotated spaces are shown in figure 2 where x,y, and z-axis represents the three extracted components related to theoretical knowledge, skill acquisition, and health activist approach.

In the next step, the responses received from 137 participants on the exposure of students to 34 competencies were analyzed for reliability. The tables 4 show the point estimate and dispersion of all the 34 competencies in unison. The combined mean score (3.74) was detected on the higher side than the

neutral and towards the agreement on a 6-point Likert scale. The lowest mean score (1.845) and the highest mean score(4.766) detected for the individual item indicates that no item was considered for the most extreme ends of the scale.

This questionnaire appeared to have a good internal consistency with an α= 0.907. We further detected the effect of deletion of three items having item-total correlation value <0.30 for the following three variables; orientation to caring and respectful behavior towards patients(0.18), orientation to informed decision-making process (0.25), the orientation of students to medical research and Biostatistics(0.27).The maximum increase in α value (from 0.907 to 0.911) would come on the removal of a variable related with an orientation to respectful behavior(having the lowest item-total correlation value) which itself was a very modest increase in the α (showing already a superior reliability) so no question was removed at this stage. Split half reliability was calculated by dividing the questionnaire into two equal parts of 17 questions in each part. The correlation between sums of each item was computed 0.545 with the Spearman-Brown co-efficient value as 0.705.

DISCUSSION

Based on the literature search, the present study initially hypothesized four factors into which the competencies for the reproductive health, relevant for a medical graduate, could be divided. They were named competency related to *care at community level*, *clinical care*, *functional soft skills*, and *health protection/promotion*. The initial theoretical framework is inspired from the competencies identified for reproductive and sexual health care workers at primary health care level by world health organization in 2011 **(10)** and the core competencies identified for the obstetrics and gynecology specialist by accreditation council for graduate medical council through the year 1998 to 2013 **(11,12)**. The end outcome in the process was the emergence of one more factor (advocacy to evidence-based practice) in addition to hypothesized four factors. The factor one "Exposure *to theoretical Knowledge for decision making and wisdom extraction*" and factor two "*Demonstration of relevant skills in OBGY embedded in systems*" have a significant number of items being shared between them (8 items). Factor three "*Exposure to Health activism through health promotion and protection*" included competencies related to two factors in the hypothesis health promotion and protection as well as care at community level. This factor shares several competencies with the fourth factor that is "*Exposure to personal attributes facilitating patient care*". Factor five "*Advocacy to Evidence-Based Practices*" exclusively emphasizes the need for exposure for continued exposure to recent advances and self-directed learning. The items related to the demonstration of skills of performing a cervical biopsy, endometrial biopsy and colposcopy could not load into factor two (related to skills) or into any of the factors for that matter. Being intended for measuring the curricular exposure for undergraduates, inclusion of these three operative skills were considered beyond the essential requirement. Similarly, the exposure to evaluation and management of subfertile couples also felt not necessary for graduates and thus could not load into any factor. The fifth items which could not be loaded were needed for the exposure to knowledge of internet-based tools. This item probably failed to convince teachers regarding its essentiality for the subject of obstetrics and gynecology in particular when this skill otherwise also is common among young generations.

The fundamental aim of a medical curriculum is to deliver human resource which is capable of giving economically sustainable medical care that can better the health of individual and population in a dynamic environment. The first step to achieve this goal would be to develop valid and feasible measures indicating the success of training programs **(13).** Every medical curriculum should be evaluated against such measures of outcome. Presently most of the institutes depend on measuring the process indicators like a predefined number of lectures, cases, procedures etc or intermediate outcome measures like grades in knowledge-based examinations for curriculum

designing **(14)**. It is now taking pace to define education at all levels by expected outcomes of the teaching and learning methodologies. Moving away from the topic based teaching, outcome-based teaching depends on a series of outcome statements which a student is expected to perform at the end of the educational experience. The predefined outcomes guide the students as to how well he/she should learn to do something, guides his/her teacher to understand the level of learning required and thus design appropriate teaching and learning activities. Most importantly it helps to decide upon the best way to do an assessment so that the achievement of predefined outcomes by students could be appropriately measured. This constructive alignment of the outcomes, the teaching-learning method and assessment ensure learning-centric outcome-based curricula **(15,16).**

The criticism attracted by outcome-based models is that the process of defining outcome objectives can be difficult and time-consuming. More seriously in the process of narrowing the goals to acquiring skills and knowledge, characteristics like higher-order thinking, problem-solving and acquiring human values may be missed as these are difficult to define as behavioral objectives **(17)**. Even with these ongoing debate regarding scope, method, and shortcomings, the introduction of outcome-based education in medical curricula has broad consensus **(18,19).**

The competency gap assessment tool for reproductive health curriculum for undergraduates measures the extent to which students are exposed in particular curricular process of an institute. This tool is based on the outcome objectives which have been identified by a novel statistical method by the authors of the present study. This report is a part of the study called competency-based teaching-learning methods in undergraduate obstetrics and gynecology curriculum: A need assessment and validation study, undertaken by the investigators at All India Institute of Medical Sciences Bhopal India. Unlike the SRH –PHC-WHO core competencies which are intended for service at the primary health care level, present competencies are meant to be demonstrated by a single student and thus helpful his assessment at the end of the course helps him make a competent Indian medical graduate. On the other hand, the ACGME core competencies are meant for designing curriculum and assessment of students but those are meant for post graduated residency programs and thus more elaborate. Availability of a reliable and valid tool to evaluate the curricular content of individual institutes on the lines with predefined objectives will be a useful guide for improving the performance of reproductive health/obstetrics and gynecology curricula. It will form a benchmark for continuous quality improvement and betterment of obstetrics and gynecology training and education. And also ensure that all obstetrics and gynecology training and education meet society needs and expectations. Having said that it also needs to be emphasized here that there will be a regular requirement of efforts to redefine as to what constitute core competencies in reproductive health/ obstetrics and gynecology and what curriculum is necessary to develop most competent and up-to-date obstetrics and gynecology medical graduates.

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Figure 1. Conceptual framework for identifying competencies

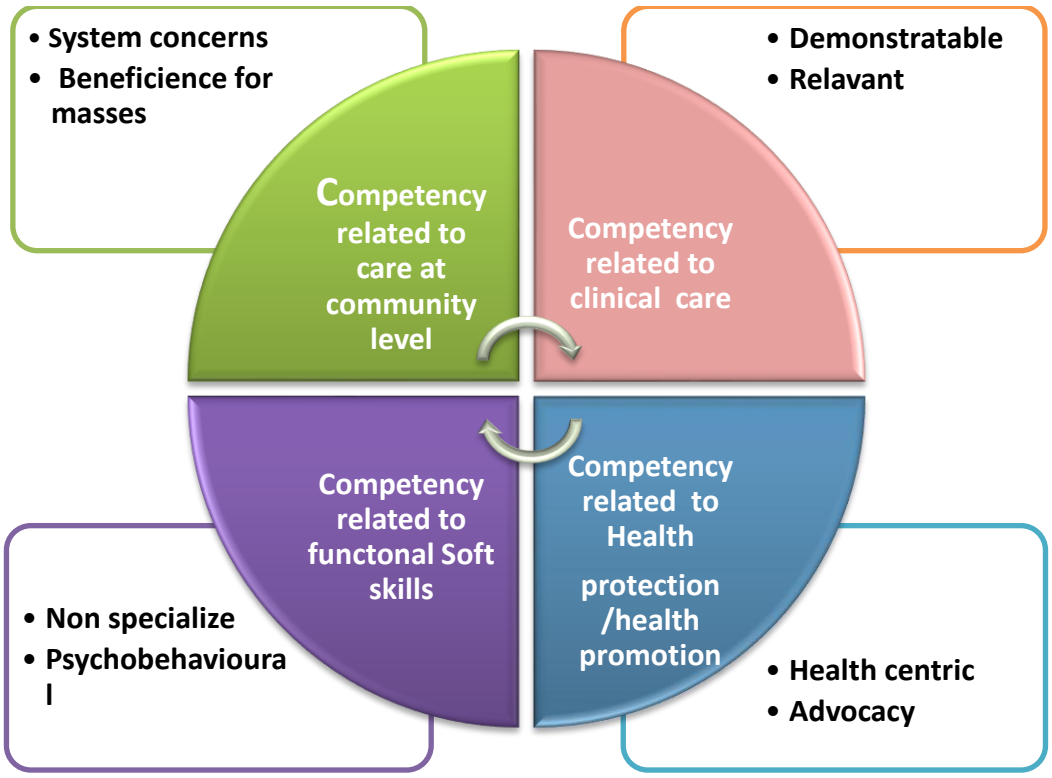

Figure 2: Numbers represent the sequence of the item in the questionnaire.