

Development of Case Vignette Tool on ECG and its Interpretation (CVECGI)

Hariprasath Panduragan¹ (corresponding author),
Balasubramanian N², Raja A³

¹ Associate Professor Jyoti College of Management Science & Technology Bareilly, Uttar Pradesh.

² Principal, Ambika College of Nursing, Mohali, Punjab.

³ Principal, Unity College of Nursing, Mangalore, Karnataka.

Abstract:-

Background: In nursing research, vignettes are used less and extensively utilized in psychological social sciences. It is a type of self reported qualitative research where case scenarios, situations are given to the research participants and their perception, opinions, beliefs, and attitudes are elicited within the vignettes. In certain research, text or pictures presented to participants to prompt responses to interview questions. ECG is a frequent safe and inexpensive procedure that supports arrhythmias and ischemia diagnosis. Nurses are usually the first to conduct an ECG and therefore need to know how to interpret it, but many nurses lack ECG Interpretation skills.

Aim: The aim of this article is to describe the sequential steps of case vignette tool on ECG and its interpretation prepared for nursing students.

Materials and Methods: Development of this tool involves three phases which are: the conceptualization phase, the preliminary item evaluation phase and the scale refinement phase. This case vignette tool development is a part of large-scale study employed a tri-phase which aims to determine ECG Interpretation skills among nursing students. The developed case vignette was submitted to the experts in the field of nursing and medicine. The content validity ratio and content validity indexed was computed. Further, reliability was calculated. Pretesting was done to rule out the feasibility of tool.

Results and findings: The computed content validity index and content validity was found to be +1 respectively, which indicates that the developed tool is highly valid. The internal consistency of the tool was calculated by using Cronbach's alpha correlation coefficient its value was 0.86 which indicates the tool is highly reliable.

Conclusion: This study identified the dimensions of the case vignette and contributed to advancing the measurement of the ECG interpretation skills among nursing students. The case vignette is a brief and cost-effective instrument that can measure skills of nursing students on ECG interpretation.

Keywords:- Case Vignette, Content Validity, Content Validity Index, Content Validity Ratio, Reliability.

I. INTRODUCTION

Case vignette is a type of qualitative research where case scenarios, situations are given to the research subjects and their perception, opinions, beliefs, and attitudes are elicited within the vignettes [1-4]. In case vignette, text or pictures presented to participants to prompt responses to interview questions [2]. Vignettes is "a brief descriptions of situations to which respondents are asked to react and provide information about how they could handle things" (Polit and Beck, 2008) [3]. Clinical vignettes are used as clinical teaching method principally to assess the participants' knowledge and clinical reasoning [5-8]. A vignette is often designed to measure knowledge regarding specific diagnosis or clinical situation at the same time, it measures trainees' skills in performing the tasks necessary to diagnose and appearance after a patient [9-11].

According to Indian Health Survey, Expert Assessment Report (2000) Electrocardiogram (ECG) plays an important role in to diagnosis, follow-up, and detects cardiac related abnormalities such as ischemia, infarction and it is a vast area, lots training, and skill is need for interpretation. Nurses are usually the primary person to carry out an ECG in hospitals especially in ICUs and nurses are the one who receives the patients in emergencies and early detections of cardiac symptoms through ECG, vital signs and other investigations. Thus, sound knowledge on ECG interpretation is required for the nurses. However, some nurses do not know exactly where to apply the electrodes on the patients and lack interpretations of its findings. If any complications are not detected earlier can hampers the prognosis [12] (Hamilton, R. 2005). Nurse plays significant role in associating the rhythm strip with the clinical Status of the patient and therefore the nurse identification and recognition of arrhythmias within the initiation of appropriate nursing and medical response. Knowledge about the classification of arrhythmias and consequent authentication of nurse's proficiency are critical knowledge safe efficient practice [13] (Enlund M. 2010). It is better to train nurses when they are students. Hence, it is indispensable to identify nursing student skill on ECG interpretation with valid and reliable tool. This tool CVECGI is one such tool developed by the authors. Several phases involves in development of a valid and reliable case vignette instrument.[14]

Development of Case Vignette: It involves various phases. It includes conceptualization phase, item evaluation phase and scale refinement phase.

Phase 1: Conceptualization phase

Conceptualization phase involves extensive literature search and item generation. According to American Nurses Association (2000) "A literature review is a body of text that aims to review the critical points of knowledge on a particular topic research. [15-17] Authors reviewed electronic literature sources such as CINAHL, MEDLINE, British Nursing Index, MedlinePlus, and printed sources such as—nursing research abstract, journals, dissertations were tracked for the development of items of case vignette [9]. The main purpose of literature search is to find existing case vignette tool. Some of the existing instruments are Compinet S A M (2018) and Kathiresan J (2014). However, it is clear that no such tools existed to determine skills on ECG interpretation among nursing students [18,19].

Furthermore, authors started to develop case vignette on their own. Various published and unpublished articles were reviewed on ECG for the development of items of case vignette. This case vignette has two components i.e., normal (five fiction case scenario) and abnormal ECG interpretation (ten fiction case scenario). The normal ECG components includes heart rate calculation, rhythm identification, axis determination, measuring of intervals and segments, morphology of ECG waves was included. The abnormal

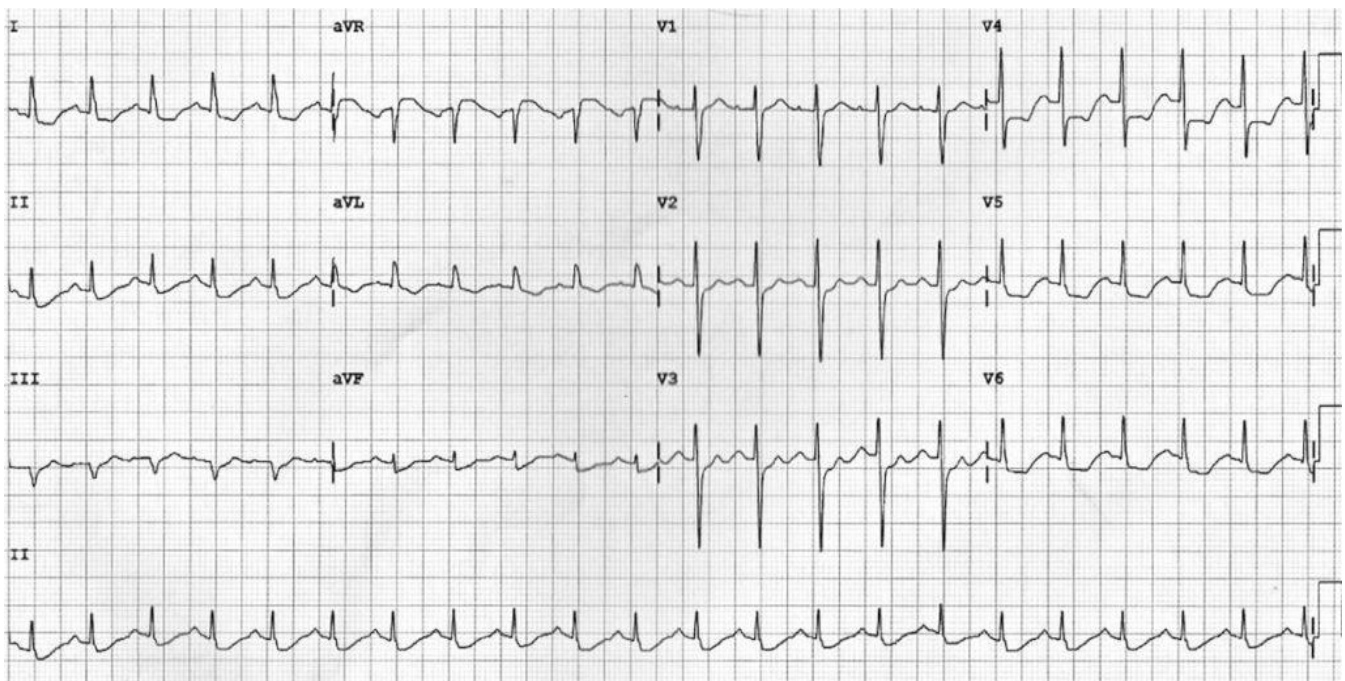
ECG components include myocardial ischemia and infraction, Bradyarrhythmia, Tachyarrhythmia, Bundle branch block and fascicular block, enlargement and hypertrophy and electrolyte imbalances [20-21].

The fiction case scenario was given with ECG strip. Based on the scenario, questions were asked to the participants to interpret the ECG strip. The question items were given in declarative form which is stated in brief, concise, clearly and avoided double-barreled items. Each item carries one mark if the respondent answered correctly, if not zero will be marked. The preliminary instrument has 15 fiction case scenarios with 50 items.

Example of fiction case vignette with developed items to assess the nursing students skill on ECG interpretation

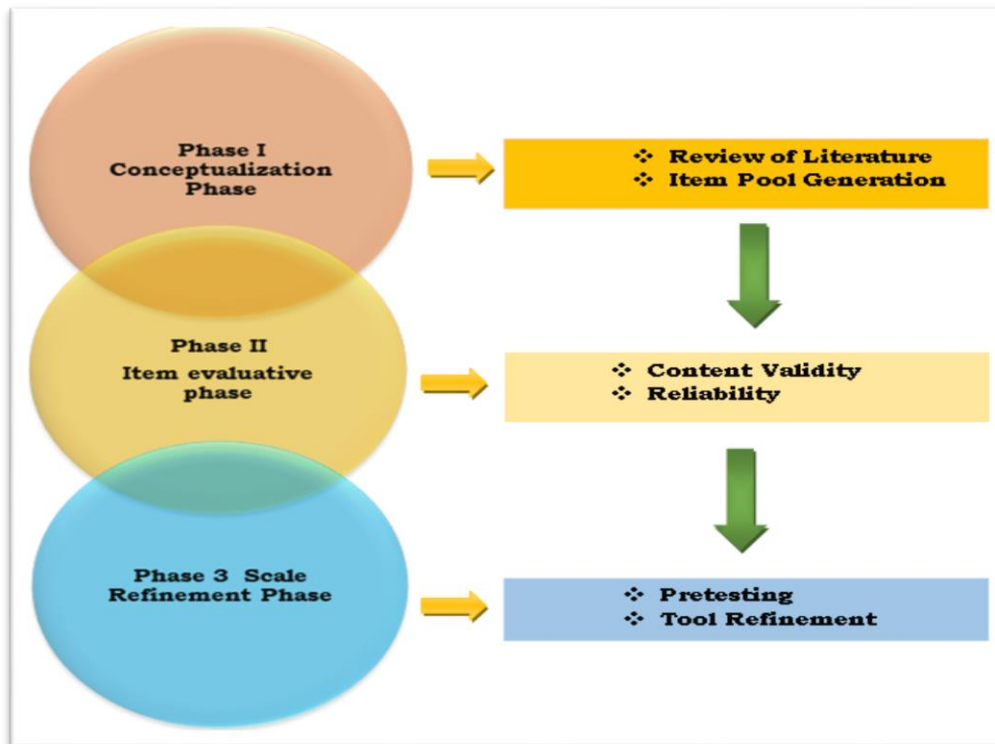
Case scenario

A 40-year-old male, presented to the hospital with a 10-minute episode of sweating and pain. The chest pain was spreading to the left hand. The pain settled promptly following 300 mg aspirin orally and 400 mcg nitroglycerin (GTN) spray sublingually. On examination, he appeared comfortable and was ready to complete sentences fully. There have been no heart murmurs present on cardiac auscultation. Vital sign was 140/100 mmHg, pulse was 90 bpm and regular, oxygen saturation was 97%. An ECG had taken half-hour after onset of pain.



Items are given below, analyse the given ECG strip given above and answer the following questions in a word.

1. What is the heart rate of Mr. X is _____
2. The type of ST segment depression in lead V4 _____
3. What is the amplitude of R wave in V5 _____
4. What is type abnormality found in lead aVR _____



Phase 2: Item evaluative phase

This phase includes content validity and reliability of the tool. Validity is more complex that broadly concerns the accuracy of the study's evidence that is, whether the findings are coherent, credible, and well justified. (American Psychological Foundation) Validity is a crucial criterion for assessing the methods of measuring variables. The content validity refers to the extent that the research area under the analysis has been captured by the subject matter of vignettes. (Polit and Hungler)

The developed tool was presented to five experts in the field of cardiology medical surgical nursing respectively and one biostatistician. These experts were asked to scrutinize the case scenarios and items developed by the authors. The authors adopted Yaghmaie F criteria for measuring content validity and based on that evaluation form was developed. The scoring ranges from 1 to 4. Experts were asked to rate the items in the content validity evaluation form. The four-point relevance ordinal scale was given to the experts to rate the items which comprised of not relevant, needs modification, needs minor modifications and relevant. The tool has been collected and analyzed for validity after receiving from all experts [22-23].

Initially, content validity index was computed. According to Polit and Hungler content validity index is representing the proportion of experts rating an item as relevant. Experts in agreement and universal agreement were calculated for CVI. The calculated CVI value was one for 12 case vignettes and three case vignettes had I-CVI of 0.64 from the experts and it was revised as per the recommendations given by the experts. In the second

validation, all 15-case vignettes had I-CVI of 1 among different experts.

The content validity index was calculated. It is the sum up of I-CVI score of all items divided by the total number of items, for example the S-CVI/Ave. I-CVI values range from 0 to 1. If I-CVI > 0.79, the item is appropriate, between 0.70 and 0.79, the item needs modifications, and if the value is below 0.70 the item is excluded. Based on the findings authors conclude that I-CVI, S-CVI/Ave and S-CVI/UA meet satisfactory level, and thus the scale of questionnaire have achieved satisfactory level of content validity of CVI.

Further, content validity ratio was also calculated for the same tool. Content Validity Ratio (CVR) was calculated to quantify the extent of expert's agreement. CVR was determined using the formula established by Lawshe (1975):

$$\text{CVR} = (\text{Ne} - \text{N}/2) / \text{N}/2$$

CVR= is a direct linear transformation from the expert list saying "essential"

Ne= is the number of the expert list indicating "essential"

N/2= total number of the expert list divided by two.

CVR values range from +1 to -1. Values close to +1 indicate experts' agreement that the item is essential to content validity. Lawshe "concluded that a CVR of at least 0.99 should be essential with seven experts or fewer subject matter experts" The CVR for case vignette was +1 indicating that the items are essential to content validity. After content validity, then tool was computed for reliability.

Reliability refers to the accuracy and consistency of data obtained during a study. The term is most frequently related to the methods used to measure research variables interpreting the results of statistical analyses. Statistical reliability refers to the probability that an equivalent result would be obtained with a totally new sample of subject that the results are an accurate reflection of a wider group than simply the actual people that participated within the study. This article is a part of doctoral research of corresponding author. Himalayan University, Itanagar, Arunachal Pradesh approved this study reference no: HU/RES/16-17/03-241 dated 12.04.2016. Ethical clearance was obtained from Jyoti College of nursing Management Science & Technology, Bareilly, Uttar Pradesh wide reference no: JCMST/EC/21/19 dated. 15.01.2019. The tool was administered to 30 samples after obtaining their consent. The samples are selected based on inclusion criteria via non-probability probability sampling technique to collect data, for reliability. The test-retest method was adopted that is instrument was administered to the samples and was repeated to the same samples, after the gap of one week. The test-retest reliability showed the tool was stable with r value of 0.86. The internal consistency of tool was computed using Cronbach alpha correlation coefficient using the formula

$$r = \left[\frac{k}{(k-1)} \right] \left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right]$$

- Where r = estimated reliability
- k= the total number of items in the tool
- σ_b^2 = variance of each individual item
- σ_t^2 = variance of total test score

Reliability coefficients range from zero to one. A reliability coefficient of 0.7 or greater is generally believed to be suitable. The internal consistency of case vignette tool was 0.853 and it indicates that the tool was reliable.

Table 1: Descriptive statistics and reliability analysis of the Case Vignette

Item	Mean	S.D.	Item Total Correlation	Alpha if Item Deleted
Item 1	.9333	.25371	.288	.851
Item 2	.7333	.44978	.119	.854
Item 3	.6667	.47946	.235	.852
Item 4	.4333	.50401	.475	.846
Item 5	.9333	.25371	.288	.851
Item 6	.9000	.30513	-.110	.856
Item 7	.9333	.25371	-.036	.855
Item 8	.8333	.37905	.246	.851
Item 9	.9667	.18257	.368	.850
Item 10	.9333	.25371	.474	.848
Item 11	.9667	.18257	.283	.851
Item 12	.8667	.34575	.432	.848
Item 13	.5667	.50401	.207	.853

Item 14	.7667	.43018	.046	.855
Item 15	.6667	.47946	.368	.849
Item 16	.8667	.34575	.667	.844
Item 17	.8667	.34575	.494	.847
Item 18	.8667	.34575	.463	.847
Item 19	.8667	.34575	.635	.844
Item 20	.8000	.40684	.550	.845
Item 21	.8333	.37905	.456	.847
Item 22	.6667	.47946	.125	.854
Item 23	.7000	.46609	.088	.855
Item 24	.8333	.37905	.427	.848
Item 25	.6667	.47946	.562	.844
Item 26	.7333	.44978	.119	.854
Item 27	.7333	.44978	.270	.851
Item 28	.5000	.50855	.351	.849
Item 29	.9333	.25371	.288	.851
Item 30	.9000	.30513	-.110	.856
Item 31	.9333	.25371	-.036	.855
Item 32	.8000	.40684	.208	.852
Item 33	.9000	.30513	.040	.854
Item 34	.8667	.34575	.310	.850
Item 35	.9000	.30513	.074	.854
Item 36	.9000	.30513	.415	.848
Item 37	.6667	.47946	.246	.851
Item 38	.8667	.34575	-.034	.856
Item 39	.7667	.43018	.400	.848
Item 40	.8667	.34575	.667	.844
Item 41	.8333	.37905	.329	.849
Item 42	.8000	.40684	.430	.847
Item 43	.7667	.43018	.475	.846
Item 44	.8667	.34575	.494	.847
Item 45	.8000	.40684	.404	.848
Item 46	.6667	.47946	.125	.854
Item 47	.6667	.47946	-.035	.858
Item 48	.8333	.37905	.427	.848
Item 49	.7333	.44978	.682	.841
Item 50	.7333	.44978	.485	.846

Phase 3: Scale Refinement Phase

During this phase, the tool is pretested before starting main data collection. The aim of the pre-test is to enhance its clarity and to form sure acceptance of the study by the participants and to see vocabulary of case vignettes tool. It provides information on the feasibility and the appropriateness of the tool. It helps to estimate sample size by calculation of variance from the pre-test sample. It will provide additional training for authors on interview technique, instrument administration, coding, and data editing. Pretesting of this case vignette tool helped the authors to identify weaknesses or assess the time requirement. This was done to determine the simplicity of the items and the mean time required for completing the tool. The case vignette was found to be clear and understandable to the subjects. The average time taken to complete the tool was approximately 50 minutes. [24-25]

Limitation of the tool

The limitation of the tool is that confirmatory factor analysis was not conducted. No measure of construct validity was executed.

II. DISCUSSION

A case vignette tool to evaluate the ECG interpretation skills among nursing students was not designed till now. The higher the alpha is, the more solid the test is taken into account. Usually 0.7 and above is suitable. (Nunnally JC., 1978). The Cronbach's alpha value of Case vignette was found to be worthy (0.853). The Cronbach's alpha coefficient is a may be measurement of the internal consistency of the items in the instrument. Alpha coefficient demonstrated that internal consistency was satisfactory.

III. CONCLUSION

In this article, the authors have presented the phases applied in the development of case vignettes for ECG and its interpretation among nursing students. This case vignette tool consists of 15 case scenarios with 50 items. Various sequential steps are required to develop these types of case vignette tool. There is no published tool till now related to ECG and its interpretation. Moreover, this article clearly described the sequential steps process of the content validity and reliability. This will be beneficial for health professionals in future investigations in development of such type of tools.

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Conflict of interest: None

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