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Clinical Summary and Reasoning Format:
Cognition Levels and Proposal of a Grading System

Résumé Clinique et Format de Raisonnement :
Niveaux de Cognition et Proposition d'un Système de Notation

[1]E. A. Disu, [2]*A. N. Ikefuna, [1]F. O. Njokanma, [3]K. E. Nkanginieme

ABSTRACT

The Clinical Summary and Reasoning Format (CSRF) was designed by the Faculties of Paediatrics of the National Postgraduate Medical College of Nigeria and the West African College of Physicians. The form is recommended for routine use in clinical practice as well as for training and examination purposes. The form has sections for documenting information derived from interacting with an index patient and sections for documenting sequential deductions on the way to various levels of diagnosis. The levels of cognition required to complete different sections of the Clinical Summary and Reasoning Format (CSRF) vary in complexity.

The CSRF is potentially useful for assessing the quality of a clinician's clinical reasoning process. Such assessment will be enhanced by having a grading system for completed CSRF forms. In turn, grading contents of the form should reflect complexity of the levels of cognition required for the various sections.

The present paper evaluated the sections of the CSRF with reference to the modified Bloom's Taxonomy of cognition and also proposed a grading scheme for assessing CSRF forms completed by trainees. **WAJM 2022; 39(5): 543–547.**

Keywords: Cognition, Clinical reasoning, Assessment, Grading.

RÉSUMÉ

Le format de résumé clinique et de raisonnement (CSRF) était conçu par les Facultés de Pédiatrie du National Collège médical de troisième cycle du Nigeria et de l'Afrique de l'Ouest Collège des médecins. Le formulaire est recommandé pour la routine utilisation dans la pratique clinique ainsi que pour la formation et l'examen Fins. Le formulaire comporte des sections pour documenter les informations dérivé de l'interaction avec un patient index et des sections pour documenter les déductions séquentiel les sur le chemin de diverses niveaux de diagnostic. Les niveaux de cognition requis pour compléter différentes sections du résumé clinique et du raisonnement Le format (CSRF) varie en complexité.Le CSRF est potentiellement utile pour évaluer la qualité d'un processus de raisonnement clinique du clinicien. Cette évaluation sera amélioré par la mise en place d'un système de classement pour le CSRF complété Formes. À son tour, le contenu de classement du formulaire doit refléter complexité des niveaux de cognition requis pour les différents sections.Le présent document a évalué les sections du CSRF avec référence à la taxonomie modifiée de bloom de la cognition et a également proposé un système de notation pour l'évaluation des formulaires CSRF complété par des stagiaires. **WAJM 2022; 39(5): 543–547.**

Mots-clés: Cognition, Raisonnement clinique, Évaluation, Notation.

[1]Department of Paediatrics and Child Health, College of Medicine, Lagos State University, Ikeja, Lagos State, Nigeria. Email: arumadisu@yahoo.com; faconj@yahoo.com [2]Department of Paediatrics, College of Medicine, University of Nigeria, Ituku-Ozalla, Nigeria. Email: nnaaikefuna@yahoo.com [3]Department of Paediatrics, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria. Email: kanu_nkanginieme@hotmail.com
Correspondence: Professor Anthony Nnaemeka Ikefuna, Department of Paediatrics, College of Medicine, University of Nigeria, Ituku-Ozalla, Nigeria. Phone: +234 803 743 1074. Email: nnaaikefuna@yahoo.com
Abbreviations: CSRF, Clinical Summary and Reasoning Format; NPMCN, National Postgraduate Medical College of Nigeria; WACP, West African College of Physicians.

INTRODUCTION

The Clinical Summary and Reasoning Format (CSRF) was designed by the Faculties of Paediatrics of the National Postgraduate Medical College of Nigeria (NPMCN) and the West African College of Physicians (WACP) – (Appendix 1). It is positioned for completion after full clerking of an index patient. It was first published in 2012 but has since undergone modifications.[1] The first of its two major functions is to document the highlights of patient-derived information i.e. socio-demographic data, symptoms, information from other aspects of history, signs and early laboratory data. The second function is to document sequential, hierarchical inferences and deductions of the clinician leading up to various levels of diagnosis. These include system(s) involved in the disease, pathological process in operation, functional/structural abnormalities, diagnosis and desired investigations.

The CSRF is essentially a practice tool for the encouragement of deliberate, conscious engagement and documentation of clinical reasoning on the part of practitioners. By extension, it also finds a place in training medical students and resident doctors in skills of clinical reasoning. Further, it provides a potential template for assessing the performance of trainees in clinical reasoning.

In order to fulfill the desired role in evaluation of clinical reasoning skills, there needs to be a system for awarding marks/points for correctly completed sections of the CSRF. Also, it would be logical to award higher points to tasks that require higher cognition functions. The recommended scheme of cognition levels is the modified Bloom Taxonomy which recognizes six hierarchical steps viz., Remembering, Understanding, Applying, Analyzing, Evaluating and Creating.[2] There is, as yet, no suggested grading scheme for the CSRF for assessment of trainees. This paper identifies the cognition step required for sections of the CSRF and proposes a grading scheme based on modified Bloom cognition taxonomy.

METHODS

A translation table (Table 1) was created showing general descriptions of the terms used in Bloom's Taxonomy. The descriptions came from combining information from five sources.[2–6] The table also has a column showing the equivalents of the general words/descriptions in clinical scenarios as derived from Nkanginieme (1997).[3]

Following descriptions of the activities required to address each section of the CSRF, the cognition level into which it best fits was determined.

For operational purposes, the Faculties of Paediatrics prefer to group the cognition steps in Bloom's Taxonomy into three levels – I (Remembering), II (Understanding and Applying) and III (Analyzing, Evaluating and Creating), conforming to three groups of questions commonly asked of trainees – factual (level 1), interpretative (level 2) and evaluative (level 3).

It is proposed in this paper, that the quality of performance of a clinician with respect to each activity be rated on a four-point scale of "Good", "Pass", "Fail" or "Poor". Activities requiring level I cognition would attract a maximum of "5" points while level II and level III activities would attract a maximum of "10" and "15" points each respectively. A table (Table 2) was then generated as a template for rating the performance of trainees using the CSRF.

RESULTS

`Descriptions of the activities involved in the various segments of the CSRF:

1. **List of Symptoms**
   The clinician is required to identify symptoms from the patient's history and to list them. From table 2, this calls for vocabulary and recognition of symptoms. This corresponds to remembering.

Table 1: Descriptions of the Six Levels of Cognition in the Modified Bloom Taxonomy

Modified Bloom Taxonomy Levels	General Description	Medical Description
Remembering	Recall: Identify: Recognize	Basic facts of structure, function, pathology, vocabulary for symptoms and signs, recognition of symptoms and signs
Understanding	Identifying examples of a given term, concept or principle: Translate: Extrapolate	Assigning symptoms and signs to systems
Applying	Relate: Transfer: Associate using information, rules, procedures in concrete situations	To relate or associate groups of symptoms and signs to specific pathological conditions. This level calls pathophysiology into play
Analyzing	Discriminate: Distinguish: Breaking information into parts to explore patterns: Infer	To "sort the wheat from the chaff": picking out the specific from the non-specific. While fever and tachycardia are non-specific, precordial thrill is specific for an organic valvular heart lesion.
Evaluating	Constitute: Combine: Formulate: Specify: Justifying a decision or course of action: The ability to judge based on criteria and standards: Theorize	Putting features together into a recognizable pattern for a specific condition.
Creating	Validate: Argue: Reconsider: Appraise: Generating new ideas or products: Reorganizing elements into a new pattern or structure: Present and defend alternative opinions: Deduct	Checking if initial diagnosis explains all the symptoms and signs. Identifying any features not easily explained not easily explained by diagnosis. Identifying what features of the proposed diagnosis are still missing. Considering other possible causes of symptoms and signs. Predicting the likely outcome of disease.

Table 2: Grading the CSRF using Cognition Levels

Item	Cognition	Good	Pass	Fail	Poor	Not done
List of symptoms	Remembering Level I	5	3	2	1	0
Other information	Remembering Level I	5	3	2	1	0
List of signs	Remembering Level I	5	3	2	1	0
Diseased system(s)	Applying+ Level II+	10	6	4	2	0
Abnormalities Functional/ Structural	Applying Level II	10	6	4	2	0
Pathological Process	Analyzing Level III	15	9	6	3	0
Provisional Diagnosis	Evaluating Level III	15	9	6	3	0
Laboratory Investigations	Evaluating Level III	15	9	6	3	0
Pathological Diagnosis	Evaluating Level III	15	9	6	3	0
Aetiologic Diagnosis	Evaluating Level III	15	9	6	3	0

CSRF, Clinical Summary Reasoning Format

2. **Other useful Historical Information**
   The clinician is required to list important information from the history other than symptoms. The cognition required is similar to recognizing symptoms i.e. remembering.

3. **List of Signs**
   A list of elicited signs is required. This activity is similar to identifying symptoms and therefore also operates at the step of remembering.

4. **Immediately available Laboratory Data**
   The clinician is simply required to copy out results of already performed tests. There is no call for cognition.

5. **Identification of Diseased System(s) in order of Evidence-based Priority**
   Ordinarily, assigning symptoms or signs to systems does not require more cognition than translating or extrapolating, which operates at the level of understanding. For example, cough is expressed through the respiratory system. However, the presence of cough does not always mean that the respiratory system is diseased. Diseases in the cardio-vascular, digestive or neurological system may cause cough. Thus the clinician will have to determine the appropriate diseased system by applying knowledge of clusters of symptoms and/or signs. However, arranging affected systems in order of evidence-based priority calls for analyzing available evidence: the clinician has to weigh the evidence and decide the sequence in which to list the affected body systems.

6. **Identification of pathological process(es) in operation**
   The clinician is required to put together symptoms and signs that fit into a pattern to identify the pathological process in operation. This calls for utilization of knowledge of patterns to arrive at the correct pathological process and hence operates at the applying level of cognition.

7. **Discernment of Functional Abnormalities and Structural Abnormalities**
   This is similar to the cognition required for identifying the pathological process in that the clinician has to associate symptoms and signs that fit into a pattern to discern derangements of function and/or structure that may be present. It therefore calls for applying level of cognition.

8. **Proposal of a Provisional Diagnosis**
   In order to arrive at a provisional diagnosis, the clinician has to analyze and evaluate all available information. Information from symptoms, signs, affected system, pathological process and abnormalities present will have to be put together to justify the chosen diagnosis. This therefore is a Level III activity embodying both analyzing and evaluating.

Choosing Important, Diagnostic Investigations
As with proposing a provisional diagnosis, the clinician must, at this point evaluate all the evidence to discern which laboratory investigations will help sharpen the diagnosis. The chosen investigations will have to positively identify the problem and/or eliminate plausible alternatives as well as provide information on how best to manage the patient. Thus, the minimal level of cognition required is evaluating.

9. **Important/Diagnostic Investigations**
   Based on the chosen provisional diagnosis and other available information, the clinician is required to name investigations that would significantly elucidate the case. Thus there is need for evaluating clinical evidence.

10. **Naming a Pathological Diagnosis**
    Armed with clinical and laboratory evidence, the clinician is now equipped to name a pathological diagnosis. In doing so, he has to

constantly bear in mind, plausible alternatives called differential diagnosis. This calls for presenting, defending and ruling out of alternatives. The required cognition goes up to creating level.

11. **Identifying an Aetiological Diagnosis**
    At this point, a conclusion will have to be made as to the agent likely to have brought about the pathological diagnosis. Having built a case up to this point by evaluating evidence, the clinician has more evaluating to do. This involves considering the characteristics of various possible aetiologic factors in the light of disease manifestation in an index patient. Judgments will have to be made about various plausible aetiologies, requiring cognition at the evaluating and creating level.

The identified corresponding cognition levels of the CSRF were tabulated and grades were assigned as predetermined (Table 2). The first three items requiring Level I cognition are graded from "0" to "5": the next two are Level II activities and are graded from "0" to "10" while the last five are Level III activities and are graded from "0" to "15". Thus, the maximum obtainable score is 105.

DISCUSSION

The CSRF of Paediatrics Faculties of the NPMCN and the WACP was developed as a practice and training tool to inculcate in clinicians the habit of taking sequential steps in clinical decision-making.[1] In 1997, Nkanginieme[3] used a hypothetical case scenario to illustrate, among other things, the cognition levels operating in the diagnostic process. However, at the time, the current CSRF had not been developed and the Bloom's taxonomy had not been modified. Used to advantage, the CSRF encourages documentation of thought trends on the way to making inferences and conclusions. This helps to pinpoint sources of judgment error should there be any.

Prototypes of forms used in documenting clinical records abound and are varied according to the purpose for which the forms are designed. However, we are not aware of the existence of any other case summary forms specifically designed for tracking the thought processes of trainees in the build-up to diagnosis and management. Neither have we seen examples of grading the performance of trainees or candidates using any such forms. Perhaps this paper will encourage wider use and hopefully, improvements in design and operation of the CSRF.

The lack of a grading system has hitherto limited the feedback and assessment value of the CSRF. It is hoped that trainers and trainees will be encouraged to utilize the grading scheme herein presented. Hopefully, adoption of the suggested grading system will enhance full utilization of the CSRF for formative and summative examinations. The first hurdle we faced was to find a place for the medical terminologies used in the CSRF within the modified Bloom's taxonomy. Other institutions like the East Virginia Medical School[7] have an excellent tabulation of medical examples the generic terms used in the Bloom's Taxonomy. More recently, Javaeed[5] also published a similar attempt to document such equivalents. The current paper adds to available literature establishing equivalents of the generic terms in Bloom's taxonomy of cognition in clinical medicine. This should be of use in curriculum development and evaluation of medical students and residents.

The second step was to assign differential grades to specific tasks in the CSRF. This was done on defensible grounds of hierarchical cognition levels. It is logical that tasks with higher cognition demands should be weighted more and should attract additional marks. However, there was no attempt to establish a mathematical relationship between the quantum of marks awarded and cognition level. Thus, although we recommend a maximum of "15" points for Level III activities and "5" points to Level I activities, we do not claim that the former necessarily has three times the difficulty index of the latter.

Trainers and examiners are encouraged to use the proposed grading scheme as a driving tool for learning. The dictum "assessment drives learning" is well known as students tend to learn and perfect knowledge and skills upon which assessments are based.[8] It is hoped that by using evaluation to drive knowledge of mastery of the CSRF, the main goal of improving clinical reasoning skills will be achieved.

Previous Presentation

The paper has not been presented previously.

Conflicts of Interest

The authors have no conflicts of interest to declare.

REFERENCES

1. Nkanginieme KE, Owa JA, Kikelomo Osinusi, Njokanma FO, Ekanem E, Alice RN, *et al.* Consensus position on some core issues in medical practice, learning and evaluation. *Niger Postgrad Med J.* 2012; **19:** 244–249.
2. Anderson LW, Krathwohl, DR. (Editors). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition. New York. Longman. 2001
3. Nkanginieme KEO. Clinical diagnosis as a dynamic cognitive process: Application of Bloom's Taxonomy for educational objectives in the cognitive domain. Medical Education Online. 1997; **2:** 1,4288, DOI: 10.3402/meo.v2i.4288
4. McGill University Teaching and Learning Services. Workshop designing effective multiple-choice questions. https://www.mcgill.ca/skillsets/files/skillsets/mcq_handout3.pdf. Accessed January 24, 2021
5. Javaeed A. Assessment of higher ordered thinking in medical education: Multiple choice questions and modified essay questions. *Med Ed Publish.* 2018; **7:** 60, https://doi.org/10.15694/mep.2018.0000128.1 Accessed January 23, 2021.
6. Akresh-Gonzales J. Bloom's Taxonomy – From knowledge to practice. New England Journal of Medicine Knowledge+. https://knowledgeplus.nejm.org/blog/blooms-

taxonomy-from-knowledge-to-practice/ Accessed January 24, 2021.

7. East Virginia Medical School. Applying the new Bloom's Taxonomy. https://www.evms.edu/education/medical_programs/doctor_of_medicine/instructor_tools/learning/developing_objectives/blooms_taxonomy/ . Accessed January 24, 2021.

8. Wormald BW, Schoeman S, Somasunderam A, Penn M. Assessment drives learning: an unavoidable truth? *Anat Sci Educ.* 2009; **2:** 199–204. doi: 10.1002/ase.102. PMID: 19743508.

Appendix 1: Blank Clinical Summary and Reasoning Format

PATIENT'S NAME:		AGE:	DATE OF BIRTH	GENDER	DATE	ADDRESS

SYMPTOMS OBTAINED *(FROM PC, HPC & ROS)*		ALL OTHER ASPECTS OF HISTORY		SIGNS ELICITED *(POSITIVES 1ST) (FROM PHYSICAL EXAM)*	
1	6	1	6	1	6
2	7	2	7	2	7
3	8	3	8	3	8
4	9	4	9	4	9
5	10	5	10	5	10

ANY BEDSIDE INVESTIGATION OR SIDELAB RESULTS OBTAINED

TEST – 1:	RESULT – 1:	TEST – 2:	RESULT – 2:	TEST – 3:	RESULT – 3:

System/s most likely involved in disease, in order of Evidence-Based Priority				A	B	C	
Review the most likely System involved-[Name:				Review the next most likely System involved-[Name:			
1	2	3	4	1	2	3	4
5	6	7	8	5	6	7	8

Pathological Process/es likely occurring in the System/s	A	B	C

Functional Abnormalities elicited from History/Physical Examination				Structural Abnormalities elicited from History/Physical Examination			
1	2	3	4	1	2	3	4
5	6	7	8	5	6	7	8

PROVISIONAL DIAGNOSIS/ES

IMPORTANT / DIAGNOSTIC INVESTIGATIONS INDICATED	A	B	C	D

PATHOLOGIC DIAGNOSIS/ES	AETIOLOGIC DIAGNOSIS/ES

Examiner's   Name & Signature: