# L'utilisation d'une grille d'évaluation dans la lecture critique d'un article médical: essai randomisé contrôlé

## A controlled randomized trial about using a checklist-based critical appraisal

Mona Mlika[1], Chadli Dziri[2], Mehdi Ben Khelil[3], Lilia Zakhama[4], Faouzi Mezni[5]

*1-Hospital Abderrahman Mami Ariana / Université Tunis el Manar. Faculty of medicine of Tunis,*
*2-Université Tunis el Manar. Faculty of medicine of Tunis / Université Tunis el Manar. Faculty of medicine of Tunis,*
*3-Hôpital Charles Nicolle / Université Tunis el Manar. Faculty of medicine of Tunis,*
*4-Université Tunis el Manar. Faculty of medicine of Tunis / Université Tunis el Manar. Faculty of medicine of Tunis,*
*5-Hopital Abderrahman Mami Ariana - Université Tunis el Manar. Faculty of medicine of Tunis,*

**RÉSUMÉ**

**Introduction:** la lecture critique d'un article médical est une étape importante dans le cadre de la pratique de la médecine basée sur un niveau de preuve. L'objectif de cette étude était d'évaluer l'utilité d'une grille d'évaluation dans le cadre de l'implantation de cette pratique.

**Méthodes:** les auteurs ont réparti aléatoirement 2 groupes d'étudiants en troisième année médecine réalisant leur stage dans un service d'Anatomie Pathologique. Un numéro a été alloué par ordinateur à chaque étudiant. Le même article a été donné à tous les étudiants afin d'en faire une lecture critique. Tous les étudiants ont réalisé la même période de stage et ont reçu la même formation en lecture critique d'articles médicaux durant cette période. Le groupe interventionnel (n=26) a utilisé une grille d'évaluation adoptée par un journal indexé dans Pubmed et le groupe contrôle (n=25) a réalisé une lecture critique sans grille. Les copies des différents étudiants ont été évaluées en utilisant un scoring basé sur une liste de contrôle préalablement établie par les auteurs. Un test ANOVA à un facteur a été utilisé afin de comparer les scores entre les 2 groupes en utilisant le logiciel SPSS (version 11.0).

**Résultats:** 51 étudiants ont été inclus dans cette étude. Le score moyen des étudiants était 16,5 pour les hommes et 13,25 pour les femmes dans le groupe contrôle. Le score moyen était de 14,83 pour les hommes et 14,75 pour les femmes dans le groupe interventionnel. Le score moyen était de 13,65 dans le groupe contrôle et 14,42 dans le groupe interventionnel (p=0.61).

**Conclusion:** ces résultats doivent être interprétés avec prudence vu que tous les participants ont assisté à la même session d'apprentissage durant la même période. Cependant, cette étude met l'accent sur l'importance de l'implantation de la culture du raisonnement critique dans les études médicales.

**Mots-clés**

Lecture critique, médecine basée sur le niveau de preuve, pratique basée sur l'évidence de preuve, méta-analyse, test diagnostique, apprenants.

**SUMMARY**

**Background:** the critical appraisal of scientific publications is a mainstay step in the evidence-based-practice. This study aimed to assess the utility of using a checklist in implementing this practice.

**Methods:** medical students in the third year that were performing a training period in a department of pathology were randomly assigned to two groups. A computerized random number allocation was used. The same manuscript was given to both groups. All the students spent the same period of training in the department and they received the same training session about critical appraisal of scientific publications. The intervention group (n=26) performed a critical appraisal of the article using the checklist of a Pubmed-indexed journal and the control group (n=25) performed a free critical appraisal. The individual critical appraisal forms were evaluated using a scoring-based-checklist. A one-way ANOVA test was used to compare the scores between both groups using SPSS software (version 11.0).

**Results**: 51 students were enrolled in this study. The mean score of the participants using free appraisal reached 16.5 in men and 13.25 in women. The mean scores in the intervention group reached 14.83 in men and 14.75 in women. The mean scores in the control group reached 13.65 and 14.42 in the intervention group (p=0.61).

**Conclusion:** these results highlighted the absence of significant difference in critical appraisal skills when using or not a checklist. This result has to be taken with caution because all the participants received the same training methods during the same period.

**Key-words**

Critical appraisal, evidence-based-medicine, evidence-based-practice, meta-analysis, diagnostic test, trainees.

## INTRODUCTION

Evidence-based-medicine (EBM) is a widespread used concept nowadays. It is defined as the integration of best research evidence with clinical expertise and patients' values (1). It is centered on solving patients' problems using evidence and aims to bridge the gap between research and practice. It is based on five steps consisting in asking a question about a patient's problem, making a literature review, performing a critical appraisal, applying the new knowledge to practice and evaluating all the process. Critical appraisal is the third step and the most assessed one because it promotes knowledge and attitude skills. In a questionnaire-based study about the needs of trainees from various specialties, Hadley et al. (2) reported that 77.6% of the respondents needed more education. Dealing with critical appraisal is to deal with two different competences that are intimately related to each other. The first one is the critical appraisal of scientific articles, which is more relevant to researchers and tutors and the second point is the competence of reasonably using scientific information in order to deal with patients' problems. A continuum exists between both competences, which are considered as necessary for the medical trainee's education and the physician's ability to practice medicine according to the Royal College of Physicians and Surgeons of Canada and the Accreditation Council for Graduate Medical Education (3-5). Many methods of teaching critical appraisal have been reported in the literature including conferences, workshops, lectures, seminars, journal clubs, online courses and many evaluating methods have been reported including questionnaires, scores or objective structured clinical exams (6). This study aimed to assess the relevance of using a checklist when performing the critical appraisal of a scientific publication.

## METHODS

### Population

Since 2013, 17 students in the third year of medical training are received in the Department of Pathology of Abderrahman Mami Hospital. The students were assigned randomly by the faculty of medicine of Tunis. The training period lasts two to three weeks according to the university's recommendations. All the students that were assigned by the faculty were included in the study. The students that were performing their training period in other Departments were excluded.

### Learning activities

Training objectives were listed in their university portfolio. These objectives were performed by the faculty staff and validated by the pedagogical committee. The objectives were divided into items related to technical skills, the resolution of problems, ethical attitude and the critical appraisal of a scientific publication.

A diary about the daily activities of the students was available in the e-portfolio of the students (7). It contained their repartition in the Department and the different learning activities. Different methods of learning were displayed in the Department of Pathology including traditional methods which consisted in lectures dealing with the pathologies mentioned in the training board, integrative and participative methods consisting in case-based and problem-based learning (8, 9).

The five steps of the evidence-based-practice (EBP) were planned during the third week as mentioned in box 1. During day 4, a collective critical appraisal session was planned and centered on the discussion of the same publication entitled: diagnostic accuracy of ultrasound for identifying shoulder dislocations and reductions: a systematic review of the literature (10). Different learning methods were used to implement the principles of EBM including lectures and a workshop because the trainees weren't used to perform a critical appraisal of the different types of publications. During the workshop session, a clinical scenario inspired by the scenario published by Schranz et al. (11)physicians need to determine not only if the study's results and conclu-sions were accurately deduced but also if the methods used to arrive at the conclusions were free of error and bias. This is the most crucial step in evaluating an article. If its validity is ques-tionable, the article's results cannot be confidently inter-preted. 2,5,6 Physicians may use the following questions 3 to help them determine an article's validity: \u2162 Was there an independent and blind comparison to a ref-erence standard? A reference standard is a method of defining the presence or absence of the disease or condition in question. 7 To determine whether a diagnostic test is effective, a reference standard is needed for comparison. 8 If a reference standard is not used in the study, the benefit of the diagnostic test cannot be ascer-tained. In addition, not all reference standards are equal or subjective. 9 For example, reference standards for psychiatric dis-orders may not be clear-cut and subjective, and other stan-dards, such as biopsies, rely on expert interpretation. The best reference standard to evaluate the

effectiveness of a diagnostic test is the criterion standard, which is considered the diagnostic model for identifying a specific disease or condition. 3 The study's data collection and analysis must be care-fully planned and executed to ensure that unconscious (or conscious was used. During this workshop, the tutor presented to the trainees some elementary epidemiological and statistical notions about meta-analyses. The choice of meta-analysis was due to the fact that they are rated with the highest value according to the EBM levels.

**Box 1:** structure of the evidence-based-medicine learning during the third week of training

| | |
|---|---|
| Day 1: 3-hour-session | Introduction to evidence-based-medicine, phrasing questions and the different types of publications (Lectures and conferences) |
| Day 2: 2-hour-session | Searching the literature |
| Day 3: 2-hour-session | Introduction to critical appraisal and study design (lecture) |
| Day 4: 3-hour session | Collective critical appraisal of a meta-analysis about a diagnostic test (workshop). |
| Day 5: 3-hour-voluntary-session | Individual application of the critical appraisal principles |
| Day 6 | Feed-back and questionnaire about the week-training |

**Intervention**

This interventional and longitudinal study was performed during a 3-year-period (2016-2017 and 2018). During the fifth day of learning, an individual critical appraisal session was planned. The students were randomly assigned to two groups by using computerised random number allocation and give both groups the same manuscript to discuss and analyze entitled: diagnostic efficacy of sentinel lymph node biopsy for cT1/T2N0 tongue squamous cell carcinoma: a meta-analysis (12). The intervention group tried to perform a critical appraisal of the article using the checklist of the Tunisia medical journal (http://www.latunisiemedicale.com/) and the control group tried to perform a free critical appraisal. The individual critical appraisal forms were evaluated using a scoring-based-checklist (box 2). This evaluating checklist was elaborated by the tutor according to the main items that have to be evaluated when dealing with the critical appraisal of a meta-analysis focusing on a diagnostic test.

Besides, the trainees fulfilled a Likert-type-scale questionnaire to report their self-assessed competences to evaluate study design, interpretation of results, statistical methods and their satisfaction concerning the learning methods used. An open-ended questioning was used at the end for further comments and suggestions.

**Box 2:** the scoring-based-checklist used to assess the individual critical appraisals

| Items | Scores |
|---|---|
| Title identifying the meta-analysis | 0.5 |
| Summary structured mentioning the objectives, the methods and the results | 0.5 |
| Introduction with PICO items | 1 |
| Methods | 10 |
| Eligibility criteria | 2 |
| Information sources | 2 |
| Study selection | 2 |
| Flow shart mentioned | 2 |
| Objective clearly mentioned | 2 |
| Results | 5 |
| Study selection | 1 |
| Study characteristics | 1 |
| Mention of bias within studies | 1 |
| Synthesis of results | 1 |
| Additional analysis | 1 |
| Discussion | 2 |
| Summary of the main findings and consider their relevance | 1 |
| Discuss limitations of the study and outcome level | 1 |
| Conclusions | 2 |
| Provide a general interpretation of the results in the context of other evidence and implications for future research | 1.5 |
| Describe sources of funding | 0.5 |

PICO: P: population, I: intervention, C: comparison, O: outcome

**Statistics**

Statistical tests used to compare the scores between both groups and men and women consisted in non-parametric test (one-way ANOVA test) with alpha levels set at 0.05. The authors used SPSS software (version 11.0).

**Ethics**

Ethical approval for the study was not required. Participants were made aware of the purpose of the study, the anonymous nature of the purpose, the anonymous nature

of the dataset generated and the option to not respond if they so wished. This information served as the basis for an informed consent from each respondent.

## RESULTS

- Critical appraisal skills: The mean age of the students was 21 years (average 20 to 22 years). They all had elementary statistical notions and never performed critical appraisal. The mean score of the participants using free appraisal reached 16.5 in men and 13,25 in women. The mean scores in the intervention group reached 14.83 in men and 14.75 in women. The mean scores in the control group reached 13.65 and 14.42 in the intervention group. There was no statistical difference in scores between men and women and between both groups (p>0.05). Table 1 illustrates the different results.

**Table 1:** different scores of critical appraisal in both groups

| | All participants (n=51) | Men (n=22) | Women (n=29) | Intervention Group (n=26) | Control Group (n=25) |
|---|---|---|---|---|---|
| Mean score +/-sd | 14.53±2.06 | 15.67±1.9 | 13.85±2.5 | 14.42 ±2.6 | 13.65±2.7 |
| 95%CI | [13.31-15.75] | [13.47-17.86] | [12.27-15.43] | [13.03-15.80] | [11.21-16.09] |
| P value | | 0.13 | | 0.61 | |

- Satisfaction questionnaire: all the students reported their satisfaction about the teaching methods. No one performed a critical appraisal before the training sessions. They all reported their satisfaction about the new skills achieved. Thirty (58.8%) students expressed their desire to repeat the experience and to maintain the habit of reading and performing critical appraisal of scientific publications.

## DISCUSSION

This study results highlighted the absence of significant difference in critical appraisal skills when using or not a checklist. This result has to be taken with caution because all the students received the same training methods during the same period. The used training methods consisted in conferences and workshops about critical appraisal with emphasis on meta-analyses about diagnostic tests. These results are contradictory with those published by MacAuley et al. (13) who reported that using a READER (Relevance, Education, Applicability, Discrimination, overall Evaluation) method of critical appraisal was more accurate and repeatable than a free appraisal one. The authors reported a randomized trial about 243 general practitioners who didn't receive the same tutoring like in this experience and with different backgrounds (13). Besides, in a qualitative study about the characteristics of journal club in plastic surgery residency program, Hryciw et al. reported the necessity of an educational tool in order to guide the critical appraisal practice of residents (14). The present study results put emphasis on the necessity of using effective teaching methods in order to motivate the students. The choice of the population consisting in trainees in the third year of education was motivated by the need to give some ability to appraise literature early to students in order to easier the process when they will begin practicing medicine (14). In a questionnaire-based study, Godwin et Seguin reported that younger physicians were more knowledgeable than older ones (15). Other factors influencing the needs of trainees in EBM have been reported including the sex, the place of basic medical qualification, the time since graduation, the existence of prior research experience and the specialty. They have also pointed out more abilities in evaluating statistical tests and more belief in the impact of EBM in trainees from surgical specialties and in more qualified trainees (2). Teaching critical appraisal has to turn to the issue of how to teach rather than whether to teach critical appraisal skills. The competence of critical appraisal incorporates a variety of domains including knowledge, skills and attitudes (16)skills and attitudes. Adopting an evidence-based approach to practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools. This concept was promoted in order to improve the doctors' skills and to improve the patients' outcomes and to change the process of care making it more relevant and valid. These different domains imply different methods of teaching and assessment (16)skills and attitudes. Adopting an evidence-based approach to practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP

competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools. Many learning methods have been reported including lectures, workshops, tutorials, case-based presentations and journal clubs. Every method presents advantages and limitations. Journal clubs have been reported since the mid-1800s (17) and many authors pointed out their limits in implementing critical appraisal skills because of the insufficient time and the passive experience for learners in most of the cases (14, 18, 19). Some authors reported the advantages of implementing online modules on EBM in order to promote a critical appraisal culture but pointed out also the need for face-to-face methods in order to maintain the motivation of the students (20)beneficial health care practices and abandonment of ineffective, harmful ones. Stellenbosch University in Cape Town, South Africa, offers a 12-week, completely online module on EBM within the Family Medicine division, to medical specialists in their first year of training. The aim of this study was to formatively evaluate this module; assessing both the mode of delivery; as well as the perceived effectiveness and usefulness thereof.\\n\\nMETHODS: We used mixed methods to evaluate this module: A document review to assess whether the content of the module reflects important EBM competencies; a survey of the students to determine their experiences of the module; and semi-structured interviews with the tutors to explore their perspectives of the module. Ethics approval was obtained.\\n\\nRESULTS: The document review indicated that EBM competencies were covered adequately, although critical appraisal only focused on randomised controlled trials and guidelines. Students had a positive attitude towards the module, but felt that they needed more support from the tutors. Tutors felt that students engaged actively in discussions, but experienced difficulties with understanding certain concepts of EBM. Furthermore, they felt that it was challenging explaining these via the online learning platform and saw the need to incorporate more advanced technology to better connect with the students. In their view the key to successful learning of EBM was to keep it relevant and applicable to everyday practice. Tutors also felt that an online module on EBM was advantageous, since doctors from all over the world were able to participate.\\n\\nCONCLUSION: Our study has shown that the online module on EBM was effective in increasing EBM knowledge and skills of postgraduate students and was well received by both students and tutors. Students and tutors experienced generic challenges that accompany any educational intervention of EBM (e.g. understanding difficult concepts. The different studies assessing the importance of critical appraisal practice were mainly based on questionnaires evaluating the improvement of the knowledge and the satisfaction of the participants (6). In a questionnaire-based study, the authors reported a response rate of 30% to the questionnaire that can reflect the lack of motivation of the participants to respond (15). Moreover, the majority of studies reporting improvements in critical appraisal skills are based on perception or pre and post-test scores or self-assessment rather than randomized control trials (16,skills and attitudes. Adopting an evidence-based approach to practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools 17, 21)mean 56% per program, range 0%-100%. In a review article dealing with the assessment of the effects of the practice of the EBM on the process of care, Horsley et al. (22) reported that among 11057 abstracts, no study evaluated the process of care or patient outcomes in relation to the practice of EBM. In the case of the practice of critical appraisal, the absence of evidence can't be considered as the evidence of absence. Assessing changes in attitudes and behaviorism with tools presenting certain level of validity may be challenging. The different steps of EBP consisting in converting clinical scenarios into a structured question, searching the literature, critically appraising the evidence, applying the results and evaluating the EBP process require for each step different levels of knowledge and skills consisting in the construction of a question (step 1), the application of literature searching skills (step 2), a level of expertise in epidemiology and biostatistics (step 3), a competence of communication the results (step 4) and the capacity of assessing the EBP process (step 5) (16)skills and attitudes. Adopting an evidence-based approach to

practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools. All these steps were assessed by the Fresno and Berlin tools (23). Objective Structured Clinical Exam has been demonstrated as a reliable tool to assess communication skills (16)skills and attitudes. Adopting an evidence-based approach to practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools. Some authors reported the need of implementing activities diaries or e-portfolios that can highlight any changes related to the evidence-medicine practice (16)skills and attitudes. Adopting an evidence-based approach to practice requires differing competencies across various domains including literature searching, critical appraisal and communication. This paper examines the current tools available to assess EBP competence and compares their applicability to existing assessment techniques used in medicine, nursing and health sciences. DISCUSSION: Only two validated assessment tools have been developed to specifically assess all aspects of EBP competence. Of the two tools (Berlin and Fresno tools. In an intervention review, Parkes et al. (24) performed a review of the literature in order to assess the effects of critical appraisal on knowledge, patient outcomes and the process of care. According to their study protocol, they included only one randomized controlled trial performed by Linzer et al. (17) which was about 44 doctors in which the authors reported a 25% improvement in critical appraisal knowledge in the intervention group in comparison to 6% improvement in the control group. The relative absence of evidence concerning the improvement of the attitudes and the practice thanks to critical appraisal practice can't be considered as an evidence of absence of efficiency. In fact, this can be explained by the scale of the critical appraisal programs that aren't very large and aren't followed up over many years. Besides, many authors reported different effects on the participants according to their level of knowledge (25)retrieved through a MEDLINE search supplemented by manual searches; review of bibliographies maintained by individuals involved in teaching critical appraisal skills; and a previous methodological review.\\n\\nSTUDY SELECTION: Articles were selected if the study involved some form of control group, although strict randomization was not required, and a measure of performance followed the intervention. Articles were excluded if they simply reported the process of teaching critical appraisal skills or used some form of \"happiness index.\"\\n\\nDATA SYNTHESIS: There were 10 studies of the impact of teaching critical appraisal skills, 6 involving medical students and 4 involving residents. Results from 3 of the studies were nearly uninterpretable and thus were excluded; the remaining 7 were methodologically acceptable. Analysis showed that interventions implemented in undergraduate programs resulted in significant gains in knowledge, as assessed by a written test (mean gain 17.0%; standard deviation [SD] 4.0%.

The major limitations of this study consist in the low number of participants enrolled and the only use of meta-analysis as publication type. The low number of students is attributed to the random distribution of the students by the faculty staff. Besides, the trainees were assigned randomly in a pathology department where microscopic exam can be considered as a diagnostic test in itself so that, the tutors decided to focus on meta-analyses and especially on meta-analyses about diagnostic tests.

To conclude, the main result of the present study was the absence of significant difference in critical appraisal skills when using or not a checklist. It has to be taken with caution because all the participants received the same training methods during the same period.

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