Writing Articles on Continuing Medical Education for Medical Journals

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ABSTRACT

Sharing of knowledge through Continuing Medical Education (CME) contribute immensely to professional development of skills in clinical medical practice. Thus, the writing of CME articles should adopt an approach that addresses the needs of the readers by attempting to fill gaps in their knowledge, skills, and ethics about clinical care. As such CME articles should be comprehensive and focused on specific areas. The specific learning outcomes should be well defined. In designing and development of such articles, pedagogic principles are to be borne in mind. In this article we outline a guide to writing a CME article, incorporating both the principles of instructional design and directed self-learning. The ideal CME articles will transit through multimedia-enhanced interactive online learning, with greater use of connectivity through the internet. Synchronous and asynchronous learning is in greater need, as distance and online learning are increasingly popular. Authors of CME articles will need to eventually design CME articles to be interactive, enriched with multimedia to engage their readers. Lesson plans employing instructional design principles should aim to promote both instructions for learning and formative assessment ensuring learning have taken place, and outcomes have been achieved. This article describes on how to write effective CME articles for medical journals.

KEYWORDS:
Writing, CME articles, learning outcomes, construct, instructional design, assessment

INTRODUCTION

The COVID-19 pandemic has seen the rapid proliferation of knowledge about the spread of this disease, its morbidity and mortality. The scientific community has been actively engaging in communicating advances in the prevention of this disease, its spread, identification of rapid diagnostic tests, therapeutic interventions in intensive care and informing policy makers and the public on all aspects of the viral infection. Due to the worldwide crisis precipitated by the COVID-19 pandemic, there has been an ever-increasing number of research studies on the causative virus and the disease. Vaccine for COVID-19 has been and is being developed and marketed globally at unprecedented scales and speed. Health care professionals, health providers, drug regulators and consumers, are in want of current information. The status of COVID-19 in Malaysia and Southeast Asian countries has been covered in previous issues of the Medical Journal of Malaysia.[1-4] Physical distancing, wearing a mask, avoiding crowds and washing our hands has become a major part of containing the viral infection as part of the Movement Control Order (MCO). This led to the disruption of normal transfer of accurate information and training of Registered Medical Practitioners (RMPs). This situation highlights the greater need for continuing medical education/continuing professional development (CME/CPD) through web seminars, video conferencing and existing medical journals Thus, this article focusses on how to write effective CME/CPD articles for medical journals. We also provide a guide for potential authors who wish to submit articles to medical journals. CME/CPD articles are a convenient means of communicating current information to health providers and other stakeholders. Systematic reviews indicate that CME articles improve individual competencies, resulting in quality patientcare by nurses and physicians. There is increasing evidence to show that CME articles have a positive impact on performance of physician leading to improved patient health outcomes.[5]

Editors of medical journals usually invite authors who are experts in a particular field, on specific topics of interest, to submit proposals on CMEs. The proposals should follow accepted, specific guidelines such as patient/population, intervention, comparison, outcomes (PICO) framework, apply systematic review strategies or specific instructions suggested by the editors, for comprehensive coverage and evidence-based outputs. In Malaysia, the accreditation body for CME/CPD is the Malaysian Medical Council (MMC). The guidelines on CPD for registered medical practitioners (RMP) has been established by MMC.[6] The RMP in Malaysia, must obtain a minimum of 20 CPD points per one CPD year as evidence of continuing professional development. Under the MMC CPD criteria, RMP will receive five CPD points for each CME article that the RMP has completed. The current CPD point collection is administered by the Ministry of Health's online myCPD, the Malaysian Medical Association (MMA) CPD mobile app and the Academy of Medicine of Malaysia (AMM)-CPD system.

GUIDE TO WRITING A CME ARTICLE: FORMAT

Table I can serve as a guide for authors to design and develop a good CME article. The essential components to justify its acceptability are indicated therein. The title of the article should be concise but informative. The expertise of the

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author in the topic of CME topic and the recent articles published by the author related to that topic should be stated clearly in the proposal. The author must deliberate on the 'research question' and plan out the rationale for the CME article, and identify the differences between the information already available and the current situation for best practice. One of the prime reasons why a CME on the topic is chosen is due to the gaps in the knowledge available on that subject. Whilst writing CME articles, it is best to avoid a patronising approach. The contents should be evidence-based and be aligned to accepted 'standards of care' leading to good clinical practice. The latter is of particular importance when novel and/or therapeutic approaches are made. Journals should look into the possibility of moving to online CME with Blended Learning technology.

The subject material chosen must be suitable for the intended audiences. Authors should avoid either being too superficial or too detailed in the content. It is essential that CME should address the intended learning activities, focusing on the target audience to achieve the learning outcomes (LOs). The terms learning objectives and learning outcomes are often used interchangeably.

Disclosures of any conflict of interests is of particular importance, as the article should be free of any commercial interests. Industry-sponsored CME articles should be scrutinised for writing bias, and authors should clearly declare in case of such alliances. Ethical considerations should be included. The article should have no more than five LOs. This section should be followed by the instructions for the readers, the number of credit points and steps to earn the CME credit. Inclusion of self-checks, with some form of assessment that will reflect on the understanding of the subject matter by the participants, lending to competency and upskilling is recommended.

A short summary in the narrative form, not exceeding 250 words should be provided. The keywords at the beginning of the article, often creates interest in readers to further explore the contents. These should include the learning objectives/outcomes, ethical and professional issues that would arise, keywords, the main text, assessment with answers (e.g., MCQs), and references.

Learning outcomes

The learning outcomes should be 'intuitive and user-friendly', especially in medical education. Developing good LOs help in identifying specific knowledge and skills that would be learnt by the participants upon completing the CME. The LOs for a CME article should be specific, measurable, achievable, realistic, time bound (SMART), and should state how the LOs will be evaluated by a set of questions at the completion of CME. We recommend that the LOs should use action verbs using Bloom's Taxonomy[7] to achieve SMART outcomes. The scope of the article is well defined by stating the LOs clearly, e.g., 'At the end of this article, the learner should be able to be competent in …'. Learning outcomes are drawn from task analysis, each of which in turn, identifies each learning bite that is to be addressed.

Bloom B. et al., developed a hierarchy of educational objectives and published a framework for categorising educational goals in 1956, 'Taxonomy of Educational Objectives'. This framework consists of six major categories or levels within the cognitive domain, from the simplest to the most complex behaviour, which includes knowledge, comprehension, application, analysis, synthesis, and evaluation. To achieve SMART outcomes, it is recommended that action verbs employing Bloom's Taxonomy are used.[7] Anderson and Krathwohl (2001) revised this classical framework to help teachers understand and implement a standards-based curriculum.[7] Marrying cognitive domain to skills-learning by incorporating factual, conceptual, procedural, and meta-cognition domains, modifications of Bloom's original concepts can be applied to the design and development of CMEs. Cognitive processes of factual, conceptual and procedural domains are combined to meta-cognition as the learner (audience) needs to be aware of his own 'cognition'.[8]

Tips in writing learning outcomes

Bloom's taxonomy gives a list of measurable verbs to be used in writing the learning outcomes.[8] Usually, Bloom's taxonomy is used for development of curriculum. However, the types of assessments for CME for medical journals are usually limited to MCQs. Hence, the level of taxonomy may just be limited to Knowledge (Level I), Comprehension (Level II) and may be application (Level III), it cannot be used for higher order in the taxonomy. The latest update in the literatures for the preparation of a CME material could be retrieved using different search engines (OVID, PubMed, etc.), and using the Medical Subject Headings (MeSH) term, search criteria (Human study, date of publication, languages) with the utilisation of PICO in developing the search terms.

Learning outcomes should be simple, without compound words or adding two LOs with 'and'. The readers are looking for current and evidence-based information. As such, the content of CME must be above the basic knowledge of the reader, with sufficient educational information and knowledge to achieve higher order thinking. Verbs that are non-measurable should be avoided entirely, e.g., the learner should appreciate, understand, know, learn, be familiar with etc. Practitioners are naturally looking for CMEs that would supplement the current knowledge of the subject, so currency of information is vital.

Writing Measurable Learning outcome

Usual approaches to writing measurable learning outcomes are to have the 'end in mind'. Action verbs are essential in LOs, as we would like the learner to know what will be achieved at the end of the article. A spiral approach in writing measurable LOs, including assessment, is adopted as the sub-topics should be sequentially arranged. Authors should refer to Bloom's six levels of learning, which makes learning methodical and meaningful. The lowest level is 'remembering'. To apply the concept being introduced in the CME article, one needs to 'remember and understand' the concept. This learning activity is followed by 'evaluation and analysis'. The higher levels of learning are 'to create' and 'to evaluate'. The authors of CME need to be familiar with these levels and select the most appropriate level of learning that

Table I: Guide to Writing CME Articles

Title of Article
State your expertise in this topic and details of any recent article published on the subject
Provide a summary of the topic, written in either narrative or point form, not exceeding 250 words
Identify target audience and learner needs
Learning Outcomes (LOs) using measurable verbs, not exceeding five LOs
Describe practice gaps and new information or skills based on three domains: • Cognitive • Psychomotor skills • Affective / Practice
Provide reasons for existing practice gap if possible
State the specific competences that would be achieved at end of CME . These could focus on one or more of the following: • Medical knowledge and skills • Clinical practice, patient care, best practices, patient safety • Change in health system • Professionalism and bioethics
Read the 'Instructions to Authors' of the journal and ensure the following are closely followed : • All references are cited as instructed • Provide source of evidence to support your argument or statement regarding gaps in skills knowledge and practice • Include the source of all tables, graphics (unless they are original artwork) • Indicate permission has been obtained should figures and tables are not personally generated
Assessment/ Evaluation

Table II: Modified Bloom's Taxonomy

Original Domain	**Change in Bloom's Taxonomy**	**New Domain**
Evaluation	→	Creating
Synthesis		Evaluating
Analysis	→	Analysing
Application	→	Applying
Comprehension	→	Understanding
Knowledge	→	Remembering

Table III: Incorporating Bloom's Taxonomy to Concepts

Facts	Specific information, data
Concepts	Concrete and abstract: common features, collated to provide a 'chunked' element
Procedure	Step-by step activities that leads to the final product in a sequential way
Processes	Workflow is shown in diagrammatic fashion
Principles	Governing terms, basic blocks that lend to development of guidelines

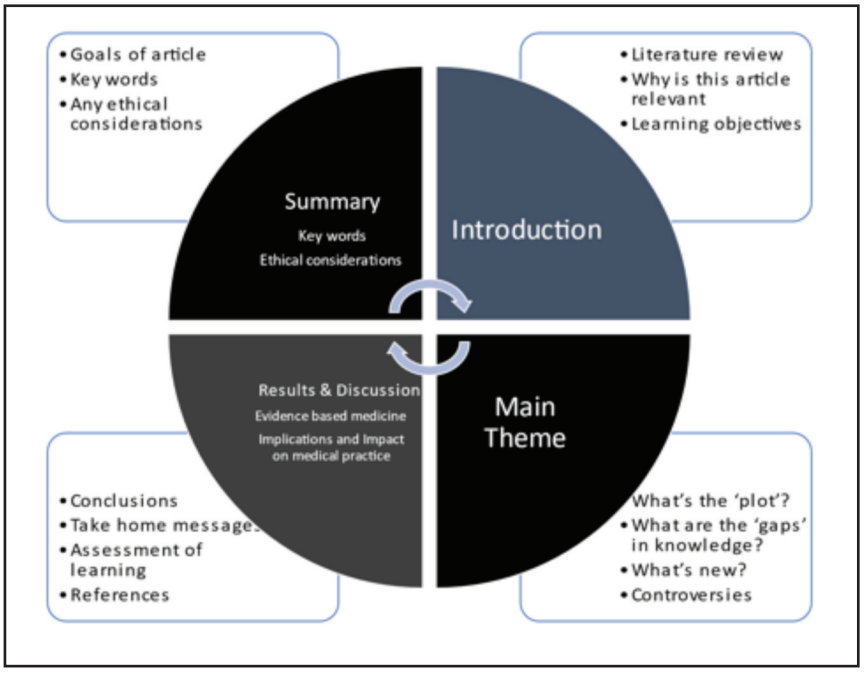

Fig. 1: Summary of Content of CME Article.

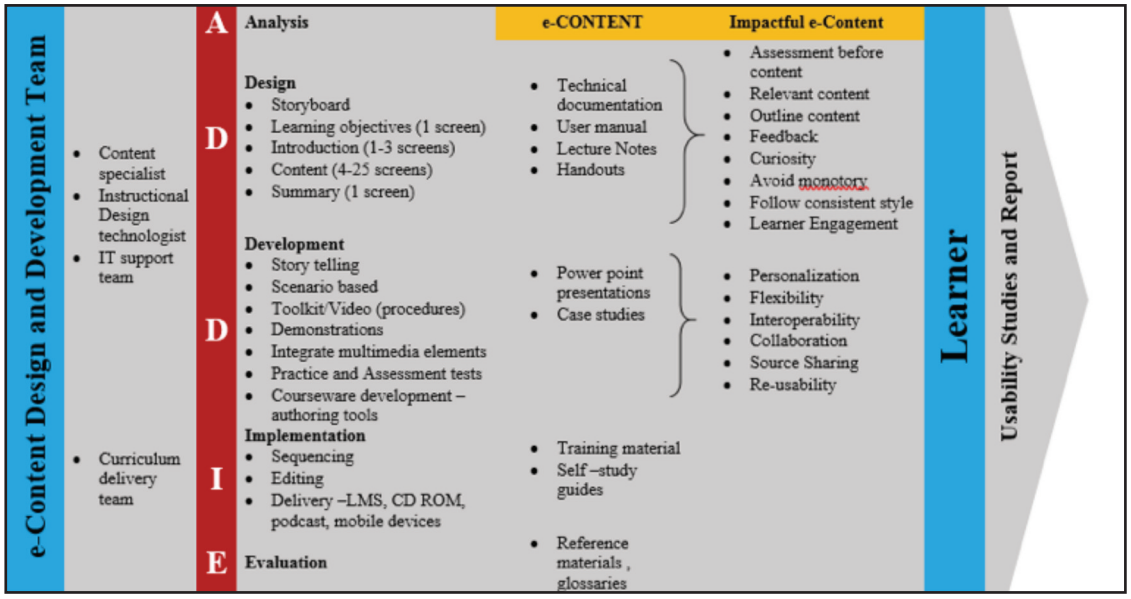

Fig. 2: Framework for Design and Development of e-Contents for CME.[18] (Sivalingam Nalliah, 2021, pp 76)

would be applicable to the reader. Selection of actions verbs according to the level of learning can be found in 'Revised Bloom's action-verbs.[9]

Main Text

A well planned and structured article should have a logical flow, e.g., PICO framework. Apart from identifying the LOs, it would be good to reflect on the content and determine if it meets the three domains of learning, i.e., cognitive, psychomotor, and affective components. These may not be of equal proportions. Images and diagrams are included as appropriate, to enhance learning. Table II shows the modified Bloom's taxonomy. Figure 1 summarises the essential contents for the main text reflected in Table II. In deciding the length of the article, authors should consider the acceptable time-duration for participants to read and complete tasks assigned for formative assessment.

Points to remember in the main text

In Instructional Design, especially for online learning, storylines are developed, and the lesson is designed and developed following principles of Instructional Design and Development like ADDIE, i.e., Analyse, Design, Develop, Implement, Evaluate.[10] Authors could employ such principles in writing their CME articles. This would become useful, as online journals also provide interactive learning approaches for upskilling and cognitive development. Details of pointers for writing online CME articles is shown in another section of this paper.

The following are some points to remember in designing the CME article:

- Logical, sequential, and well-organised concepts
- Repetition is to be avoided
- Headings and sub-headings are included to engage the reader
- Bullets points and boxes used appropriately
- Tables, figures, and diagrams are more useful than text alone, to explain complex information and concepts
- Flow charts and algorithms are useful for practice guidelines

In the 'introduction to the CME', the author should lay out the basic elements that the learner should be acquainted, to understand the concepts. In clinical CME articles, inter-relationships among the basic aspects of learning need to surface, to realise clinical reasoning skills. CME articles should avoid displaying facts, without exploring the understanding of the concepts. Suitable evidence should be presented to support a concept. Procedural knowledge can be learned, both through face-to-face approaches, and though text and online learning, which includes links to videos and animated diagrams, i.e., blended approach. Algorithms, flow-charts, and media-incorporated images, based on Instructional Technology principles are increasingly employed, in developing CME articles.

Reducing cognitive load is essential in any design of CME articles, by analysis of the learner's learning styles, needs, and scope of study. Current interactive CME courses often use the 'Lesson Plan' approach in engaging the learner. Gagne's 9-steps in instructional design of a lesson plan may be employed for active learning. Gagne's 9 steps are grouped into three phases. The pre-instructional phase could be directed self-learning and gaining attention, while the main CME article can focus on the main theme, i.e., instructional phase. The post-instructional phase can include self-assessment through reflective practice. Assessment and feedback assist in ensuring learning has taken place and lend to improved learning outcomes.[10,11] The main text should wind up the discussion with a 'conclusion'. This section, which should not be more than a paragraph, should

emphasize the salient points considered as take-home messages. Table III shows the incorporation of Bloom's taxonomy with the concepts generated by Anderson and Krathwohl.[8]

DEVELOPING SOCIALLY INTERACTIVE CME LEARNING MATERIALS

Digital technology has dramatically transformed conventional learning, leading to increased use of information and communication technology (ICT) and connectivity (internet) to facilitate online learning and massive open online courses (MOOC). Blended learning, with incorporation of eLearning is in vogue today. Current learning trends support the need for development of e-Contents, enabling synchronous or asynchronous distance learning.[12] Formal lessons and modular courses can be taken online remotely, and novel approaches are being adopted to engage the learner, using commercially available authoring tools like Articulate 360. Learning management systems have broad cloud- based or non-cloud-based platforms, for curriculum delivery, tracking progress of learning and assessing the learner.[13-15] Such self-paced learning, at the convenience of the learner, is becoming extensively used worldwide. Skills-learning based on units of learning can be delivered through 'microlearning and micro-credentialing'. There is evidence to support the increase in course completion when social and remote learning is introduced.

Multimedia is extensively used in developing interactive e-Contents. It can be made to be catchy and rich, apart from appealing to the audience. Multimedia used in learning, attracts individual learning styles focusing on visual, audio, and kinesthetic aspects. Graphic images, audio, video-creating, and editing are all employed to enrich the learning object.[14,15]

Authoring tools, which are software applications to create multimedia content for eLearning are extensively employed to develop interactive e-Contents, which would include illustrations, animations, gamification, audio podcasts and customised video productions.[15,16] There is huge scope for interactivity, navigation, editing, preview, and playback when authoring tools are employed. Three elements are necessary to engage learners, after creating awesome and appealing e-Contents. These are (i) personalisation, (ii) social learning (iii) gamification. The framework in Figure II portrays the big picture how the needs of the learner could be met in the designing and developing CME articles and learning materials for online learning adopting the ADDIE model. Instructional design and technology lend to dynamic learning products that can be easily updated and improved, based on feedback and assessment. It is of paramount importance to determine user experience and usability of online lessons for quality and currency of contents.[17,18,20]

Criteria for Quality e-Contents

The primary aim of e-Content in CME articles is to provide current and interactive lessons and online courses, appealing to 'digital native' learners of the 21st Century. Authors of lessons and CME materials for online learning should be mindful of the definition of e-contents. Online lessons and CME articles are not 'any form of digital data that is stored on a digital or analogue storage in specific format'. Apart from being evidence-based and scientifically correct, they should be well sequenced 'learning objects' arranged and aligned to meet the learning outcomes.[5,14] A good online CME article is adaptive, interactive, communicative, and collaborative (by providing a forum for feedback and evaluation). For higher level of LOs, it should promote reflective and explorative learning. It should be standardised, SCORM (shareable content objective model) and LMS (learning management system) compatible, without infringing copyright laws. An extensive discussion on design and development of e-Content for interactive learning is beyond the scope of this article and interested readers should refer to books on Instructional Design and Technology.[5,10,14]

Well-designed online CME articles will adopt similar approaches described above in identifying learning outcomes and presenting the subject matter in an organised and sequential manner. The aim is to understand the cognitive-psychomotor-affective needs of the audience. Online learning CME is designed for synchronous and asynchronous learning, employing the basic tenets of instructional design. Assessment of learning outcomes is an essential part of CME and should be standardised in its construct, apart from being contextually relevant.

The CME article should focus on how the salient learning outcomes will be achieved through assessments. The latter could be pre-test, post-test multiple choice items (OBA), which have a direct relationship with the CME outcomes, focussing on important and relevant content. Test items are based directly on the learning outcomes and relevant content. Controversial test items should be avoided, especially when the knowledge is incomplete, or the facts are debatable. Instructional design models are increasing employed in CMEs. When learning management systems and authoring tools are employed to develop CME articles, enriched content may be presented with self-check assessment tools as a package.[14,15,21]

ASSESSMENT AND EVALUATION OF CME ARTICLE

Assessment of learning outcomes is integral to CME. In clinical education, patient-care scenarios are preferred as they are more engaging and contextually relevant. Authors should only include information that would be required to answer the three to five most important "take-home" messages from your article. In constructing questions, clearly, relevant information provided in the stem should be derived from the key messages relayed in the article. Questions, that follow the stem should not be ambiguous. Common mode of assessment employed is multiple choice questions. Current pedagogic principles favour 'single best or one best answer (OBA)'. Distractors must be accurate and should not relate to regional information and expert opinions. Construct of OBA is better done by creating a brief clinical scenario which adds 'authenticity' to learning. Only information that is needed to answer the question should be included, and the correct answer should relate to the key findings in the article. Only 'positively' constructed questions should be posted, completely avoiding 'All of the following are correct EXCEPT

or All of the above and None of the Above. Care must be taken to ensure that all distractors are of the same category and as homogenous as possible. True/False and K-type questions are better avoided.

A tidy approach to constructing OBAs is to focus on 3-5 'take-home messages'. Develop a case scenario, if possible, and develop the stem for the question. Authors should keep the stem short and relevant to the objective of the assessment. Then, they should decide on the important point to write the correct answer, before penning the 'incorrect' plausible answers or distractors.

For CME articles, presented as online learning (e.g., MOOC), design assessment in a similar fashion. However, including multimedia and gamification have become a norm, as such technology-enhanced assessment modes are more engaging and motivating. Leaning management systems present innovations that facilitates provision of answers with immediate feedback. Tracking of the student's progress is electronically facilitated with access to self-generated completion badges and CME certificates. Most online courses would also provide a forum for peer-to-peer learning and promote social-cognitive learning. Evaluation of the whole online course is often welcome by the authors for further improvement of CME.

CONCLUSION

The concluding portion of a CME activity should highlight what learners should be able to do after completing the instructions or course. Recap of the importance of the topic and how practical application of the content will narrow the identified practice gap. It should focus on changes in outcome the author had planned to achieve.

Medicine is rapidly changing with application of new technology and therapeutics. Quality CME articles are written for specific purposes. CME/CPDs help practitioners to close the gap in knowledge and skills, which eventually leads to upskilling of health professionals and updating them with current standards of health care. Ultimately it will lead to improvement in patient care. CME activities also assist registered medical practitioners (RMP) to obtain CPD points for the renewal of your annual practicing certificate (APC).

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