

# Chapter 8

## Writing CBCR Cases

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Case-based teaching is considered a superior method of teaching for a variety of professional domains. Its success depends both on the way education is enhanced by adequate facilitation by teacher and on the quality of cases used (Kim et al. 2006). Dolmans et al. and Kim and colleagues have provided guidelines for effective case writing in health professions education (Dolmans et al. 1997; Kim et al. 2006). Working with adequate cases in problem-based learning is considered to stir situational interest in students during education, more than direct instruction (Schmidt et al. 2011). In a broad literature review, Kim and co-workers conclude that written clinical cases are most effective if they show five core attributes (Kim et al. 2006). They should be:

- (a) Relevant (adjusted to the level of the learner, aligned with goals and objectives, and with an adequate setting of the case narrative)
- (b) Realistic (showing authenticity, including distractors, providing a gradual disclosure of content)
- (c) Engaging (providing a rich content with multiple perspectives and with branching of content)
- (d) Challenging (sufficiently difficult, being new or atypical cases for the level of the learner, with adequate case structure, and including multiple cases)
- (e) Instructional (building upon prior knowledge, incorporating feedback, and using educational or didactic aids where possible and adequately assessed).

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CBCR cases should meet most, if not all, of these conditions. The authors provide 21 more detailed distinct and useful recommendations. There is one exception. While the authors recommend using atypical cases, in CBCR training for preclinical students, with a focus on establishing core illness scripts, we believe that atypical cases should be avoided.

The choice of cases for CBCR courses is determined by the objectives of intended illness scripts to be acquired and internalized by preclinical students. They should cover important medical conditions that serve as a strong clinical knowledge foundation, even in its inherent limitations at this stage of training, for students before they start with clinical clerkships. Writing cases for CBCR sessions must be done by clinicians with practice experience in the theme of the case, but may be edited by experienced CBCR consultants or CBCR course developers. This chapter explains how to write CBCR cases.

## Overview

CBCR cases consist of an introductory text describing a patient case in the way it is presented to a clinician. As a variant, two cases with similar presentations but different diagnoses within a differential may be worked through in one session. Alternatively, one case can be spread over two sessions, although that rarely happens. The start of the case may be at a primary care doctor's office, at an emergency department, at an outpatient clinic, or on the clinical ward after referral. The case description, after the initial vignette, continues with questions and assignments, at fixed moments with the provision of findings from further history, supplementary physical examination, or diagnostic investigations, distributed and read out loud by peer teachers during the session at the right moment. A full case includes the complete course of a problem from the initial presentation to follow up after treatment. Often, cases concentrate on key stages of this course. Case descriptions should refer to relevant (patho-)physiological backgrounds and basic sciences such as anatomy, biochemistry, cell biology, and physiology and whenever relevant during the case.

## Three Versions of the Written Case

Each CBCR case is not only a *student version* and a teacher (*consultant*) *version* but also an in-between-type *peer teacher version*. As CBCR sessions are led by two or three peer teachers who need to be instructed how to guide the meeting, they are not provided with comprehensive answers and solutions to questions, since they must practice clinical reasoning themselves as well. The consultant should have all answers available if needed.

### ***Student Version***

The student version includes general instructions, an initial case vignette, and several questions. The general instructions consist of the objectives for this case; the literature students should read when preparing for the session and instructions about which questions they need to answer before the session. The student version of the case is provided to all students, including the peer teachers.

### ***Peer Teacher Version***

The peer teacher version contains the student version information but is more extended. Only the peer teachers for a particular session receive the peer teachers' version through the consultant of the group. They should not share this information with other students before the session.

The peer teacher version provides hints and instructions with every question. These guide them toward the correct answer without directly disclosing answers or diagnoses. Any instructions given for a question suggest the peer teachers how to deal with this question: to use a table or PowerPoint®, to use a role-play, or to use instructions on how to stimulate students to come with proper arguments. Peer teachers also receive handouts, i.e., additional information about the patient on history findings, physical examination findings, diagnostic test results, and management policy, each to be disclosed during the meeting at the right moment. Finally, most cases include a peer teacher assignment for a mini-lecture (5 to a maximum of 10 min) about a relevant pathophysiological topic or background information about diagnostic tests.

### ***Consultant Version***

The full consultant version of the CBCR case includes all information, suggestions, and hints for peer teachers and all answers in detail for all questions, as much as is necessary for a non-expert clinician, and includes all patient information that peer teachers should disclose during the session.

## **Selecting Themes for CBCR Cases**

When selecting cases to be included in the CBCR course, it is useful to take the following points into consideration:

- Cases should deal with important, i.e., common medical problems that represent illness scripts that all students will need to have in mind when they embark on clinical clerkships.
- In addition, uncommon problems may be included when the problems represent severe conditions that should be treated, i.e., that should never be missed.
- Cases should have educational value. They should include enough ‘meat’ to make an instructive session, preferably both clinically and in the field of the applied basic sciences.
- Cases should preferably represent various clinical domains and make students aware that clinical reasoning is applicable in every specialty.
- Cases that are interesting primarily from an ethical or communicative perspective may be less apt for CBCR, which must train students in clinical reasoning rather than get them acquainted with non-medical or ethical problems.

Cases may be derived from actual patients and then be adapted for educational purposes. Cases can be written by primary care doctors or by specialists and should focus on complaints from different domains. Medical specialist writers should be aware that most cases start when a patient visits a primary care doctor for the first time with an undifferentiated condition often not confined to one specialty. When writing a case, the complaint of the patient needs to be the central point of focus.

Common complaints (e.g. ‘headache’) may eventually turn out to be a less common diagnosis that, however, should never be missed (e.g. ‘meningitis’). The aim of clinical reasoning is taking various causal options into account. Cases can branch off in alternative scenarios (‘now suppose the lab results had shown no signs of an infection, what then would have been your hypothesis?’). The development of illness scripts in the student’s mind should eventually represent a network of related disease patterns with interlinks. That is why discussions about differential diagnoses and the use of alternative scenarios within a case are important.

CBCR courses can be conducted in several curriculum years. The complexity of the cases should therefore depend on the developmental level of the students. During the first year, students are not yet familiar with illness scripts; the students will not yet be aware of making a differential diagnosis and how to take a medical history. CBCR in the first year of medical school is possible but should deal with simple cases, and the reasoning process may take quite some time. The complexity of the case should increase over the years, and the time allocated to work through a case should decrease. More advanced student groups may handle two or more cases in a session or a case with several scenarios branching off. Still, independent of year and level of the student, a CBCR case always reflects an entire patient case from the moment that the patient enters the doctor’s office until the moment that a plan has been made for management.

## An Annotated Template for CBCR Cases

The following section of this chapter represents a template to write cases. We recommend following a standard template. Students should not be distracted by unnecessary variations in the format of case descriptions over a course, unless the content dictates so. It is therefore recommended to stick with one format across all cases. The format below has been proven useful for many years at UMC Utrecht. Before a series of cases are written, it is advisable to start copying this template (without the annotations between brackets), adapted if necessary, and then use it for all cases.

**All bold-face text is to be used for paragraph headings**

[Annotations and explanations are given between brackets]

This framework is an example. Cases may deviate from this framework, depending on the content of the case, on the insights of the case writer and for educational reasons.

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### **Title: A ... year old ... with ....**

[A CBCR title typically is the shortest summary of the patient presentation and always includes *age*, *gender* and *main complaint or problem*. A title should not be ‘Shortness of breath’, but it could be ‘A 23-year old man with sudden shortness of breath’.]

### **Introduction and Objective**

[An introduction for the case may be given. However, it should not disclose essential information that must be sorted out by the students during the case elaboration. This also holds for the objectives of the session. What may be stated in the introduction is the frequency or epidemiology of the type of problem with which this patient presents.]

### **Preparation**

Students need to prepare questions ... - ... at home.

[State here what students should prepare for this session from both preparatory reading and answering of questions. Literature may also refer to previous courses or specific references, websites, etc. Students have less literature to read for preparation than peer teachers. On average, student preparation time for a case is 2 h and for peer teachers 4 h. It is not useful to ask students to spend days preparing for a case – that will simply not happen, so limit the preparation to what is feasible.

All students need to answer some questions at home before the session. Typically these are all questions until the first additional patient information (handout) is provided by the peer teachers. Later questions may be speculatively answered.]

### **Assessment**

[Assessment for participation should be clarified here.]

### **Suggested Time Schedule**

[An estimation should be made of the suggested time per question during the 2 h meeting. This prevents spending too much time on the first question(s) and the need to rush for the last question(s).]

## **CBCR Case Stage I: Presentation of the Patient's Problem**

### **Case**

[This is where the actual case starts. A 'stage' is a period of time between two moments of provided patient information, so in between handouts. Stage I begins with an introductory text or vignette of, usually, 50–200 words, depicting the patient's initial story, question, complaint, or evident symptoms before history taking. This means that the information will only state that what the patient will tell the doctor directly, without having to ask for it. This section should stimulate the students to start thinking of additional history questions they want to ask the patient to gain more information. Stage I also introduces the doctor, referring to specialty, position, and location.

For example, '*You are a general practitioner. In your office, a 15 year old boy Victor, accompanied by his mother, presents in the morning with complaints of severe pain in the left leg, after a football match yesterday afternoon. Victor had a sleepless night, as his leg developed a reddish painful lump*'. Patient information should always be printed in italics.]

### **Question 1 State in your own words what the main problem seems to be**

[This question may be phrased differently, but should typically reflect the first thoughts of the doctor; i.e. what diseases or major disease groups can you think of?]

### Hints for peer teachers

[After each question, one or more hints for the peer teachers are given. These are not printed in the students' version, but are included in the consultant's version. These usually do not disclose the answer to the question, but help peer teachers to guide the group process. If questions are difficult, references may be given.

Peer teachers can get pedagogical instructions in the hints, e.g. that they should always first ask student-members of the group to answer the question and only then react to the given answers. It is important to realize that all students of the group must be stimulated to think along. Direct answers from the peer teachers or from the consultant often block students from active involvement].

#### Background information for the consultant

[After each question also ‘background information for the consultant’ is given. It includes the answer and sometimes variations of the answer to the question and explanatory details.

Remember that consultants are clinicians, but not necessarily a specialist on this particular subject. It is important to provide basic background information so they are able to help the students when they get stuck. References may be given, but information that is not instantly available may not help very much on the spot].

**Question 2 Provide all hypotheses you have at this moment about the pathology and the cause of the signs and symptoms, grouped in three categories (I: likely, II: less likely, III: not very likely, but not excluded)**

[Before history taking, physical examination, and investigations, the clinical reasoning is guided by hypotheses. This is a sample question to train students to develop hypotheses and, at the same time, to weight the likelihood of cases.]

#### Hints for peer teachers

[Peer teachers may be provided with general categories of causes, i.e. cardiovascular and metabolic.]

#### Background information for the consultant

[Consultants should get a list of hypotheses.]

**Question 3 Which questions should be asked to discriminate between the most relevant hypotheses?**

#### Hints for peer teachers

[Peer teachers should stimulate students to formulate questions in a way to ask it directly to the patient, i.e. *when do you experience this complaint?* Every student should think of at least two questions. A suggestion for the peer teachers could be to let one student think of a question and let his/her neighbour tell how this helps in differentiating between hypotheses.]

#### Background information for the consultant

[Consultants need to be provided with a list of the most common questions and how the answers can differentiate between several causes.]

**Table 8.1** Hypotheses versus findings

	Hypotheses			
	Migraine	Cluster headache	[Hypothesis 3]	[Hypothesis 4]
Complaints since 2 weeks				
[History information b]				
[History information c]				
[History information d]				

## Stage II: Results from History Taking Are Provided

### Question 4 How does this information influence the differential diagnosis?

#### Hints for peer teachers

[Peer teachers should make sure that the information that is given in this handout was also asked for by the students during the previous question. If needed, the consultant can stimulate to do this.

Peer teachers should now be asked to draw a grid table on the blackboard or flip chart, as shown in Table 8.1.

This chart forces students think of why which questions are asked by the doctor.

Which information from history taking is important for which hypothesis?

A (+) should be added in the table when an answer pleads for a hypothesis. A (−) should be added if the answer pleads against a hypothesis, and a (+/−) should be added if an answer does not differentiate.]

#### Background information for the consultant

[Consultants should receive a full sample chart, filled out by the case writer.]

### **Handout 1**

*(shown on the screen and read out loud)*

[Peer teachers provide the results of the history taking. This information is printed on a handout or projected on a screen. If it is short, it may suffice to have peer teachers read the information. The handout text can then be provided at the end of the session together with other patient information. If the history information is very long, it may be helpful to provide a real handout at this stage during the session. A reading break is then necessary. In that case students also practice to filter the essential information from the handout.

Peer teachers find the handouts in their CBCR case description. The information in the handout is written as a story, i.e. *‘The headache started suddenly 2 weeks ago and the patient was forced to stay in bed with the lights of. She never experienced anything like this before. Etc...’*. A uniform layout for the patient information is printed in italics.]



**Question 5** Which parts of physical examination are required, in order to exclude some unlikely, but important hypotheses? Which examinations are necessary to confirm the most likely hypothesis and to discriminate between others?

Hints for peer teachers

[Students should be stimulated to argue specifically why they want to perform a certain examination. Peer teachers can write down for every remaining hypothesis what the students expect to find.]

Background information for the consultant

[Consultants should receive a full sample chart, filled out by the case writer.]

### Stage III: Results from Physical Examination Are Provided

#### Handout 2

*(shown on the screen and read out loud)*

[Peer teachers read out loud the findings with physical examination, or, if necessary because of its length, hand out this information (text in italics). This could give a full picture of the physical findings (PE), or may just give a focussed result of the PE. Depending on the case, some new PE information may be provided later, if it appears to be necessary to complete the physical examination at a later stage. The information in the handout is written as a story.]

**Question 6** Which hypotheses now remain as a differential diagnosis to be investigated further?

Hints for peer teachers

[Peer teachers may draw a similar table as with Question 4, or extend the table at the lower side to include the physical examination and then walk through all initial hypotheses and confirm which are left over to be considered.

A (+) should be added in the table when an answer pleads for a hypothesis. A (–) should be added if the answer pleads against a hypothesis, and a (+/–) should be added if an answer does not differentiate.]

Background information for the consultant

[Consultants receive the table with the results from the PE and how the results influence the remaining hypotheses.]

**Question 7** Which Diagnostic Investigations Need to Be Done to Confirm or Exclude Remaining Diagnoses?

Hints for peer teachers

[Depending on the stage of the students in their curriculum, they may have much knowledge of diagnostic procedures or not. But even students with primarily basic science knowledge must be able to speculate on what is physically wrong and how one would learn to know what is the matter. Hints provided for the peer teachers may be, e.g. *think of specific haematological and/or radiological tests.*]

#### Background information for the consultant

[A list of answers is provided for the consultant. For non-common diagnostic tests, a brief overview of the expected results is given as well.]

#### **Mini Lecture by One of the Peer Teachers**

[This could be a good moment for a mini lecture. One of the peer teachers gives a short explanatory presentation (5 min) on aspects of pathology or pathophysiology as assigned by the case writer.

The goal of the mini lecture is to provide additional information for the students about the main complaint or certain group of diagnoses, diagnostic tests, or treatment. It should not, however, reveal the eventual diagnosis to the peer teachers. So in a case about abdominal pain, the mini lecture could be about the difference between Crohn's disease and ulcerative colitis. Peer teachers need to be provided with clear instructions what the mini lecture should be about. Moreover, since it is a *mini* lecture, the talk should be limited to essentials.]

#### Hints for peer teachers

[The mini lecture is meant to provide the students with information they can directly apply in the continuation of the case. Peer teachers should therefore make sure that the information in the mini lecture is directly applicable (i.e. explanation about pathophysiology or pros and cons of certain diagnostics). The mini lecture is by no means meant for the peer teachers to comprehensively show how much they know, but it is meant to teach the students. Peer teachers should make sure the information reaches the students.]

#### Background information for the consultant

[Since the consultant might not be a specialist on the subject, basic background information should be provided. The background information provided for the consultant may be more extensive than what the peer teachers are going to tell. Consultants should also be instructed that the goal of the mini lecture is not to examine the peer teachers like in an oral examination but to let the peer teachers teach the students.]

### **Question 8 Try to Estimate What the Investigation Costs Are in Terms of Burden for the Patient and Cost for the Hospital**

[This question is optional and meant to train students in decision-making from a different perspective than pure medical.]

#### Hints for peer teachers

[Peer teachers can be referred to literature.]

#### Background information for the consultant

[Give summarized information for the consultant.]

## Stage IV: The Results of Diagnostic Tests Are Provided

### Handout 3

*(shown on the screen and read out loud)*

[Peer teachers distribute a handout with the findings from all diagnostic tests (text in italics). Results are given including their units and reference values. Radiological results or ECG results may be given as images as well, but peer teachers may need hints how to interpret and discuss them.

Depending on the case, some new results of advanced diagnostic tests be provided later, if it appears to be necessary to do further investigations a later stage.]

### Question 9 Interpret the Findings from the Diagnostic Tests. How Much Certainty Do They Give About the Hypotheses?

#### Hints for peer teachers

[Peer teachers may try to discuss specificity and sensitivity of these diagnostic tests; hints may lead them to do so. Also students may be asked to discuss if results that are slightly high/low still influence the differential diagnosis.]

#### Background information for the consultant

[Consultants are provided with evidence-based answers if possible.]

### Question 10 Which Diagnosis Prevails Now?

#### Hints for peer teachers

[Peer teachers don't need many hints here.]

#### Background information for the consultant

[Consultants should be provided with the answer, sometimes with arguments.]

### Question 11 Given this diagnosis and patient circumstances, which therapy or policy for care is now indicated? What is the prognosis if the patient is treated? What if the patient would not be treated?

#### Hints for peer teachers

[Peer teachers can be given hints, i.e. *think of non-pharmaceutical or pharmaceutical options/does the patient have any prehistory that makes a certain therapy more suitable/is there a difference in prognosis on the short (24 h) and long term (3 months)?*]

#### Background information for the consultant

[Consultants are provided with the correct answers.]

### Mini Lecture by One of the Peer Teachers

[Usually only one mini lecture is given during a case as it decreases the time left for clinical reasoning. This could, however, also be a good place to insert a mini lecture

if it is about therapy options with pros and cons for each option. (Instructions how to write a mini-lecture are given after question 7.)

One of the peer teachers gives a short presentation about relevant therapy options.]

**Role-Play** The information about the required or suggested therapy is conveyed to the patient. One of the students is the doctor; one of the peer teachers plays the patient. Try to explain the cause of the disease in clear language and the reason for the proposed therapy in understandable words. The other students listen and may comment afterwards.

[A role-play is optional but can be interesting in case of a difficult or controversial investigation or therapy. A role-play should not take more than 5 min and should not focus on empathy and communication skills (which takes too long and other courses are more suitable for such competency objectives) but on the skill to summarize the medical problem in plain words. Role-plays are not frequently used in CBCR cases.]

## Stage V: Information Is Provided About the Results of the Therapy Policy

### Handout 4

*(shown on the screen and read out loud)*

[Peer teachers read out loud the therapy that has been given and the effects of it on the patient's condition over a period of time. The information in the handout is written as a story. Depending on the particular situation and the educational objective, the CBCR case may continue if the therapy is followed by a renewed presentation of the patient.]

**Question 12** One of the students from the group summarizes the whole case chronologically in a few minutes

[This question is meant to train student to summarize cases in an efficient way, as they will often have to do this in the clinical years. It also urges students to keep alert during the whole session.]

It is possible to make a distinction between an oral and written summary since an oral summary only contains a minimum of information but a written summary might also contain negative findings for this patient, which allows supervisors to know that the student has asked the patient for it. Less advanced students can use a mnemonic aid to summarize, while more advanced students should be able to give a case summary in two to three sentences.

Hint for the peer-teachers

[If necessary, students may be helped to summarize using the format.

During the office hour I saw a ... year old male/female with complaints of... As relevant prehistory I mention... Relevant medication is ....

The major problem during the history is ... During the physical examination we saw ... Additional tests showed ... (special findings or no findings). In conclusion, we saw a ... year old male/female with probably ... (work diagnosis) for which we want to start... (additional testing or policy). In the differential diagnosis we still think of...]

## Scenario B

**Suppose that the results of the Stage IV diagnostic test were different.**

[Peer teachers now optionally present a different Stage IV handout, and the questions and the case develop in a different direction. Alternative scenarios may start at any stage II, III, or IV, but should always be compatible with the initial stage I.]

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It takes time to write a proper CBCR case – think of a day to a week – but great cases can be used many times and year after year. The Utrecht habit is to collect evaluation data about cases to rewrite and improve cases every year. With multiple institutions applying the CBCR method, exchange of cases is recommended. In some cases senior medical students may be asked to draft a case in the area of their interest. Experienced clinicians may edit such cases for accuracy. A high quality CBCR case should be regarded as scholarly output of a clinician educator, similar to a research paper by a clinician.

## References

- Dolmans, D., et al. (1997). Seven principles of effective case design for a problem-based curriculum. *Medical Teacher*, 19(3), 185–189.
- Kim, S., et al. (2006). A conceptual framework for developing teaching cases: A review and synthesis of the literature across disciplines. *Medical Education*, 40(9), 867–876.
- Schmidt, H. G., Rotgans, J. I., & Yew, E. H. J. (2011). The process of problem-based learning: What works and why. *Medical Education*, 45(8), 792–806.

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