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Emergency Medicine



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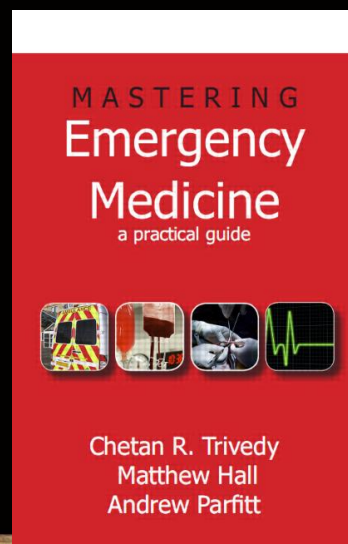
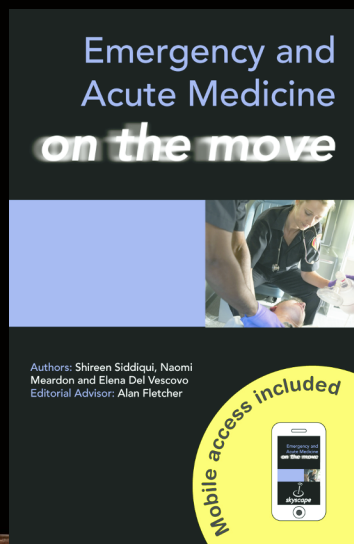
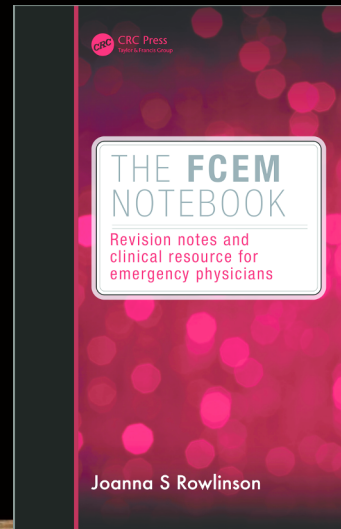
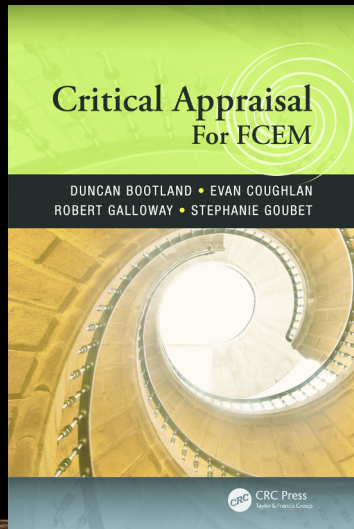
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Introduction

The speciality of emergency medicine (EM) has come a long way since the first examination for membership of the faculty of accident and emergency medicine (MFEAM) was conducted in 2003. Since then the examination has gone through many iterations, through the membership of the college of emergency medicine (MCEM) until finally, after getting its Royal charter in 2015, the MRCEM and FRCEM were merged to form the FRCEM (primary), FRCEM (intermediate) and FRCEM (final), with the stand alone MRCEM still being valid in some overseas countries such as India.

Sitting the exam in 2005 there was not a single book which EM trainees could use to prepare for the much dreaded MCEM exams. I, like many trainees, had to rely on rumours from colleagues on which texts to revise from and the best way to prepare for the OSCE component. This was unlike our medical and surgical colleagues, who relied upon a huge number of standard texts to support them through exams such as FRCS and MRCP. It was not until 2009 that the first revision guides tailored to the requirements of EM started to appear on the market. This gave those wishing to succeed in the College exams a chance to focus their knowledge, as the standard large reference EM tomes available up to that time, while comprehensive, had not been written with the requirements of the UK exam in mind.

The exam itself is a formidable challenge with the College requiring the candidate to have a good knowledge of basic anatomy, more than a passing interest statistics and critical appraisal, a detailed knowledge of guidelines and protocols, data interpretation, and management and dissertations skills, and a high level of performance in the objective structured clinical examination (OSCE). This latter component many found particularly tricky because it not only tested practical skills but also assessed soft skills such as communication and negotiation skills, as well the ability to demonstrate characteristics such as compassion and empathy. The low pass rates confirmed the high standards and the prestige the MRCEM and FRCEM status afforded successful candidates.



It is sad to admit that exams are one of the biggest drivers for students and trainees to learn. Over the past six years there has been a slow but steady interest from publishing houses on EM as a choice for new books. Having worked on two of these books as labours of love (*Mastering Emergency Medicine* and *Get through MCEM Part B Data Interpretation*) I appreciate completely the work and time required to produce material that will take the reader through an educational safari, pointing out the subtle and often neglected areas which are required to be successful in this challenging exam.

The following is a collection of chapters from a range of EM-related publications from Taylor & Francis that I have selected based on their relevance and importance for the RCEM examinations. I hope they may tempt the reader into reading more. It is only after passing the exam that one really gets a full appreciation of the breadth and depth of knowledge one has acquired through the careful distillation of others who have toiled on behalf of future candidates to hone the facts to a point they can be best absorbed. My hope is that this trend will continue and we will be able to grow the number of titles available for the EM team of the future, so that we support future generation of health care professionals to achieve the pinnacle of clinical care for their patients.

Yours Sincerely,

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01:: **Critical Appraisal**

- Chapter 5: How to dissect a paper
- Chapter 9: Passing the exam

5 How to dissect a paper

Papers are not single units; they consist of multiple parts. In this chapter, we look at what these parts are. This chapter refers predominantly to interventional trials, whether diagnostic or therapeutic, as this is what is needed for FCEM. We also explore the different facets of study design, and, over the next few chapters, how it impacts on critically appraising a paper.

The purpose of research is to answer a clinical question, which we all meet in our day-to-day clinical practice. For example in a patient with a wrist fracture, we might ask ourselves a number of questions: which is better to make the diagnosis, x-ray or ultrasound (diagnostic study) or whether haematoma block or a Bier's block is a better anaesthetic (therapeutic study). To answer this we would need to perform a literature review and if we find there is insufficient evidence to choose one over the other, it may prompt us to do a study.

In a study, we enrol a sufficient quantity of patients and once we have the raw data we use statistics to present the evidence and decide whether one is better than the other. We can then answer our question in light of our results plus any previous research. We're now in a position to write our paper and submit it for publication.

Prior to 1993, the way in which studies were written for publications varied tremendously. The CONSolidated Standards Of Reporting Trials (CONSORT) statement has meant that randomized controlled trials (RCTs) should now be reported in a specific way. A full description of the CONSORT statement is available online at <http://www.consort-statement.org>. This systematic way of presenting studies is aimed at therapeutic studies; however it is equally valid for diagnostic papers.

Putting it into the simplest terms, papers can be divided into the following sections.

- Title: a quick to read explanation of what is being studied
- Abstract: a short summary of the whole paper
- Introduction: states the clinical question and a summary of the findings of the authors' literature review
- Methods: explains how the study has been designed
- Results: shows the number of patients enrolled, those who dropped out and what the researchers' findings were
- Discussion and conclusions: explains the results in the setting of previous research and answers the clinical question

Now, let's discuss these sections in more detail.

TITLE

The first thing we notice on picking up any paper is the title. The title is often used to sieve papers when performing a literature review and as such is important. The title should be clear and give us an idea of what clinical question is being studied. It may also give an indication of the study design.

ABSTRACT

An abstract is a summary of the whole paper, usually set out in the same way as the main text. It allows the reader to get a feel for what was done, what results were found and what conclusions were drawn by the authors but will not allow the reader sufficient detail to properly appraise the paper. It does however allow a second level of sieving of papers when performing a literature review. In the FCEM critical appraisal examination you will not be provided with the abstract of the study.

INTRODUCTION

The introduction should state the research question the authors have designed the paper to answer. It should describe the importance of the clinical question, what is already known about the clinical question and why further study is necessary. *The research question can usually be found in the last paragraph of the introduction – this is an important shortcut in the context of the FCEM exam.* Once we know this information, we can decide if we think that the clinical question is important and relevant to our practice.

At this point in reading the paper, it's valuable to think about how *you* would have designed a study to answer the question the authors have set themselves. As you read through the methods compare the design that the authors have chosen to the one you would have chosen.

METHODS

The methods section describes the design of the study and how it was subsequently run. There may be an ideal study design, but this may not be practical for many reasons such as finances, ethics or availability of patients. The study design takes these practicalities into account but in reality, trials do not always run to the protocol they were designed to follow.

The elements that should appear in the methods section of a trial can be remembered by the acronym 'PICOT':

- P – Population
- I – Intervention
- C – Comparison
- O – Outcome Measures
- T – Time

POPULATION

The first thing to check in assessing the methodology of a study is the population being studied.

- How did the authors pick their study population?
- Where was it set: in the ED, in an outpatient clinic, or somewhere else?
- Is the study population representative of the population that we are interested in, i.e. emergency medicine patients?

Now consider who was included and who was excluded:

- What were the inclusion criteria?
- Did they include all the patients we would have included?
- What were the exclusion criteria?
- Were any groups of patients excluded that should not have been?

Having too strict inclusion and exclusion criteria may lead to an experimental group that is no longer representative of the population as a whole. This is known as diagnostic purity bias.

Next, think about the sample size in the study:

- How did the authors come to this sample size?
- Did they calculate it using a sample size calculation and if so did they quote all the factors required for this calculation?

In many diagnostic studies the sample size calculation is not mentioned in the paper; however it should be.

Finally we consider how we draw our sample from the general population.

- What type of sampling did the authors use?

When taking a sample, we want it to represent the population in which we are interested (Figure 5.1). There are many different methods of taking a sample.

- *Random sampling* is where patients are randomly taken from the population in which you are interested.
- *Systematic sampling* is where every n th patient is chosen (n th can be any number, e.g. every third or every fourth, etc.).
- *Stratified sampling* involves taking a random sample from different strata of a population, e.g. a random sample from smokers and non-smokers. Generally the best method is for the numbers in each sample group to reflect the size of each of these groups in the general population. For example if 30% of the population were smokers and we were to sample 100 people

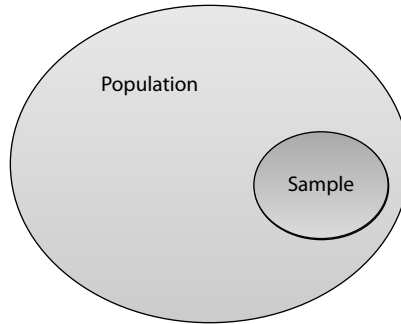


FIGURE 5.1 Sample size in respect to population.

then 30 people would be enrolled who are smokers. Stratified sampling may allow for a smaller sample size to be used and hence can be more cost-effective. It provides for a more representative sample and can allow better inferences to be made about specific subgroups.

- *Cluster sampling* is where instead of enrolling individual patients, we enrol groups of patients. Imagine we were looking at the impact of *bare below the elbows*. We could look at 10 hospitals where we compare bare below the elbow and 10 where we don't. We would have enrolled the hospitals, not the individual patients. Cluster sampling can be used when sampling of individuals is difficult or impossible. A regular example of this is in papers examining changes in service delivery. However, cluster sampling may not reflect the diversity of the population as a whole and sampling errors are more common. If you take a random sample of clusters it is a one-stage cluster sampling; if you also take a random sample within each cluster as well as a random sample of clusters, this is known as a two-stage cluster sampling.
- *Convenience sampling* is a sample taken when it is convenient for the researchers of the study, for example enrolling patients during office hours. This method of sampling is quick and easy but is prone to bias as the sample is likely not to be representative of the whole population.
- *Consecutive sampling* is similar to convenience sampling but with this form of sampling we try to enrol every patient who is available to us.

Fundamentally, we need to know whether the sample is representative of the population the authors wanted to study and of the population we are interested in.

INTERVENTION AND COMPARISON

In therapeutic studies, those enrolled undergo some form of intervention, which is compared with current practice or another treatment. In diagnostic studies we

compare a test with a gold standard. We discuss these types of studies in more detail in Chapters 6 and 7, but when reading a paper it is important to ask the following questions:

- What is the intervention in the study? What treatment or diagnostic test is being looked at?
- What is the comparison? In a therapeutic trial, what is the control and in a diagnostic study, what is the gold standard?
- What are the baseline characteristics of the patients and in therapeutic trials are they the same between these two groups?
 - Generally, ‘Table 1’ in the paper gives a list of patient baseline characteristics and it is always worth looking at this to make sure that there are no obvious differences between the groups.
- Have the authors identified any confounding factors? If so, how have they been taken into account?
- If none have been identified, are there any confounders that should have been taken into account?

There are specific questions to ask for therapeutic and diagnostic studies that are covered later. Do not worry if you are unsure of some of the concepts mentioned here, as we cover them in the next chapter.

OUTCOME MEASURES

The type of outcome we look at depends on whether it is a diagnostic or a therapeutic trial. In therapeutic papers we need to ask:

- What are the outcome measures?
- What is the primary outcome measure?
- Is this appropriate?
 - Outcome measures should be reliable (they should give the same result each time a measurement is performed if there has been no change), valid (how well they measure what we are expecting it to measure) and responsive (able to detect a change).
- Is the outcome measure clinically relevant, such as mortality or is a surrogate end point used?
 - A surrogate end point is an outcome measure that is used instead of a clinically relevant one, usually because it allows the trial to be smaller and to take less time. It also allows studies to be performed that would otherwise not be possible due to cost or an inability to enrol enough patients, e.g. using gastric pH instead of rate of GI bleeding when looking at proton pump inhibitors.

In diagnostic studies the outcome measure is a measure of the ability of the test under investigation to diagnose the disease.

TIME

It is important to assess if adequate time has been allotted to enrol and follow up patients.

- How long did it take to enrol the required number of subjects?
 - Taking a long time to enrol might suggest that the inclusion and exclusion criteria were too restrictive.
- Were patients followed up and if so, for how long and was this length of time appropriate?
 - Ideally patients should be followed up for an adequate period to determine whether they return to full function or have any complications of the treatment.
- Were there many dropouts and if so why did they drop out?
 - It is not unusual for patients to drop out of a study or be lost to follow-up. However, if this number is large it may be because of treatment side effects or a difficult to tolerate regimen, which may limit the treatment's usefulness. The authors should explain why patients dropped out so we can assess this.

RESULTS

The results section of the paper tells the findings of the study. It should tell how many patients were enrolled and how many patients dropped out or were lost to follow-up. We must consider:

- Did the authors enrol the required sample size?
- How many patients were excluded?
- How many patients dropped out or were lost to follow-up?
- Were all the patients compliant with the study protocol?
- Is the number of patients who dropped out of the study similar to the number estimated by the authors when they performed their sample size calculation?
- What was the number of protocol violations?
- Did the authors take into account dropouts and protocol violations in their analysis?
- Is there a CONSORT flow diagram or similar graph? (See Chapter 6.)
- Have the authors reported the appropriate statistics?
 - For therapeutic trials the authors should mention relative risk, absolute risk reduction, relative risk reduction and number needed to treat. For diagnostic studies they should quote sensitivity, specificity and ideally likelihood ratios and predictive values as well.

The authors should present their results in a way that can be easily understood by the reader. You should be able to draw a contingency (2×2) table from the data and ensure that the authors correctly quoted statistics. You might think that the quoted statistics are never wrong, but it can happen.

DISCUSSION AND CONCLUSIONS

The discussion should critically look at the study, outline how the results of the study fit into the current literature and explain how the authors have come to the conclusion they have. It should give us the limitations of the study and explain any ways in which the authors tried to take these into account. When reading the discussion and conclusion section consider:

- Are the results a surprise or expected?
- Why do the authors think this is?
- What limitations do the authors give?
- Are there any other limitations the authors haven't mentioned?
- Are their conclusions valid?
- Do they match your own conclusions?

At this point it is important to consider the validity of the study. There are two types of validity: *internal validity* and *external validity*. Internal validity is our assessment of the methodology of the study and whether this permits us to believe the results from this sample of patients. External validity is the extent to which the study can be extrapolated to the wider population beyond this sample of patients and in particular to our own local population.

After having decided about internal and external validity, the next thing to decide is whether the result of the study is important for your patients. If it is, then consider implementing it. This is not as easy as it sounds; there are many barriers which may prevent implementation of the intervention. We remember this as the 4 Bs:

- **Badness:** What harms are caused by the intervention?
- **Burden of disease:** Is it so rare that no one cares?
- **Budget:** Can we afford to make the changes?
- **Beliefs:** How will we educate people about this new intervention and how will we deal with intransigent colleagues?

OTHER FACTORS TO CONSIDER

BIAS

Bias is a systematic error in the way observations were made, or the experiment is carried out, which leads to inaccuracy. Many types of bias have been described. Figure 5.2 and Table 5.1 give a list of the most common types of bias. Although we have listed a number of types of bias for information, it is more important to understand that bias leads to inaccuracy and how bias occurs, rather than knowing the name of each type of bias.

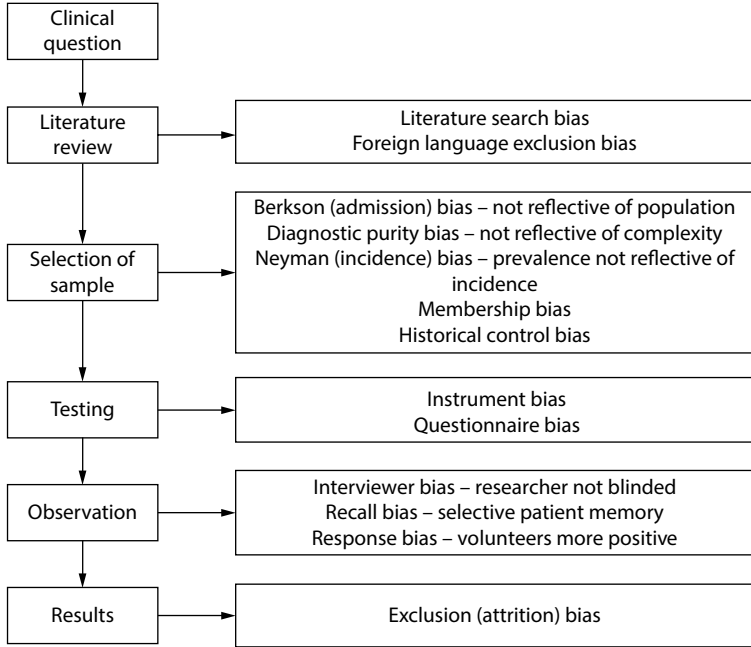


FIGURE 5.2 Types of bias from each stage of a study.

Bias can be combated by means of:

- A comprehensive literature review
- Consecutive patient enrolment
- Prospective study design – designing the study before you collect data
- Randomization
- Concealed allocation
- Blinding
- Use of intention to treat analysis

AUTHORS AND INSTITUTION

The list of authors of the paper is given a highly prominent and therefore important place in the writeup of any study. We need to be aware of the potential for our opinion about a paper to be influenced by the person or people who have written it. There are certain authors whose papers we are more likely to read and whose conclusions we are more likely to believe. This is particularly true of those authors who have a research pedigree. It is reasonable for us to consider that studies performed by these people are likely to be of good quality but we must never lose sight of the fact that each paper must be judged on its individual merits.

TABLE 5.1
Types of bias

Type of bias	Type of study	Explanation
Attrition	Therapeutic	Loss of subjects in a study leading to inequality between the two groups in respect to exposure and/or outcome.
Berkson	Case control	Patients who present to hospital may not be representative of community as a whole.
Diagnostic purity	Therapeutic	Exclusion criteria are too tight and so the study group may not be representative of the complexity of disease in the community.
Foreign language	Systematic review and meta-analysis	Less likely to include studies not published in English in a literature review.
Historical control	Observational	Apart from the intervention being studied, there may be a difference in management and prognosis between the research group and the controls simply because medical care improves (or should improve) over time.
Interviewer	Observational	The interviewer’s opinions, prejudices and even non-verbal cues may influence the responses of subjects.
Language	Meta-analysis	English language papers are more likely to be published.
Literature search	Meta-analysis	Studies are more likely to be used if from a journal with a better reputation in a literature review.
Measurement	Diagnostic	Inaccurate measurement tool used.
Membership	Therapeutic	People who choose to be members of a group may differ in important respects to the general community.
Multiple publication	Meta-analysis	Variations of the same research or even the same study published in different journals.
Neyman	Observational	A bias seen in observational studies where we look at the links between a risk factor and the chance of getting a certain disease. If that disease causes the death of patients and our study only looks at survivors at any one point, we may underestimate the effect of the risk factor.
Non-respondent	Observational	Responders may differ significantly from non-responders.
Publication	Meta-analysis	Positive results are more likely to be published.
Questionnaire	Observational	Questions may be written to lead the respondent towards a particular reply.
Recall	Observational	Subjects with the disease are more likely to remember a potential causative agent than controls.
Response	Observational	Subjects may shape their response in order to please the interviewer.

It is also worth taking note of the institution or institutions in which the study was performed. Some institutions, like some authors, will be renowned for high quality research but remember that the environment in which the study is run impacts heavily on its external validity.

FINANCIAL INTERESTS

We have mentioned that studies cost money to run. Ask yourself:

- Where did the money come from for the study?
- Did the authors have any financial interest in the results of the study?

REFERENCES

The last section of the paper is the reference section. You might question the use of a list of studies. In fact the reference section is often a goldmine of information. When reading the paper look through the reference list to see what foundation the authors have built their study upon and to check whether you think they have missed any significant papers from the literature. Assess whether the number of references given, and the papers that the authors have drawn them from, represent a reasonable evidence base for the study performed.

PUBLISHING JOURNAL

A final point to note is in which journal the paper has been published. In the same way as considering who the authors are, we need to remember to not be too influenced by what journal a paper is published in, but to be aware that the larger journals have a bigger reviewing staff and in-house statisticians to check the internal validity of a trial before it is published. Because of this, most people feel instinctively more confident in the results of papers published in the bigger journals.

Many journals have an impact factor associated with them. The impact factor of a journal reflects how widely the papers it publishes are cited in the medical literature and as such can be seen as a measure of how important or 'big' a journal is.

TAKE HOME MESSAGE

1. A study consists of many parts and these can be divided into title, abstract, introduction, methods, results, discussion and conclusions.
2. The methods section can be divided into PICOT (population, intervention, comparison, outcome measures and time).
3. When reading a paper, consider the factors that are affecting internal validity and the factors that are affecting external validity.
4. There are many forms of bias – knowledge of each individual type is not necessary but understanding the concept is.

9 Passing the exam

Let's face it – passing the exam is why you've bought this book. The thought of missing out on a consultant post and not getting rid of your registrar rota because of a lack of knowledge of p-values is not a pleasant one.

The critical appraisal exam (and FCEM as a whole) is an incredibly good exam. It is challenging and requires a high standard of clinical acumen to pass and it covers the areas needed to help us function as senior emergency medicine doctors. Learning how to appraise papers is an essential requirement for a senior doctor – both to shape your practice as a 'best' evidence based clinician and also to help make decisions on departmental policies.

Historically, the critical appraisal exam has had a poor pass rate. Some people feel the exam is too hard – but we disagree; the exam is very fair. The exam is there to test your ability to critically appraise a paper and understand the process. It is not about turning you into a medical statistician. The questions are generally predictable and relevant, and require knowledge and understanding rather than rote formula learning; core concepts are examined and not 'far-out' minutiae.

But most importantly, the exam tests what you need to know – i.e. as consultants how will you assess the papers you read and how will that change your practice and departmental policy?

So why do people fail? There are generally three reasons: lack of preparation leading to lack of knowledge and understanding, lack of exam technique and lack of exam practice.

By this point in the book, we have addressed the knowledge and understanding aspects and over the next two chapters we move on to exam technique and practice.

Because the exam is often tight for time, those who have done multiple mock exams often do the best. There are lots of mock exams out there – practise them in exam conditions with colleagues and discuss the answers together. Even better, find recent relevant papers, set your own exams and go over the answers. By practising multiple papers, you will embed your skills and knowledge to make sure you pass. We have provided some mock examinations for you to use at the end of this section.

EXAM TECHNIQUE

Everybody who goes on an exam course or reads an exam preparation book thinks the exam technique section will just be common sense. There is no exception here, but (and a big but) there are specific tactics we used to pass FCEM and we advise others to use – and these have worked well for many candidates.

The first thing to remember is that the exam is often very tight for time – especially if there is a long journal article. You must use your time very carefully. The key is

reading the questions first and *then* reading the paper so you know where to concentrate your efforts. While reading the journal article, use a highlighter to make a note of key points, and write over the paper which question the key point is relevant to.

The questions are usually predictable and over the years have followed a standard format. (This is true up to the exams in 2014 when this book was written and we see no reason why the standard format would significantly change.)

There are usually six to eight questions. Each carries a certain number of marks; the number of marks is stated alongside the question. Trying to predict the pass mark is usually not helpful. Just try and get as many points for each question as possible.

The best way to pass is make sure you get the full marks for the questions that require the least amount of effort. These are often the first and last questions, and we suggest you consider answering these initially, as you don't want to run out of time and not have answered the 'easier-to-score' questions.

When answering questions, remember that you need to write in pencil (so you can rub out) and also you must stay within the boxes and (for question 1) word count. The boxes and associated marks for each question give an indication of how long the answer needs to be. It goes without saying that you should write in a sensible and readable size – sadly, people have actually failed because of their handwriting. The examiners have multiple papers to mark, and so you need to make it easy for them to give you the marks. Write clearly and legibly; when practising exams do it in pencil to get used to it. Writing in bullet points and underlining key points is acceptable, as is writing in capital letters.

Finally, just in case, bring your own pencil, rubber, sharpener and highlighter. Unfortunately, *you will not be allowed to take in calculators.*

Prior to answering any of the questions, there is one thing you must do. *It is imperative that you work out very quickly what type of paper you are reading.* Invariably it will either be a diagnostic paper or a therapeutic paper. (However there is no reason why the College cannot use a meta-analysis of these types of papers. Theoretically they could also use any other type of paper – but this has not yet happened and as therapeutic and diagnostic papers are the most important for EM doctors, we would doubt that this format would change.)

It should be very obvious what type of paper it is, but a large number of people who fail do so because they don't recognize what type of paper they are reading and thus how they should answer the questions. So, right at the start, think 'Is there a test being investigated (diagnostic paper) or is the paper looking at differences between two treatments (therapeutic paper)?'

We recommend that as soon as you have recognized what type of paper it is you write this at the top of your answer sheet.

The format of the questions is usually along the following lines:

- Question 1: Always a summary
- Questions 2–4: Usually about design and methodology of the trial
- Questions 4–7: Something about statistics and mathematics, which may be simple calculations, e.g. sensitivity
- Question 8: Your interpretation of the strength and limitations of the paper

QUESTION 1: A SUMMARY (USUALLY 7 MARKS)

These are the easiest marks in the paper to get – so make sure you get them. The question will read something like this:

Provide a no more than 200-word summary of this paper in the box provided. Only the first 200 words will be considered – short bullet points are acceptable. Maximum of seven marks.

Do as the instructions say. Provide a summary – not your interpretation, not the whole paper regurgitated, not if you would implement their findings. Nothing but the summary; a bit like an informal version of what you would expect in the abstract. The beauty of this question is that there are 7 marks for literally copying sentences from the paper – a bit like when the medical senior house officer (SHO) gets praised for copying your clerking.

In many ways this is a brilliant but simple question – it asks if you have understood the paper well enough that you can distil it down to the abstract. You should have no problem with this as long as you have practised doing this a number of times before the exam.

When writing the summary, think about the following points:

- It needs to stand alone, so don't refer to other specific papers.
- There is no need to detail the background information.
- You need to include results as well as statistics (don't just say that the treatment worked or the test was good). You must include the primary outcome, but may wish to include some of the secondary outcomes if they were important.
- Use the author's conclusions, not your own.
- Do not write your opinion of the paper – you will get a chance later in the exam.
- *The key point*: This is not a checklist assessing the quality of the paper. Many people make this simple mistake and lose out on very easy marks.

What goes into a summary depends on the type of paper: diagnostic or therapeutic article.

THERAPEUTIC PAPERS

You should include all the following sections to ensure you cover all the areas that could generate a mark. The College's marking scheme may be shorter than your summary but by including all the details you should cover all the bases.

It is often best if you start by writing out the headings and underlining them and then filling in the details as you go along. This makes it easier for the examiner to see where you have scored points. Bullet points are acceptable. The key sections are in italics:

- Objectives
- *Design*

- Setting
- *Population*
- Methods
- *Intervention/treatment*
- *Control*
- Outcome measurements
- *Results* – state the results that the authors give but it's especially important to give relative risk, number needed to treat and associated statistics.
- *Conclusions*

As with every list in medicine, there are various mnemonics to remember this by. We advise you to make up your own.

The key is to state that it is a therapeutic trial and to state how it was designed. You also must be sure to state the intervention and control. However, it can be hard to work out how much detail to put into this answer. An example is given here.

Austin et al. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in pre-hospital setting: randomized controlled trial. *BMJ* 2010;341:c5462

Question 1: Provide a no more than 200 word summary of this paper in the box provided. Only the first 200 words will be considered – short bullet points are acceptable. Maximum of seven marks.

Objective	To compare pre-hospital high flow oxygen with titrated oxygen therapy for patients with acute exacerbations of chronic obstructive pulmonary disease
Design	A therapeutic trial – interventional, non-blinded, cluster randomized, controlled, parallel group trial
Setting	Pre-hospital patients attended by the Tasmanian Hospital Service between July 2006 – July 2007
Population	All patients were admitted to the Royal Hobart Hospital, Tasmania 405 patients aged ≥ 35 years with breathlessness and a history or risk of COPD Risk of COPD defined as greater than 10 pack years
Intervention and control	Titrated oxygen in the pre-hospital setting High-flow oxygen in the pre-hospital setting
Primary outcome	Pre-hospital and in-hospital mortality
Results	An intention to treat analysis was performed. The mortality in the intervention group was 4% compared to 9% in the control group and this reduction was significant (RR 0.42, 95 CI 0.20–0.89, $p = 0.02$). This was also true in those with confirmed COPD (RR 0.22, 95% CI 0.05–0.91, $p = 0.04$). Titrated oxygen reduced the risk of death by 58% for all patients and 78% for those with COPD.
Conclusions	Compared with high flow oxygen therapy, pre-hospital titrated oxygen therapy significantly reduced mortality in patients with acute exacerbations of COPD.

DIAGNOSTIC PAPERS

For diagnostic papers, we suggest you include all the following sections. Again, as with therapeutic papers, it is often easiest if you start by writing out the headings and underlining them and then filling in the details as you go along. The key sections are in italics.

- Objective
- *Design*
- Setting
- *Population*
- Methods
- *Test under investigation*
- *The gold standard* (good idea to mention if the test was done to all patients and if it was done blindly)
- *Results* (PPV, NPV, sensitivity, specificity, LR, Kappa), also quote the relevant statistics
- *Conclusion*

Again, make sure you state that it is a diagnostic study and what is the test under investigation and the gold standard. Remember they may not be as simple as an assay/radiological diagnosis. For example in a test for appendicitis the gold standard could be operative findings plus follow-up for those who got discharged with a diagnosis of no appendicitis. In a similar way, the test may not be so easy to spot as a simple assay – it could be a clinical score, a set of rules or a combination of test and clinical score. This is explained in more detail in Chapter 7.

An example of a diagnostic summary is given here.

Diagnosis of intussusception by physician novice sonographers in the emergency department. Riera et al. *Ann Emerg Med.* 2012 September; 60(3):264–268.

Question 1: Provide a no more than 200 word summary of this paper in the box provided. Only the first 200 words will be considered – short bullet points are acceptable. Maximum of seven marks.

Objective	To investigate the performance characteristics of bedside ultrasound by paediatric emergency physicians who received limited and focused training in the diagnosis of ileocolic intussusception in children
Design	Prospective diagnostic study
Setting	Tertiary care children’s hospital emergency department
Population	Children with suspected ileocolic intussusception who were to undergo ultrasonography in the diagnostic radiology department
Methods	Patients underwent bedside ultrasound performed by one of six emergency physicians attending or fellows who had received a one hour focused training session
Test under investigation	Bedside ultrasound by an emergency physician
Gold Standard	Radiological department ultrasound

(Continued)

Results	Bedside ultrasound had a sensitivity of 85% (95%CI 54–97%), specificity of 97% (95%CI 89–99%), positive predictive value of 85% (95%CI 54–97%), negative predictive value of 97% (95%CI 89–99%), positive likelihood ratio of 29 (95%CI 7.3–11.7) and negative likelihood ratio of 0.16 (95% CI 0.04–0.57)
Conclusion	This prospective observational study demonstrated the good performance characteristics of paediatric emergency physician-performed bedside ultrasonography for the diagnosis of intussusception in children after a single, focused training session.

META-ANALYSIS

Although very unlikely, there is no reason why a meta-analysis could not be used in the exam. If there were a meta-analysis then it would be based on either a series of diagnostic studies or therapeutic studies. You would have to include the same headings as in the summary for the individual paper but be sure to mention some specific extra points. All these areas are described in detail in Chapter 8.

- Paper identification
- Paper selection
- Funnel plot to see missing papers
- Forest plot
- Statistical analysis (including test for heterogeneity)

QUESTIONS 2–4: USUALLY ABOUT DESIGN AND METHODOLOGY (6–10 MARKS)

Knowledge and understanding are needed for this section. There may be questions directly related to the paper and there may be free-standing questions, e.g. explain the importance of randomization.

Again, technique is required. The length of your answer should be proportional to the marks allocated and the size of the box should also give an indication. There are some specific ways of answering the questions to help maximize marks.

1. Read the question. If it asks for a specific number of points give that specific number of points. But if it says list the aspects of the design that were well done, then list all the factors you can think of starting with the most relevant as long as it fits within the box.
2. If it asks for strength of the design, do not write strengths of the paper but concentrate on the design.
3. You must explain ‘buzz’ words and not just put them in, in the hope that you will get some marks. For example instead of stating that the study was pragmatic so generalizable, state ‘the study was pragmatic in the fact that it was done with normal staff, using normal processes, with the type of patients

we see and no special resources. Therefore the conclusions could easily be applied to our everyday practice’.

4. You must give attention to detail to your answers. For example, don’t state that there was no loss to follow-up as an example of the strength of the design. This is careless as it is a *consequence* of the strength of the design. Instead you can say, ‘The design of the study was excellent in that all patients would have a telephone follow-up and if they didn’t answer the phone, a home visit was arranged. This ensured that there was minimal loss to follow-up’.

The key though is to remember that therapeutic and diagnostic papers will have different things to look for when asked to assess the strengths of the design. Always think about design in terms of internal and external validity. Meta-analysis will have additional things to think about. See Appendix A, which goes through a checklist of things to think about when asked to assess how good a study was.

QUESTIONS 4–7: USUALLY SOMETHING ABOUT RESULTS, STATISTICS AND 2 × 2 TABLES (6–10 MARKS)

These are easy marks to get if you have a good understanding of critical appraisal. You will not be expected to calculate p-values or power calculations, but you will be expected to understand how they are derived. You may be asked to calculate simple things based on the 2 × 2 tables, which are the key to the results section of both therapeutic and diagnostic papers. For questions based on 2 × 2 tables, you will get the marks if you understand what you are calculating and can do it however the table is presented. You should start by stating the definitions and then always show your workings for your calculations.

Two things that will help you score well in these questions are:

1. Know your definitions, e.g. number needed to treat, sensitivity, etc.
2. Be able to draw a standard 2 × 2 table no matter how the data is presented in the question or paper.

QUESTION 8: YOUR INTERPRETATION OF THE PAPER AND/OR LIMITATIONS OF THE PAPER (4–8 MARKS)

These should be ‘easy-ish’ marks to get. There is often no definitive right or wrong answer and marks can be awarded for coherent answers, whatever your interpretation of the paper.

The question will be put into a context of how they want you to answer the question. For example instead of saying ‘Is this paper any good?’, the question will be something like ‘Your new chief executive heard about this paper and has asked if the ED will be introducing the intervention. Explain what you would do if you were clinical lead and give your reasons.’

The best way to approach this question is to split your answer to cover different areas where marks can be gained:

1. What are the results? Are the differences in outcome significant or due to chance? Do not get confused by the difference between statistical significance ($p < 0.05$) and clinical significance (will it affect my patients?).
2. Is the methodology good enough for you to believe the results and conclusion – internal validity.
3. Decide if it could be generalized to your patients – external validity.
4. Decide if it is important for your patients. How common is the condition, what is the clinical significance of the result?
5. What could prevent implementation of the intervention in the ED and how easy would the identified barriers be to overcome? Think about the four barriers to implementation: they all begin with B:
 - a. Badness: What harm could be caused by the intervention?
 - b. Burden of disease: Is it so rare that no one cares?
 - c. Budget: Can we afford to make the changes?
 - d. Beliefs: How will we educate people about this new intervention and how will we deal with intransigent colleagues?

TAKE HOME MESSAGE

1. At the beginning work out what type of study it is.
2. Read the questions before you read the paper.
3. You will be asked to write a summary. Write nothing but a summary, use the author's words and write it as you go along.
4. Answer the easy questions first – first and last questions.
5. When considering your opinion of the paper, consider internal and external validity.

02:: **FCEM notebook**

- Chapter: Safeguarding
- Chapter: Musculoskeletal and injury



SAFEGUARDING

Which features of a bruise in a child would be concerning?

Describe concerning burns

BRUISING IN CHILDREN

Features of a bruise to be considered as potentially resulting from maltreatment

Shape of a hand, ligature, stick, tooth marks, grip or implement imprint

Clear demarcation

Bruising or petechiae that are not explained by a medical condition (e.g. coagulopathy)

Bruising in non-ambulant child (e.g. child that does not roll yet or child with cerebral palsy who cannot move independently)

Multiple bruises

Multiple of similar shapes and sizes

In clusters

Away from bony prominences

Face, back, abdominal, arm, buttock, ear and hand bruises

On the neck that look like attempted strangulation

On the ankles and wrists that look like ligature marks

CONCERNING BURNS

Symmetrical hands or feet distribution

Circumferential distribution on limb

Absence of splash marks

Sparing in flexion creases

Area not expected to be in contact with hot object (back of hand, sole of feet, back, buttocks)

Cigarette shaped

NOTES:

Other concerning history features:

History inadequate, vague or inconsistent or no suitable explanation given

History not appropriate for child's age

Unwitnessed injury

Delayed presentation beyond what a 'reasonable' parent would do

Injury in under one year

Previous similar injuries/multiple attendances

Concerns about child's demeanour/parent-child interaction

READING

CEM clinical standards for emergency departments Feb 2013 – safeguarding children.

Available from: <http://www.collemergencymed.ac.uk/Shop-Floor/Clinical%20Standards/default.asp>

NICE guidelines (CG89). When to expect child maltreatment. March 2013.

Who has parental responsibility?

PARENTAL RESPONSIBILITY UK

A mother automatically has parental responsibility (PR) for her child from birth.

A father has parental responsibility if he:

- is married to the child's mother at time of birth

- is listed on the birth certificate (from Dec 2003 England and Wales, Apr 2002 Northern Ireland, May 2006 Scotland)

- has jointly adopted a child

- has entered into a PR agreement with the mother

- has been issued a PR order from a court

Local authorities have PR if the child is subject to a care order.

Adoptive parents who jointly adopt a child have PR.

Parents do not lose PR if they divorce.

A guardian who will have PR can be appointed by a court.

READING

BMA Ethics Department – Parental Responsibility. 2008.

GMC 0–18 Years: Guidance for all Doctors. Appendix 2. 2007.

What are the Caldicott principles?

CALDICOTT PRINCIPLES

Caldicott principles when handling confidential patient data

Justify the purpose(s) for using patient data

Don't use patient-identifiable information unless it is absolutely necessary

Use the minimum necessary patient-identifiable information

Access to patient-identifiable information should be on a strict need-to-know basis

Everyone should be aware of their responsibilities to maintain confidentiality

Understand and comply with the law, in particular the Data Protection Act

The duty to share information can be as important as the duty to protect patient confidentiality

NOTES:

A Caldicott Guardian is a senior NHS person who is responsible for ensuring that his or her organization adheres to the Caldicott principles and ensures patient data is kept secure. It is now a requirement for every NHS organization to have a Caldicott guardian.

READING

The *Caldicott Report*. 1997.

Information: To share or not to share? *The Information Governance Review*. 2013.



MUSCULOSKELETAL AND INJURY

What are the clinical findings in necrotizing fasciitis?

NECROTIZING FASCIITIS

Rapidly spreading infection of the fascia with necrosis.

Clinical features

- Significant disproportionate/unexplained pain
- Pain beyond margins of erythema
- Swelling
- Crepitus
- Erythema, later purple/dusky skin discolouration
- Lethargy
- Pyrexia, hypotension, tachycardia
- Bullae, later become haemorrhagic
- Minor skin changes initially with later rapidly spreading skin changes
- Offensive discharge
- Skin necrosis
- Anaesthesia of affected area
- Lack of bleeding from deep tissues

Risk factors/associations

- Diabetes
- Chronic renal failure
- Alcohol excess
- Malignancy
- Sea swimming
- Chronic liver disease
- Immunocompromised
- IV drug misuse
- Insect bites/stings
- Minor skin trauma
- Post op surgical wounds/invasive procedure/minor procedures

Investigation

- Initially a clinical diagnosis, with surgical exploration required to confirm.
- Blood cultures, blood gas, clotting screen, U&E, albumin, LFT, CRP, ESR, CK, calcium, wound swabs, cross-match blood
- XR and CT may show air in soft tissues and demonstrate extent

Management

- Fluid resuscitation
- Antibiotics, liaise with microbiology, e.g. benzylpenicillin, clindamycin and metronidazole
- Analgesia
- Aggressive, prompt extensive surgical debridement
- Admit to intensive care unit

Organisms

There are often mixed anaerobic and aerobic bacteria. Organisms include:

Group A streptococcus	<i>Staphylococcus aureus</i>
Streptococci	<i>Clostridium perfringens</i>
Coliforms	<i>Proteus</i>
<i>Pseudomonas</i>	<i>Klebsiella</i>

NOTES:

The initial skin wound can be minimal with limited skin findings and the patient appearing well, followed by a rapid deterioration and high mortality rate. Commonly misdiagnosed initially as cellulitis.

**Describe the features of Kanavel sign
and the significance of this sign
Give the causes of a radial nerve palsy**

KANAVEL SIGN

Four components

- Finger is held in slight flexion
- Fusiform swelling of the finger ('sausage-shaped finger')
- Tenderness along the course of the flexor tendon sheath
- Pain on passive extension of the finger

Clinical features are found in infection of a flexor tendon sheath in the hand.

Infection usually occurs following a bite or a puncture wound. Early recognition is essential to prevent tendon scarring and loss of function. Patients require IV antibiotics, analgesia and referral for urgent incision and drainage of the flexor tendon sheath.

CAUSES OF RADIAL NERVE PALSY

- Compression in axilla 'crutch palsy'
- Compression of upper medial humerus – 'Saturday night palsy'
- Humeral fracture
- Elbow dislocation
- Compression at wrist from tight handcuffs or watch strap
- Upper arm injections in infants

What are the features of a tetanus-prone wound?

What is the UK tetanus immunization schedule?

Describe the clinical findings in tetanus

TETANUS

Tetanus-prone wounds

Wounds or burns that require surgical intervention that is delayed for more than six hours

Wounds or burns that show a significant degree of devitalized tissue or a puncture-type injury, particularly where there has been contact with soil or manure

Wounds containing foreign bodies

Compound fractures

Wounds or burns in patients who have systemic sepsis

Higher risk

Injecting drug users (tetanus-contaminated illicit drugs, especially through pre-existing skin abscesses)

Heavy contamination with material likely to contain tetanus spores (manure, soil)

Extensive devitalized tissue

UK TETANUS IMMUNIZATION PROGRAMME

Immunization given at two months, three months, four months, four years, 14 years.

CLINICAL FINDINGS IN TETANUS

Hypertonia

Painful muscular contractions, especially face (risus sardonicus), jaw (lock-jaw), back (opisthotonus), neck

Generalized muscle spasms triggered by minimal stimuli (e.g. noise, light, touch)

Autonomic dysfunction

Dysphagia (pharyngeal muscle spasms)

Airway obstruction (laryngeal spasm)

NOTES:

Five doses of tetanus-containing vaccine at appropriate intervals are considered to give long-term protection. Those born in the UK before 1961 may not have been immunized. Immunosuppressed patients who had been fully immunized should be managed as if incompletely immunized. Tetanus toxin causes failure of inhibition of motor reflex response following infection with *Clostridium tetani*.

Spores present in soil or manure, most commonly introduced through puncture wounds, burns and minor wounds. Clusters occur in IV drug misuse population. Mortality 10% to 90%. (Neonatal tetanus is due to infection of the umbilical stump. Clinical findings – inability to suck aged 3–10 days, irritability, poor feeding, rigidity, facial grimacing, spasms when touched.)

Contains public sector information licensed under the Open Government Licence v2.0.

READING

The Green Book: <http://www.immunisation.dh.gov.uk/green-book-chapters/>

List the causes of compartment syndrome

COMPARTMENT SYNDROME

Associated causes

Bone fractures	Burns
Cannula extravasation	Crush trauma
Haemorrhage	Intramuscular or intra-arterial injection
Large vessel injury	Over tight casts/dressings
Penetrating trauma	Prolonged lie on limb
Seizure	Snake bites
Tetany	Vigorous exercise

Clinical features

Enhanced pain, pain on passive range of movement, tense swollen limb
Late signs – pallor, paralysis, paraesthesia, reduced pulses

Initial approach

FBC, U&E, CK, coagulation screen, urinalysis (myoglobinuria)
Remove casts/dressings fully
Urgent orthopaedic referral for fasciotomy
Keep limb level with body
Intravenous 0.9% saline
Analgesia
Compartment pressures can be measured

Define the following eponyms

EPONYMS

Bohler angle	Boutonniere deformity
De Quervain	Freiberg disease
Keinbock lunate	Kohler disease
Lisfranc injury	Osgood Schlatter
Severs disease	Simmond test
Terry Thomas sign	Trethowan sign

DESCRIPTIONS

Bohler angle	Angle formed at the crossing of lines drawn from the posterior and anterior aspects of the superior calcaneum on lateral radiographs. Angle less than 20 degrees is seen in calcaneum fractures (but angle can also be normal in a fracture, normal range 20–40 degrees).
Boutonniere deformity De Quervain	Rupture of central slip of extensor tendon at PIPJ. Tenosynovitis of extensor pollicis brevis and abductor pollicis longus tendons causing pain over radial styloid. Finkelstein test is positive in De Quervain tenosynovitis (fist is made over thumb and wrist is ulnar-deviated; test is positive if causes pain over radial styloid).
Freiberg disease	Avascular necrosis head of the second metatarsal.
Keinbock lunate	Avascular necrosis of lunate.
Kohler disease	Avascular necrosis of navicular.
Lisfranc injury	Disruption of the tarsometatarsal ligamentous joint complex.
Osgood Schlatter	Pain from tibial attachment of patella tendon.
Severs disease	Inflammation of the calcaneum apophysis.
Simmond test	Test for ruptured Achilles tendon. A positive test if no movement of foot is seen when the calf is squeezed on the affected side (also known as Thompson test).
Terry Thomas sign	Increase in the scapholunate space on AP wrist radiograph indicative of scapholunate dissociation.
Trethowan sign	A line drawn along superior surface of femoral neck should pass through femoral head. Positive sign, indicative of slipped femoral epiphysis, if line is above femoral head.

READING

NICE guidelines (CG124). Hip fracture. June 2011.

Wright M et al. Easily missed? Lisfranc injuries. *BMJ*. 2013;347:31–32.

What are the findings in the following eponymous fractures?

EPONYMS

Bennett fracture	Chance fracture
Clay shoveler's fracture	Galeazzi fracture
Gamekeeper's thumb	Holstein-Lewis fracture
Jefferson fracture	Jones fracture
Maisonneuve fracture	Monteggia fracture
Rolando fracture	Segond fracture
Tillaux fracture	

FINDINGS

Bennett fracture	Intra-articular fracture at the base of first metacarpal with dislocation/subluxation
Chance fracture	Compression of anterior column of vertebra with distraction of posterior portion of vertebra (hyperflexion injury)
Clay shoveler's fracture	Fracture of spinous process of C6/C7/T1
Galeazzi fracture	Fracture between middle and distal thirds of radius with dislocation of the radial ulnar joint at the wrist
Gamekeeper's thumb	Ulnar collateral ligament injury at the thumb metacarpophalangeal joint (now more common in falls holding a ski-pole – skier's thumb)
Holstein-Lewis fracture	Fracture of distal third of humerus commonly associated with radial nerve injury
Jefferson fracture	Fracture of C1 anterior and posterior arches (following axial load on occiput of head)
Jones fracture	Fracture at the fifth metatarsal metaphyseal-diaphyseal junction
Maisonneuve fracture	Fracture of proximal third of fibula with injury of medial ankle including fracture of medial malleolus, rupture of deltoid ligament/intraosseous membrane/anterior talofibular ligament (external rotation injury)
Monteggia fracture	Fracture of proximal third of ulna with dislocation of the radial head
Rolando fracture	Three-part intra-articular comminuted Y-shaped fracture at base of first metacarpal
Segond fracture	Avulsion fracture seen as a lateral proximal tibia; associated with anterior cruciate tear and menisci injury

Tillaux fracture

Salter Harris III fracture of the distal anterolateral tibial epiphysis (commonly external rotation injury in 12–15 yr-olds)

NOTES:

Eponyms should not be used solely to describe a fracture but it can be useful to consider eponymous fractures when initially viewing radiographs. Remember to document whether right/left limb.

READING**Pain management**

Clinical standards for emergency departments. *Pain*, Feb 2013.

College of Emergency Medicine. Guidance for the management of pain in adults. June 2010/pain in children May 2010.

Nerve block techniques

Chad S et al. Local anesthetics and peripheral nerve blocks in the emergency department. *Emerg Med Clin N Am.*, 2005;23:477–502.

What is the Parkland formula?

PARKLAND FORMULA FOR BURNS RESUSCITATION

Total fluid requirement in 24 hours = $4 \text{ mL} \times \text{body surface area (\%)} \times \text{body weight (kg)}$

50% given in first 8 hours

50% given in next 16 hours

Use for burns over 20%

Time of initial burn/injury (not the time of writing fluid chart) should be used when prescribing, thus the initial 50% of fluids may, for example, in reality need to be given over six hours following a two-hour pre-hospital extrication

NOTES:

Rule of Nines to estimate the area of adult medium to large burns:

Anterior and posterior arm	9%
Anterior and posterior head	9%
Anterior and posterior leg	18%
Posterior trunk	18%
Anterior trunk	18%
Genitalia	1%
Palmar surface including fingers	1%

When are ankle/foot X-rays indicated following trauma?

OTTAWA RULES

Ankle X-rays indicated if

Bone tenderness distal 6 cm of the posterior edge of the fibula or tip of the lateral malleolus

Bone tenderness distal 6 cm of the posterior edge of the tibia or tip of the medial malleolus

Inability to weight bear both immediately and in the emergency department

Foot X-rays indicated if

Pain in the midfoot and any one of the following

Bone tenderness navicular

Bone tenderness base of fifth metatarsal

Inability to weight bear both immediately and in the emergency department

Reproduced from *BMJ*, Multicentre trial to introduce the Ottawa ankle rules for use of radiography in acute ankle injuries, Stiell G et al, 311, 594–97, copyright (1995) with permission from BMJ Publishing Group Ltd.

READING

Stiell I, Greenberg G, Wells G et al. Prospective validation of a decision rule for the use of radiography in acute knee injuries. *JAMA*. 1996;611–615.

**Describe the key features to identify
on a child's elbow radiograph**

PAEDIATRIC ELBOWS

Specifically look for the following

Anterior humeral line – Drawn along anterior cortex of distal humerus metaphysis and should pass through the middle third of the capitellum

Radiocapitellar line – Drawn through radial neck and should pass through the capitellum

Presence of anterior and/or posterior fat pads

Order elbow epiphyses appear in a child (mnemonic CRITOL)

Capitellum	1 year
Radial head	3 years
Internal (medial) epicondyle	5 years
Trochlea	7 years
Olecranon	9 years
Lateral epicondyle	11 years

NOTES:

The exact age of epiphysis development can vary normally between children, though the order of appearance should always follow as above. Thus, bony changes not present in order should be presumed to be due to a fracture.

Give the complications and contraindications of intra-osseous needle insertion

IO (INTRA-OSSEOUS) NEEDLES

Complications

- Compartment syndrome
- Fracture
- Fat embolus
- Haematoma
- Infection (osteomyelitis, cellulitis)
- Possible growth plate injury

Contraindications

- Inability to locate landmarks
- Extensive pelvic injury (use upper limb site)
- Previous attempts in same limb
- Overlying skin infection
- Fracture of limb
- Vascular injuries on same side
- Osteogenesis imperfect

Insertion sites

- Tibia (one finger breadth below tibial tuberosity)
- Humerus (base of greater tuberosity, palpate for protrusion in humeral head with arm internally rotated and adducted)
- Distal tibia (proximal to medial malleolus)
- Distal femur

NOTES:

Indicated in cardiac arrest or when urgent vascular access is required but not immediately available.

To reduce the risk of late recognition of compartment syndrome avoid bandaging/covering the limb. Monitor limb in comparison with other limb for capillary refill distally, swelling, firmness, colour (pink, pale, blue, white) every 15 minutes. Stop using and remove if clinical concerns and discuss with orthopaedic team re fasciotomy. Cease using IO needles once alternative vascular access has been achieved.

What are the presenting features of toxic shock syndrome in children following a burn, and what is the initial management approach?

TOXIC SHOCK SYNDROME (TSS) FOLLOWING BURNS IN CHILDREN

Presenting features of TSS in children

Fever $>39^{\circ}\text{C}$
Rash
Diarrhoea +/- vomiting
Irritability
Lymphopaenia

Treatment approach

Move to resuscitation area
Obtain intravenous access
Send blood and microbiology samples (FBC, U&E, clotting screen, G&S, blood cultures, wound swabs)
Resuscitate and treat hypoperfusion with fluid boluses, normal saline 10 mL/kg and reassess (may need 40–60 mL/kg)
Give intravenous antibiotics, anti-staphylococcal and streptococcal (flucloxacillin and penicillin)
Give FFP 10 mL/kg (repeat if necessary) or immunoglobulin to provide passive immunity against staphylococcal toxic shock syndrome toxin 1 (TSST-1)
Remove dressings, inspect and clean burn wound
Consider catheterization for fluid balance
Manage in paediatric HDU
Review hourly until improving

NOTES:

TSS is a toxin-mediated illness that is challenging to diagnose due to the initial non-specific symptoms that mimic other common childhood illnesses. High mortality up to 50% if untreated, thus early recognition is essential. Currently there is no evidence on methods to prevent.

READING

Young A, Thornton K. Toxic shock syndrome in burns: Diagnosis and management. *Arch Dis Child Educ Pract Ed.* 2007;92:ep97–ep100.

03:: Emergency and Acute Medicine on the Move

- Chapter 10: Poisoning and environmental accidents
- Chapter 14: Paediatrics

10

Poisoning and environmental accidents

10.1 ASSESSMENT

ABCDE

- See Chapter 1.
- History/poison not always initially available: look for clues in pockets, witnesses, examination.
- Look for patterns of signs and symptoms suggestive of a toxidrome – e.g. pinpoint pupils, reduced conscious level, and respiratory rate suggests opiate toxicity.

Toxbase®

- National poisons information service.
- Extremely useful information on clinical features and management.
- Medicines information within local hospitals can also access programmes to help identify unknown tablets.

MICRO-reference

Toxbase: National Poisons Information Service, <http://www.toxbase.org/>

10.2 PARACETAMOL TOXICITY

Definition

- Significant overdose: 150 mg/kg or 12 g (24 tablets) carries moderate to high risk

Risk factors

- Enzyme-inducing drugs:
 - Phenytoin
 - Carbamazepine

- Rifampicin
- Sulphonylureas
 - Chronic alcohol excess
 - Intercurrent infection
 - Malnourishment:
 - Anorexia
 - Alcoholism
 - Cystic fibrosis
 - HIV

Risk assessment

- Time of ingestion:
 - Triangulate time using:
 - Witness information
 - Mobile phone call/text times
 - If in doubt take the time as the earliest it could be
- Suicide note
- Staggered overdose
- Other drugs ingested
- Alcohol use:
 - Chronic excess ↑ risk of toxicity
 - Acute consumption may be protective

Clinical features

- Within 24 h:
 - Nausea, vomiting
 - Abdominal pain
- >2 days:
 - Jaundice
- >4 days:
 - Hepatic encephalopathy
 - DIC

MICRO-facts

Beware of staggered overdoses!

Investigations

- Paracetamol levels:
 - Take at 4 h post-ingestion.
 - Take as soon as possible if ingestion >4 h ago.

- Use treatment graph (Fig. 10.1) to assess risk of liver damage:
 - Normal treatment line
 - High-risk treatment line
 - With risk factors indicated above
- Other bloods:
 - U&E, bicarbonate
 - LFTs
 - Glucose
 - Venous pH
 - Clotting screen

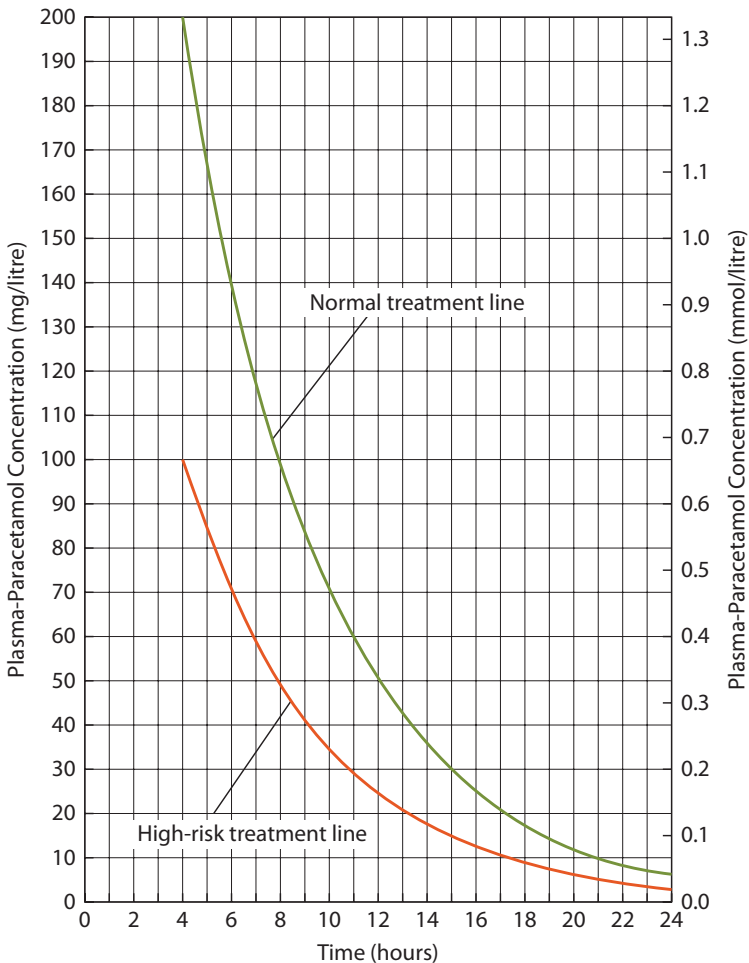


Fig. 10.1 Treatment chart for acetylcysteine in paracetamol.

Management

- Follow treatment outline in Table 10.1
- In staggered overdoses:
 - Start treatment immediately
 - Use the time of first ingestion as the reference point for placing paracetamol level on the treatment graph
- Psychiatric review before discharge

Table 10.1 Management of paracetamol overdose

TIME POST-INGESTION	MANAGEMENT
<1 h	Activate charcoal if >12 g ingested
0–8 h	Check plasma paracetamol at 4 h If above treatment line on graph start treatment IV N-acetylcysteine in following order: 150 mg/kg in 200 mL dextrose over 15 min 50 mg/kg in 500 mL dextrose over 4 h 100 mg/kg in 1000 mL dextrose over 16 h Oral methionine: Used if N-acetylcysteine not available 2.5 g every 4 h to a total of 10 g
8–15 h	Start N-acetylcysteine if >12 g paracetamol ingested Do not wait for plasma paracetamol levels
15–24 h	Urgent N-acetylcysteine Late presentation has severe risk Check plasma paracetamol level, renal function, LFTs, prothrombin time, pH Assess for signs of encephalopathy
>24 h	If >12 g paracetamol ingested start N-acetylcysteine Seek expert advice

MICRO-print

- N-acetylcysteine (NAC) can cause anaphylactoid reactions.
- Treat with antihistamines, fluids, supportive care (see Chapter 1); slow the rate of infusion.

10.3 ASPIRIN TOXICITY

Clinical features

- Vomiting
- Tinnitus
- Hyperventilation
- Confusion
- Mixed metabolic acidosis and respiratory alkalosis

Investigations

- Bloods:
 - U&E:
 - Electrolyte abnormalities
 - Acute renal failure
 - ABG:
 - Mixed respiratory alkalosis and metabolic acidosis
 - Glucose

Management

- Activated charcoal:
 - Within 1 h of ingestion and >120 mg/kg
- Consider sodium bicarbonate if:
 - Metabolic acidosis
 - Salicylate levels >500 mg/L
 - Patient may need to be observed in ITU
- Haemodialysis if:
 - Patient unresponsive to above measures
 - CNS features are present
 - Salicylate levels >700 mg/L
- Psychiatric review before discharge

10.4 OPIOID TOXICITY

Clinical features

- Venepuncture marks
- Iatrogenic – check inpatient medication charts
- Pinpoint pupils
- ↓ RR
- ↓ GCS
- Evidence of addiction:
 - Multiple venepuncture marks, old and new
 - Thrombosed veins

Investigations

- Bloods:
 - FBC
 - U&Es: poor renal function can exacerbate toxicity
 - LFTs
 - Clotting screen
 - Glucose: rule out hypoglycaemia
 - Other drug levels:
 - Paracetamol
 - Salicylates
- ABG: type II respiratory failure
- ECG: may show runs of VT
- Urine toxicology: opioid positive
- CXR: high risk of aspiration

Management

- ABCDE: assisted ventilation with bag and mask
- Exclude organic illness/injury, e.g. hypoglycaemia, head injury, infection
- Naloxone:
 - 0.4–0.8 mg IV every 2 min – maximum 1.2 mg
 - Titrate dose according to response
 - Give dose IM as well as IV, to prolong effect of naloxone, and if struggling with IV access
 - Shorter half-life than opioids, symptoms of toxicity can recur
 - Consider naloxone infusion 0.1–0.4 mg/h if still symptomatic
 - Observe for 6 h after last dose; long-acting opioids naturally have a longer half-life and so will require longer observation. See Toxbase for advice with individual preparations
 - Respiratory depression, coma may recur
- Avoid fully reversing opioid in addicts
- Nurse in left lateral position to reduce the risk of aspiration
- Risk assessment: psychiatric management of the patient (if necessary)

10.5 TRICYCLIC TOXICITY

Clinical features

- Anticholinergic:
 - Dry skin
 - Urinary retention
 - Dilated pupils

- Neurological:
 - Altered level of consciousness
 - Convulsions
- Cardiovascular:
 - Sinus tachycardia
 - Arrhythmias
 - ECG abnormalities – see below

Investigations

- Bloods:
 - FBC
 - U&E
 - LFTs
 - Prothrombin time (PT)
 - Glucose
 - Blood levels:
 - Paracetamol
 - Salicylates
- ABG:
 - Hypoxia
 - Metabolic acidosis
 - Electrolyte discrepancies
- ECG:
 - Prolonged PR interval
 - Non-specific T wave changes
 - Broad QRS
 - Prolonged QT segment
 - Heart block
 - VT

Management

- ABCDE
- Oral-activated charcoal:
 - If presentation is within 1 h of ingestion
 - Ensure secure airway before administration
- IV fluids
- Sodium bicarbonate for acidosis, broad QRS and arrhythmias
- With significant overdoses, HDU/ITU admission is almost always required
- Psychiatric review before discharge

10.6 BENZODIAZEPINE TOXICITY

Clinical features

- CNS depression: ↓ GCS
- Ataxia
- Slurred speech
- Respiratory depression
- Hypotonia
- Coma
- With significant overdoses, HDU/ITU admission is almost always required

Investigations

- Bloods:
 - FBC
 - U&E: assess renal function
 - LFT
 - Clotting screen
 - Glucose: rule out other causes such as hypoglycaemia
- Blood levels: paracetamol and salicylate
- ABG: respiratory acidosis
- ECG

Management

- Respiratory depression:
 - Maintain airway
 - Intubate
 - Assist ventilation, if required
- Monitor frequently:
 - GCS
 - ECG
- Supportive therapy: IV fluids as required
- Consider antidote:
 - Flumazenil
 - Only in iatrogenic benzodiazepine toxicity where it is the only drug taken
- Psychiatric review before discharge

10.7 CARBON MONOXIDE POISONING

Clinical features

- Depends on duration and concentration of CO exposure:
 - May be asymptomatic
 - Headache
 - Breathlessness

- Malaise
- Cognitive impairment
- Cherry-red skin
- Respiratory failure
- Cardiac arrest

MICRO-facts

- Chronic low concentration exposure → non-specific symptoms
- Short-duration high-concentration exposure → severe symptoms and metabolic acidosis

Management

- High-flow oxygen
- Consider intubation
- Fluid resuscitation

10.8 OTHER TOXINS AND ANTIDOTES

- See Table 10.2

Table 10.2 Toxins and antidotes

TOXIN	ANTIDOTE
Beta-blockers	Glucagon
Digoxin	Digibind®
Iron	Desferrioxamine
Organophosphates	Atropine

10.9 BURNS

Assessment

- History:
 - Circumstance of burn:
 - Enclosed space? (CO poisoning)
 - Duration of exposure to smoke/fire
 - Material that was burning; was it toxic?
- Examination:
 - Hoarse voice
 - Singed nasal hair
 - Restriction in lung expansion

- Exposure, estimation of extent of burn: rule of nines – quick method to estimate body surface burned (see Fig. 10.2 and Table 10.3; see also Table 10.4 for degree of burn calculation)

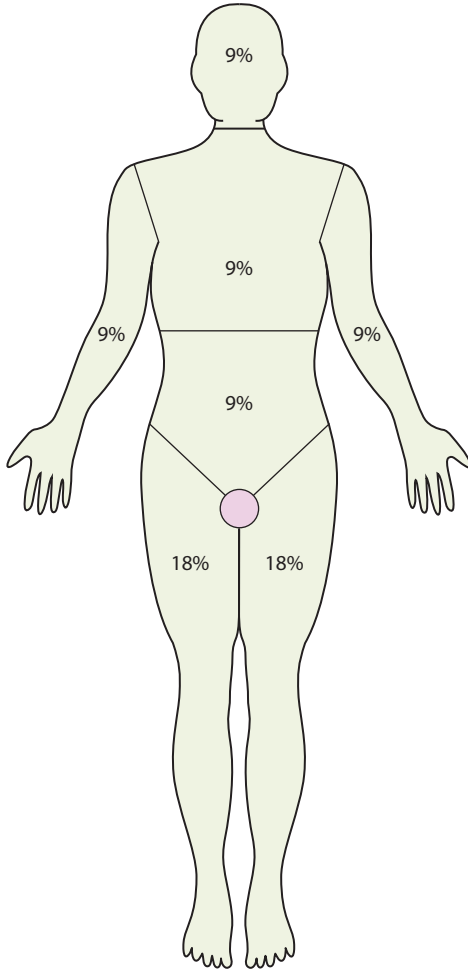


Fig. 10.2 Rule of nines body chart.

Table 10.3 Rule of nines

BODY PART	PERCENTAGE
Head	9%
Chest (front)	9%
Abdomen (front)	9%
Back and buttocks	18%
Each arm	9%
Each palm	1%
Groin	1%
Each leg	18%

Management

- A, B:
 - Intubate early if airway involvement likely – it will swell very quickly!
 - Oxygen
 - Be aware that chest burns can restrict lung expansion; may need surgical release – escharotomy
- C:
 - IV fluid resuscitation
 - Aim for a urine output of 1 mL/kg/h as a minimum
 - Analgesia
 - Consider tetanus prophylaxis
 - Monitor potassium:
 - Hyperkalaemia can occur due to muscle damage which can result in acute renal failure
 - Bandaging:
 - Cling film initially
 - Biosynthetic dressings speed up wound healing
 - Antibiotics not routinely given
 - Referral to specialist burns management unit:
 - Burns over 10% children, 15% adults
 - Respiratory burns
 - Face, hands, feet, perineum, genitalia burns
 - Check for secondary infection

Table 10.4 Degree burn developed

DEGREE BURN	DEPTH	APPEARANCE
Superficial thickness	Epidermis	Erythema, tender
Partial thickness – superficial	Superficial dermis	Blisters
Partial thickness – deep	Deep dermis	Whiter appearance, ↓ sensation
Full thickness	Destruction to subcutaneous fat	Charred, leather, no sensation

MICRO-print**Parkland Formula**

- This can be used to guide the rate of fluid administration in burns.
- Fluid is administered at 4 mL/kg per body surface area burned.
- First 50% – initial 8 h.
- Second 50% – subsequent 16 h.
- Additional maintenance fluid:
 - 1–1.5 mL/kg/h

MICRO-case

An HIV-positive 25-year-old male presents to ED after taking 30 tablets of paracetamol in a suicide attempt. He took the tablets over a period of 5 h. He is brought to the ED 6 h after the first ingestion.

On arrival patient is alert, but appears anxious and tearful. His partner attends, and explains that she found a note when she returned early from work explaining his reasons for the suicide attempt. She has brought in several empty paracetamol packets, but is unsure if he has taken other drugs or alcohol with it. IV access is obtained, venous gas, FBC, clotting screen, LFTs, U&Es, glucose and plasma paracetamol and salicylate levels are sent immediately. IV N-acetylcysteine is started promptly without waiting for paracetamol levels to return.

Key points:

- The patient has taken 15 g of paracetamol which carries a moderate to severe risk.
- An important point is that the overdose was taken over a 5 h period, and thus the time of the first ingestion should be used as the reference point.
- It is important not to delay treatment, especially as the patient also has HIV, and this will put him at a higher risk. In any case,

continued...

continued...

a paracetamol level result is unlikely to be available before the 8 h watershed when glutathione reserves are exhausted. His plasma paracetamol levels should be taken immediately, as there is no need to wait for 4 h, given that he started the overdose 6 h ago.

- It is important to also test for salicylate levels, as often multiple drugs are used in overdoses.
- A collateral history should be obtained from relatives to obtain further clues about the attempt. Suicide notes often indicate a more serious attempt, and after the patient is medically stable, psychiatric assistance should be sought from the crisis team, who are generally available 24 h a day. See Chapter 19, Psychiatry.

14

Paediatrics

14.1 ASSESSING THE PAEDIATRIC PATIENT

- See Table 14.1

Principles

- Children are very different to adults.
- Anatomical differences – size and shape.
- Physiological differences – cardiovascular, respiratory and immune function.
- Psychological – emotional response and intellectual ability.
- Weight difference.
- Performing an assessment of an acutely unwell child is different to that of an adult.
- Children cannot always explain their specific complaint and symptoms can often be non-specific.
- Children often have a high physiological reserve, and once they start to decompensate deteriorate very rapidly.
- Always check and double-check drug dosages and calculate according to a child's actual or estimated weight.
- Remember that children and their parents require additional reassurance and explanation.
- Always remember to obtain senior help early.

Paediatric history taking

- Usually taken from parent or guardian in attendance with child
- History of presenting complaint
- Systemic review
 - Cardiovascular:
 - Shortness of breath/sweating especially on feeding
 - Feeding difficulties
 - Cyanosis

Table 14.1 Assessment of paediatric patients

ASSESSMENT	CLINICAL FEATURES
Airway and breathing	<ul style="list-style-type: none"> • ↑ Respiratory rate • ↓ Respiratory rate: if exhausted • Recessions <ul style="list-style-type: none"> • Subcostal • Intercostal • Sternal • Respiratory noises <ul style="list-style-type: none"> • Wheezing • Stridor • Grunting • Excretions • Accessory muscle use <ul style="list-style-type: none"> • Head bobbing • Abdominal movement • Shoulder movement • Cyanosis • Drowsiness • Nasal flaring
Circulation	<ul style="list-style-type: none"> • Tachycardia • Bradycardia (often a pre-terminal sign) • Prolonged capillary refill time (>2 s) • Hypotension • Weak peripheral pulses • ↓ Urine output • Cold peripheries, can often be warm in sepsis • Mottled skin • Agitation/drowsiness
Disability	<ul style="list-style-type: none"> • ↓ GCS • Drowsiness • Hypotonia • ↓ Blood glucose level

- Respiratory:
 - Shortness of breath
 - Laboured breathing
 - Cough
 - Stridor/wheeze

- Gastrointestinal:
 - Nausea or vomiting
 - Bowel habit: diarrhoea or constipation and description
 - Abdominal pain: often draws knees up to chest
 - Appetite:
 - Avoidance of food
 - Increased thirst – can also occur when the child has a sore throat
 - Weight loss
- Feeding history (baby):
 - Is the baby breast- or bottle-fed?
 - How much, how often?
- Genitourinary (baby): number of wet nappies (helps assess hydration)
- Neurological:
 - Drowsiness
 - Seizures/posturing
 - Headache
- Skin and musculoskeletal:
 - Rash
 - Ulcers
 - Joint pain
- Development: enquire about developmental milestones
- Past medical history
 - Pregnancy and birth history:
 - Complications during pregnancy
 - Gestation at delivery
 - Mode of delivery
 - Any SCBU attendance
 - Previous hospital admissions
- Drug history:
 - Any regular medications
 - Any allergies (both drugs and other allergies including reactions)
- Immunizations: are they up to date?
- Family history:
 - Inherited diseases
 - Health of parents and siblings
- Social history:
 - Who lives at home?
 - Number of siblings
 - Parental circumstances
 - Social care/health visitor involvement
- Review of child health record – the Red Book

Normal values

- See Table 14.2

MICRO-facts

Estimation of a child's weight

$$\text{Weight in kg} = (\text{age} + 4) \times 2$$

Or new APLS calculations:

Age up to 12 months; weight in kg = (1/2 age in months) + 4

Age 1–5 years; weight in kg = (2 × age in years) + 8

Age 5 years and above; weight in kg = (3 × age in years) + 7

Table 14.2 Normal values in paediatric patients

AGE	RESPIRATORY RATE/MIN	HEART RATE/MIN	SYSTOLIC BLOOD PRESSURE/MMHG
<1	30–40	110–160	70–90
1–2	25–35	100–150	80–95
2–5	25–30	95–140	80–100
5–12	20–25	80–120	90–110
>12	15–20	60–100	100–120

MICRO-facts

Paracetamol dose: 15 mg/kg 4–6 hourly

Ibuprofen dose: 5 mg/kg 8 hourly

Pain management

- It is important to provide analgesia in unwell children.
- Children rarely tell you they are in pain, but their behaviour often demonstrates this such as becoming quiet and miserable or holding their knees up to their chest.
- Always consult the children's BNF when prescribing for children and calculate dosages according to an actual or estimated weight.

Basic life support

- See Fig. 14.1
- As with any medical emergency, always seek help from senior doctors. Paediatric specialists should be involved as soon as possible.
- Resus Council UK guidelines: available in MICRO-reference.

MICRO-reference

Paediatric Basic Life Support Guidelines on the Resus Council (UK) website, <http://www.resus.org.uk/pages/pbls.pdf>

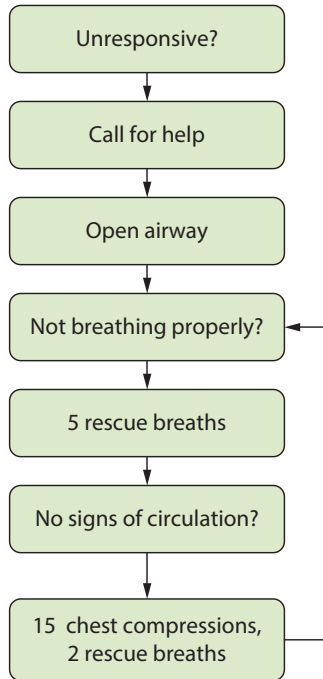


Fig. 14.1 Paediatric Basic Life Support (BLS) algorithm.

Choking management

- See Fig. 14.2

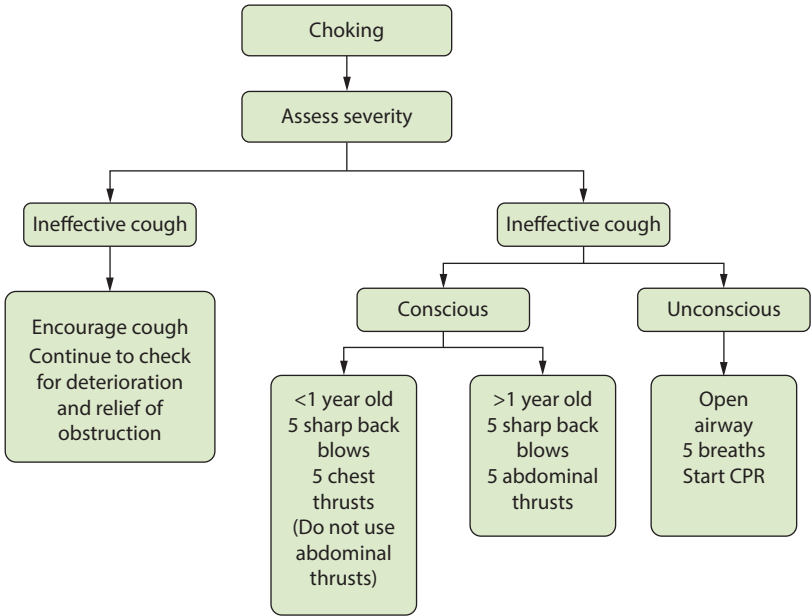


Fig. 14.2 Choking management algorithm.

14.2 RESPIRATORY CONDITIONS

BRONCHIOLITIS

Definition

- Inflammation of the bronchioles

Aetiology

- Respiratory syncytial virus (RSV) (90%)
- Other causes are parainfluenza, influenza, adenoviruses and human metapneumovirus

Clinical features

- Usually occurs in infants <9 months old
- Coryza
- Rhinorrhoea
- Chest cough
- Breathlessness

- Fever
- Poor feeding
- Tachypnoea
- Tachycardia
- Bilateral fine inspiratory crackles with wheeze on auscultation
- Chest hyperinflation with subcostal and intercostal recession

MICRO-facts

Risk factors for bronchiolitis

- Age <6 weeks
- Congenital heart disease
- Prematurity
- Respiratory disease
- Immunodeficiency
- Multiple congenital abnormalities
- Severe neurological disease
- Apnoeic episodes

Severity assessment

- See Table 14.3

Table 14.3 Assessing bronchiolitis severity

SEVERITY	CLINICAL FEATURES	MANAGEMENT
Mild	<ul style="list-style-type: none"> • Feeding – well • Respiratory rate <50/min and • SpO₂ >95% on room air • Minimal respiratory distress • No risk factors or social concerns • At least 3 months old 	<ul style="list-style-type: none"> • Monitor at home • Small-volume frequent feeds • Return if deterioration in feeding
Moderate	<ul style="list-style-type: none"> • Feeding – reduced • Respiratory rate 50–70/min • Mild to moderate respiratory distress • SpO₂ 92–95% ORA 	<ul style="list-style-type: none"> • Admit • Oxygen therapy to maintain SpO₂ >95% • Feeding monitoring – may need NG feeds

(Continued)

Table 14.3 (Continued) Assessing bronchiolitis severity

SEVERITY	CLINICAL FEATURES	MANAGEMENT
Severe	<ul style="list-style-type: none"> • Poor feeding • Respiratory rate >70 • Moderate to severe respiratory distress • SpO₂ 92% on room air • Apnoeic episodes • Unwell/toxic 	<ul style="list-style-type: none"> • Admit to HDU • Consider assisted ventilation • Oxygen therapy to maintain SpO₂ >95% • NG feeds

Management

- Supportive
 - Titrated oxygen therapy to maintain SpO₂ >95% on room air
 - Monitor:
 - Oxygen saturations
 - Heart rate
- Feeding – NG feeding
- Nasopharyngeal aspirate (NPA) to allow cohort nursing on ward

MICRO-case

A 9-month-old female is brought to see her general practitioner by her father. She has had coryzal symptoms for the past 3 days and is becoming increasingly breathless particularly on feeding. Her father reports that she is feeding poorly, miserable and that he can hear her wheezing. On examination she is tachypnoeic, tachycardic with an audible wheeze and end inspiratory crackles on auscultation. She is using her accessory muscles to breathe. The diagnosis of bronchiolitis is made and she is referred to the paediatric team for hospital admission.

Learning points:

- Bronchiolitis is the most common respiratory infection affecting infants <12 months old.
- Annual winter epidemics are common and infants often require hospital admission for supportive treatment.
- Most will recover within 2 weeks.

ASTHMA

Adult asthma is covered in Chapter 4, Respiratory

Clinical features

- See Table 14.4

Table 14.4 Assessment of asthma severity

Mild	<ul style="list-style-type: none"> • SpO₂ >95% on room air • Able to talk in full sentences • No respiratory distress
Moderate	<ul style="list-style-type: none"> • SpO₂ 92–95% on room air • Use of accessory muscles • Increased work of breathing
Severe	<ul style="list-style-type: none"> • Inability to complete sentences or feed • Tachypnoea: >30/min (>5 years) or >40/min (2–5 years) • Tachycardia: >125/min (>5 years) or >140/min (2–5 years) • PEFr 33–50% • Marked respiratory effort • SpO₂ <92%
Life threatening	<ul style="list-style-type: none"> • Remember mnemonic SHOCKED <ul style="list-style-type: none"> • Silent chest • Hypotension • One-third of best/predicted PEFr (<33%) • Cyanosis • Confusion/coma • K(c)yanosis • Exhaustion – poor respiratory effort • Dysrhythmia – bradycardia • SpO₂ <92%

Management

- Oxygen – high flow 15 L/min via non-rebreathe mask
- Salbutamol:
 - 10 puffs MDI via spacer
 - Via oxygen driven nebulizer
 - 2.5 mg (<5 years) or 5 mg (>5 years)
 - High-dose burst therapy
 - 3 doses back to back
- Ipratropium bromide:
 - 125 mcg (<1 year) or 250 mcg (>1 year) nebulizer
- Steroid:
 - 1-day course oral prednisolone 1–2 mg/kg (40 mg maximum dose)
 - IV hydrocortisone and IV salbutamol if life-threatening
- Hospital admission if:
 - Poor response to treatment
 - ↓ Oxygen saturations <92% on air

- Exhaustion
- Severe exacerbations require admission regardless of response to treatment

MICRO-reference

British Thoracic Society (BTS) and Scottish Intercollegiate Guidelines Network (SIGN) Guidelines on the Management of Asthma, www.sign.ac.uk

CROUP

Definition

- Laryngotracheobronchitis

Aetiology

- Parainfluenza virus

Clinical features

- Children 1–3 years old
- Coryza
- Barking cough
- Harsh stridor
- Mild fever
- Recession

Management

- Clinical severity can be assessed by the Westley modified croup score (Table 14.5)
- Management of croup depends on severity

Table 14.5 Westley modified croup score

CLINICAL FEATURE	SEVERITY	SCORE
Chest wall recession	• None	0
	• Mild	1
	• Moderate	2
	• Severe	3
Stridor	• None	0
	• With agitation	1
	• At rest	2

(Continued)

Table 14.5 (Continued) Westley modified croup score

CLINICAL FEATURE	SEVERITY	SCORE
Cyanosis	<ul style="list-style-type: none"> • None • With agitation • At rest 	<p>0</p> <p>4</p> <p>5</p>
Level of consciousness	<ul style="list-style-type: none"> • Normal • Disorientated 	<p>0</p> <p>5</p>
Air entry	<ul style="list-style-type: none"> • Normal • Decreased • Markedly decreased 	<p>0</p> <p>1</p> <p>2</p>

Severity: mild 0–3; moderate 4–6; severe 7–17.

- Mild croup
 - Oral steroids: dexamethasone (0.15 mg/kg to a maximum dose of 10 mg) or prednisolone (2 mg/kg to a maximum dose of 40 mg)
 - Child can be safely discharged from the ED with appropriate instructions.
- Moderate croup
 - May warrant admission depending on clinical progress.
 - Oral steroids as above.
 - If unable to administer steroids orally give 2 mg nebulized budesonide.
- Severe croup
 - Should be assessed and treated in the resuscitation room.
 - Call for senior help immediately.
 - Administer 0.4 mL/g of 1:1000 nebulized adrenaline.
 - Cyanosis at any time indicates severe croup.
 - Intubation may be required.

WHOOPING COUGH

Aetiology

- Respiratory tract infection with *Bordatella pertussis*

Clinical features

- Coryza
- Characteristic cough occurring in paroxysms
- Complications include pneumonia, encephalopathy, seizures and earache

Management

- Refer acutely unwell children to paediatrics
- Erythromycin (12.5 mg/kg QDS) orally: 7-day course
- Avoid contact with other children
- Formal diagnosis confirmed by per nasal swab
- Notifiable disease

INHALED FOREIGN BODY

Key points

- Common in toddlers
- May be anything: food, toys, coins, teeth
- Usually involves right main bronchus as this is more vertical than the left

Clinical features

- Inspiratory stridor
- Wheeze
- Cough

Investigations and management

- Well, relatively asymptomatic:
 - Anterior-posterior chest X-ray
 - Consider lateral neck X-ray if clinical picture consistent with upper airway obstruction
 - Refer to ENT for bronchoscopy
 - Consider anaesthetic assistance
- Complete airway obstruction:
 - Follow Resus Council UK guidelines on choking (Section 14.2)
 - Lower respiratory tract infection

Aetiology and epidemiology

- See Table 14.6

Table 14.6 Causative organisms of LRTI ordered by age group and prevalence, with most common cause first

AGE GROUP	CAUSATIVE ORGANISMS
Neonatal	<ul style="list-style-type: none"> • Group B <i>Streptococcus</i> • <i>Listeria monocytogenes</i> • <i>Staphylococcus aureus</i> • Gram-negative, e.g. <i>E. coli</i>
1 month–2 years	<ul style="list-style-type: none"> • Viral, e.g. respiratory syncytial virus • <i>Streptococcus pneumoniae</i> • <i>Staphylococcus aureus</i> • Gram-negative, e.g. <i>E. coli</i> • <i>Chlamydia pneumoniae</i>
2–5 years	<ul style="list-style-type: none"> • Viral • <i>Streptococcus pneumoniae</i> • <i>Mycoplasma pneumoniae</i> • <i>Chlamydia pneumoniae</i>

(Continued)

Table 14.6 (Continued) Causative organisms of LRTI ordered by age group and prevalence, with most common cause first

AGE GROUP	CAUSATIVE ORGANISMS
>5 years	<ul style="list-style-type: none"> • <i>Mycoplasma pneumoniae</i> • <i>Streptococcus pneumoniae</i> • Viral • <i>Chlamydia pneumoniae</i>

MICRO-reference

British Thoracic Society Standards of Care, British Thoracic Society Guidelines for the Management of Community Acquired Pneumonia in Childhood, *Thorax* 2002;57 (Suppl 1): 1–24.

Clinical features

- Cough
- Fever
- Respiratory distress
- Poor feeding
- Lethargy

Investigations

- CXR: consolidation (Fig. 14.3)

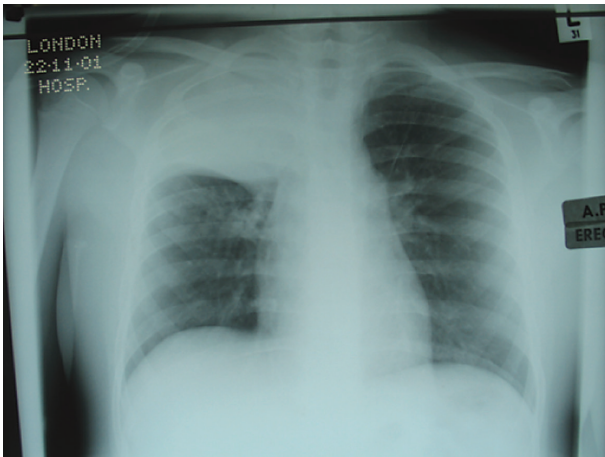


Fig. 14.3 CXR: Right upper lobe consolidation. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

Management

- Antibiotics:
 - Type depends on possible organism
 - Route depends on severity
- Supplemental oxygen therapy to maintain SpO₂ above 95%
- Rehydration

14.3 GASTROINTESTINAL AND RENAL TRACT CONDITIONS

ABDOMINAL PAIN

Aetiology

- See Table 14.7

Table 14.7 Causes of abdominal pain in paediatric patients

MEDICAL	SURGICAL
<ul style="list-style-type: none"> ● Gastroenteritis ● Systemic infection ● Meningitis ● Local infections ● Otitis media ● Tonsillitis ● UTI ● Mesenteric adenitis ● Coeliac disease ● Diabetic ketoacidosis ● Henoch-Schönlein purpura ● Psychological ● Non-specific abdominal pain 	<ul style="list-style-type: none"> ● Acute appendicitis ● Intussusception ● Hirschprung disease ● Incarcerated hernia ● Ureteric obstruction ● Testicular torsion ● Ectopic pregnancy (girls of childbearing age) ● Volvulus ● Malrotation

Diagnosis and management

- See Chapter 11, Surgical emergencies
- Ascertain an accurate history:
 - Onset
 - Duration
 - Site
- Bowel habit: diarrhoea/constipation

MICRO-facts

Always remember to examine the external genitalia in boys presenting with abdominal pain to rule out testicular torsion.

- Vomiting
- Pyrexia
- Anorexia
- Full examination:
 - Rash
 - Temperature
 - Abdominal distension, tenderness, masses, guarding, bowel sounds
 - Genitalia and hernial orifices
- Obtain urgent surgical review if features of an acute surgical abdomen are present

Investigation

- Bloods:
 - FBC
 - U&E
 - Blood cultures
- Urine dipstick
- Urinary or serum β -hCG
- Erect CXR: for suspected visceral perforation
- AXR: for suspected bowel obstruction
- USS

Management

- Rehydration
- Analgesia: see Section 1.3
- Antibiotics
- If a surgical abdomen is suspected, keep the patient nil by mouth until surgical review

MICRO-case

A 5-year-old boy is brought to the ED by his mother. He has worsening lower abdominal pain over the past 2 h. He had previously been well and playing normally. At present, he is struggling to walk and upset. On examination, his abdomen is soft with lower abdominal tenderness. He has been unable to perform a urine sample for testing. On examination of his genitalia, a tender, erythematous and swollen right testis is found.

Learning points:

- Always examine the external genitalia in boys presenting with abdominal pain.
- Testicular torsion (Fig. 14.1) is an emergency and needs to be relieved within 6 h from symptom onset.
- Refer urgently for a surgical review!
- See also Chapter 11, Surgical emergencies.

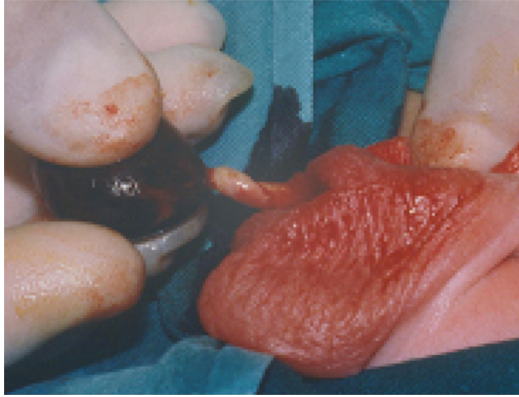


Fig. 14.4 Testicular torsion showing necrotic right testis. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

ACUTE APPENDICITIS

Covered in Chapter 11, Surgical emergencies.

MESENTERIC ADENITIS

Definition

- Inflammation of the mesenteric lymph nodes
- Enlarged secondary to a viral or bacterial infection

Clinical features

- Non-localized abdominal pain
- Can often mimic appendicitis

Investigations

- FBC: raised WCC indicates infection
- USS: preferred choice of investigation

Management

- Usually resolves with symptomatic management

INTUSSUSCEPTION

Definition

- Telescoping of one section of intestine into another.
- The blood supply to the distal segment is compromised, which can result in necrosis and perforation.
- Occurs between 6 months and 4 years of age with half of all cases occurring in infants <1 year old with a male:female ratio of 3:1.

Clinical features

- Sudden and episodic abdominal pain
- Drawing up of knees due to pain
- Distressed infant – crying and screaming
- Dehydration
- Abdominal distension
- Abdominal tenderness and palpable ‘sausage’ mass
- Vomiting
- ‘Redcurrant jelly’ stool – late sign

Investigations

- AXR: may show signs of bowel obstruction
- Air or barium enema:
 - Is also curative
 - Not to be performed if peritonitic

Management

- Resuscitation – IV fluids
- Urgent surgical referral for reduction

INTESTINAL OBSTRUCTION

Aetiology

- Pyloric stenosis
- Intussusception
- Appendicitis
- Inguinal hernia
- Inflammatory bowel disease
- Volvulus
- Malrotation

Clinical features

- Abdominal distension
- Abdominal tenderness
- Absolute constipation
- Hyperactive bowel sounds
- Vomiting
- Features of shock

Management

- Resuscitation – IV fluids
- Nil by mouth, NGT
- Analgesia
- Urgent surgical review – treat cause of obstruction

14.4 DIARRHOEA AND VOMITING

Aetiology

- See Table 14.8

Table 14.8 Causes of diarrhoea and vomiting in paediatric patients

MEDICAL	SURGICAL
<ul style="list-style-type: none"> • Gastroenteritis • Systemic infection: <ul style="list-style-type: none"> • Meningitis • Local infections: <ul style="list-style-type: none"> • Otitis media • Tonsillitis • UTI • Coeliac disease • Diabetic ketoacidosis • Psychological 	<ul style="list-style-type: none"> • Acute appendicitis • Intussusception • Hirschprung disease

MICRO-facts

Diarrhoea and vomiting are very common and not always due to gastroenteritis. Always perform a full examination to rule out other causes.

MICRO-facts

Viral gastroenteritis is unlikely if the following are present:

- Bloody diarrhoea
- Severe abdominal pain
- Bilious vomiting
- Septicaemia

Consider more serious causes such as acute abdominal pathology.

Investigations

- FBC: raised WCC
- U&E: renal function
- Imaging: if clinically indicated
- Stool culture: if clinically indicated

Management

- Rehydration: oral or IV fluids depending on severity
- Antibiotics if indicated

14.5 DEHYDRATION

Clinical features and severity assessment

- See Table 14.9

Table 14.9 Assessing severity of dehydration

DEHYDRATION SEVERITY	CLINICAL FEATURES
Mild <5%	<ul style="list-style-type: none"> • Well • Increased thirst • Slight reduction in urine output
Moderate 5–10%	<ul style="list-style-type: none"> • Unwell • Restless • Sunken eyes and fontanelle • Tachycardia • Tachypnoea • Normal capillary refill time • Oliguria • Reduced skin turgor • Dry mucous membranes • Normal blood pressure
Severe >10%	<ul style="list-style-type: none"> • Drowsy • Cold, pale mottled skin • Weak peripheral pulses • Hypotension • Marked oliguria • Prolonged capillary refill time • Tachycardia • Tachypnoea • Decreased level of consciousness

Management

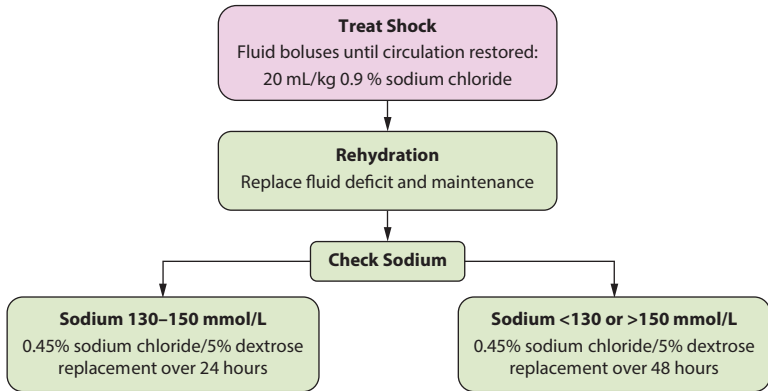
- Fluid rehydration (see Fig. 14.5):
 - Replace fluid deficit (see MICRO-facts box for calculation)
 - Replace ongoing losses
 - Provide maintenance fluid (see Table 14.10)

MICRO-facts

Calculating fluid deficit in mL = % dehydration × body weight (kg) × 10

Table 14.10 Calculating fluid maintenance

BODY WEIGHT	FLUID MAINTENANCE ML/KG/24 H
First 10 kg	100
Second 10 kg	50
Each subsequent kg	20

**Fig. 14.5** Calculating fluid rehydration.**14.6 THE FEBRILE CHILD****Definition**

- Temperature $>38.0^{\circ}\text{C}$

Aetiology

- See Table 14.11

Clinical features

- Lethargy
- Poor feeding
- Miserable
- Signs of dehydration
- Reduced urinary output
- Tachycardia

Table 14.11 Causes of a febrile child

SYSTEM	AETIOLOGY
Respiratory	<ul style="list-style-type: none"> • Upper respiratory tract infection • Lower respiratory tract infection • Croup
Gastrointestinal	<ul style="list-style-type: none"> • Gastroenteritis • Appendicitis
ENT	<ul style="list-style-type: none"> • Otitis media • Tonsillitis • Epiglottitis
Genitourinary	<ul style="list-style-type: none"> • Lower urinary tract infection • Upper urinary tract infection
Neurological	<ul style="list-style-type: none"> • Meningitis • Encephalitis • Seizure
Other	<ul style="list-style-type: none"> • Osteomyelitis • Septic arthritis • Kawasaki disease • Septicaemia, e.g. meningococcal

- Hypotension
- Tachypnoea/respiratory distress
- Fever
- Purpuric rash – meningococcal septicaemia
- Hypoxia/cyanosis
- Joint/limb swelling

Investigations: Septic screen

- Bloods:
 - FBC: May show raised WCC indicating infection
 - Glucose
 - U&Es: raised urea and creatinine can indicate dehydration
 - Blood cultures
 - Acute phase reactants: ↑ CRP and ESR
- Meningococcal PCR
- Throat swab
- Urine for microscopy, culture and sensitivity
- CXR: rule out pneumonia
- Lumbar puncture: if indicated would be performed by the paediatric team

Management

- Treat the cause if a focus of infection is found
- Admit if:
 - Systemically unwell, with or without focus of infection
 - 0–3 months old with a temperature $>38^{\circ}\text{C}$
 - 3–6 months old with a temperature $>39^{\circ}\text{C}$
 - Signs of meningism (see below)
 - Non-blanching rash
- Discharge if:
 - No systemic toxic findings
 - No abnormalities in septic screen
 - Infection may be safely managed at home:
 - Regular fluid intake
 - Paracetamol
 - Ibuprofen
 - Antibiotics if indicated
 - Review with GP in 24–48 h, or sooner if any concerns

14.7 FEBRILE CONVULSIONS

Definition

- Seizure occurring in a child from 6 months to 5 years who is neurologically normal precipitated by a fever arising from infection outside the nervous system

Epidemiology

- 6 months–5 years
- Affects 3% of children
- Can often reoccur

Clinical features

- Typically last <5 min but may develop into a complex febrile seizure lasting >15 min
- No focal neurological deficit
- No residual weakness

Investigations

- Septic screen: see Section 14.6

Management

- Treat underlying aetiology
- Manage convulsion (see Table 14.12)
- Reduce the fever (see Table 14.12)

Table 14.12 Management of febrile convulsions

Manage the convulsion	<ul style="list-style-type: none"> • Oxygen • IV lorazepam (0.1 mg/kg) or PR diazepam (0.5 mg/kg) if appropriate
Reduce the fever	<ul style="list-style-type: none"> • Undress • Tepid sponging/fan • Paracetamol • Ibuprofen • Treat cause

- Admit if:
 - First febrile seizure
 - <2 years old
- Discuss with paediatric team if any concerns

14.8 MENINGITIS AND MENINGOCOCCAL SEPTICAEMIA

MICRO-facts

Bacterial meningitis carries a 5–10% mortality rate.

Aetiology

- May be due to bacteria or viruses
- Enterovirus accounts for 80% of viral meningitis
- See Table 14.13 for bacterial epidemiology
- If in doubt as to the cause, always treat as bacterial, as more likely to cause complications

Key points

- Meningitis:
 - Inflammation of the meningeal tissues that surround the brain
 - Refer to Chapter 18, Infectious diseases
- Meningococcal septicaemia:
 - Septicaemia caused by *Neisseria meningitidis*
 - May or may not be associated with meningitis
 - Carries a high risk of complication and mortality

Table 14.13 Causative organisms in meningitis

AGE	CAUSATIVE ORGANISM
Neonatal–3 months	<ul style="list-style-type: none"> • Group B <i>Streptococcus</i> • <i>Listeria monocytogenes</i> • <i>Escherichia coli</i>
1 month–6 years	<ul style="list-style-type: none"> • <i>Neisseria meningitidis</i> • <i>Streptococcus pneumoniae</i> • <i>Haemophilus influenzae</i>
Over 6 years	<ul style="list-style-type: none"> • <i>Neisseria meningitidis</i> • <i>S. pneumoniae</i>

History

- Fever, rigors
- Irritability, confusion
- Lethargy, drowsiness
- Headache
- Photophobia
- Vomiting
- Seizures

Examination

- Early signs are often non-specific
- Fever
- Features of meningism:
 - Neck stiffness
 - Brudzinski sign
 - Kernig sign

MICRO-facts

- Brudzinski sign: With the child supine, neck flexion causes flexion of the knees and hips.
- Kernig sign: With the child supine, hips and knees flexed, extension of the knees causes back pain.

- Features of shock:
 - Tachycardia
 - Prolonged capillary refill time
 - Tachypnoea
 - Drowsiness
 - Reduced urine output
 - Hypotension (late sign)

- Features of raised intracranial pressure:
 - Fluctuating or reduced consciousness
 - Relative bradycardia and hypertension
 - Unequal, dilated pupils
 - Seizures
 - Focal neurological signs
- Features of septicaemia:
 - Shock (see above)
 - Purpuric, non-blanching rash (late sign, may be atypical)

Investigations

- Blood tests:
 - FBC
 - U&Es
 - LFT
 - Clotting screen
 - CRP
 - Blood cultures (take before starting antibiotics)
 - Meningococcal PCR
- Other microbiology:
 - Urine
 - Throat swab
 - Stool
- Lumbar puncture
- CT/MRI if appropriate; do not allow to delay treatment



Fig. 14.6 Petechial rash. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

Management

- See Fig. 14.7

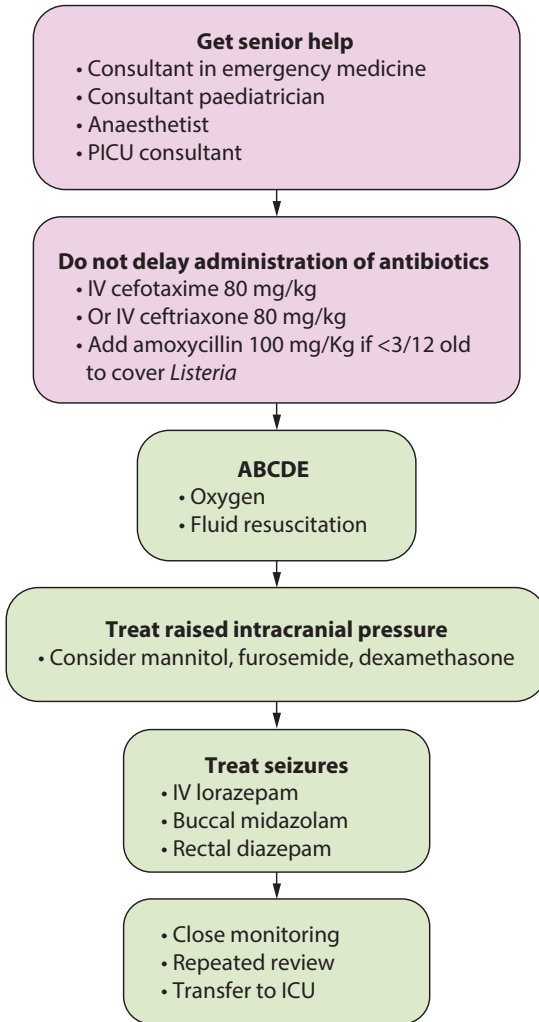


Fig. 14.7 Emergency management of meningococcal septicaemia.

MICRO-reference

NICE Guidelines on Management of Bacterial Meningitis and Meningococcal Septicaemia, <http://guidance.nice.org.uk/CG102>

14.9 SKIN CONDITIONS

RASHES

- See Table 14.14

ATOPIC ECZEMA

Clinical features

- Dry, itchy skin
- Skin flexures (see Fig. 14.8)
- Frictional areas
- Family or personal history of atopy (asthma, eczema, allergic rhinitis) is common

Management

- Emollient cream
- Anti-pruritic: antihistamines
- Steroid cream:
 - 0.5–1% hydrocortisone twice daily
 - Avoid potent preparations on the face
- Consider systemic or topical antibiotics if evidence of superimposed infection
- Advise to avoid irritants
- Arrange dermatology follow-up if severe

Table 14.14 Skin rashes and causes

CHARACTERISTIC	AETIOLOGY
Itchy	<ul style="list-style-type: none"> • Atopic eczema • Urticaria • Scabies • Chicken pox • Fungal infections
Petechial	<ul style="list-style-type: none"> • Meningococcal disease • Henoch-Schönlein purpura • Idiopathic thrombocytopenia • Viral illness • Trauma • Superior vena cava distribution
Blistering	<ul style="list-style-type: none"> • Chicken pox • Herpes zoster • Hand, foot and mouth disease • Stevens-Johnson syndrome



Fig. 14.8 Flexural eczema. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

URTICARIA

Aetiology

- Hypersensitivity
- May be due to specific allergens

Clinical features

- Hives, wheals, flares (see Fig. 14.9)
- Oedematous lesions
- Angioedema

Management

- Antihistamines, e.g. chlorphenamine
- Emollient cream
- Management of anaphylaxis, if present (see Section 1.2)
- Adrenaline doses in children:
 - >12 years: 500 micrograms IM (0.5 mL) i.e. same as adult dose
 - >6 – 12 years: 300 micrograms IM (0.3 mL)
 - >6 months – 6 years: 150 micrograms IM (0.15 mL)
 - <6 months: 150 micrograms IM (0.15 mL)
- Avoid allergens
- Dermatology follow-up

HENOCH-SCHÖNLEIN PURPURA (HSP)

Definition

- Systemic vasculitis affecting the small arterioles of the skin, joints, gastrointestinal tract and kidneys



Fig. 14.9 Urticaria wheals. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

Aetiology

- Follows a recent viral or bacterial illness, e.g. upper respiratory tract infection or gastroenteritis
- More common in boys
- Usually affects children aged 2–11 years

Clinical features

- Rash:
 - Characteristically over buttocks/extensor surfaces of limbs (Fig. 14.10)
 - Symmetrical
 - Maculopapular
 - Purpuric or petechial
- Nephritis:
 - Oedema
 - Abdominal pain



Fig. 14.10 Henoch-Schönlein purpura. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

- Haematuria
- Proteinuria
- Hypertension
- Arthralgia:
 - \pm Joint swelling typically affecting the larger joints lasting up to 48 h

Investigation

- Visual inspection of urine for macroscopic haematuria
- Urine dipstick for blood \pm microscopy to quantify RBC count
- Measure blood pressure
- Further investigations as dictated by degree of systemic upset, haematuria or hypertension

Management

- Supportive management of above symptoms: analgesia
- Assess for renal damage: renal history

SCABIES

Aetiology

- Infestation with *Sarcoptes scabiei*

Clinical features

- Severe itching
- Burrows between fingers but can occur in other flexure surfaces
- See Fig. 14.11

Management

- Treat both the patient and their household contacts
- 5% permethrin cream applied everywhere below the neck for 8–12 h

HAND-FOOT-AND-MOUTH DISEASE

Aetiology

- Molluscum contagiosum virus

Clinical features

- Pearly papules
- Affecting hands, feet and mucous membranes of the mouth
- Parents may report that other children in contact have the virus
- See Fig. 14.12

Management

- Self-limiting, no specific treatment required
- Advise parents to keep child away from other children until the rash has cleared



Fig. 14.11 Scabies. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)



Fig. 14.12 Molluscum contagiosum. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

VARICELLA ZOSTER (CHICKEN POX)

Aetiology

- Varicella zoster virus
- Incubation period of 10–21 days

Management

- Supportive and symptomatic, e.g. paracetamol, calamine lotion, oral antihistamines
- Avoid NSAIDs: increased risk of developing invasive streptococcal disease
- Consider the following in severe cases:
 - Admission
 - Varicella zoster immunoglobulin
 - Aciclovir

Complications

- Secondary bacterial infection
- Pneumonia/pneumonitis
- Cerebellar ataxia
- Hepatitis
- Encephalitis

MICRO-facts

There has been a sharp increase in the number of cases of measles in recent years. This is most likely due to the false claim that linked the MMR vaccine to autism.

MEASLES

Aetiology

- Highly infectious RNA paramyxovirus
- Droplet transmission
- Most common in children aged 1–4 years old

Clinical features

- Prodromal stage:
 - Cough
 - Coryza
 - Conjunctivitis
 - Koplik spots: white spots on mucous membranes of mouth
 - Infective during this stage until fourth day of rash
- Rash:
 - Maculopapular red rash (see Fig. 14.13)
 - Spreads downwards from face

Complications

- Otitis media
- Diarrhoea
- Secondary bacterial infection, e.g. pneumonia, cellulitis
- Meningitis
- Encephalitis
- Subacute sclerosing panencephalitis
- Complications during pregnancy if infected while pregnant

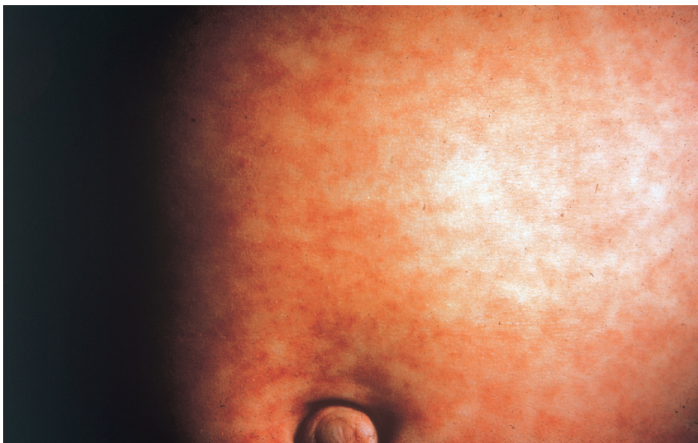


Fig. 14.13 Measles rash. (From Sidwell, R. and Thompson, M., *Easy Paediatrics*, CRC Press, Boca Raton, FL, 2011.)

Management

- Symptomatic:
 - Analgesia
 - Monitor fluid balance
 - Treat any secondary infection
- Immunoglobulin can be used in infants and immunocompromised patients within 6 days of exposure

MUMPS

Aetiology

- RNA paramyxovirus
- Droplet transmission

Clinical features

- Prodromal stage:
 - Non-specific symptoms
 - Fever
 - Myalgia
 - Headache
- Tender swelling of salivary glands, mainly parotid

Complications

- Meningitis
- Encephalitis
- Epididymo-orchitis
- Eye symptoms
- Pancreatitis

Management

- Symptomatic: analgesia
- Management of above complications

RUBELLA

Aetiology

- RNA togavirus
- Droplet transmission

Clinical features

- Prodromal stage:
 - Non-specific symptoms
 - Fever
 - Coryza
 - Myalgia
 - Headache

- Pink maculopapular rash:
 - Spreads downwards from face
- Cervical lymphadenopathy

Complications

- Teratogenic in pregnancy:
 - Fetal complications worst during first trimester
 - Congenital rubella syndrome
- Arthritis
- Encephalitis
- Thrombocytopaenia

Management

- Supportive
- Obstetric advice if pregnant

14.10 EAR, NOSE AND THROAT

TONSILLITIS AND PHARYNGITIS

Covered in Chapter 16, Ear, nose and throat

MICRO-facts

NICE Centor criteria for sore throat

- Tonsillar exudate
- Absence of cough
- History of fever
- Tender anterior cervical lymph nodes

Presence of three or four clinical signs suggests chance of patient having group A β -haemolytic streptococcal infection is 40–60% and so may benefit from antibiotic treatment.

OTITIS MEDIA

Covered in Chapter 16, Ear, nose and throat

EPIGLOTTITIS

Definition

- Inflammation of the epiglottis

Aetiology

- Haemophilus influenzae type B

Epidemiology

- Usually 1 to 6 years old

Clinical features

- Acute onset
- Toxic, septic, unwell
- Difficulty talking
- Drooling saliva
- Respiratory distress
- Open mouth
- Upright in a 'tripod' position to aid accessory muscle use
- Stridor

MICRO-facts

Remember epiglottitis

- Sepsis
- Stridor
- Saliva – drooling
- Speech – muffled
- Swallowing – difficult

Management

- Urgent senior ENT, anaesthetic and paediatric help required to secure airway.
- Do not attempt bloods or cannulation until the airway is secure, as this can cause the child to become distressed and further compromise the airway.
- Intravenous antibiotics – cefotaxime if not allergic.

MICRO-facts

Never examine the throat in suspected epiglottitis as this may further compromise the airway!

Acute epiglottitis vs. croup

- See Table 14.15

Table 14.15 Acute epiglottitis vs. croup

FEATURE	CROUP	EPIGLOTTITIS
Onset	Days	Hours
Preceding coryza	Yes	No

(Continued)

Table 14.15 (Continued) Acute epiglottitis vs. croup

FEATURE	CROUP	EPIGLOTTITIS
Cough	Severe Barking	Absent Slight
Able to drink	Yes	No
Drooling saliva	No	Yes
Appearance	Unwell	Toxic/very unwell
Fever	<38.5	>38.5
Stridor	Harsh Rasping	Soft Whispering
Voice/cry	Hoarse	Muffled Reluctant to speak
Pain	Not usually	Intensely painful

14.11 URINARY TRACT INFECTION (UTI)

See also Chapter 8, Renal emergencies.

Definition

- Pure growth of 10^4 – 10^5 organisms/mL

Clinical features

- Non-specific symptoms:
 - Poor feeding
 - Lethargy
 - Irritable
- Pyrexia
- Dysuria
- Offensive-smelling urine
- Abdominal pain
- Incontinence

MICRO-facts

- Symptoms of a UTI can be non-specific especially in children under 3 years.
- Always remember to test urine samples in children with an unexplained fever.

Diagnosis

- Clean catch urine dipstick, presence of:
 - Nitrites (highly indicative)
 - Leucocytes
 - Blood
 - Protein
- Positive urine culture, confirms UTI

MICRO-facts

Measure BP, height, weight and temperature in all children presenting with a UTI. Abnormalities in these readings may suggest underlying pathology.

Management

- Infants <3 months must be admitted
- Children >3 months with symptoms of a lower urinary tract infection can be treated with 3 days of oral antibiotics
- Treat with antibiotics if clinical features and urine dipstick are suggestive of a UTI
- Antibiotic choice can be based on local guidelines; trimethoprim, amoxicillin, cephalosporin and nitrofurantoin may all be suitable
- Hydration
- Re-assess the child after 24–48 h if still unwell
- Further investigations may be needed to check for any renal structural abnormalities

MICRO-references

NICE Guidelines (CG54) on Urinary Tract Infection; Diagnosis, Treatment and Long Term Management of Urinary Tract Infection in Children, www.nice.org.uk/CG54

14.12 THE LIMPING CHILD

Aetiology

- Wide differential diagnoses:
 - Medical causes:
 - Neoplasia
 - Sickle cell disease
 - Leukaemia
 - Sepsis
 - Non-accidental injury (NAI)

- Bony/joint causes:
 - Septic arthritis
 - Fracture
 - Osteomyelitis
 - Soft tissue injury
 - Discitis
- Hip pathologies:
 - Transient synovitis
 - Most common presentation especially following active or recent URTI
 - Perthes disease
 - Septic arthritis
 - Slipped upper femoral epiphysis
 - Missed developmental dysplasia of the hip
- Surgical:
 - Peritonitis
 - Hernias
 - Testicular torsion

14.13 THE HYPOGLYCAEMIC (NON-DIABETIC) CHILD

Definition

- Hypoglycaemia:
 - May be the only presenting complaint for a serious underlying metabolic condition
 - Plasma glucose less than 2.5 mmol/L
 - Threshold definitions vary from hospital to hospital; follow local hospital policy

Management

- Hypoglycaemic screening blood tests prior to giving glucose
- Neonates <72 h who are yet to establish feeding:
 - Observe response after single feed
 - Consider hypoglycaemic screening blood tests
 - Refer to the paediatric team for admission

14.14 NON-ACCIDENTAL INJURY AND ABUSE

Definition

- Parents or carers can inflict abuse on children under their care in different forms:
 - Physical

- Emotional
- Sexual
- Neglect

Recognition

- History:
 - May not be consistent with injuries sustained
 - Denial of injury
 - Changing, variable
 - Unexplained delay in presentation
 - Frequent ED attendance
 - Missed appointments for medical care
- Examination:
 - Parental interaction
 - Injuries inconsistent with the child's developmental stage
 - Old injuries
 - Failure to thrive
 - Quiet, watchful child
 - Delay in developmental milestones
 - Unusual sites for injuries:
 - Face
 - Back
 - Thigh
 - Specific injuries:
 - Bite marks
 - Finger marks
 - Burns
 - Torn frenulum
 - Retinal haemorrhages
 - Trauma to genitalia
 - Fractures in a child <2 years old
 - Sexually transmitted infections
 - Fabricated or induced illness

MICRO-facts

Don't forget medical causes. Immune thrombocytopenic purpura (ITP) can also present with multiple bruises and petechiae and osteogenesis imperfecta with fractures.

Management

- Inform senior member of ED.
- Inform senior paediatrician.
- Arrange admission to enable further investigation, observation and safeguarding procedures to be instituted.
- Check the child protection register to see if previous episodes of abuse have been recorded.
- Document clearly and accurately.

04:: Mastering Emergency Medicine

- Chapter: Communication skills
- Chapter: Maxillofacial emergencies

30

Communication Skills

CHETAN R TRIVEDY AND ANDREW PARFITT

CORE TOPICS

- The angry patient
- Breaking bad news
- Making a difficult referral
- Dealing with a complaint

Within the acute medical setting, clear and effective communication with patients and colleagues is a fundamental skill for all emergency medicine trainees. Communication skills are therefore tested extensively in Part C of the MCEM and FCEM examinations and it is an area that many candidates find particularly difficult to master. Many try to prepare specifically for the communication skill stations of the OSCE without addressing any shortcomings in their underlying ability to communicate in everyday practice. It is here where the real preparation is. Every candidate will have their own style of communicating with others. Some are natural communicators, others struggle. The important point is that we all have our own style, and it is essential to preserve this in the examination to avoid seeming artificial or false. In this chapter, we will attempt to introduce some key concepts in communication skills and look at some methods that may be incorporated into the everyday practice of these skills. We will also look at some typical communications skills stations that are old favorites in the MCEM and FCEM examinations.

It may seem obvious, but the first and perhaps most important goal in the communication skills test is to completely understand what you are asked to do by the examiners. This corresponds in clinical practice to understanding clearly the issue or problem that requires effective communication as the solution. There is no point in making a cake, however grand it may be, when your examiner – or the patient – has asked for a loaf of bread! Obvious, yes, but many candidates will steer the consultation away from the original problem and consequently fail the station. In this type of test, you will often have the opportunity to study a pie chart indicating the distribution of the marks between practical skills, knowledge and communication skills for that station. As an example, you may be asked to see a 7-year-old asthmatic child who has presented with his mother. Your task may be to demonstrate and explain how to use an inhaler. Most marks will be awarded for the actual communication element of the scenario. Remember also that a significant number of marks will be given to the actor to score you on how well they thought you communicated!

In any communication with patients, it is important to use language that they will understand and to explain medical matters to them in terms that they will be familiar with. You will have been told this many times, but it is a point that is easily forgotten. For example, having patiently explained to a patient that they have fractured their wrist and described in detail what you are going to do about it, you will be familiar with the frequent response 'So it isn't broken then?' The term 'fracture' is meaningless to most people. The examiner will be watching for technical

jargon and you will be marked down. On the flip side, however, you must not appear patronizing. Use every patient encounter during your working day to practise striking the right balance and it will come effortlessly in the OSCE.

SCENARIO 30.1 THE ANGRY PATIENT

You are asked as the emergency department registrar to see a 54-year-old businessman who has presented to the emergency department with an injury to his right ankle. He fell while attempting to disembark from a bus. He has been seen by an emergency nurse practitioner, who felt that there was no bony injury and that an X-ray is not required. He is demanding to be seen by a senior doctor and has been very aggressive with the nursing staff.

You are asked to see him by the emergency department sister and calm the situation.

SUGGESTED APPROACH

The key to managing this type of patient in the emergency department is to defuse the situation and prevent escalation. To achieve this, you must avoid responding to a patient's aggression and frustrations with those same feelings of your own. This is not always easy in a busy department, but it is essential in order to allow any kind of engagement with the patient. In the OSCE itself, if the actor feels that you were aggressive, dismissive or defensive toward the patient they are playing then you will not score well.

First ensure you have the correct mindset, and then greet the patient positively, introduce yourself and, wherever possible, move the patient to a more private area. A slanging match in the middle of a busy waiting room will only make the situation worse. It is advisable to have a nurse or other colleague present in case the aggression escalates and as a witness of events. It is important to remember that, although most patients will use verbal aggression to vent their frustrations, physical assaults on emergency department staff are not uncommon.

The best way to defuse a volatile situation is to listen. Refrain from the urge to interrupt, since attempts to butt in will only increase the patient's frustration. Allow them to give their side of the problem and to calm down before attempting to negotiate a management plan. In many instances, listening is all that is required.

If necessary, impartially establish the facts early on from the patient, the casualty card/notes and other members of staff who may be involved. This avoids making judgmental remarks and annoying the patient further by 'getting it all wrong' or 'backing up your colleague' in their eyes.

The best approach to responding to the concerns of an angry patient is to acknowledge these concerns and show that you are taking them seriously. An apology early in the consultation may also go a long way in defusing an escalating situation. The following may be appropriate ways of addressing the patient in this case:

'Hi, my name is Dr _____, I'm really sorry you have had to wait so long ...'

'What seems to be the problem?'

'I understand this must be difficult for you ... but I hope you understand how busy we are.'

'I can appreciate how you feel.'

'It concerns me that you feel so strongly about this.'

Show that you are listening to the patient and exhibit the correct body language. You should not promise the patient anything that is not feasible, nor should you reward bad behaviour by giving in to unreasonable requests. In this case, you should not order an X-ray of his foot if it is not clinically indicated, since it is not good practice to conduct unnecessary examinations in order to keep a patient happy.

It is also important to keep an open mind and not have preconceived ideas about the patient's clinical condition, since even obnoxious or aggressive patients can have serious conditions, which may be missed because of their demeanour. Once the patient is calmer, explain that you would like to take a history and examine them. Once you have examined the patient and decided on the appropriate management, you should convey this to them.

It often helps to explain to the patient how you have arrived at the conclusion that you have regarding their problem, so that they understand that your management is rooted in good practice and is not arising from prejudice, laziness or 'not listening to what they are telling you'. In the case of the ankle injury, you could explain that a lot of work has gone into distinguishing which injuries need an X-ray and which do not, and that these rules are applied by all emergency doctors and in all emergency departments.

You may be faced with a situation where the patient refuses to accept your management plan, and it is important that you look for the reasons underlying their concerns, the so-called 'hidden agenda'. In this case, the hidden agenda is the desire to bring legal proceedings against the bus company. Often, to score well on an OSCE of this kind, you will be required to use your expert communication skills to find the underlying agenda and address it adequately.

Patients who are anxious or scared often present with aggression, and calm down once their fears and anxieties have been dealt with. However, it is useful to bear in mind the '5Hs' of aggressive behaviour, since such behaviour might have a medical cause:

Head injury

Hash: illicit drugs and alcohol

Hyperglycaemia: diabetic ketoacidosis (DKA) or hyperosmolar non-ketotic (HONK) hyperglycaemia

High temperature: fever/sepsis

Hypoxia

It is essential that you come to an agreed management plan. In the present case, this may mean providing the patient with appropriate analgesia, giving advice to how to manage his sprained ankle and, most importantly, arranging follow-up, even if this is with the patient's own GP. Offering to write a letter for the GP reassures the patient that there will not be any confusion. It is also useful to inform the patient of things that might suggest deterioration in their condition and what should trigger re-presentation, either to their GP or the emergency department.

Scoring Scenario 30.1: The angry patient

	Inadequate/ not done	Adequate	Good
Reads relevant notes to confirm facts	0	1	—
Appropriate introduction	0	1	—
Takes patient to private area to discuss problem	0	1	—
Listens to patient's complaints without interrupting	0	1	2
Apologizes for long wait	0	1	—
Ascertains patient's concerns: <ul style="list-style-type: none"> • long wait in emergency department • not seen by a doctor • missed meeting • cancellation of skiing trip • litigation against bus company 	0	1	2
Offers to examine patient's ankle	0	1	—
Explains to patient why X-ray is not necessary	0	1	—
Explain role of emergency nurse practitioner and their significant experience and skills in managing minor injuries	0	1	—
Suggests an agreed treatment plan: <ul style="list-style-type: none"> • rest/elevation/analgesia • crutches • GP to review • physiotherapy • letter to travel company 	0	1	2
Responds to patient's concerns effectively	0	1	—
Does not appear to collude with emergency nurse practitioner	0	1	—
Does not arrange X-ray to keep patient happy	0	1	—
Remains calm and professional throughout consultation	0	1	2
Avoids use of technical jargon	0	1	—
Effective use of silence as well as verbal and non-verbal communication skills	0	1	2
Ends interview effectively	0	1	—
Score from actor		/5	
Global score from examiner		/5	
Total score		/32	

SCENARIO 30.2 BREAKING BAD NEWS

You are the emergency department registrar and have just attended a trauma call involving a 32-year-old man who was severely injured in a motor vehicle collision. He suffered severe head injuries and arrived in the emergency department in cardiac arrest. After 45 minutes of CPR, the trauma team agreed that further attempts to resuscitate the patient would be futile, and he was pronounced dead.

You have been asked to speak to his wife, who has rushed to the emergency department after learning that her husband has been involved in an accident. You have 7 minutes to break the news.

SUGGESTED APPROACH

This is a difficult scenario that we face all too often in the emergency department, and one that, with a few variations, often crops up in OSCEs. The following is a suggested approach.

First, establish the facts before you speak to the relatives. Make sure that you know the patient's name. Obtain information on the accident and pre-hospital care from the police and ambulance crew. Review the details of resuscitation and the findings of the primary survey. Relatives will often ask for a lot of information – be prepared.

Find an appropriate place to talk to the relatives. The waiting room or the resuscitation bay is inappropriate. Most emergency departments have a dedicated relative's room. Failing that, use any room that is comfortable and where there is adequate privacy and seating facilities. Ask for a member of the nursing staff who was involved in the resuscitation to accompany you. Turn off your pager, as well your mobile. There should be no interruptions.

Introduce yourself and your colleague to the relatives, clearly stating your involvement with the patient. Take care to find out who they are and to establish their relationship to the patient:

'Hello, my name is Dr_____. I am the emergency department registrar looking after Mr_____. 'Can I ask, you are Mrs_____, his wife?'

After establishing the relationship and identity of the relatives, you can prepare them and yourself for the difficult process of breaking the news.

Ask the relatives to take a seat. If there is just one person on their own, ask if there is anyone else they would like to be present. You can also ask if they would like a glass of water or a cup of tea.

Ask the relatives how much they know about the situation and what they have been told so far. Do not interrupt. Wait until they have finished, and then say:

'I have some very bad news, I am afraid. Mr_____ has died.'

You have to use the words 'died', 'dead' or 'death' explicitly. Avoid terms such as 'passed on', 'gone to heaven' or 'is no longer with us'. These phrases may sound more comforting, but they are not explicit enough. The relative has to get the clear message that their loved one has died.

Once you have imparted the bad news, the best approach is to remain silent and expect anything. Responses may range from anger or hysteria to complete denial, or even silence. Shock is a common response and it essential that you give the relatives time to accept the situation. You may have to repeat the fact that the patient has died. At an appropriate moment, offer your apologies. Be prepared to answer any questions from the relatives, but give only the facts that you have. Do not speculate on a cause of death if it is not clear.

Touch is a contentious issue. Put simply, only consider touching the relatives to show sympathy if this is something you do naturally and with success when dealing with such situations in everyday practice. If you do not use touch normally, do not use it in the OSCE, since it will look forced and make both you and the relative uncomfortable. There are never marks awarded for touching the relative, so not doing so is always safest.

Once the relatives are more collected, you should attempt to engage them. Explain to them in simple terms the circumstances surrounding the admission to hospital and what medical treatment was provided. Occasionally, relatives arrive while CPR is ongoing. It is acceptable for them to be present, especially when children are being resuscitated. A dedicated team member should stand with them and explain what is taking place.

The relatives should be given the opportunity to see the patient, but this should be done once the body has been prepared and cleaned. It is important to pre-warn the relatives that there may be tubes (endotracheal, central lines or cannulae) present and that these may have to remain in case there is a coroner's inquest.

This may also be the opportunity to ask the relatives if they would like a representative from their religious community to be contacted. Most hospitals have dedicated staff available on-call.

You should allow the relatives the opportunity to grieve in private and encourage them to hold the patient's hand if they want to. Do not feel pressurized to give them too much information at this stage. It may be appropriate to leave them and return in half an hour or so and then ask if they are OK or if they have any questions. It is always appropriate to ask if there is anything you can do to help.

It is often surprising how quickly relatives focus on the practical issues now facing them. Common questions include:

- What will happen to the body once it leaves the emergency department?
- When can the funeral be organized?
- How is the paperwork organized?
- Will they be able to visit the deceased?

The relatives should be given the appropriate leaflets on bereavement and also the telephone number of the bereavement office. There are also several national organizations that deal with bereavement counselling, such as Cruse Bereavement Care, which provide free advice and a helpline for those who are bereaved.

It is also vital that you consider and approach the sensitive issue of organ transplantation. This is a difficult area, but, if organ donation is a viable option, it should not be avoided. The issue can be raised by asking the relatives if the deceased carried an organ donor card. The transplant coordinator may also be contacted where organ donation is a possibility.

As with all OSCEs, you should end with a management plan or follow-up. In this case, you should ensure that the relatives have been referred to the bereavement office and that you have answered any relevant questions.

Scoring Scenario 30.2: Breaking bad news

	Inadequate/ not done	Adequate	Good
Read relevant notes to confirm facts	0	1	—
Appropriate introduction and confirmation of relative's identity and relationship to patient	0	1	—
Explains own role in looking after patient	0	1	—
Takes relative to private area to break news. Asks for nurse to be present	0	1	—
Asks relative if she wants anyone to be present	0	1	—
Enquires how much she knows about what has happened	0	1	—
Explains facts and implicitly states that patient has died/is dead. Avoids use of terms such as 'moved on' and 'passed away'	0	1	2
Makes good use of silence and gives relative time to accept bad news	0	1	—
Checks understanding of information given	0	1	—
Does not give relative false hope	0	1	—
Explores relative's concerns/questions: <ul style="list-style-type: none"> • Can she see the body? • coroner's inquest • funeral arrangements according to Islamic faith • request for Islamic imam 	0	1	2
Explains need for post-mortem and coroner's inquest	0	1	—
Demonstrates good use of silence and non-verbal communication skills	0	1	2
Demonstrates empathy	0	1	2
Avoids use of technical jargon	0	1	—
Raises issue of organ donation	0	1	—
Offers details of bereavement office and relevant literature	0	1	—
Ends interview effectively	0	1	—
Score from actor		/5	
Global score from examiner		/5	
Total score		/32	

SCENARIO 30.3 THE DIFFICULT REFERRAL

As the emergency department registrar, you are asked to see a 50-year-old roofer who has fallen off some scaffolding. His C-spine is immobilized and plain radiography demonstrates a fracture at C5. Your F2 has unsuccessfully attempted to refer this patient to the orthopaedic registrar on call. You examine the patient and find the patient fully orientated with a GCS of 15 and no neurology apart from tingling in his right hand.

You call the orthopaedic registrar with a view to making a referral. You have 7 minutes to make the referral. You have access to the patient's notes and X-ray for your information.

SUGGESTED APPROACH

Negotiating a referral with a difficult colleague is a common practice in the emergency department. The ability to turn a diagnosis and treatment plan into action often requires specialist input, and it is crucial that the emergency department trainee can make appropriate referrals, even in the face of adversity. Further, the smooth handover of responsibility for patients is essential for safe management across specialties.

There are several factors that may contribute to a difficult referral:

- The referring doctor has insufficient knowledge about the patient to adequately refer.
- The receiving doctor is under pressure themselves and does not want additional work.
- There are personality clashes from either party, which result in 'referral meltdown'.
- The receiving doctor feels that the referral is inappropriate.
- The referring doctor believes that the accepting doctor is being lazy by not wanting to accept the patient.

Ensure that you know the facts before you make the call. This means that you should take a focused history, and at least perform a brief examination yourself. In addition, you should personally review the relevant tests that have been carried out (ECGs, blood results, X-rays and observations). The results should be at hand at the time of the referral. It is important that you explain why you are referring the patient and that the other party understands the need for the referral – you should clarify this to make sure that there is no misunderstanding.

As with all professional communication, a good introduction is a key step in achieving good rapport. The following phrase is a good opener, since it demonstrates that you appreciate that the person may be extremely busy and that you would like some of their time:

'Hello. My name is Dr _____. I am the emergency department registrar. I would like to refer a patient to you. Do you have a moment to discuss?'

In the OSCE, and occasionally in real life, you may get a torrent of abuse about how you or emergency department clinicians are making inappropriate referrals and wasting time. It is imperative that you do not take the bait and become embroiled in a slanging match. In real life, this will certainly result in referral meltdown; in the OSCE, it will not look good on your global score. Retaliation to aggression from a colleague is not an option, and you should ride out the storm. Once you have an appropriate platform, you should defuse the situation by the use of one of the following phrases:

'I am sorry you feel that way, but I feel that this patient needs admission because ...'

'I understand that you are really busy, but I have seen this patient and I think that they need to be seen because ...'

'I am quite concerned about this patient and really value your opinion because ...'

You should not agree to any management plan that you think might compromise patient safety, or back out of

a referral because of friction. If you cannot refer, you should at least insist that the patient be reviewed by the specialist team for an opinion.

Another strategy to use when making a difficult referral is to compromise or negotiate an agreed treatment plan, provided that this does not compromise patient safety. In this scenario, for example, it may involve the emergency department registrar organizing a CT scan of the neck prior to the requested orthopaedic opinion. Admitting the patient to a clinical observation unit or sending them to the orthopaedic ward without being seen is not a safe outcome of compromise. In the OSCE, the actor playing the difficult colleague will propose numerous inappropriate, and some unsafe, management options, and may even try to bully you into accepting one of them. The examiners are looking for you to put the patient's safety first in any agreed plan that you do make with the difficult colleague.

If you continue to meet with implacable obstruction and things are getting heated then you can acknowledge this and suggest ways out for both of you. For example:

'I feel that we are not getting anywhere. Maybe we should both think about the situation, and can I call you back in five minutes. Is that OK?'

'I feel that we are not getting anywhere and that I do have concerns about this patient. I think I will have to discuss this with my consultant. Is that OK?'

Whatever the outcome, remember to remain courteous and polite at all times

Ultimately, you will have to talk to your consultant if an appropriate management plan cannot be negotiated. It is important to realize that asking for senior help is not a sign of failure or 'snitching'. Often, a fresh approach is required once you have exhausted your diplomatic attempts to refer a patient. It is important that you carefully document the outcome of your discussion. It is possible that your consultant may not even be on site, and so they will be relying not only on your history and examination, but also on your synopsis of the discussion that you have had with the orthopaedic registrar. It is vital that you record the salient points of your discussion accurately.

Once the patient has been referred, it is useful to make a transcript of the referral in your notes, or at least document the time of referral, the accepting doctor's details and contact number, as well the agreed outcome.

Scoring Scenario 30.3: The difficult referral

	Inadequate/ not done	Adequate	Good
Reads patient's notes and states intention to review patient (does not actually have to do so). Looks at X-ray and confirms fracture	0	1	2
Appropriate introduction, stating his/her role and ascertaining name, grade and bleep number of orthopaedic registrar	0	1	2
Asks if it is a good time to discuss patient	0	1	—
Gives details of referral: <ul style="list-style-type: none"> • significant mechanism of injury • fracture at C5 on plain film • neurology (tingling in fingers) 	0	1	2
Listens to orthopaedic registrar: <ul style="list-style-type: none"> • Avoids interrupting or talking over colleague • Refrains from entering into an argument • Remains calm and professional at all times 	0	1	2
Explores and deals with orthopaedic registrar's concerns: <ul style="list-style-type: none"> • F2 who referred earlier not knowledgeable about facts • Short-staffed and under pressure • Previous poor referrals from emergency department • About to start a case in theatre 	0	1	2
Does not give into unsafe management options: <ul style="list-style-type: none"> • Review on fracture clinic tomorrow • Refer to neurologists for opinion • Admit to clinical decision unit under emergency department 	0	1	2
Politely but firmly insists that patient is reviewed by orthopaedic registrar	0	1	—
Checks understanding on need for referral	0	1	—
Agrees on safe plan of action: <ul style="list-style-type: none"> • Emergency department to organize further imaging (CT) • Patient to be reviewed by orthopaedic registrar after emergency case 	0	1	—
Remains calm and professional at all times	0	1	2
Deals with aggression and is non-judgemental	0	1	—
Avoids blaming F2 or criticizing registrar for their behaviour	0	1	—
Agrees time for further discussion to ensure resolution to conflict	0	1	—
Clearly documents conversation, with times and outcome	0	1	—
Effective use of silence as well as verbal and non-verbal communication skills	0	1	2
Ends interview effectively and suggests consultant input if there is no resolution	0	1	—
Score from actor		/5	
Global score from examiner		/5	
Total score		/35	

SCENARIO 30.4 DEALING WITH A COMPLAINT

A 60-year-old woman presented with a 1-week history of dysuria and increased urinary frequency. She was diagnosed with a urinary tract infection (UTI). Despite having a documented allergy to penicillin, she was prescribed a course of co-amoxiclav. The pharmacist picked up the potential drug error and another doctor prescribed the patient an alternative antibiotic. The patient has returned from the pharmacy and is unhappy with her treatment. She has spoken to the nurse in charge of the department and is planning to write to the chief executive about the incompetence of the junior doctor as well as his manner and lack of professionalism.

You have 7 minutes to discuss her concerns.

SUGGESTED APPROACH

As an emergency department trainee, you will be expected to deal with complaints made against your junior colleagues and take the appropriate action. The Citizens Charter Complaints Taskforce defined a complaint as ‘an expression of dissatisfaction requiring a response’. Dealing with complaints requires tact, diplomacy and, above all, integrity and transparency. It is important not only to resolve the complaint, but also to look critically at how such complaints can be prevented in the future. All complaints from patients should be taken seriously, since there is still a public perception that doctors work in collusion and that complaints are never dealt with. Furthermore, it is important not alienate or negate the member of staff against whom the complaint was made. Most emergency departments have complaints procedures in place, and it is advisable that you familiarize yourself with the policies of your department to use both in practice and as an example for examination purposes.

The patient in this case has raised an important concern about a drug error that could have had serious implications for her. She has also raised concerns regarding the junior doctor’s manner and level of professionalism, which should also be addressed. We recommend the following approach when dealing with this particular complaint.

Start with the patient. As with all of the communication skill stations, you should find an appropriate room where you are not likely to be disturbed. Turn off your bleep and telephone and introduce yourself to the patient, stating your name and position. Explain that you are the most senior person in the department at night and that you consider it important to hear what she has to say.

You can start off with a statement such as:

‘I’m sorry that you feel that you have not had good treatment in our department. Can you tell me more about what you are worried about so that we can do something about it.’

You are not apologizing for what happened, but are sorry that the patient has not been satisfied with her treatment.

You should allow the patient the opportunity to speak without interruption. Many patients who make a complaint want to be heard, and listening to their concerns goes a long way in resolving the complaint in the emergency department and preventing it going further. You should ask the patient to give specific examples of behaviour from the doctor that she felt was unprofessional or rude. With regard to the drug error, assure her that this is a serious concern and will not be ignored. Describe the procedures that you will undertake to flag this up – filling out an incident form and alerting the consultant of the error – and explain that, where necessary, a review of policy will result.

Once you have heard the patient’s side of things, you need to gain further information from the junior doctor, the emergency department record and other staff who may have been involved. Use this to respond to questions that the patient may have about her treatment, but not to judge whether mismanagement has occurred or to make what might be taken as a formal response to the complaint yourself.

If the patient indicates that she wishes to make a written complaint, do not try to dissuade her from doing so. Instead, outline the procedure for written complaints and to whom she must write – give her details of the trust's Patient Advice and Liaison Services (PALS). Assure her that all complaints are taken seriously and let her know how long after her complaint she can expect to receive a response from the Trust.

Finally, it is likely that the patient will not have confidence in her diagnosis and treatment so far. Review with her the history and offer to re-examine her to ensure that a UTI is the correct diagnosis. Arrange follow-up. Ensure detailed documentation in the notes.

Scoring Scenario 30.4: Dealing with a complaint

	Inadequate/ not done	Adequate	Good
Reviews relevant notes to confirm facts	0	1	—
Takes patient to private area to discuss complaint	0	1	—
Listens to patient's complaints without interrupting	0	1	2
Apologizes for error and checks that patient has correct medications	0	1	—
Ascertains and addresses patient's concerns: <ul style="list-style-type: none"> • drug error • rude/unprofessional junior doctor • death of husband in emergency department after missed aneurysm • concerns over hospital cover-up • wish to make formal complaint 	0	1	2
Agrees to speak to junior doctor regarding patient's concerns	0	1	—
Gives patient details of the PALS and offers information on departmental complaints procedure	0	1	—
Avoids blaming or colluding with junior doctor	0	1	—
Suggests filling an adverse incident form and looking at departmental drug policies	0	1	—
Remains calm and professional throughout consultation	0	1	2
Demonstrates empathy	0	1	—
Avoids use of technical jargon	0	1	—
Effective use of silence as well as verbal and non-verbal communication skills	0	1	2
Ends interview effectively	0	1	—
Score from actor		/5	
Global score from examiner		/5	
Total score		/28	

12

Maxillofacial Emergencies

CHETAN R TRIVEDY

CORE TOPICS

Maxillofacial trauma

- Nasal fractures
- Le Fort classification of maxillary fractures
- Mandibular fractures
- Zygomatic fractures
- Temporomandibular joint dislocation
- Tongue lacerations
- Soft tissue injuries

Dental emergencies

- Dental anatomy
- Dental abscesses
- Avulsed permanent teeth
- Post-extraction complications
- Dental nerve blocks

Maxillofacial and dental injuries are common presentations seen in the emergency department. Although the majority of emergency department trainees receive no formal training on how to manage these types of emergencies, this area is included in the CEM curriculum and hence can be tested in the examinations. The detailed management of specific dental/maxillofacial injuries is beyond the remit of this book, and you are advised to contact your local maxillofacial unit for local guidelines.

SCENARIO 12.1: MAXILLOFACIAL INJURY

As the registrar on duty, you are asked to review a 45-year-old man who has been assaulted with a baseball bat. Carry out an examination of his maxillofacial system and outline your management plan. You are not expected to take a history.

SUGGESTED APPROACH

You may be faced with a simulated patient, and have approximately 7 minutes to conduct a thorough examination of the maxillofacial system. As with all emergencies, it is essential that the primary survey be reviewed, and this should form the starting point of your examination. The airway/C-spine control, breathing, circulation and GCS should be assessed and managed appropriately before you conduct a detailed survey of the facial skeleton.

It is essential that you introduce yourself to the patient and explain the procedure that you are about to undertake. Some of the examination may be uncomfortable for the patient, and it is useful to provide analgesia as appropriate before you examine them.

Examine the scalp for any lacerations. You should also feel for the presence of any swellings or irregularities. A soft 'boggy' haematoma may be indicative of a skull fracture and should be investigated with appropriate imaging.

Palpate the supraorbital ridges for any bony tenderness or step deformities. Crepitus or surgical emphysema in this area suggests a fracture involving the nasoethmoidal complex or the roof of the orbit. You should proceed to examine for any sensory loss in the distribution of the supraorbital nerve.

A detailed ophthalmological examination is an essential part of the assessment. You should start by looking for any signs of asymmetry and widening of the intracanthal distance. Each eyelid should be everted and examined for abrasions, foreign bodies and lacerations.

A formal test of visual acuity should be carried out as part of the assessment. This should be followed by checking the pupillary and accommodation reflexes and examining for visual field defects. Cranial nerves II, III, IV and VI should be assessed; the presence of ophthalmoplegia may represent a traumatic injury either to the brain or to the nerves as they pass through the orbit. Entrapment or snagging of the rectus muscles in orbital floor fractures may also result in diplopia.

The globe should be inspected for trauma or penetrating injuries; if these are suspected, you should proceed to conduct a slit-lamp examination after administering local anaesthetic eye drops and fluorescein dye. All penetrating injuries to the globe should be referred to an ophthalmologist for specialist management.

The nasal complex should be examined carefully, looking for any obvious asymmetry, swelling, epistaxis, rhinorrhea and the presence of a cerebrospinal fluid leak. The nasal cavities should be examined with a good light source and nasal prongs for septal haematomas.

The ears should be examined with an otoscope, looking for any disruption to the tympanic membrane and the presence of blood in the middle ear. These may be due to a fracture of the base of the skull and may warrant further imaging. You should also look for bruising behind the ears, which is referred to as Battle's sign, which results from blood accumulating beneath the skin around the tip of the mastoid process. Although this is also often quoted as another sign suggestive of a fracture of the base of the skull, it is a relatively late sign, since it takes time for the blood to accumulate and so may not appear for several days following the injury.

The zygomaticomaxillary complex should be inspected, looking for any asymmetry or flattening of the zygomatic arch. This should be followed by gently palpating the infraorbital rim for a step deformity. This is often difficult to demonstrate when there is swelling of the overlying periorbital tissues.

Check for the presence of paraesthesia in the cheek, signifying potential trauma to the infraorbital nerve as it leaves the infraorbital foramen. Ask the patient if they have any numbness in the cheek, anterior teeth or upper lip. A displaced fracture involving the zygomatic arch may also interfere with the coronoid process of the mandible, resulting in a restriction in normal mouth opening.

Fractures of the midface have classically been referred to as Le Fort fractures:

- **Le Fort I:** The fracture extends in a plane parallel to the upper teeth, passing horizontally above the roots of the upper teeth. The patient may complain of an inability to bite their teeth together or that they have loose teeth. When the anterior teeth are grasped with thumb and forefinger, the palatal arch can be felt to move.

- **Le Fort II:** This is also referred to as a pyramidal fracture. It extends from the nasal bridge through to the frontal process of the maxilla and the infraorbital margin. It also extends laterally, involving the zygomatic arch and the pterygoids.
- **Le Fort III:** This is the most severe of the midface fractures. It is a craniofacial fracture in a plane that separates the maxilla from the base of the skull. The fracture usually extends posteriorly from the bridge of the nose through the orbit, ethmoid and sphenoid bones.

The temporomandibular joint (TMJ) should be examined using an extra- and intraoral approach. The joint should be palpated by placing your hands in front of the ears while you ask the patient to open and close their mouth.

An inability to open the mouth (trismus) suggests trauma to the TMJ or to the condylar head of the mandible or a displaced fracture of the zygomatic arch. Also look for any deviation in the excursion of the mandible during opening and closing. Feel for any clicks and crepitus during mouth opening. You should be aware that pain from the TMJ can be referred to several places, including the ear, eye, head, mandible and neck. Tenderness over the masseter and lateral pterygoids may also indicate a traumatic injury to the TMJ. Masseteric spasm can be elicited by placing a gloved finger between the upper posterior molars and the cheek. The patient is then asked to clench their teeth together. If this elicits pain, it may signify joint pathology.

A thorough inspection of the oral cavity should be carried out, paying special attention to any soft tissue trauma and traumatic injuries to the dentition. The emergency physician should have a basic understanding of adult and paediatric dental anatomy. The eruption dates of permanent and deciduous teeth are shown in Table 12.1.

Table 12.1 Eruption dates of permanent and deciduous teeth

Permanent maxillary teeth		Eruption dates	Deciduous maxillary teeth		Eruption dates
1	Central incisor	7–8 years	A	Central incisor	8–12 months
2	Lateral incisor	8–9 years	B	Lateral incisor	9–13 months
3	Canine	11–12 years	C	Canine	16–22 months
4	First premolar	10–11 years	D	First molar	13–19 months
5	Second premolar	10–12 years	E	Second molar	25–33 months
6	First molar	6–7 years			
7	Second molar	12–13 years			
8	Third molar	17–21 years			
Permanent mandibular teeth		Eruption dates	Deciduous mandibular teeth		Eruption dates
1	Central incisor	6–7 years	A	Central incisor	6–10 months
2	Lateral incisor	8–9 years	B	Lateral incisor	10–16 months
3	Canine	11–12 years	C	Canine	17–23 months
4	First premolar	10–11 years	D	First molar	14–18 months
5	Second premolar	10–12 years	E	Second molar	23–31 months
6	First molar	6–7 years			
7	Second molar	12–13 years			
8	Third molar	17–21 years			

Examination of occlusion (bite) is a crucial part of the assessment, since a change in the patient's bite may suggest a shift in the tooth-bearing part of the maxilla or mandible. This sign is quite subtle, and most patients will complain that their teeth do not meet the way they used to. Look for a new cross-bite, premature contacts or a step deformity in the occlusion. The teeth should also be examined for any cracks or shearing injuries.

The soft tissues of the oral cavity should be examined carefully under direct lighting, paying particular attention to the presence of any lacerations or tears over the opening of the major salivary glands in the floor of the mouth (submandibular and sublingual glands) and in the cheek adjacent to the upper first molar (parotid gland). If these are missed, they often heal with scarring, resulting in salivary gland obstruction.

Look for any bruising or laceration around the chin. In the presence of limited mouth opening and a painful bite, this is suggestive of a 'guardsman's fracture' – so-called because of the mechanism of injury. Any direct impact on the symphysis menti will result in a fracture of the mandible at three sites: the midline and one or both condylar heads. The resulting triad presents as a patient who has a limited opening, with bruising or laceration on the chin and tenderness around the lower anterior teeth.

You should complete the examination by making a visual inspection of the patient's neck, looking for any bruising, puncture marks or tenderness over the thyroid cartilage and trachea, which may be indicative of trauma to the airways.

The management and the appropriate imaging in the emergency department are summarized in Table 12.2.

Table 12.2 Imaging and management of common facial fractures

Injury	Imaging	Management
Isolated undisplaced zygomatic fracture	<ul style="list-style-type: none"> • Occipitomental 15° and 30° views 	<ul style="list-style-type: none"> • Soft diet • No nose blowing • Analgesia • Maxillofacial outpatients review • Head injury advice sheet • Tetanus cover if appropriate
Complex fractures involving the floor of the orbit	<ul style="list-style-type: none"> • Occipitomental 15° and 30° views. CT of facial skeleton, with 3D reconstruction 	<ul style="list-style-type: none"> • Ophthalmology review • Urgent maxillofacial review • Tetanus cover if appropriate • Admit under specialist team with neurological observations
Nasal complex injury	<ul style="list-style-type: none"> • No imaging in the emergency department 	<ul style="list-style-type: none"> • Nasal tampons to treat epistaxis • Analgesia • Tetanus cover if appropriate • Head injury advice sheet • Avoid nose blowing • Discharge with ENT follow-up unless you detect a septal haematoma
Injury to base of skull	<ul style="list-style-type: none"> • CT head 	<ul style="list-style-type: none"> • Neurosurgical referral • Admit under specialist team • Neurological observations • Antibiotics • Tetanus cover if appropriate
Le Fort fractures	<ul style="list-style-type: none"> • CT face 	<ul style="list-style-type: none"> • These are serious midface injuries and there is a risk of airway compromise • Senior anaesthetic opinion • Urgent maxillofacial opinion • Admission in preparation for surgery • Tetanus cover if appropriate
Undisplaced mandibular fracture	<ul style="list-style-type: none"> • An orthopantomogram (OPG) is the X-ray of choice for all mandibular fractures. • If an OPG is not available, posteroanterior (PA) mandible and lateral oblique views are useful 	<ul style="list-style-type: none"> • Soft diet • Antibiotics if there is an open fracture • Analgesia • Outpatient follow-up with maxillofacial surgeons • Head injury advice sheet • Oral hygiene instructions • Tetanus cover if appropriate
Displaced mandibular fracture	<ul style="list-style-type: none"> • OPG • PA mandible • Lateral oblique view • CT face for comminuted fractures 	<ul style="list-style-type: none"> • Secure airway if there is a bilateral mandibular fracture • Urgent referral to maxillofacial team for reduction and plating • Soft diet and antibiotics • Tetanus cover if appropriate
TMJ injury	<ul style="list-style-type: none"> • OPG • PA mandible/lateral oblique • No indication for TMJ views 	<ul style="list-style-type: none"> • Soft diet • Maxillofacial OPD review • Analgesia

Scoring Scenario 12.1: Maxillofacial injury

	Inadequate/ not done	Adequate	Good
Appropriate introduction	0	1	—
Asks about pain; offers analgesia and obtains verbal consent	0	1	—
States intention to wash hands and glove-up	0	1	—
Examines scalp	0	1	—
Examines orbital margins	0	1	—
Rapid assessment of visual acuity: <ul style="list-style-type: none"> • asks about visual acuity • asks about diplopia 	0	1	2
Examines nasal complex for stability and septal haematoma	0	1	—
Examines the TMJ and looks for Battle's sign	0	1	—
States intention to conduct an internal examination of the ear	0	1	—
Ascertains whether there is any: <ul style="list-style-type: none"> • trismus • change in occlusion • maxillary/mandibular bony tenderness • maxillary/mandibular deformity • sensory loss over the face 	0	1	2
Examines the oral cavity for soft tissue trauma or evidence of dental trauma	0	1	—
Makes a working diagnosis from the clinical signs	0	1	—
Asks for appropriate imaging	0	1	—
Constructs an appropriate treatment plan	0	1	—
Arranges appropriate follow-up	0	1	—
Conducts examination in a fluent and logical manner	0	1	—
Score from patient		/5	
Global score from examiner		/5	
Total score		/28	