Clinical Cases for AMU – Case Ten: Chest Pain

Introduction

These cases are designed to support your learning during your time in Acute and General Medicine. You can use them when you have free time on the ward. They can be done either alone, or in a small group. They use fictional scenarios to demonstrate learning points from common presentations to the Acute Medical Unit (AMU) and on the General Medical wards. As you work through the cases, you will find a mixture of case discussions, practical activities, and practice questions to assess your learning.

If there is a knowledge check or interpretation exercise, the answer can be found on the back of the same page that the question is on.

Case History

John is a 57-year-old man who has been referred to the Medical Assessment Unit by his GP due to chest pains. He describes waking up this morning at 5.30 am with a central chest heaviness that radiated to the left side of his neck and his jaw. This lasted for an hour and then resolved. He felt nauseated, breathless, and sweaty. Over recent months John has been having a similar sensation of chest heaviness whenever he walks up the hill to his house. The sensation settles when he rests.

John has a past medical history of hypercholesterolaemia, hypertension and gastro-oesophageal reflux disease (GORD).

He smokes 20 cigarettes a day. He drinks 3 pints of beer on a Friday and Saturday night. He lives with his wife and one son. He works as a bus driver.

His observation chart is enclosed. His initial observations are marked observation set one.

He is currently denying chest pain. On examination he looks comfortable. He is obese. He has a regular pulse and is warm and well perfused. His heart sounds are normal with no added sounds and his chest is clear. His abdomen is soft, with no tenderness. His JVP is not elevated, and there is no peripheral oedema.

You are suspicious of cardiac chest pain.

<u>Knowledge Check One - Consider the answer to these questions</u>

1. What are John's risk factors for cardiovascular disease?
2. What are the other potential differential diagnoses for chest pain
3. What features of the history are most suggestive of cardiac chest pain?
4. What investigations would you plan next?

Knowledge Check One - Answers

1. John's risk factors for cardiovascular disease include smoking, hypertension, obesity, male gender and hypercholesterolaemia. Other risk factors include age, alcohol excess, poor diet and inactivity.

2. The differential diagnosis for chest pain is wide. It includes cardiovascular, respiratory and GI conditions. Differentials include:

Cardiovascular	**Respiratory**	**Gastroenterology**
Ischaemic heart disease	Pneumothorax	Reflux
Pericarditis/Myocarditis	Pneumonia	Peptic ulcer
Aortic dissection	Pulmonary embolism	Biliary colic

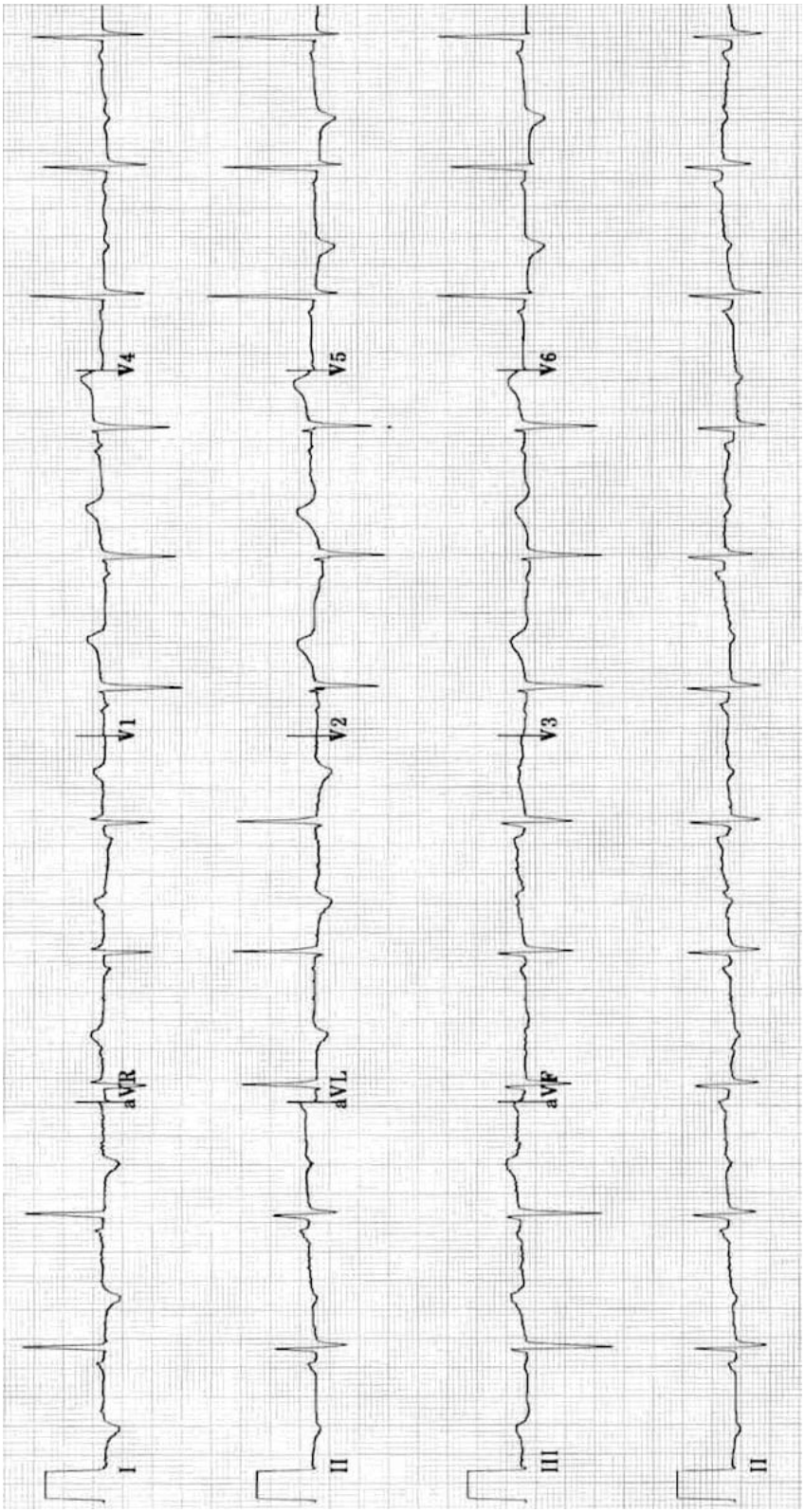
3. Features of John's history that are indicative of cardiac chest pain include: central chest heaviness, radiation to the jaw and the arm and the associated nausea, sweatiness and breathlessness.

   One of the most important indicators that John's symptoms are cardiac in origin, is that he has a history of exertional chest pain. Prior to this event, John has a history of exertional chest pain that sounds very consistent with angina. It sounds like this has been worsening before John presented on this occasion with an acute event. When assessing anyone with chest pain, it is important to determine the pains relationship to exertion.

4. In the first instance, you would investigate John with an ECG, a chest X-ray and bloods including a troponin. Everyone referred with chest pain should have an ECG and a CXR.

Interpretation One

The nurses have performed an ECG, which can be seen below. Interpret the below ECG.



Interpretation One - Answer

The ECG shows sinus rhythm, with T-wave inversion in I, aVL, V4, V5 and V6. In the right clinical context, this would be suggestive of ischaemia.

Activity One

Ask the doctors and nurses on the ward if anybody needs an ECG. If there isn't anybody who needs one, you could check if there were any patients who didn't have an ECG on admission, and you could do that so that they have an ECG on record. Alternatively, you could ask a patient to volunteer to let you do an ECG.

Investigation Results

The patient has now had a chest X-ray, and his blood results are back. The blood results are as follows:

Test	Result	Normal range
Hb (g/L)	141	130 - 180
WCC (10^9/L)	5.2	4.0 - 11.0
Plt (10^9/L)	329	150 - 400
Na (mmol/L)	138	135 - 145
K (mmol/L)	4.4	3.6 - 5.0
Urea (mmol/L)	4.7	2.5 - 6.6
Creatinine (umol/L)	72	64 - 111
eGFR (ml/min)	>60	>60
Bil (umol/L)	12	3 - 21
ALT (U/L)	38	10 - 50
ALP (U/L)	95	40 - 125
CRP (mg/L)	<1	0 - 5
HS Troponin T (ng/L)	523	1 - 9

Knowledge Check Two

There are three types of Acute Coronary Syndrome (ACS). They are:

A. Unstable Angina
B. Non- ST Elevation Myocardial Infarction (NSTEMI)
C. ST-elevation Myocardial Infarction (STEMI)

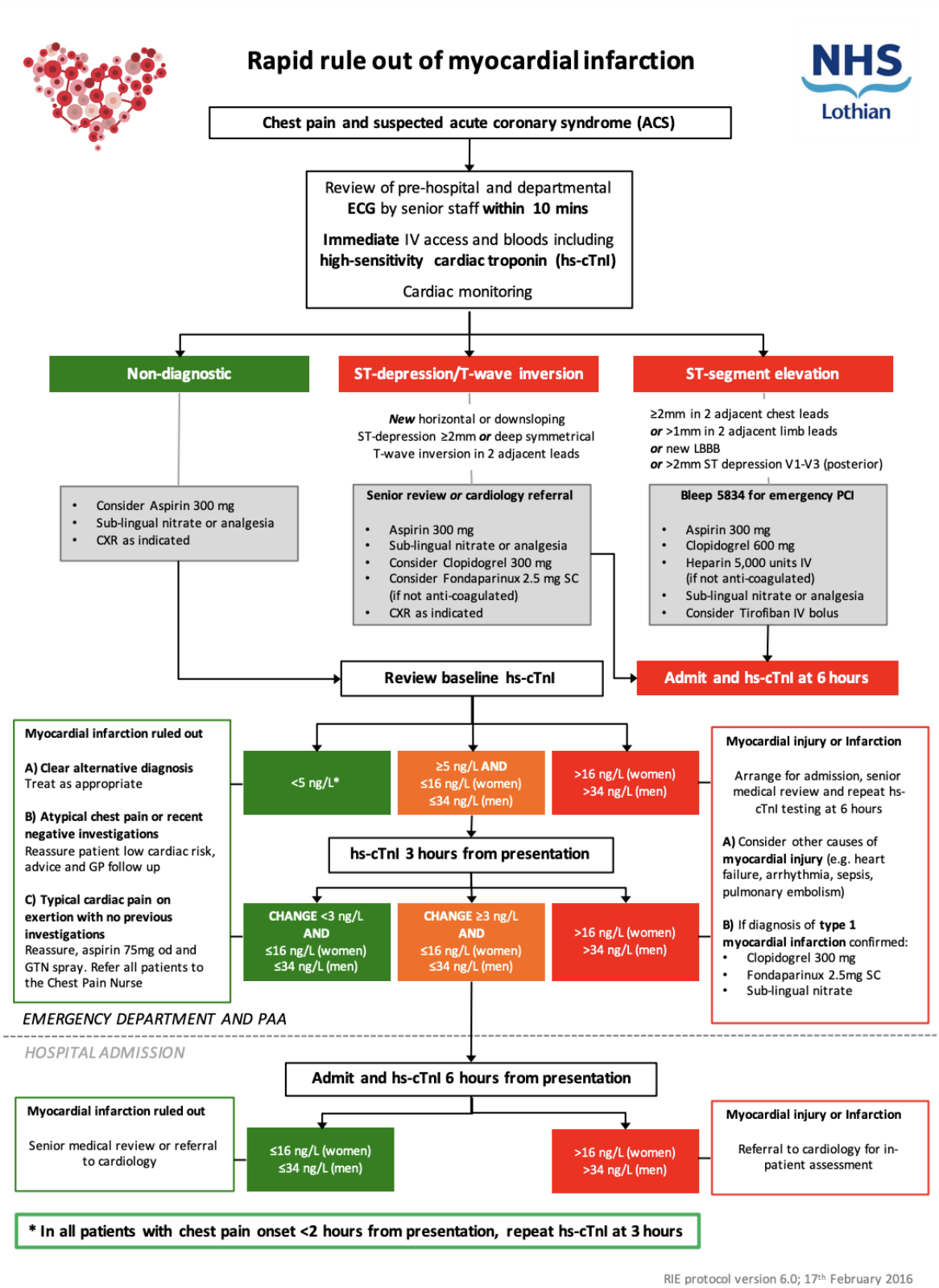
1. Which type of ACS is John suffering from and why?
2. Bearing in mind that John does not currently have any chest pain, and is stable, what would your next steps be in terms of treatment?

Knowledge Check Two - Answers

1. B – Non-ST elevation Myocardial Infarction (NSTEMI)
   Given the significant troponin rise, John has had a myocardial infarction. Unstable angina occurs when a patient is having angina symptoms without exertion i.e. symptoms can come on at rest. Though it is part of the spectrum of conditions known as Acute Coronary Syndromes, it does not cause any damage to the heart, so there is no troponin release. As John's troponin is markedly raised, this cannot be unstable angina.

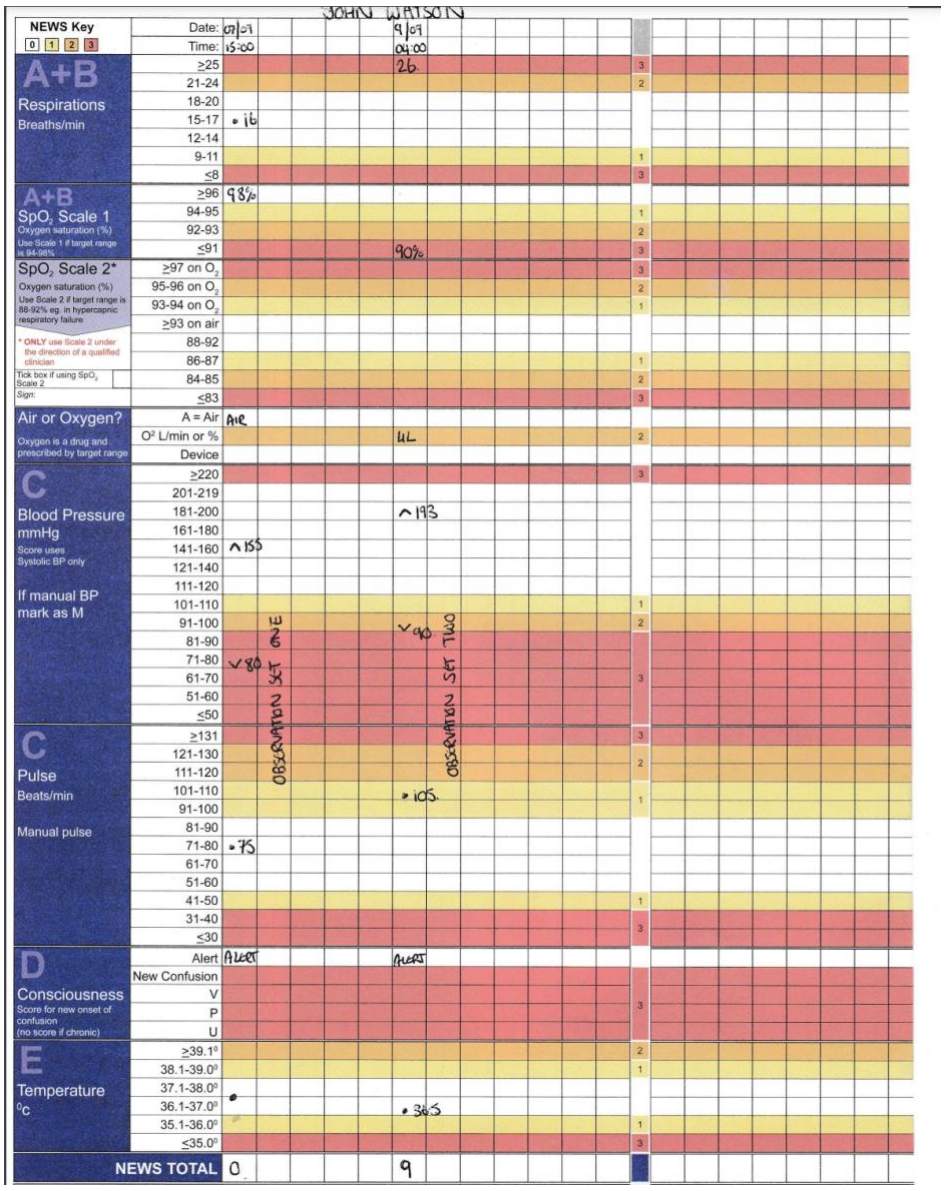
   This leaves the options being either an ST-elevation Myocaridal Infarction or a Non-ST Elevation Myocardial Infarction. Though his ECG does show ischaemic changes, with T-wave inversion in II, aVL, V4, V5 and V6, there is no ST elevation in any lead. STEMIs are only diagnosed in the presence of ST-elevation. All other MIs are classified as NSTEMIs.

2. John has had a proven NSTEMI. Different health boards will have different protocols for management of NSTEMIs, but in NHS Lothian, we initiate treatment with 300mg aspirin (if he hadn't already been given this by the ambulance), 300mg clopidogrel, and 2.5mg of heparin in the form of fondaparinux. John would then be admitted for assessment by Cardiology. In the pack, you will find the NHS Lothian Chest Pain protocol.



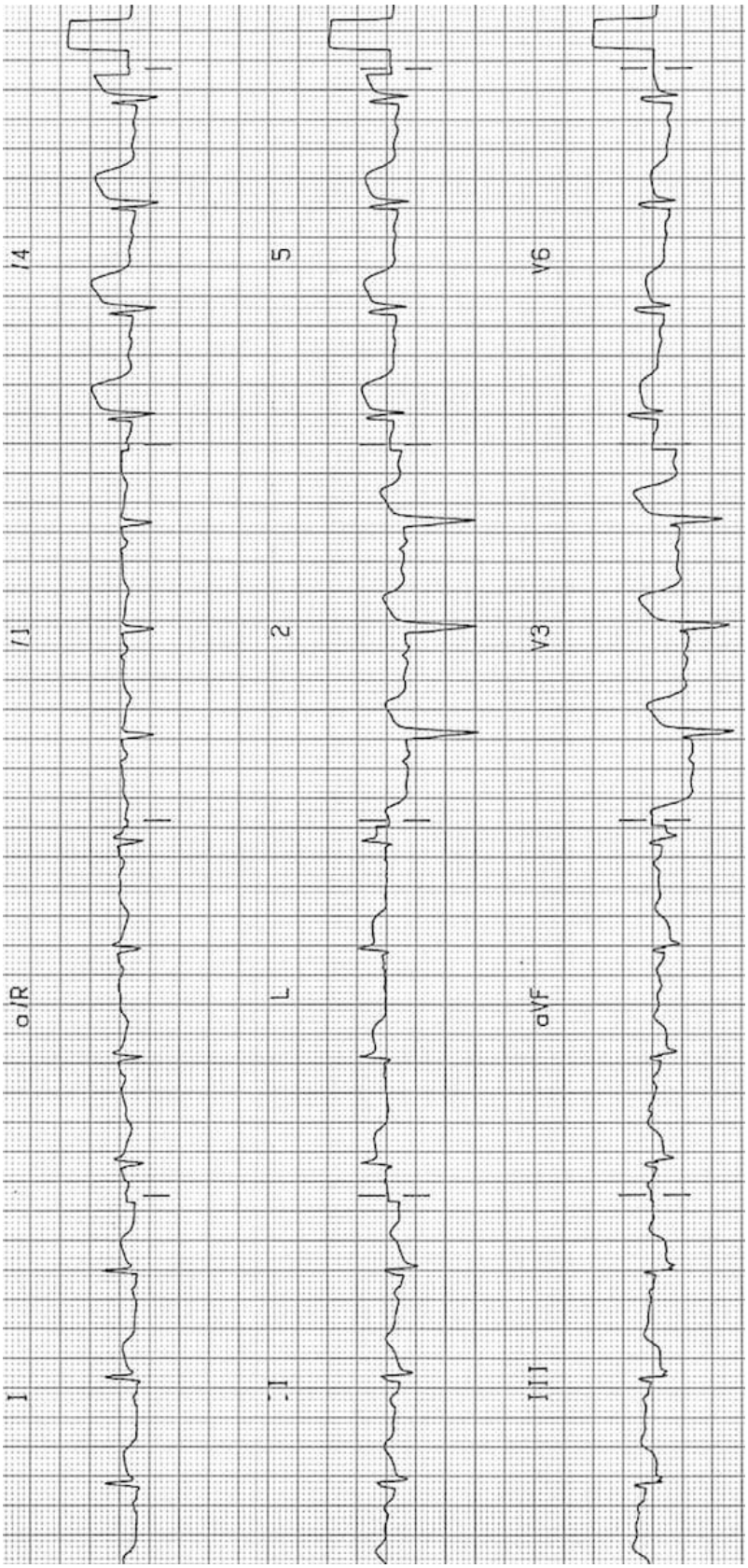
A Deterioration…

After starting the initial treatment for John, you begin to clerk in another patient. However, the nurse looking after John calls you over as he looks more unwell, and he is complaining of more chest pain. You reassess John and he looks much more unwell. He is clammy and sweaty. His respiratory rate is raised, and he is in visible distress. He describes a central, crushing chest pain, with radiation to his jaw. He describes this pain as much more severe as before and rates it 10/10. The nurse has repeated his ECG.



Interpretation Two

Interpret the below ECG



Interpretation Two - Answer

This ECG shows sinus rhythm with ST-elevation in I, aVL, V2, V3, V4, V5 and V6. There is reciprocal ST-depression in III and aVF. These findings demonstrate a STEMI.

Knowledge Check Three

John is now having a STEMI.

1. Which part of the heart is the STEMI affecting
2. What are the initial steps in the management of active cardiac chest pain
3. Once you have initiated management, how would you arrange for John to be treated definitively.

Two Days Later

After you saw John in MAU, he was taken by the cardiology team for primary PCI. They found an occluding thrombus in John's right coronary artery and inserted a drug eluting stent. He spent a day recuperating in the Coronary Care Unit (CCU), before being stepped down to the Cardiology ward. You are now on night shift, and you have been asked to see John as he has become breathless.

John denies any chest pain, but states that he has become increasingly breathless over the course of the evening. He is now unable to lie flat as it makes him more short of breath. He says he has been coughing up some frothy sputum. He denies any ankle swelling, fever or green sputum.

His new observation chart is enclosed (marked observation set 2). On examination, his work of breathing is increased, his JVP is elevated and on auscultation of his chest he has fine crepitations bilaterally to the midzones.

His repeat ECG does not show any acute change, and his blood tests are not significantly different from before. You organise a chest X-ray to further investigate.

Knowledge Check Three - Answers

1. The ECG demonstrates an anterolateral STEMI. Each of the leads of the ECG 'look' at a different part of the heart. When grouped together, they can give you an idea of which area of the heart has been damaged during a STEMI or NSTEMI. As an example, ST changed in II, III and aVF would suggest inferior damage.

   Figure One demonstrates what areas of the heart the leads look at.

2. In a patient with active cardiac chest pain, you should treat them with analgesia, GTN and aspirin. Analgesia is usually in the form of IV morphine. Patients may also require an IV anti-emetic. GTN can be given as a sublingual spray. 300mg of oral aspirin is given. In this case, John has already had aspirin, so he wouldn't need to be given anymore. Previously, the pneumonic 'MONA' was used to demonstrate the acute treatment of cardiac chest pain. This stood for morphine, oxygen, nitroglycerin (GTN), and aspirin. Now, it is recommended that oxygen is only given if the patient is hypoxic.

3. The next step in John's management is immediate referral to the Cardiology team for consideration of primary percutaneous coronary intervention (PCI).

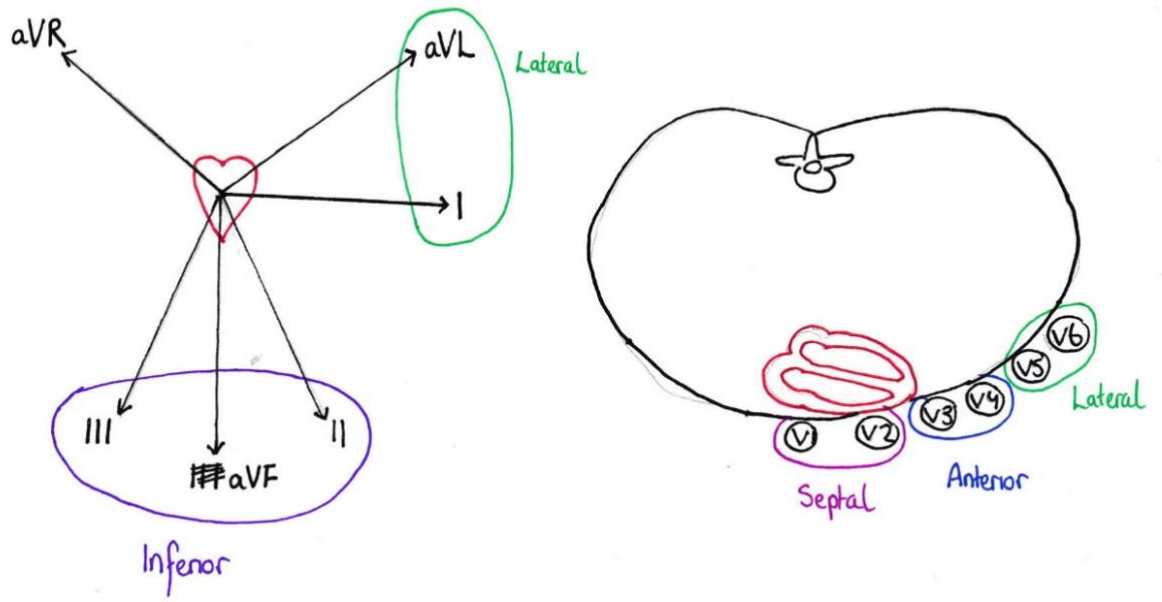
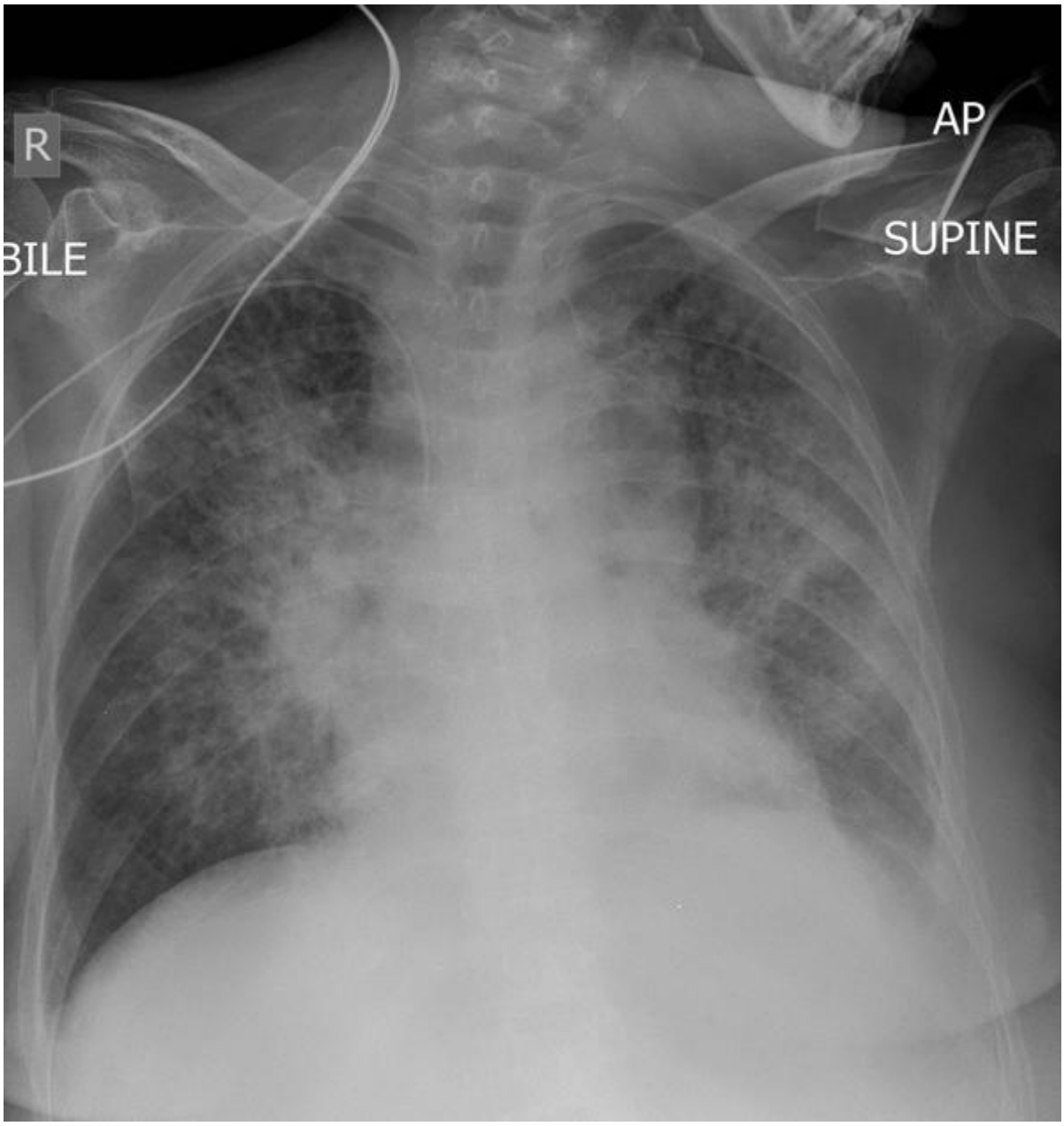


Figure One – Areas of the heart that each leads 'look' at

Interpretation Three

Interpret the below CXR



Knowledge Check Four

John has developed pulmonary oedema following his heart attack.

1. What signs on a CXR suggest pulmonary oedema
2. What would be your initial management plan for acute pulmonary oedema

Interpretation Three

This CXR demonstrates pulmonary oedema

Knowledge Check Four - Answers

1. Signs that suggest pulmonary oedema on a CXR include cardiomegaly, bilateral pleural effusions, upper lobe venous diversion, Kerley B lines, perihilar infiltrates (often giving the appearance of 'batswing oedema') and fluid in the horizontal fissure.

2. Initial treatment of pulmonary oedema is with diuretics. This is normally IV furosemide, with the dose depending on whether the patient has been on diuretics before, their size and their blood pressure. A bolus of 40mg is normally a good place to start. Both morphine and GTN can also be helpful.

Activity Two

John only had saturations of 80% on 2l of oxygen. In patients who are acutely unwell, you would initially given them 15l of oxygen via a high-flow non-rebreath. Familiarise yourself with the different methods of delivering oxygen. Go to the treatment room and see if you can find:

- A high-flow non-rebreath mask
- Nasal cannula
- A Venturi mask, with valves for the delivery of 28%, 40% and 60% oxygen

Another Two Days Later

John is now much improved. An echocardiogram has shown moderate left ventricular systolic dysfunction following his heart attack. He has been established on furosemide as a diuretic. He has also been started on bisoprolol and ramipril to prevent further cardiac remodelling. Other medications that he has been initiated on are a statin for secondary prevention, and aspirin and clopidogrel as antiplatelet agents.

John has been given advice on how to adjust his lifestyle to reduce his risk of further events and has agreed to be referred to the smoking cessation service. He has now been discharged home, with outpatient follow up with Cardiology, and the cardiac rehabilitation team.

Activity Three

Ask if any of the patients on the ward are having an ECHO either today or in the coming days. See if you can go with the patient to watch the scan.

Conclusion

Well done on completing this case. I hope that you have found it informative. If you have any questions, please contact …

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Thank you for completing this long case. As these cases are new intervention, we would really value your feedback.

We would be very grateful if you could complete the feedback form accessed from the QR code below.

References

Life in the Fast Lane (2022). *Anterior Myocardial Infarction.* https://litfl.com/anterior-myocardial-infarction-ecg-library/

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