

## EDUCATIONAL CASE

# Educational Case: A 57-year-old man with chest pain

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This is an educational case report including multiple choice questions and their answers. For the best educational experience we recommend the interactive web version of the exercise which is available via the following link: [http://www.oxfordjournals.org/our\\_journals/omcr/ec01p1.html](http://www.oxfordjournals.org/our_journals/omcr/ec01p1.html)

## Part 1

A 57 year-old male lorry driver, presented to his local emergency department with a 20-minute episode of diaphoresis and chest pain. The chest pain was central, radiating to the left arm and crushing in nature. The pain settled promptly following 300 mg aspirin orally and 800 mcg glyceryl trinitrate (GTN) spray sublingually administered by paramedics in the community. He smoked 20 cigarettes daily (38 pack years) but was not aware of any other cardiovascular risk factors. On examination he appeared comfortable and was able to complete sentences fully. There were no heart murmurs present on cardiac auscultation. Blood pressure was 180/105 mmHg, heart rate was 83 bpm and regular, oxygen saturation was 97%.

What is the most likely diagnosis?

- |   |                         |
|---|-------------------------|
| A | Acute coronary syndrome |
| B | Aortic dissection       |
| C | Esophageal rupture      |
| D | Peptic ulceration       |
| E | Pneumothorax            |

## Part 2

An ECG was requested and is shown in figure 1.

How would you manage the patient? (The patient has already received 300 mg aspirin).

- |   |   |
|---|---|
| A | Atenolol 25 mg, Atorvastatin 80 mg, Clopidogrel 75 mg, GTN 500 mcg    |
| B | Atenolol 25 mg, Clopidogrel 75 mg, GTN 500 mcg, Simvastatin 20 mg     |
| C | Atorvastatin 80 mg, Clopidogrel 300 mcg, GTN 500 mcg, Ramipril 2.5 mg |
| D | Atorvastatin 80 mg, Clopidogrel 75 mg, Diltiazem 60 mg, Oxygen        |
| E | Clopidogrel 300 mg, Morphine 5 mg, Ramipril 2.5 mg, Simvastatin 20 mg |

## Part 3

30 minutes later the patient's chest pain returned with greater intensity whilst waiting in the emergency department. Now, he described the pain as though "an elephant is sitting on his chest". The nurse has already done an ECG by the time you were called to see him. This is shown in figure 2.

What would be the optimal management for this patient?

- |   |                                       |
|---|---------------------------------------|
| A | Administer intravenous morphine       |
| B | Increase GTN dose                     |
| C | Observe as no new significant changes |
| D | Proceed to coronary angiography       |
| E | Thrombolysis with alteplase           |

## Part 4

He was taken to the catheterization lab where the left anterior descending coronary artery (LAD) was shown to be completely occluded. Following successful percutaneous intervention and one drug eluting stent implantation in the LAD normal flow is restored (Thrombolysis in myocardial infarction, TIMI = 3). 72 hours

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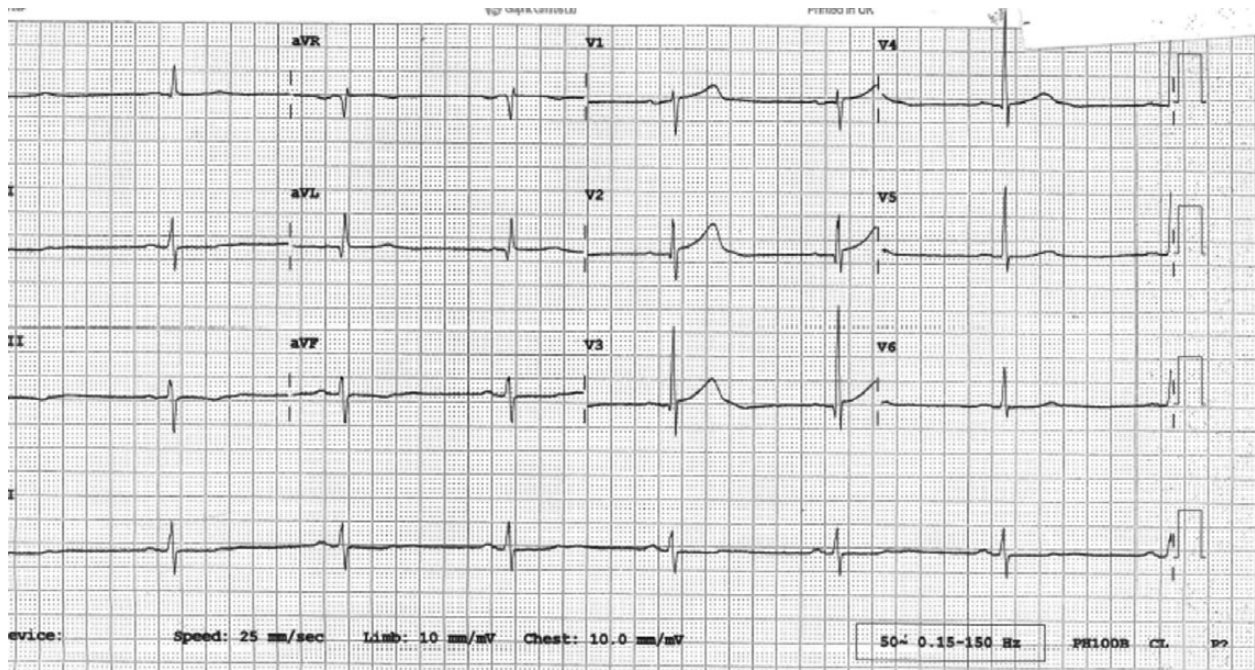


Figure 1: ECG on admission.

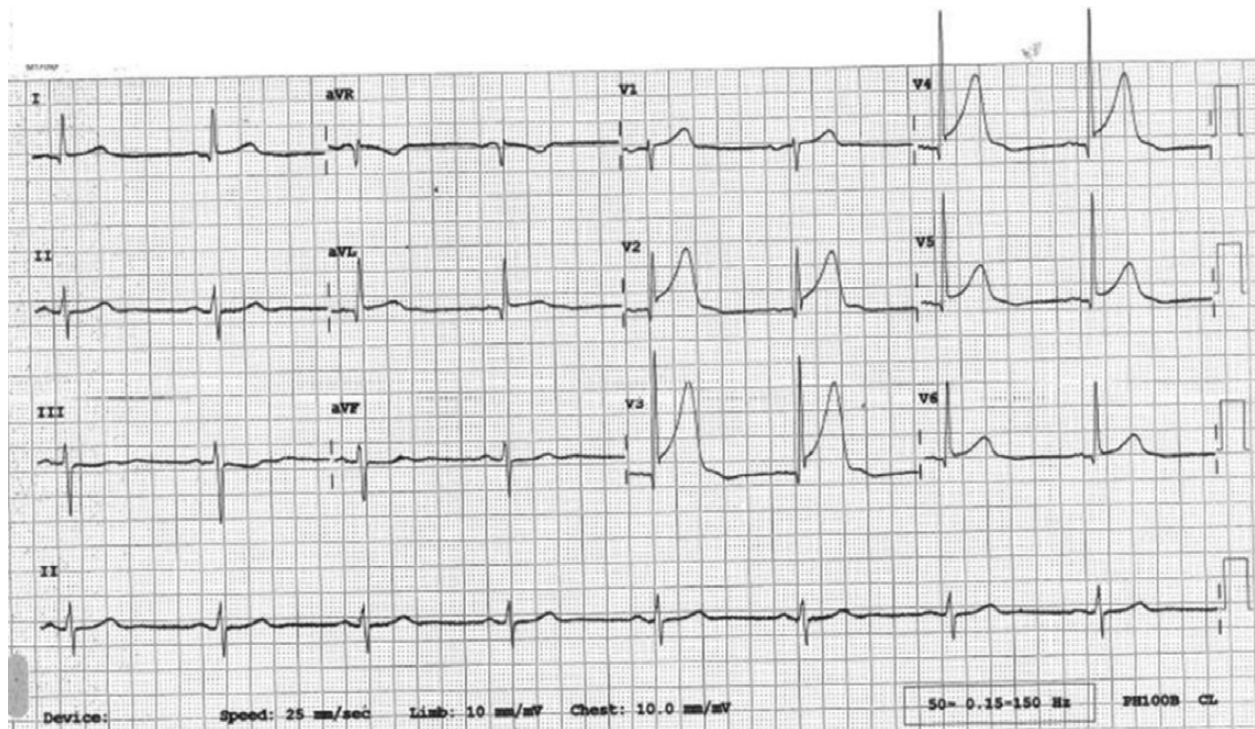


Figure 2: ECG 30 minutes after admission.

later, he is ready to be discharged home. The patient is keen to return to work and asks when he could do so.

When would you advise him that he could return to work?

- |   |                               |
|---|-------------------------------|
| A | 1 week later                  |
| B | 3 weeks later                 |
| C | 6 weeks later                 |
| D | Not before repeat angiography |
| E | Not before an exercise test   |

### Part 5

One week later, he receives a letter informing him that he is required to attend cardiac rehabilitation. The patient is confused as to what cardiac rehabilitation entails, although he does remember a nurse discussing this with him briefly before he was discharged. He phones the hospital in order to get some more information.

Which of the following can be addressed during cardiac rehabilitation?

A	Diet
B	Exercise
C	Pharmacotherapy
D	Smoking cessation
E	All of the above

### Answer to Part 1

A - Acute coronary syndrome

Although the presentation could be attributable to any of the above differential diagnoses, the most likely etiology given the clinical picture and risk factors is one of cardiac ischemia. Risk factors include gender, smoking status and age making the diagnosis of acute coronary syndrome the most likely one. The broad differential diagnosis in patients presenting with chest pain has been discussed extensively in the medical literature. An old but relevant review can be found freely available<sup>1</sup> as well as more recent reviews.<sup>2,3</sup>

### Answer to Part 2

C - Atorvastatin 80 mg, Clopidogrel 300 mcg, GTN 500 mcg, Ramipril 2.5 mg,

In patients with ACS, medications can be tailored to the individual patient. Some medications have symptomatic benefit but some also have prognostic benefit. Aspirin<sup>4</sup>, Clopidogrel<sup>5</sup>, Atenolol<sup>6</sup> and Atorvastatin<sup>7</sup> have been found to improve prognosis significantly. ACE inhibitors have also been found to improve left ventricular modeling and function after an MI.<sup>8,9</sup> Furthermore, GTN<sup>10</sup> and morphine<sup>11</sup> have been found to be of only significant symptomatic benefit.

Oxygen should only be used when saturations <95% and at the lowest concentration required to keep saturations >95%.<sup>12</sup>

There is no evidence that diltiazem, a calcium channel blocker, is of benefit.<sup>13</sup>

His ECG in figure 1 does not fulfil ST elevation myocardial infarction (STEMI) criteria and he should therefore be managed as a Non-STEMI. He would benefit prognostically from beta-blockade however his heart rate is only 42bpm and therefore this is contraindicated. He should receive a loading dose of clopidogrel (300 mg) followed by daily maintenance dose (75 mg).<sup>14,15</sup> He might not require GTN if he is pain-free but out of the available answers 3 is the most correct.

### Answer to Part 3

D - Proceed to coronary angiography

The ECG shows ST elevation in leads V2-V6 and confirms an anterolateral STEMI, which suggests a completely occluded LAD. This ECG fulfils the criteria to initiate reperfusion therapy which traditionally require one of the three to be present:

- $\geq 1$  mm of ST change in at least two contiguous limb leads (II, III, AVF, I, AVL).
- $\geq 2$  mm of ST change in at least two contiguous chest leads (V1-V6).
- New left bundle branch block.

According to guidance, if the patient can undergo coronary angiography within 120 minutes from the onset of chest pain, then this represents the optimal management. If it is not possible to undergo coronary angiography and potentially percutaneous

intervention within 2 hours, then thrombolysis is considered an acceptable alternative.<sup>12,16</sup>

GTN and morphine administration can be considered in parallel but they do not have a prognostic benefit.

### Answer to Part 4

E - Not before an exercise test

This patient is a lorry driver and therefore has a professional heavy vehicle driving license. The regulation for driving initiation in a lorry driver following a NSTEMI/ STEMI may be different in various countries and therefore the local regulations should be followed.

In the UK, a lorry driver holds a category 2 driving license. He should therefore refrain from driving a lorry for at least 6 weeks and can only return to driving if he completes successfully an exercise evaluation. An exercise evaluation is performed on a bicycle or treadmill. Drivers should be able to complete 3 stages of the standard Bruce protocol<sup>17</sup> or equivalent (e.g. Myocardial perfusion scan) safely, having refrained from taking anti-anginal medication for 48 hours and should remain free from signs of cardiovascular dysfunction during the test, notably: angina pectoris, syncope, hypotension, sustained ventricular tachycardia, and/or electrocardiographic ST segment shift which is considered as being indicative of myocardial ischemia (usually >2 mm horizontal or down-sloping) during exercise or the recovery period.<sup>18</sup>

For a standard car driving license (category 1), driving can resume one week after successful intervention providing that no other revascularization is planned within 4 weeks; left ventricular ejection fraction (LVEF) is at least 40% prior to hospital discharge and there is no other disqualifying condition.

Therefore if this patient was in the UK, he could restart driving a normal car one week later assuming an echocardiogram confirmed an EF > 40%. However, he could only continue lorry driving once he has passed the required tests.<sup>18</sup>

### Answer to Part 5

E - All of the above

Cardiac rehabilitation bridges the gap between hospitals and patients' homes. The cardiac rehabilitation team consists of various healthcare professions and the programme is started during hospital admission or after diagnosis. Its aim is to educate patients about their cardiac condition in order to help them adopt a healthier lifestyle. This includes educating patients' about their diet, exercise, risk factors associated with their condition such as smoking and alcohol intake and finally, about the medication recommended. There is good evidence that adherence to cardiac rehabilitation programmes improves survival and leads to a reduction in future cardiovascular events.<sup>19,20</sup>

### References

1. Oille JA. Differential diagnosis of pain in the chest. *Can Med Assoc J.* 1937;**37**(3):209–216. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC536075/>.
2. Lee TH, Goldman L. Evaluation of the patient with acute chest pain. *N Engl J Med.* 2000;**342**(16):1187–1195. <http://www.nejm.org/doi/full/10.1056/NEJM200004203421607>.
3. Douglas PS, Ginsburg GS. The evaluation of chest pain in women. *N Engl J Med.* 1996;**334**(20):1311–1315. <http://www.nejm.org/doi/full/10.1056/NEJM199605163342007>.
4. Baigent C, Collins R, Appleby P, Parish S, Sleight P, Peto R. ISIS-2: 10 year survival among patients with suspected acute



- myocardial infarction in randomised comparison of intravenous streptokinase, oral aspirin, both, or neither. the ISIS-2 (second international study of infarct survival) collaborative group. *BMJ*. 1998;**316**(7141):1337–1343. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC28530/>.
5. Yusuf S, Zhao F, Mehta S, Chrolavicius S, Tognoni G, Fox K. Clopidogrel in unstable angina to prevent recurrent events trial investigators. effects of clopidogrel in addition to aspirin in patients with acute coronary syndromes without ST-segment elevation. *N Engl J Med*. 2001;**345**(7):494–502. <http://www.nejm.org/doi/full/10.1056/NEJMoa010746#t=articleTop>.
  6. Yusuf S, Peto R, Lewis J, Collins R, Sleight P. Beta blockade during and after myocardial infarction: An overview of the randomized trials. *Prog Cardiovasc Dis*. 1985;**27**(5):335–371. <http://www.sciencedirect.com/science/article/pii/S0033062085800037>.
  7. Schwartz GG, Olsson AG, Ezekowitz MD, et al. Effects of atorvastatin on early recurrent ischemic events in acute coronary syndromes: The MIRACL study: A randomized controlled trial. *JAMA*. 2001;**285**(13):1711–1718. <http://jama.jamanetwork.com/article.aspx?articleid=193709>.
  8. Pfeffer MA, Lamas GA, Vaughan DE, Parisi AF, Braunwald E. Effect of captopril on progressive ventricular dilatation after anterior myocardial infarction. *N Engl J Med*. 1988;**319**(2):80–86. <http://content.onlinejacc.org/article.aspx?articleid=1118054>.
  9. Sharpe N, Smith H, Murphy J, Hannan S. Treatment of patients with symptomless left ventricular dysfunction after myocardial infarction. *The Lancet*. 1988;**331**(8580):255–259. <http://www.sciencedirect.com/science/article/pii/S0140673688903479>.
  10. Ferreira JC, Mochly-Rosen D. Nitroglycerin use in myocardial infarction patients. *Circ J*. 2012;**76**(1):15–21. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3527093/>.
  11. Herlitz J, Hjalmarson A, Waagstein F. Treatment of pain in acute myocardial infarction. *Br Heart J*. 1989;**61**(1):9–13. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1216614/>.
  12. Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC), Steg PG, James SK, et al. ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J*. 2012;**33**(20):2569–2619. <http://eurheartj.oxfordjournals.org/content/33/20/2569>.
  13. The effect of diltiazem on mortality and reinfarction after myocardial infarction. the multicenter diltiazem postinfarction trial research group. *N Engl J Med*. 1988;**319**(7):385–392. <http://www.nejm.org/doi/full/10.1056/NEJM198808183190701>.
  14. Jneid H, Anderson JL, Wright RS, et al. 2012 ACCF/AHA focused update of the guideline for the management of patients with unstable angina/Non-ST-elevation myocardial infarction (updating the 2007 guideline and replacing the 2011 focused update) A report of the american college of cardiology foundation/american heart association task force on practice guidelines. *J Am Coll Cardiol*. 2012;**60**(7):645–681. <http://circ.ahajournals.org/content/123/18/2022.full>.
  15. Hamm CW, Bassand JP, Agewall S, et al. ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The task force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the european society of cardiology (ESC). *Eur Heart J*. 2011;**32**(23):2999–3054. <http://eurheartj.oxfordjournals.org/content/32/23/2999.long>.
  16. O’Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: Executive summary: A report of the american college of cardiology foundation/american heart association task force on practice guidelines. *J Am Coll Cardiol*. 2013;**61**(4):485–510. <http://content.onlinejacc.org/article.aspx?articleid=1486115>.
  17. BRUCE RA, LOVEJOY FW Jr. Normal respiratory and circulatory pathways of adaptation in exercise. *J Clin Invest*. 1949;**28**(6 Pt 2):1423–1430. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC439698/>.
  18. DVLA. <https://www.gov.uk/current-medical-guidelines-dvla-guidance-for-professionals-cardiovascular-chapter-appendix>.
  19. British Heart Foundation. <http://www.bhf.org.uk/heart-health/living-with-heart-disease/cardiac-rehabilitation.aspx>.
  20. Kwan G, Balady GJ. Cardiac rehabilitation 2012: Advancing the field through emerging science. *Circulation*. 2012;**125**(7):e369–73. <http://circ.ahajournals.org/content/125/7/e369.full>.