



Action on PCR Test Results

Technical Note

Acknowledgments

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1 Background

Any individual in the UK is eligible for NHS testing for COVID-19 infection by PCR (Polymerase Chain Reaction) “swab test” if they are unwell with symptoms of COVID-19 (cough, fever, shortness of breath, loss of taste sensation); or if they are well but someone in their household has COVID-19 symptoms; or if they have been identified by Government contact tracing mechanisms.

In addition, some offshore workers may undergo testing prior to deployment offshore, organised by their employer / the installation operator.

The following flowcharts provide guidance on the employment / mobilisation actions to take on receipt of a PCR test result, in various circumstances. It is expected that employers will seek advice from their company medical advisor on the action to be taken regarding test results and, while the content of the flowcharts is not intended to replace that advice, it is anticipated that these will be useful to company medical advisors in achieving a consistent approach across industry.

1.1 General information about test results

There are four possible outcomes from a test result looking for the presence/absence of a condition:

1. True positive – the condition is present, and the test correctly indicates this
2. True negative – the condition is not present, and the test correctly indicates this
3. False positive – the condition is not in fact present, but the test incorrectly says that it is.
4. False negative – the condition is actually present, but the test incorrectly says that it is not.

Whether an individual test result is likely to be either a true or false positive/negative depends on the clinical circumstances the test is used in, and on some technical characteristics of the test. The important clinical circumstance is whether or not the person is already showing clinical signs or symptoms of the condition being tested for, and the important technical characteristics of the test are its sensitivity and specificity. How these interact to affect the interpretation of test results can usefully be seen in online tools such as at references (1) and (2) and are discussed in the explanatory comments at each flowchart.

Because COVID-19 is a new virus, there is uncertainty about some of the clinical aspects of infectiousness and about the technical aspects of the tests used to detect it. Some ‘best guess’ assumptions have to be made about these, and the resulting uncertainty around test interpretation acknowledged. A preference for a ‘cautious’ approach to test interpretation is appropriate.

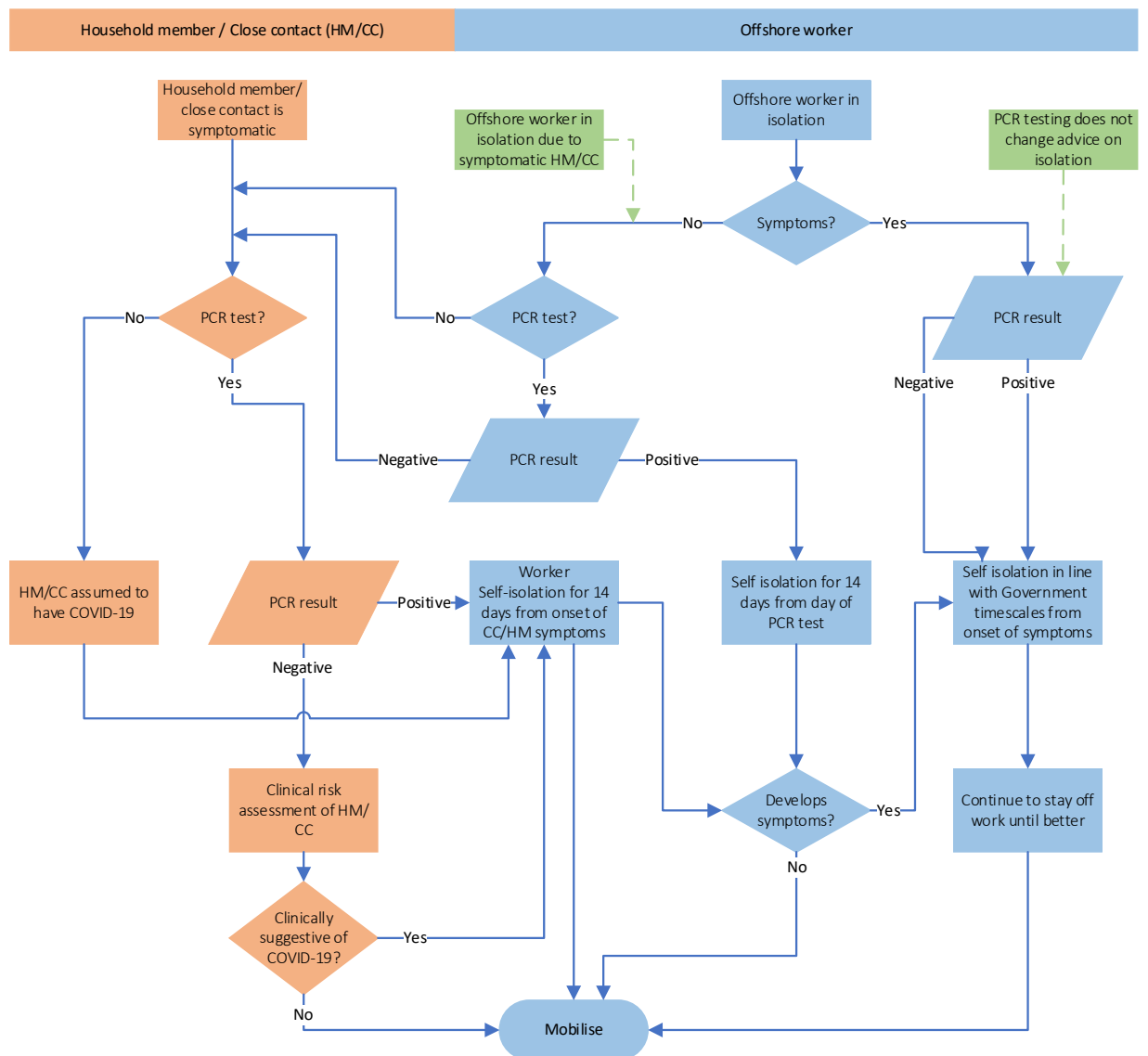
The decision which needs to be made on receipt of a test result is whether or not a person can go to work. The decision aids here take account of the fact that the offshore industry is very keen to avoid the occurrence of COVID-19 cases on offshore installations, and they therefore take a more cautious approach in recommendations about deployment to work than some other sources of advice may do; again, the technical aspects of this is explained at each flowchart.

1.2 PCR or Immunoassay Test?

These flowcharts deal only with PCR test results. Immunoassay tests are available for sale, but to date, none have been approved for clinical diagnostic use in the UK*. An evaluation report (3) indicates the sensitivity of lateral-flow immunoassay tests to be as low as 55%. Commercial confidentiality agreements prevent the brands of immunoassay tested being known (4), and the National Screening Co-ordinator has advised the public 'please do not buy or take an unvalidated test' (5). The only appropriate advice on interpretation of currently available lateral-flow immunoassay tests is that the results are too unreliable to be clinically interpretable.

*a news item (<https://www.bbc.co.uk/news/health-52656808>) on 14 May indicates that a laboratory-based test has been approved for use in England. It is not known when the test will become available for use in industry.

2 PCR testing for workers in isolation at home / residence



2.1 Explanatory comments

In this flowchart it is assumed that in clinical practice PCR tests, carried out by good sampling technique, have a sensitivity of 71% and specificity of 95% (6). Note that these figures are lower than the figures which are likely to be quoted from laboratories using standardised reference test samples and laboratory verification procedures. It is also assumed that for a worker with symptoms sufficient to prompt testing for COVID-19, the probability of clinical infection is 50% or greater.

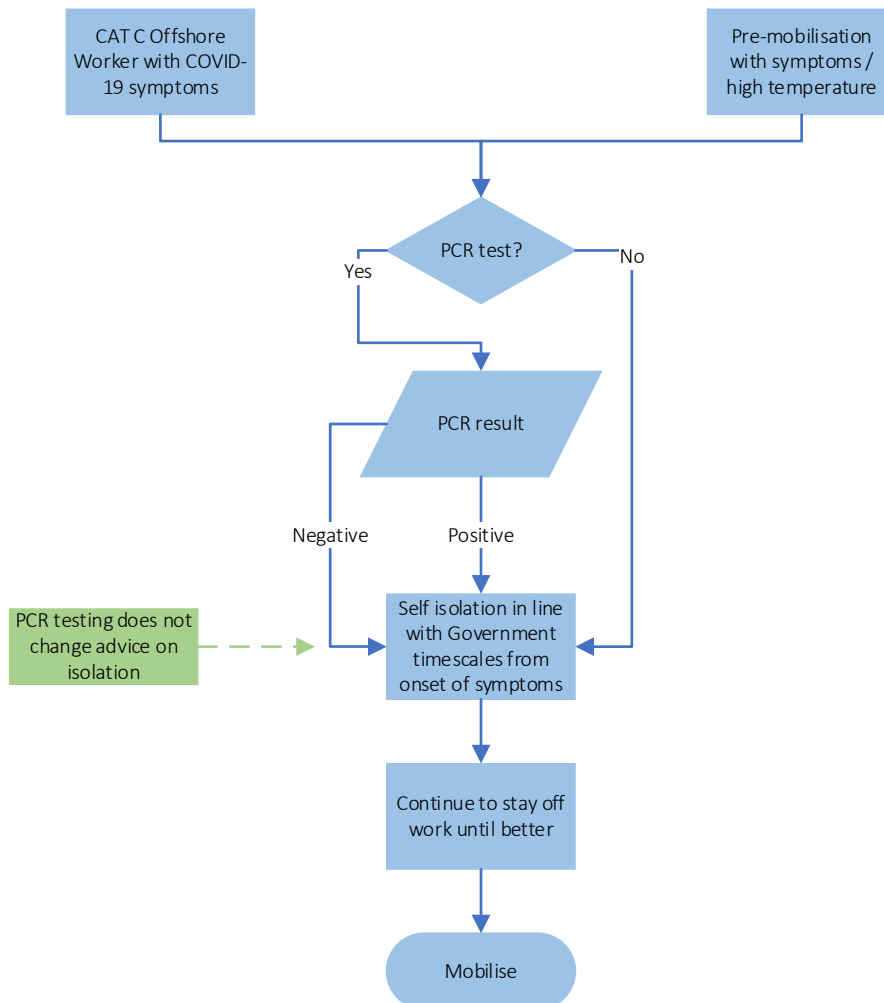
In this scenario, the positive predictive value (PPV) of a positive PCR test for an offshore worker isolating at home with symptoms is 93%: in other words, the test confirms they are very likely to have COVID-19, and they should continue isolation for the recommended government timescales. For the same worker, a negative test has a negative predictive value (NPV) of 76% (in other words, 24% of negative tests are

false negative results), which is not considered sufficient to confidently return the worker offshore. The worker should continue to isolate for the recommended government timescales.

Case reports from operator medical advisors (7) of asymptomatic workers developing symptoms 10 to 13 days after a positive PCR test justify the 'cautious' 14-day isolation period in that scenario.

For a worker with no symptoms isolating at home because another household member is unwell, the probability of infection in the household contact is a critical consideration. Again, a positive PCR result in the household contact should be taken as confirmation of infection, and a high risk of transmission to the well worker, even if they have a negative PCR test themselves, assumed. Only where the household contact has a probability of COVID-19 less than 14% does the NPV of their negative test exceed 95%, a level where deployment of the worker may be considered reasonable. Even in the presence of a negative PCR test, clinicians should therefore be very confident clinically that the household contact's symptoms are not due to COVID-19 before declaring a well worker fit for offshore deployment.

3 CAT C medevac / person with symptoms or high temperature at heliport check-in

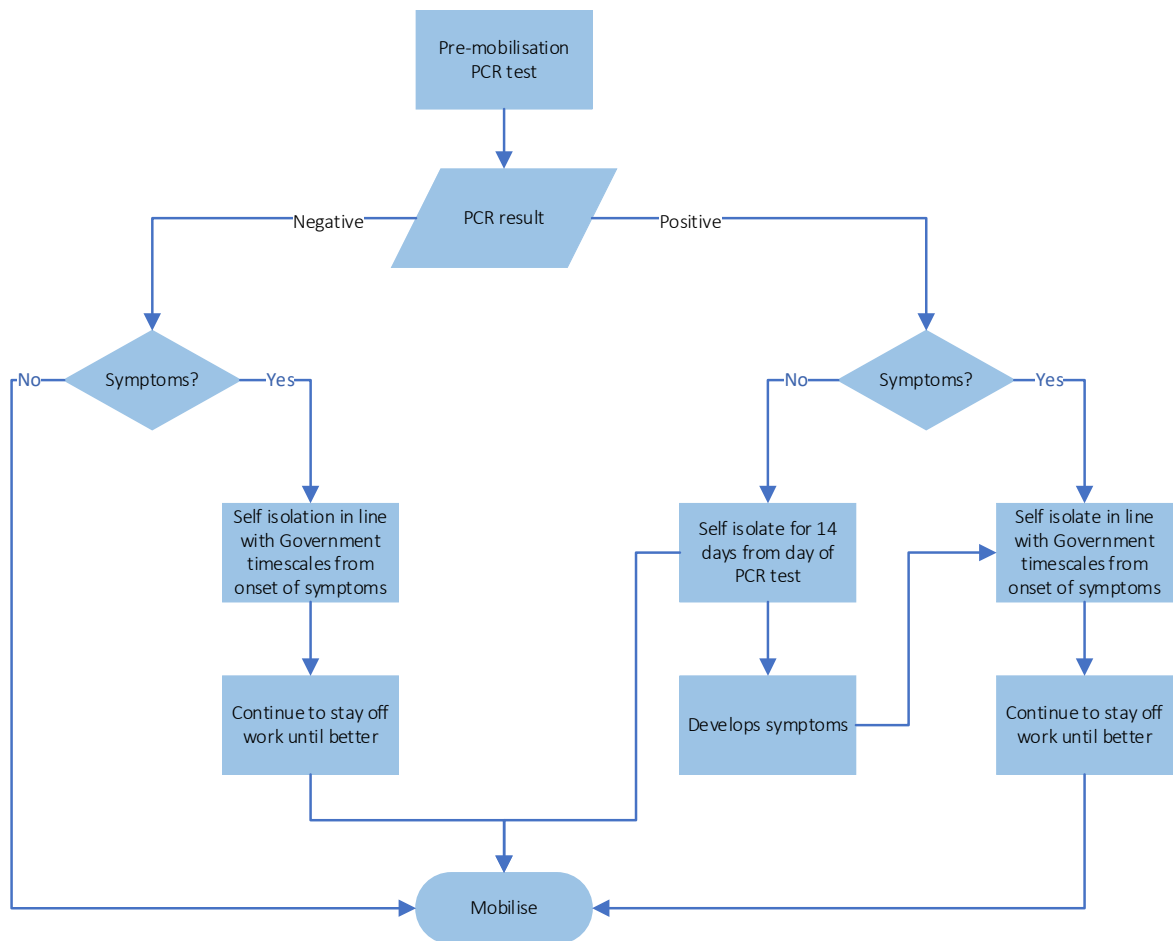


3.1 Explanatory comments

It is unlikely that a PCR test would be available to a worker offshore, but medevaced workers may undergo testing on arrival onshore. Applying the same assumptions about sensitivity (71%) and specificity (95%), an NPV of 95% or greater for a negative test is only reached when the probability of symptoms being due to COVID-19 is 14% or less. Unless the clinician is very confident that the signs or symptoms are due to a condition other than COVID-19, aversion to retaining a worker with COVID-19 offshore (where clinical deterioration is undesirable) or mobilising an infected worker offshore suggests that a negative test in these circumstances should not be taken as adequate assurance of the absence of infection.

A PPV of 50% or greater is reached when the probability of symptoms being COVID-19 is 6.5% or more, confirming that a positive result in any of these circumstances should be treated as confirmation of infection.

4 Pre-mobilisation testing



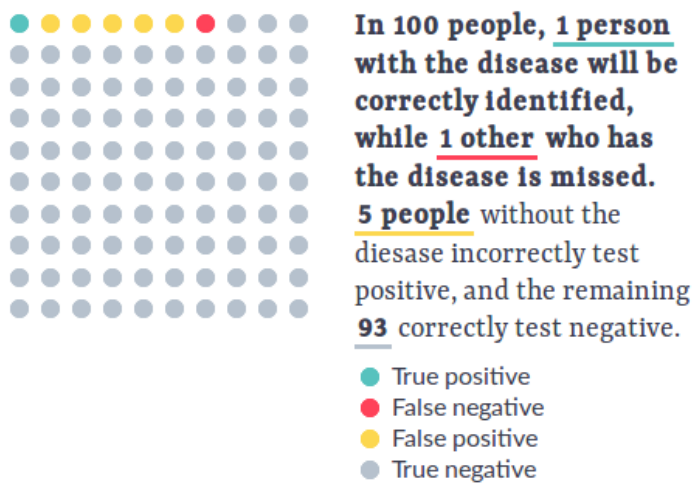
4.1 Explanatory comments

The use of PCR as a screening test in an asymptomatic population with no history of contact with a suspected case has not been investigated, and the true sensitivity and specificity of PCR as a screening test is not known. This flowchart nevertheless assumes that the technical performance of PCR remains the same (sensitivity 71%, specificity 95%) as previously considered. This being the case, the same considerations as have previously been discussed apply to workers with symptoms, leading to the conclusion that workers with symptoms consistent with possible COVID-19 should not deploy offshore, regardless of their PCR result.

Case reports from operator medical advisors (7) of asymptomatic workers developing symptoms 10 to 13 days after a positive PCR test justify the 'cautious' 14-day isolation period in that scenario.

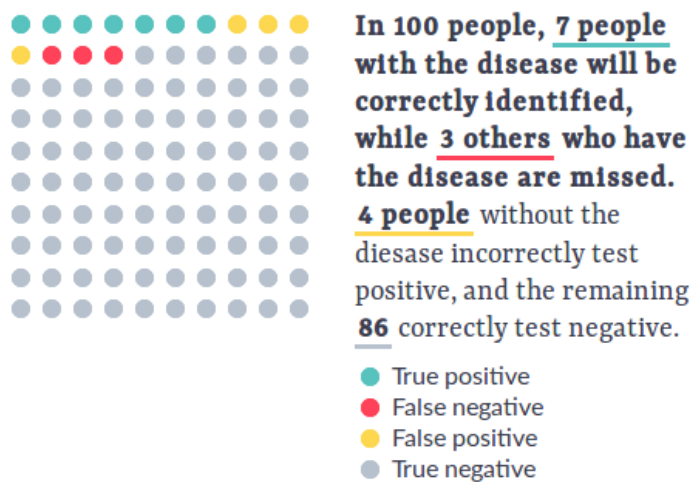
The concept of pre-mobilisation testing of asymptomatic workers first requires an estimate of the proportion of workers actually in a phase of asymptomatic illness in which virus is potentially detectable, and then on being able to detect them with the available test. The success of the test in detecting infected workers depends in turn on the proportion of the workers expected to be infected. This is illustrated in the following figures:

Figure 1: 2% of apparently well workers infected with virus



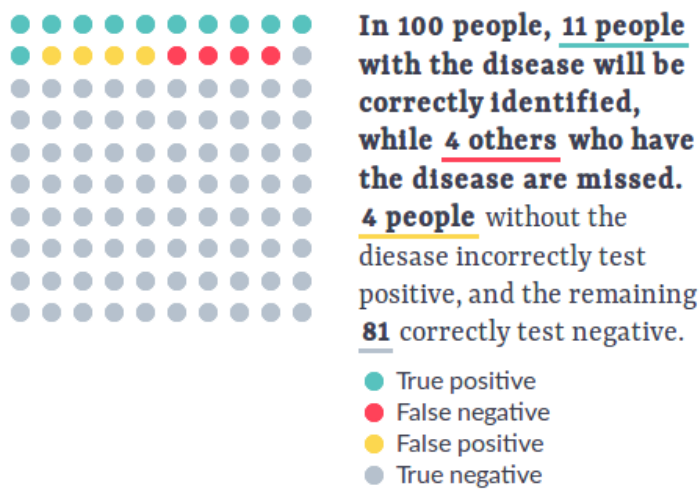
Expected results if 100 people were given a test

Figure 2: 2% of apparently well workers infected with virus



Expected results if 100 people were given a test

Figure 3: 15% of apparently well workers infected with virus



Expected results if 100 people were given a test

It is important that any screening programme is evaluated to establish whether or not it does achieve its objective: in the case of pre-mobilisation testing it is clear that testing does have the potential to detect significant numbers of infected workers (particularly when social conditions indicate a probable high rate of infection in the workforce), although it is also clear that the occurrence of ‘false negative’ results means that it cannot be relied on to exclude all such workers from deployment.

The extent to which excluding asymptomatic infected workers from offshore reduces the occurrence and transmission of infection on offshore installations depends on how significant asymptomatic transmission is in the epidemiology of Covid-19. OGUK is currently working with the London School of Hygiene and Tropical Medicine on a study to establish the effectiveness of the pre-mobilisation testing that has been undertaken to date in reducing medevacs due to suspected Covid-19.

5 References

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4. BMJ 2020;369:m1816 Mahase, E. Covid-19: Confidentiality agreements allow antibody test manufacturers to withhold evaluation results. 4 May 2020.
<https://www.bmj.com/content/369/bmj.m1816>
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6. Watson, J et al. Interpreting a covid-19 test result. 12 May 2020. BMJ 2020;369:m1808
<https://www.bmj.com/content/369/bmj.m1808>
7. Dr S Kong. Personal communication to health subgroup, 14 May 2020

6 Further reading / useful links

[OGUK COVID-19 Testing Technical Note](#)

[OGUK COVID-19 Testing Guideline](#)

[HPS Guidance for Prevention and Management of Cases of COVID-19 on Offshore Installations](#)

[IOGP-IPIECA Health Committee statement on COVID-19 testing in the oil and gas industry](#)

[UK Government – Coronavirus \(COVID-19\): getting tested](#)

[Scottish Government – Coronavirus \(COVID-19\): getting tested in Scotland](#)

[UK Government – NHS test and trace: how it works](#)

[Scottish Government – Coronavirus \(COVID-19\): test, trace, isolate, support strategy](#)



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