T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Healthcare Science

Occupational specialism assessment (OSA)

Assisting with Healthcare Science

Assignment 4 - Distinction

Guide standard exemplification materials

v1.1: Specimen assessment materials
September 2021
603/7083/X

Internal reference: HCSci-GSEM-04

NCFE CACHE

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Contents

Introduction

The material within this document relates to the Assisting with Healthcare Science occupational specialism sample assessment. These exemplification materials are designed to give providers and students an indication of what would be expected for the lowest level of attainment required to achieve a pass or distinction grade.

The examiner commentary is provided to detail the judgements examiners will undertake when examining the student work. This is not intended to replace the information within the qualification specification and providers must refer to this for the content.

In assignment 4, the student must carry out sample analysis.

After each live assessment series, authentic student evidence will be published with examiner commentary across the range of achievement.

Extended written task 1: maintenance of complex medical equipment

Scenario

You are working as a healthcare scientist assistant in the medical physics and clinical engineering department.

You are asked to assist a healthcare scientist in the radiology department, checking an x-ray system maintenance schedule within a restricted clinical area. You are aware that x-ray machine maintenance is performed by an external engineering contractor and its maintenance is not within your remit. Your team are responsible for daily routine checks. Teams must comply with Ionising Radiation Regulations 2017 and Ionising Radiation (Medical Exposures) Regulations 2018 in relation to use, maintenance and servicing of equipment.

Task

Discuss the importance of adhering to an x-ray machine maintenance schedule with reference to the existing regulations detailed in the scenario. You should consider how medical x-rays operate when being used on patients, and the risks associated with clinical staff working within this environment when maintenance schedules are not maintained.

Give some examples of how regular maintenance of complex medical equipment limits the risks associated with x-ray equipment. Consider the levels of maintenance performed by different teams and the purpose of specific regulations as discussed in the scenario and how they support healthcare professionals in using and managing specialist x-ray equipment.

(20 marks)

Record your response here:

Exposure to electromagnetic rays for example, x-rays can, depending on the time exposed, cause sterility, genetic defects, premature ageing and death. It is therefore mandatory to introduce and adhere to safe systems of work in the x-ray environment in healthcare settings. In agreement with the Ionising Radiation Regulations 2017, it is a statutory duty that employers keep exposure to ionising radiations in the workplace as low as reasonably practicable. A restricted clinical area, such as the one mentioned in the scenario above, is an example of how exposure of staff and patients to ionising radiation can be limited. Only staff with special access and selected patients can enter such area. Setting up and following x-ray machine maintenance schedules is another important way of ensuring that exposure to ionising radiation is kept within the safety limits. Regular functional and performance checks of an x-ray system extend its life and helps determine deterioration of parts and decline in performance early on. Thus, preventing serious faults from happening and putting patients and staff at risk of harm; for example, through over-exposure to x-ray ionisation which can have a range of effects such as vomiting, hair loss, radiation tissue burns and in the most extreme cases even cancer. Employers must ensure they meet the ionising radiation regulations, by putting into place quality assurance systems within their x-ray departments and ask their employees to carry out regular quality checks on the x-ray systems. Quality checks include preventative maintenance and performance checks at different intervals.

Performance checks should be carried out only by the trained x-ray department staff (or under supervision) at regular intervals. These include testing equipment before the first use, regular performance testing of equipment in use (daily performance checks before the start of the service), and performance checks following maintenance or repair jobs that may have affected the system's performance. Performance checks include specific tests for each part of the system and require setting up exposure parameters, distances and position of phantoms. Results need to be recorded and compared to the tolerances. Performance check results should be stored and reviewed occasionally to show performance over time. It is a professional duty of staff to report any faults or damage of

equipment to the relevant team and report to the line manager if any of the planned performance checks or preventative maintenance services have been missed.

Preventative maintenance is usually performed once a year by a qualified service engineer, who is usually a contractor. Preventative maintenance is made up of function verification, interior cleaning and mechanical and electrical testing of the hardware. A service starts with verification of functions: movement, x-ray production and image acquisition. The results are compared against the tolerances which gives the service engineer a baseline reference for the current level of system performance. Cleaning inside the system removes dust and debris which can affect movement or show up in images. To prevent these symptoms, internal parts are inspected, cleaned, and re-greased. Mechanical checks include testing of safety interlock, warning lamp, sensor tests and verifying secure mounting of hardware. Electrical checks test the machine for electrical safety and for leakage currents to be within the safety limits. Maintenance tests are conducted on the workstation functions. These may include updating applications, installing software patches, and backing up files. The engineer will test the IT network connectivity and interoperability after any updates as well.

Extended written task 2: testing equipment calibration

Scenario

As part of a quality assurance and audit within a laboratory, you are asked to assist a healthcare scientist in testing calibration of automatic pipettes using a balance and the density of water.

- if the accuracy value lies in the 99 to 101% range, the pipette is considered normal and calibrated – calculating accuracy is done by using the formula A = 100 x V_{avg}/V_0, where A is the accuracy of the pipette, V_{avg} is the average calculated volume, and V_0 is the theoretical volume you tried to dispense
- you have performed the required steps of pipette calibration for a volume of 10µL of water at a temperature of 23°C (item A)
- the formula for calculating the volume dispensed by the pipette is V = w * Z, where w is the weight of the water, Z is the conversion factor based on the density of the water, and V is the calculated volume of how much water was dispensed (item B)

Task

Using the formulas provided as well as the information in item A and item B from the insert provided, calculate the accuracy of the pipette and recommend if the device is in calibration or not. You should also explain the difference between accuracy and precision.

Discuss how audits contribute to the accreditation process and consider why this is important for clinical areas, patients, quality and safety.

(20 marks)

Record your response here:

The formula for calculating the average volume dispensed by the pipette is V = w * Z. Using item B, I have checked that Z factor at 23°C equals Z = 1.0035µL/mg. To calculate the volume dispensed I must calculate the average weight of the water using recorded weights of water in the item A.

The average weight is: w = (9.89 + 10.01 + 10.02 + 9.99 + 9.95+ 10.04 + 9.96 + 10.01 + 9.99 + 9.98)/10 = 99.84/10 = 9.984mg.

And, therefore, V_{avg} = w * Z = 9.984mg * 1.0035µL/mg = 10.019 µL.

To calculate accuracy, I am using my calculated V_{avg} = 10.019 and V_0 = 10 which is the value I set the pipette to dispense.

A = 100 x V_{avg}/V_0 = 100 x 10.019/10 = 100 x 1.0019 = 100.19%.

Accuracy should be between 99−101%, therefore this pipette is properly calibrated.

Accuracy is defined as the degree to which the result of a measurement conforms to the correct value and essentially refers to how close a measurement is to its agreed value. Precision is defined as the quality of being exact and refers to how close 2 or more measurements are to each other, regardless of whether those measurements are accurate or not. It is possible for precision measurements not to be accurate.

Audit is an important element of a lab quality system. An audit allows the laboratory to understand how well it is performing when compared to a benchmark or standard, for example, a standard by International Organisation for Standardisation (ISO) – ISO 15189:2012 – states the requirements for quality and competence in medical laboratories.

Any gaps or nonconformities in performance can show if the policies and procedures that the laboratory has set require revision or are not being followed. A laboratory needs this information about its performance to achieve and maintain its accreditation, through planning and implementing the quality system, monitoring effectiveness of the quality system, correcting any deficiencies that are identified, and working toward continuous improvement. Audits conducted by organisations from outside the laboratories are called external audits. These audits are performed as a part of the accreditation process. Audits performed by laboratories themselves are called internal audits, where staff working in one area of the laboratory conduct assessments on another area of the same laboratory. This provides information quickly and easily on how the laboratory is performing and whether it is observing policy requirements.

The overarching purpose of accreditations and audits is to ensure high standards of laboratory practice, a high level of efficiency and quality analysis carried out by the laboratory staff. This guarantees consistency of the results for patients and improved safety at work for the laboratory staff.

Extended written task 3: escalation of issues related to equipment

Scenario

You are asked to perform a functional check on some devices stocked in the medical equipment library. You have found that one of the tympanic thermometers is showing an error message after turning it on and its audible alarm is very quiet. You have spoken to the user who has confirmed the device has not been dropped. The user has stated that there are no spare devices in their clinical area and this item is needed for the next clinic. You decided to replace the batteries but that has not resolved the issue. You have not been trained to conduct any further checks on a fault such as this one.

Task

Describe how to perform a basic (daily) functional check on a tympanic thermometer and discuss the actions you should take to address this situation.

(20 marks)

Record your response here:

The daily functional checks on a tympanic thermometer includes visual and functional checks. I would start the inspection with checking a sticker informing that the device and the cradle have been cleaned after last use and if this has not been carried out, I would wipe down the casing with a medical grade cleaning wipe and check that there are no signs of external and internal contamination or water damage. Next, I would visually inspect the cradle and the thermometer's case for signs of cracks in the casing. It is good practice to lightly shake the device to check for any rattling sounds. This could indicate the presence of some loose components inside. If no signs of damage are found, I would then turn the thermometer on. It should start up by showing a message on the display screen and running a quick self-check which includes a calibration check and a loud clear alarm sound. Unless some error messages appear on the screen, the thermometer is ready to be used. One of the most common issues with the thermometers is a low-level battery charge. This would be flagged up with an error message on the screen, for example, ERR BATT. In this case I would open a battery cover and replace the batteries with a new set. But, in this case scenario, changing the batteries did not resolve the issue. The last action is to check if we have the right consumables available for the collection of the measurement, such as a box of single use plastic tips.

In the presented scenario I have performed all the checks and actions that are within my role of a healthcare science assistant working in a medical library and which I received device training on. Since I was not able to find the root cause of the faulty audio alarm, I would not be making any attempts to repair the device myself as I was not trained to do that. I would log a repair job on the locally used medical device management system, recording device type, unique reference number (usually ID number on an asset label), the date and time of the report and that the device is now located in the equipment library (including location number on the shelf). I would include description of the fault, checks and actions I have performed on the device so far, as well as the information provided by the user. I would add to the record that the user flagged that they don't have a spare thermometer available and they need one immediately for the next patient in their clinic. I would also ask the user for their name and contact details to make sure we can contact them. I would mark this job as urgent and inform my senior colleague or line manager, asking if we can provide a replacement thermometer to the users immediately, or if not, could the device be repaired as a priority task. The lack of medical equipment can potentially compromise patient's safety or delay their treatment.

Extended written task 4: research and innovation

Scenario

You are working as a healthcare science assistant in a respiratory clinic. You have been given an opportunity to contribute to a diagnostic research and innovation project led by your department.

The study will examine if 30 minutes of light intensity physical activity, for example, fast paced walk, performed 2 hours before sleep has a positive effect on the sleep quality of the patients with sleep apnoea (a type of a sleep disorder). Only adults with a mild condition will be included in the study. Sleep quality will be assessed in an overnight study (using a finger probe pulse oximeter). The study will be carried out over a period of 8 weeks.

Research lead must prepare the study participant information sheet and consent form for the Health Research Authority approval showing that the study proposal is safe, legal and ethical. You have been asked to contribute to the participant information leaflet.

Task

Discuss the information that should be included in the document, considering the following:

- study information
- patient involvement
- possible effects for patients
- additional supporting information
- information about consent and participation
- information about use of patient data
- accessibility requirements

(20 marks)

Record your response here:

Study title - this needs to be shown so that the potential candidate has a quick idea of what the study will be about. The title needs to be concise but clear as many possible participants will use only this information to make a decision regarding continuing to find out more or disregarding the study as of no interest.

Examination of effects of light physical activity before sleep on the quality of sleep-in patients with sleep apnoea.

Invitation and summary of the study - by including a summary at the start of the leaflet I can provide more information than just in the title without the possible candidate needing to read the whole leaflet, this gives them more information to make a decision above and beyond the title but without taking up too much time. It will include some key information, but the more detailed explanations will be given further into the leaflet and on sign up.

The respiratory clinic would like to invite you to a study assessing if 30 minutes of light physical activity, for example, a fast paced walk, performed 2 hours before sleep has a positive effect on the sleep quality of the patients with sleep apnoea.

Patient involvement - this allows the patient to determine if they are eligible for the study. If we did not include this section, there is a risk that the patients arrive and have to be turned away.

Only adults with a mild condition will be included in the study. Sleep quality will be assessed in an overnight study (using a finger probe pulse oximeter). The study will be carried out over a period of 8 weeks.

Possible benefits of taking part - this is a bit of a carrot giving any undecided patients an incentive to give it a go, it appeals to both personal gains and helping others so will attract a range of mind sets.

We cannot promise that you will experience improvement of your condition or any specific benefits. However, it is likely that you will improve your fitness, quality of sleep and overall wellbeing. Your participation will contribute to better understanding of sleep apnoea and its treatment methods.

Possible disadvantages, risks of taking part - while risk is minimal, not declaring any effects could leave us open to risk of a complaint or even being sued should something go wrong. By including this information, the patient can make a rational decision with full facts as to whether they feel it's appropriate to take part.

Although this is a safe study, there may be some potential risks which have not been envisaged. The study will require only 30 minutes of light physical activity of your choice and your health will be under regular monitoring by trained medical professionals.

Additional supporting information - this reassures the patient that we are here to help. There will be support for any questions and queries. It also reassures that should something change, making the patient feel the study is not appropriate for them at any stage, there is a way out and they are not committed to this regardless of change in circumstances. While we would hope that once signed up very few people change their mind it is unrealistic to expect that every single patient will complete the trial, there may be changes in employment or personal circumstances that mean this no longer works for them.

If you have any questions or would like to request help with regards to your participation you can find a telephone number, email address and postal address on the bottom of this leaflet. You can contact the team 24 hours/day, 7 days a week.

If you don't want to carry on with the study, you will be able to withdraw at any point by contacting us using provided contact details.

Confidentiality of your personal information will be protected by anonymisation of your results. We will not share your personal identifiable data and results of this study with any other organisations without your knowledge and consent.

Consent and participation - to protect the department it is essential to confirm that the patient is genuinely ok with this and they are not being pushed into the trial or unknowingly taking part. By obtaining a signature we confirm that this is all being done properly and have proof should it ever be required due to a complaint or other reasons. Because we have patient data, we need to make them aware that it will only be used in the context we have agreed, and we will not share data outside of the trial.

I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care being affected.

I understand that relevant sections of my medical notes and data collected during the study will be looked at by individuals from the respiratory clinic research team, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records subject to data protection legislation.

I agree to take part in the above study.

Name of participant: Date: Signature:

Accessibility requirements - equality laws require that all patients are treated fairly. If they would like to receive this information in another format to make it more accessible, we have an obligation to provide that, however it would be costly to produce all formats just in case, so these options are available on request.

This leaflet is available, on request, in other languages and formats to aid understanding.

Examiner commentary

Task 1

The student showed an excellent understanding of the importance of equipment maintenance and provided extensive examples of potential risks associated with x-rays and showed a comprehensive understanding of how regular maintenance can limit risks.

They showed outstanding understanding of the principles of operation and maintenance of medical equipment at different time intervals, with detailed examples of different parts of the system and types of checks included in the service protocol.

They have shown solid knowledge of content and purpose of related legislation with sound understanding of professional responsibility in relation to the legislations.

Task 2

The student was able use provided formulas and correctly calculate the accuracy of the pipette. They provided a correct answer to the question in task, which shows the ability to correctly interpret tolerance in relation to calibration testing. They presented the method and the order of calculations in a clear and logical manner explaining their thinking process. They provided thorough definition of accuracy and precision. Excellent discussion of the role of audit and its importance in relation to laboratory accreditation, with a reference to a specific ISO standard for laboratories. They provided extensive and detailed discussion of types and purpose of different audits showing excellent understanding of the laboratory accreditation protocols. Their response was highly relevant and presented an outstanding consideration of quality and safety in patient care.

Task 3

The student showed an extensive understanding of thermometer set up (including consideration of appropriate accessories), use and infection control. They showed excellent knowledge of fault checks and interpretation of errors. They presented a strong understanding of the limitations of their role and correctly recommended escalation of the problem to a senior member of staff. They provided a detailed description of procedures carried out in a medical equipment library (such as logging job and equipment details on the computer database) and thorough consideration of information that should be communicated when reporting an issue/emergency. Discussion is very detailed and includes assessing urgency of the situation and a very good consideration of potential risks to patient and the service as a result of unavailability of equipment.

Task 4

The student presented information in a clear format of an information leaflet, including a title of the study, and addressed all the bullet points listed in the task instruction. They provided extensive information showing very good familiarity with the Health Research Authority approval process, including understanding of principles of patient consent and personal information anonymisation. They displayed competence in selecting the relevant information from the details provided. They made very good choices in their use of language appropriate to the audience. They creatively built on the provided information and added some more details in each section of the leaflet which were all highly relevant to the scenario. They managed to clearly address accessibility requirements by offering the leaflet in different languages and formats.

Overall grade descriptors

The performance outcomes form the basis of the overall grading descriptors for pass and distinction grades.

These grading descriptors have been developed to reflect the appropriate level of demand for students of other level 3 qualifications, the threshold competence requirements of the role and have been validated with employers within the sector to describe achievement appropriate to the role.

Occupational specialism overall grade descriptors:

Assisting with Healthcare Science occupational specialism grade descriptors.

Grade

Demonstration of attainment.

Pass

The student demonstrates good knowledge and understanding of the topics and the healthcare context in which it lies.

The student demonstrates professional practice whilst carrying out tasks/activities showing respect to safety, care and confidentiality for patients, colleagues and oneself.

The student has an appreciation of action to be taken when errors occur.

The student demonstrates a good understanding of their own development with some learning through reflective practice.

The student may not always connect learning to work in practice.

Distinction

The student demonstrates excellent knowledge and understanding of the topics and appreciation of the healthcare context in which it lies.

The student demonstrates excellent understanding of professional practice whilst carrying out tasks/activities applying them in the healthcare context.

The student shows respect for safety, care and confidentiality for patients, colleagues and oneself.

The student fully acknowledges when errors occur and the reporting process.

The student demonstrates a good insight to their own development, demonstrating significant learning through reflective practice.

The student draws on reflective practice and relates their development and learning to work in practice.

Document information

The T Level Technical Qualification is a qualification approved and managed by the Institute for Apprenticeships and Technical Education.

Owner: Head of Assessment Design

Change History Record

Version	Description of change	Approval	Date of Issue
v1.0	Published final version.		June 2021
v1.1	NCFE rebrand		September 2021