

Competency Standards for Australasian Polysomnographic Technologists.

Prepared for the membership of the Australasian Sleep Technologists' Association Inc. by the 1999 Professional Standards sub-committee.

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ACKNOWLEDGMENT.

The draft document was originally developed by Rhondo Russo and the 1998 Professional Standards Sub-committee of the Australasian Sleep Technologists' Association Inc. It was further refined by the 1999 Professional Standards Sub-committee with the encouragement and support of Ellen Dickson, Course Co-ordinator, Clinical Neurophysiology, Royal Melbourne Institute of Technology, and the Association of Polysomnographic Technologists, USA.

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INTRODUCTION

This document contains the Competency Standards for Australasian Polysomnographic Technologists. They have been developed to reflect the contribution routinely expected from a clinical professional with extensive experience and expertise in Polysomnography.

This document was prepared for the Australasian Sleep Technologists' Association Inc. and outlines definition of roles, terms and concepts that will aid in the interpretation of general competency standards.

Following the Commonwealth's initiatives in relation to competency standards development, multi-skilling and structural efficiency that form the basis of the National Training Agenda, polysomnography, along with other professions, has proceeded to develop competency standards (National Community Services and Health Industry Training Advisory Board Limited, 1994. P.4). Some of the intended uses of competency standards in the health professions include the following:

Assisting in accrediting educational programs,
Facilitating communication within the profession,
Facilitating communication between professional groups across disciplines,
Assessing the competence of people re-entering the profession after an absence,
Providing a public information document setting out the roles and responsibilities of the professional.

Standards development must reflect current best practice and include a combination of qualifications, skills and the assumption of personal responsibilities and accountability. Refinement and alteration of the competency standards will be through a process of consultation and validation. It is essential therefore that the document be regularly reviewed to ensure it remains relevant in a dynamic environment with rapid technological advancement.

COMPREHENDING STANDARDS

Units of Competence

A unit of work-based activity which:

- is an aspect of work activity which describes a broad area of para-professional performance.
- can be undertaken by one person
- is a marketable element of work-based activity
- can be grouped with other components to form a qualification

Elements of Competence

Each competency is divided into elements to describe how the units can be performed.

Performance Criteria

Specifies the type of performance in 'output' terms, which will determine whether a Unit of Competence has been achieved.

DEVELOPMENT OF COMPETENCY STANDARDS

“Competency standards are normally developed through the conduct of a project which will research the needs of the sector of industry concerned, consult with workers in that sector, their supervisors, management and key organisations with an interest to develop an initial set of standards. That draft is then validated (ie tested) in a number of ways to ensure that the proposed standards are accurate, encompass all aspects of the area of work, can be used to develop curriculum, assessment and for other relevant purposes, are easily understood and, critically, have the support of the relevant sector of industry.”, (Emery, 1993, cited National Community Services and Health Industry Training Advisory Board Limited, 1994, p.8).

ROLE OF THE POLYSOMNOGRAPHIC TECHNOLOGIST

The defined area of clinical polysomnography practice is related to and requires specific knowledge of behavioural, physiological and biomedical aspects of care to patients undergoing polysomnographic testing. The polysomnographic technologist is a highly skilled and trained health professional who is individually responsible and accountable for their actions. The role includes producing quality recordings and reports, correlating and interpreting data, assessing and improving existing recording methods. A commitment to best practice, quality, service and continuing education and training is expected. Adherence to Occupational Health and Safety and confidentiality legislation must be maintained.

UNITS OF COMPETENCY

UNIT 1: PROFESSIONAL & ETHICAL PRACTICE

COMPETENCY 1: Use an accurate and comprehensive knowledge base relevant for polysomnographic practice

Elements of Competence:

- 1.1 Demonstrate a thorough familiarity and understanding of all instrumentation used in a sleep laboratory;
- 1.2 Have a command of the sleep-induced changes in the physiology of various body systems including, but not limited to, the neurological, musculoskeletal, cardiac, and respiratory systems;
- 1.3 Have a working knowledge of the physiological and behavioral aberrations associated with sleep/arousal pathology

Performance Criteria:

- 1.1.1 Identifies relevant theoretical concepts and principles and applies these in practice, so as to be capable of rapid interpretation of electroencephalographic (EEG), electro-oculographic (EOG), electromyographic (EMG), electrocardiographic (ECG), and respiratory tracings, enabling appropriate interventions during a study
- 1.2.1 Discuss sleep-induced changes in the physiology of various body systems including, but not limited to, the neurological, musculoskeletal, cardiac, and respiratory systems;
- 1.3.1 Identify and discuss behavioral aberrations associated with sleep/arousal pathology

COMPETENCY 2: Accurately use a standard of electrode and body sensor placements for patient application

Elements of Competence:

- 2.1 Identify, measure and mark proper locations of EEG electrodes (C3, C4, O1, O2, A1 and A2), using the 10/20 system of electrode placement
- 2.2 Identify proper placement for right and left EOG electrodes
- 2.3 Identify proper placement for chin EMG electrodes
- 2.4 Identify proper placement for ECG electrodes
- 2.5 Identify proper placement for EMG diaphragm electrodes
- 2.6 Identify proper placement for anterior tibialis electrodes
- 2.7 Prepare skin for surface electrode or body sensor placement
- 2.8 Securely attach electrodes with collodion, paste or tape, according to departmental procedures
- 2.9 Identify proper placement for respiratory monitors (piezoelectric or other belts, thermocouple, nasal pressure, esophageal pressure, snore sensor, etc)
- 2.10 Identify proper placement for oximeter probe
- 2.11 Identify proper placement for TcCO₂ probe
- 2.12 Remove surface electrodes and body sensors

Performance Criteria:

- 2.1.1 Measure the distance from the nasion to inion along the midline through the vertex;
Make a preliminary mark at the midpoint (Cz);
Mark the points 10% up from the inion (Oz) and nasion (Fpz)
- 2.2.1 Center Cz in the transverse plane by marking the halfway distance between the left and right pre-auricular points;
Mark 10% (T3) and 30% (C3) up from the left pre-auricular point and 10% (T4) and 30% (C4) up from the right pre-auricular point
- 2.3.1 Make a mark along the midline through Fpz by "eyeball method" up from the bridge of the nose;
Apply the tape around the circumference of the head through Fpz, T3, Oz and T4;
Make a mark along the midline at 50% of this circumference distance through Oz;
Make a mark at 5% of this circumference distance to the left of Oz (O1) and 5% to the right (O2);
Make a mark at 5% of this circumference distance to the left of Fpz (Fp1) and 5% to the right (Fp2);
Along the same horizontal plane (Fpz, T3, Oz & T4), extend the horizontal marking from Oz to intersect O1 and O2, and from Fpz to intersect Fp1 and Fp2
- 2.4.1 To center C3, place the tape from Fp1, through C3 to O1, marking the midpoint which intersects with C3;
Repeat on the right side for C4
- 2.5.1 A1 and A2 are placed in an electrically isolated area, generally the right and left mastoid regions, although ear lobes may be used
- 2.6.1 The ground is generally placed at Cz or near Fpz
- 2.7.1 EOG electrodes need to be offset, although it does not matter which one is higher;
Typically, place the LEOG one cm out and one cm down from the outer canthus;
Place the REOG one cm out and one cm up from the outer canthus
- 2.8.1 Placement of the chin EMG may be on the mentalis, submentalis or massiter muscles;
- 2.9.1 Three electrodes should be placed to allow for one back-up electrode
Using a modified Lead I placement, electrodes should be placed on the right and left side of the upper chest, avoiding bony areas;
Starting at the xiphoid process, palpate down the ribs on the patient's right side to the intercostal space just above the eighth rib;
Have the patient take deep breaths and feel for the area of the most expansion;
Place two electrodes here, a few centimeters apart;
Find the intercostal space just above the ninth rib and place the third back-up electrode here, midline between the first two electrodes, forming a "V", or place as per departmental protocol
- 2.10.1 Two electrodes should be placed on the anterior tibialis muscle on each leg;
The muscle is located on the anterior portion of the calf, just to the outside of the bone;

- Having the patient flex or point their foot, place the electrodes approximately 2 cm apart on the belly (the portion that bulges furthest with movement) of the muscle
- 2.11.1 Using Omniprep (or other like skin prep) and a cotton tip swab, scrub with a gentle but firm circular motion over site area no bigger than the electrode head, being careful not to break the skin and always within Occupational Health and Safety guidelines
- 2.12.1 Within Occupational Health and Safety Guidelines, apply electrodes (filled with electroconductive gel or paste) and sensors using collodian, paste or tape;
 If using collodian, adequate ventilation and proper storage are essential; Generally, collodian soaked gauze is used in those areas where hair prevents secure attachment by other means;
 If using paste, care must be taken to ensure the "electrode size" remains as close to the actual size of the electrode cup as possible, by keeping gauze size small and in any case, no bigger than that of a five cent piece;
 Tape should be long enough to cover the electrode cup completely, as well as a portion of the wire itself
- 2.13.1 Place chest effort belts under the arms and in nipple area across the chest (female patients will need to have it somewhat higher);
 Abdominal belts should be placed on the area which moves most with respirations, generally mid to lower abdominal area;
 Thermocouple/thermistor/nasal pressure sensors fit under the nose directed toward the nares and with second wire/cannula bent gently in front of the mouth;
 Wires may be placed over the ears to the back of the head or back under the chin;
 Eosophageal pressure uses a small balloon catheter filled with air or water, which is snaked down the nose and placed in the eosophagus just above the stomach, according to departmental/hospital protocol and within Occupational Health and Safety Guidelines;
 Snore sensors/microphones are generally taped to the patient's throat next to the vocal chords;
 Having the patient hum and feeling for the spot that vibrates most will help determine the best recording site
- 2.14.1 Place the oximeter probe on the finger(s) or the ear lobe
- 2.15.1 Place TcCO₂ probe (filled with electrolyte), on a flat area of skin, typically the inside forearm or upper chest area;
 Change probe site every 2-4 hrs or as necessary to prevent burning
- 2.16.1 Cleanly remove surface electrodes, body sensors and residue, within Occupational Health and Safety Guidelines, ensuring that patient's head is tipped back and eyes closed to prevent any liquid removal agents coming into contact with face/eyes, and ensuring tape is removed by pulling in the same direction of hair growth to minimise discomfort

COMPETENCY 3: Care and maintenance of electrodes and body sensors

Elements of Competence:

- 3.1 Prepare and clean electrodes and sensors before;
- 3.2 Sterilize and store electrodes;
- 3.3 Care for blunted needles;

Performance Criteria

- 3.1.1 Clean excess substance from electrode or sensor, within Occupational Health and Safety Guidelines
- 3.2.1 Use chemical or autoclave method of electrode or sensor sterilization if suitable, according to Occupational Health and Safety guidelines; Store electrodes and sensors for short term and long term use
- 3.3.1 Discard disposable needles appropriately according to Occupational Health and Safety regulations

COMPETENCY 4: Use an accurate and comprehensive knowledge base to perform, record, recognise and annotate components of a full polysomnogram, utilising appropriate apparatus

Elements of Competence:

- 4.1 Calibrate polygraph apparatus before and after use
- 4.2 Identify different types of electrodes, sensors and ancillary equipment required
- 4.3 Complete signal pathway from patient to polygraph
- 4.4 Check and adjust electrode impedance and resistance
- 4.5 Optimise polygraph apparatus display, altering control settings as required according to departmental procedures
- 4.6 Perform patient biocalibrations
- 4.7 Demonstrate and explain a range of derivations and montages
- 4.8 Identify and eliminate artefacts
- 4.9 Identify and correct simple equipment faults
- 4.10 Recognise and explain all EEG wave forms
- 4.11 Discuss features and significance of different sleep stages
- 4.12 Demonstrate ability to correlate sleep stages to EEG
- 4.13 Discuss the criteria for and significance of arousals
- 4.14 Recognise abnormal EEG patterns and seizures
- 4.15 Clearly annotate changes in patient state
- 4.16 Discuss ECG and explain normal sinus rhythm, basic normal components and cardiac conduction
- 4.17 Discuss and explain basic abnormal rhythms, components and cardiac conduction
- 4.18 Recognise life-threatening and non life-threatening ECG abnormalities and act appropriately
- 4.19 Discuss importance of recording limb EMG
- 4.20 Demonstrate the calibration of SpO₂, TcCO₂, respiratory effort (if applicable), and other ancillary equipment
- 4.21 Recognise, annotate and act appropriately to changes in respiratory function
- 4.22 Perform video and audio recording procedures

Performance Criteria

- 4.1.1 Demonstrate a thorough understanding of the relationship between voltage, sensitivity/gain and pen deflection, as well as time axis and mechanical & electrical baselines /offset in order to calibrate the polygraph to ensure accuracy of tracings pre & post PSG
- 4.2.1 Identify all electrodes and sensors used, discuss advantages and disadvantages of each, discuss type of electrode or sensor needed for specific recording
- 4.3.1 Complete patient application and connect all electrodes and sensors to head box or directly to amplifier as required
- 4.4.1 Using either handheld or computerised impedance meter check each electrode impedance according to departmental procedure;
Correct any high impedance levels by repositioning or re-applying the electrodes, adding electroconductive gel, changing electrode wires, etc to achieve EMG and ECG below 10 Kohms and all other electrodes below 5 Kohms.
- 4.5.1 Demonstrate a full knowledge of various signal types (EEG, ECG, EMG, resp, etc) as related to sensitivity/gain, low and high frequency filters, sampling rates and resolution in order to optimise signals at start of study with appropriate default settings and as required throughout remainder of study
- 4.6.1 Perform 30 sec biocalibrations for each of : eyes closed, eyes open, eyes right, eyes left, eyes up, eyes down, five eye blinks, teeth grind/swallow, right foot, left foot, breath in, breath out, nasal and oral breathing, breath hold, five snores, position supine, position right, position left, position prone, making changes as in 4.5.1 above in order to achieve best baseline
- 4.7.1 Explain referential and bipolar derivations and the relationship between differential amplifiers and Common Mode Rejection (CMR), along with their impact on sleep signals;
Demonstrate full use of various montages (including appropriate amplifier settings), including diagnostic, titration, respiratory, seizure, Rem Behaviour Disorder, parasomnia, etc
- 4.8.1 Identify and eliminate the following artefacts by making appropriate changes to environment or amplifier settings, without removing or inappropriately attenuating sleep signals: sweat, respiratory, muscle, slow interference/wandering baselines, 50 Hz, ECG;
All settings changes must be annotated clearly and must be returned to defaults if artefact situation is resolved
- 4.9.1 Troubleshoot by tracing the signal pathway from patient to polygraph in order to identify and correct simple equipment faults such as interference, occlusions, disconnects, cable faults, simple preamplifier faults, etc
- 4.10.1 Demonstrate full knowledge of EEG waveforms/frequencies relevant to polysomnography, including delta, theta, alpha, beta, spindles, K-complexes, vertex sharp waves, saw-tooth waves, etc
- 4.11.1 Explain identifying features of each sleep stage, ie. background EEG patterns/frequencies, complexes and specific morphologies, presence or absence of and types of eye movements, level of EMG activity, etc;
Explain significance of each in terms of general health and well being
- 4.12.1 Immediately recognise sleep stage by EEG patterns and be able to anticipate changes in stage by current status

- 4.13.1 Explain arousals as defined by Rechtschaffen & Kales (R&K) as well as the criteria put forth by the ASDA Atlas Task Force Arousal Scoring Rules; Explain their significance with respect to quality of sleep
- 4.14.1 Recognise abnormal EEG patterns and seizures, including spike and focal activity, generalised tonic-clonic seizure activity, post-ictal slowing, together with typical patient behaviours which require immediate medical attention and act appropriately to assist patient care
- 4.15.1 Annotate all changes in patient state including significant EEG, ECG, EMG changes, position, sleeptalking, parasomnia behaviour, etc, as well as patient comments during awakenings
- 4.16.1 Explain normal cardiac function in terms of rate & rhythm, P wave, P-R interval, QRS complex, T wave, etc and correlating normal conduction through the chambers of the heart
- 4.17.1 Explain basic abnormalities in terms of rate & rhythm, changes in P wave, P-R interval, QRS complex, T wave, etc and correlating abnormal condition through the chambers of the heart
- 4.18.1 According to hospital/departmental protocol, recognise arrhythmias which require simple documentation and monitoring, those which require documentation, monitoring and notification of physician, and those which are life threatening and require an emergency response, then act accordingly
- 4.19.1 Relate activity seen on limb EMG (legs & arms) for recognition of periodic limb movement disorders, parasomnias, RBD, seizures, etc
- 4.20.1 Calibrate TcCO₂, SpO₂, other respiratory or ancillary equipment as per equipment manuals and/or departmental procedures
- 4.21.1 Identify and appropriately respond to any changes in respiratory function, including rate and rhythm, obstructive and central apneas, hypopneas, partial obstructions, snoring, Upper Airway Resistance Syndrome (UARS), REM hypoventilation, desaturations, etc;
Implement treatment protocols for PAP, oxygen administration, waking patient and utilising emergency services as laid out in hospital/departmental protocols
- 4.22.1 Demonstrate proper video and microphone function, including synchronisation of video to polygraph if necessary

Competency 5: Perform other diagnostic procedures in conjunction with a PSG

Elements of Competence:

- 5.1 Perform Multiple Sleep Latency Test (MSLT)
- 5.2 Perform Maintenance of Wakefulness Test (MWT)
- 5.3 Perform other tests as necessary

Performance Criteria:

- 5.1.1 Perform as per the MSLT Guidelines outlined in The Principles and Practice of Sleep Medicine or to specific, documented departmental/research protocol
- 5.2.1 Perform MWT according to best current practice or to specific, documented departmental/research protocol
- 5.3.1 Perform Other tests, such as cognitive response tests, etc to specific, documented departmental/research protocol

Competency 6: Perform consistently accurate scoring and analysis of PSG recordings, including preparation of detailed reports of sleep architecture, cardiac, respiratory, and other physiologic events recorded

Elements Of Competency:

- 6.1 Utilise automated computer scoring according to current best practice
- 6.2 Analyse/score and report sleep stages
- 6.3 Analyse/score and report respiratory events
- 6.4 Analyse/score and report limb movement events
- 6.5 Analyse/score and report arousals
- 6.6 Analyse/score and report other physiologic events recorded

Performance Criteria:

- 6.1.1 Utilise computer as a scoring aid only, being sure to carefully check and verify results manually on an epoch-by epoch basis to ensure accuracy
- 6.2.1 Analyse/score sleep stages as per R&K, or as per specific, documented research protocol;
Report according to current best practice and departmental protocol
- 6.3.1 Analyse/score and report respiratory events according to current best practice and departmental protocol, or as per specific, documented research protocol
- 6.4.1 Analyse/score and report limb movements according to current best practice and departmental protocol, or as per specific, documented research protocol
- 6.5.1 Analyse/score arousals as per R&K for obvious event-related arousals, and as per ASDA Atlas Task Force on Arousal Scoring for EEG micro-arousals not associated with clear physiologic events, or as per specific, documented research protocol;
Arousals should be reported by type to demonstrate pathology
- 6.6.1 Analyse/score and report other physiologic events recorded according to current best practice

UNIT 2 CONTINUOUS AND BI-LEVEL, POSITIVE PRESSURE MANAGEMENT

Competency 7: Effectively select the most appropriate mask or interface system to initiate positive pressure therapy.

Element Of Competency:

- 7.1 Fit the most appropriate mask or interface system on the patient.

Performance Criteria:

- 7.1.1 Know and explain the differences in mask type and function.
 - Use appropriate type and size of interface system
 - Check for patient comfort
 - Check for adequate seal around interface in sitting and reclined positions
 - Adjust for comfort and seal as appropriate
 - Ensure patient can apply and remove mask system when needed.
 - Re-check comfort and seal with flow generator on under low and medium pressures
 - Ensure any mouth leak is minimized

Competency 8: Perform nCPAP and Non Invasive, Bi-Level positive pressure determinations.

Element Of Competency:

- 8.1 Effectively determine optimal pressure requirements for patients requiring CPAP or Bi-Level positive pressure therapy.

Performance Criteria:

- 8.1.1 Prepare patient and equipment as per medical orders
 - Increase pressure to eliminate obstructed upper airway (CPAP) and improve ventilation and gas exchange (Bi-Level)
 - Increase pressure by 1 to 2 cms H₂O increments and on inspiration only, according to departmental protocol.
 - Annotate changes in pressure, body position and clinical status.
 - If central apnoeas develop or TcCO₂ increases, decrease set pressure until these events resolve:
 - Add humidification, oxygen or other additional treatment modalities to PAP as per departmental protocol and current best practice.
 - Analyse, interpret and report results of pressure determination at conclusion of test
 - Monitor clinical status and in the event of emergency situation call for immediate medical assistance as per departmental protocol.

Competency 9: Correctly use CPAP and Bi-Level flow generators.

Element Of Competency:

9.1 Correctly know and use the department's CPAP and Bi-Level flow generators

Performance Criteria:

9.1.1 Explain the functions and differences in CPAP and Bi-Level flow generators

Correctly adjust controls

Correctly check and replace filter systems as required

Effectively clean and maintain after each patient's use according to Occupational Health and Safety guidelines.

UNIT 3 PATIENT EDUCATION AND FOLLOW-UP

Competency 10: Effectively prepares patients for polysomnogram, specific tests, pressure titrations and clinician follow-up if required as per departmental protocol

Element Of Competency:

- 10.1 Effectively educates and prepares patient for testing to procure quality results.
- 10.2 Understands the need for follow-up with clinic or clinicians.

Performance Criteria:

- 10.1.1 Effectively and succinctly explains procedures to patient and/or family as per departmental protocol.
Ensures patient's understanding of proceedings and the need for same.
Demonstrates use of appropriate equipment and safety procedures
- 10.2.1 Discusses and explains specific follow-up protocol
Recognises the need for collaboration .

UNIT 4 COMMUNICATIONS

Competency 11: Communicate information, verbally or in writing, with colleagues and allied health professionals

Element Of Competency:

- 11.1 Liaise with allied health professionals
- 11.2 Act upon directions or instructions from senior staff and other health professionals.

Performance Criteria:

- 11.1.1 Communicate information regarding policies, procedures and equipment in accordance with institution's protocol
 Provide education and training through in-service program to the host institution and/or department
- 11.2.1 Give efficient and courteous responses to directions or instructions to requested tasks.
 Work as part of a team within Quality Management guidelines
Disagreements in regard to work policy or procedures are appropriately dealt with through conflict resolution procedures.

UNIT 5 ORGANISATION AND MANAGEMENT

Competency 12: Demonstrates leadership in the specialty through organisation of daily tasks for maximum efficiency of worktime and initiate actions to overcome problems

Element Of Competency:

- 12.1 Plan and prioritise a daily work schedule
- 12.2 Initiate action to resolve work problems
- 12.3 Manage information and communication of procedures, protocols, manuals, patient documentation and emergency procedures
- 12.4 Supervise junior staff and 'visitors'
- 12.5 Acts as a role model for others in the practice area.

Performance Criteria:

- 12.1.1 Develop and implement work schedules
 - Determine work priorities in consultation with senior staff and/or colleagues
 - Accommodates rescheduling of urgent requests, equipment breakdown or unexpected staff shortage
 - Prioritise and distribute work appropriately
 - Work allocated in recognition of knowledge and skill level of staff
- 12.2.1 Demonstrates problem solving and 'trouble-shooting' strategies
 - Performs daily preventative maintenance check on equipment, instruments and environment
 - Initiates adjustments and repairs as needed for optimal performance.
- 12.3.1 Operate an effective documentation system
 - Maintain appropriate registers of staff, patient and equipment
 - Ensure emergency procedures and drills are carried out as per protocol
- 12.4.1 Junior staff trained in emergency, routine and safety procedures
 - Junior staff assisted with problem solving and trained in 'trouble-shooting' techniques
 - Ensure safety of visitors
 - Escort visitors as required per departmental protocol
- 12.5.1 Implements innovative and creative practice
 - Demonstrates accountability
 - Involvement in strategic and policy planning.

UNIT 6 MAINTAIN PERSONAL AND PROFESSIONAL DEVELOPMENT

Competency 13: Continuously improve and update skills and knowledge

Element Of Competency:

- 13.1 Improve knowledge and skills
- 13.2 Performance evaluation

Performance Criteria:

- 13.1.1 Identify current deficiencies in knowledge and skills through audit process
 - Seeks membership of professional associations
 - Undertakes formal and informal courses
- 13.2.1 Assess workplace personal and professional performance through performance appraisal processes
 - Identifies short and long term goals
 - Plan, develop and implement for goal achievement

UNIT 7 INITIATE RESEARCH

Competency 14: Ability to initiate research

Element Of Competency

14.1 Initiate research efforts

Performance Criteria:

- 14.1.1 The need for further research information and data is identified and defined in consultation with relevant stakeholders and supervisors
- 14.1.2 Opportunities are sought, and created where possible to encourage and support people to undertake research
- 14.1.3 Research ideas and concepts are developed and tested with relevant stakeholders and supervisors
- 14.1.4 Research designs are developed proposing: the size and nature of the research sample; research methods; the human, financial and physical resources which will be required; the nature and scope of information to be gathered; and a timeframe developed.

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Polysomnographic Technologists Competency Standards - January 2003.