

Sleep Technologists Educational Needs Assessment: A Survey of Polysomnography, Electroneurodiagnostic Technology, and Respiratory Therapy Education Program Directors

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Study Objectives: In this study, we assessed the community and educational needs for sleep technologists by surveying program directors of nationally accredited polysomnography, electroneurodiagnostic technology, and respiratory care educational programs. Currently, little is known about our educational capacity and the need for advanced degrees for sleep medicine technical support.

Methods: A questionnaire was developed about current and future community and educational needs for sleep technologists. The questionnaire was sent to directors of CAAHEP-accredited polysomnography and electroneurodiagnostic technology programs (associate degree and certificate programs), and directors of CoARC-accredited respiratory therapy associate degree and bachelor degree programs (n = 358). Qualitative and quantitative data were collected via an internet survey tool. Data analysis was conducted with the IBM SPSS statistical package and included calculating means and standard deviations of the frequency of responses. Qualitative data was analyzed and classified based on emerging themes.

Results: One hundred seven of 408 program directors

completed the survey. Seventy-four percent agreed that demand for qualified sleep technologists will increase, yet 50% of those surveyed believe there are not enough educational programs to meet the demand. Seventy-eight percent of those surveyed agreed that the educational requirements for sleep technologists will soon increase; 79% of those surveyed believe sleep centers have a need for technologists with advanced training or specialization.

Conclusions: Our study shows educators of associate and certificate degree programs believe there is a need for a bachelor's degree in sleep science and technology.

Keywords: Sleep technology, polysomnography, education, sleep medicine

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Over the last two decades, researchers have made great inroads into understanding the mechanisms of state control and associated physiology. This new knowledge is leading the clinical field toward further technological changes in how we measure sleep and related pathophysiology. As our technology advances, we will have a greater dependence on highly trained individuals to accurately perform these studies. Sleep technologists are professionally credentialed by the Board of Registered Sleep Technologists (BRPT).¹ Their scope of practice includes, but is not limited to polysomnography, use of positive airway pressure devices, oximetry, capnography, actigraphy, administering nocturnal oxygen, utilization of screening devices, involvement in sleep education efforts, administering patient questionnaires, laboratory management, quality assessment, and research.² Currently, the highest degree available in sleep technology is an associate degree. No data exist for the need of an advanced degree (baccalaureate or higher), yet data and advanced degrees exist for other disciplines such as respiratory therapy, radiology, and clinical laboratory science. In 2009, a survey of sleep disorders laboratories in North Carolina accredited by the American Academy of Sleep Medicine was conducted: 73% acknowledged difficulty in filling management

BRIEF SUMMARY

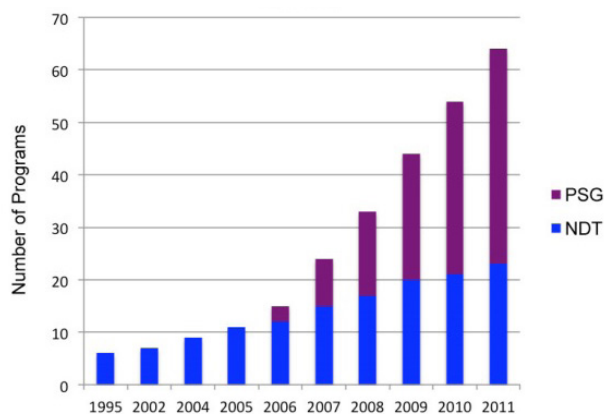
Current Knowledge/Study Rationale: Sleep medicine is becoming more diagnostically and therapeutically complex. An increasing number of states have passed legislation requiring sleep technologists to hold the RPSGT or equivalent credential to be able to practice sleep technology. Educational institutions across the country have responded to this need by adding formal educational programs for entry-level sleep technologists; however, these programs do not fill the need for advanced-level technologists.

Study Impact: Our survey shows that educational program directors feel greater educational opportunities are needed to improve the supply and quality of sleep technologists. The technology, diagnostic, and therapeutic procedures used are complex and not easily mastered by on the job training. The associate degree programs and certificate programs in sleep technology prepare entry-level sleep technologists, yet program directors express that technologists will need to fill roles that require significant levels of analysis, problem solving, and professional judgment.

and leadership roles within their laboratories; 73% of these laboratories also stated the number of sleep technologists needed in the immediate future was likely to increase.³

As the knowledge of sleep and its disorders increases, the range and sophistication of diagnostic testing and treatments

Figure 1—Growth of NDT and PSG programs accredited by CAAHEP



CAAHEP, Commission on Accreditation of Allied Health Education Programs; NDT, Neurodiagnostic Technology; PSG, Polysomnographic Technology. Adapted from data from the CAAHEP.⁵

will likely broaden. Technologists will be required to attain new knowledge and expertise to maintain quality of patient care. This broadening will likely increase the educational requirements for technologists.⁴ There are currently four pathways for technologists to qualify to sit for the BRPT examination.¹

- **Clinical Experience.** *For candidates working in the field for at least 18 months, who have completed a STAR-designated Self-Study education program.*
- **Healthcare Credential.** *For candidates working in the field for at least 6 months, who have another healthcare credential.*
- **CAAHEP/CoARC Student.** *For graduates of a CAAHEP or CoARC-accredited polysomnography education program.*
- **Focused Training.** *For candidates working in the field for at least 9 months, who have completed STAR-designated Focused education, or a combination of Self-Study and Focused 2 education.*

Several types of formal educational programs exist, offering credentials including a diploma, a certification, and an associate degree. The Commission on Accreditation of Allied Health Education Programs (CAAHEP) is the national accreditor of educational programs in Polysomnography (n = 29) and Electroneurodiagnostic Technology (n = 21), and the Commission on Accreditation for Respiratory Care (CoARC) accredits Respiratory Care educational programs and has an add-on track for Polysomnography (n = 358). Formal educational programs accredited by these organizations produce graduates eligible to take the BRPT examination under the formal education pathway. The number of these educational programs is slowly increasing (see **Figure 1**). A recent national survey of students enrolled in associate degree programs with concentrations in sleep technology revealed that 65% of them are interested in pursuing degrees beyond the associate level.³ However, the need for more programs or advanced degree is unclear.

The primary objective of this study was to measure current and future community needs and educational needs for sleep

technologists. A second goal was to determine the effects and benefits an advanced degree in sleep technology will have on the field and technologists. We conducted a national survey of program directors of polysomnography, electroneurodiagnostic technology, and respiratory care educational programs to address the following research questions:

1. What are the current and future community needs for sleep technologists?
2. What are the current and future educational needs for sleep technologists?
3. What effects will an advanced degree in sleep technology have for community, patients, and technologists?

To our knowledge this is the first survey of program directors to assess these needs and effects.

METHODS

Participants

Program directors of nationally accredited Polysomnography, Electroneurodiagnostic Technology, and Respiratory Care educational programs within the United States were asked to participate in this study. Program directors were identified from lists of accredited programs maintained by CAAHEP and CoARC.

These participants were selected, since one of the primary pathways to sit for the BRPT examination is graduation from a CAAHEP or CoARC accredited program with a focus in Polysomnography. These accredited programs track graduates and collect data from facilities and institutions employing sleep technologists. They also collect data about community needs for sleep technologists as they plan clinical rotations for their students. Therefore, program directors of the accredited programs with concentrations in polysomnography are ideal participants for this study because they have knowledge of the educational and community needs for sleep technologists.

Materials

Data collection involved conducting surveys of the participants. Surveys were administered via a digital survey tool over the internet.

Procedure

An initial email was sent to the identified program directors explaining the purpose of the survey and asking for participation. Program directors were informed that their participation was voluntary and that no personal identifiable information would be collected. A link to the Internet survey was included in the email to the participants. The survey was open for 14 days. A reminder email was sent to the participants after 7 days asking them to participate if they had not already done so.

Design

Mixed methodology with a descriptive design was used for this study. This methodology was appropriate because few data exist on the topic of sleep technology education, and our goals centered around recording opinions. We were seeking to gain knowledge about the issue of sleep technology education and explore what those involved in sleep technology education viewed as the future for the field.

Table 1—Survey results for current and future community needs for sleep technologists

Survey Question	Strongly Agree / Agree	Neutral	Strongly Disagree / Disagree	Mean	Std. Deviation
There is a shortage of sleep technologists in my geographic area	52	33	22	2.65	1.066
In the next 5-10 years, demand will increase for qualified sleep technologists in my geographic area	79	25	3	2.11	0.745
There are underserved ethnic groups near me with respect to sleep disorder assessment and treatment	57	43	6	2.35	0.801
There are underserved geographic areas near me with respect to sleep disorder assessment and treatment	55	42	9	2.39	0.892
Cost of sleep disorder services will negatively impact the assessment and treatment of sleep disorders in the next 5 years	60	35	12	2.50	0.815
Access to sleep disorder services will increase in the next 5 years.	80	23	4	2.16	0.714
Community education of sleep disorders will increase in the next 5 years	89	15	3	1.99	0.696
Therapeutic interventions for sleep disorders will advance in the next 5 years	93	9	3	2.12	0.763
Testing equipment and devices will improve in the next 5 years	92	12	3	1.97	0.680
The use of remote sleep testing (where technologist and patient are geographically separated) will increase in the next 5 years	76	24	7	2.04	0.717

Table 2—Current and future educational needs for sleep technologists

Survey Question	Strongly Agree / Agree	Neutral	Strongly Disagree / Disagree	Mean	Std. Deviation
There is a shortage of sleep technology educators in my geographic area	80	18	8	2.03	0.989
In the next 5-10 years, demand will increase for sleep technology educators in my geographic area	75	25	7	2.13	0.904
There are a sufficient number of educational programs available in my geographic area to fulfill sleep technologist positions	30	22	55	2.66	1.139
Sleep centers have a need for technologists with advanced training or specialization	84	19	3	1.95	0.778
Education requirements for sleep technologists will increase in the next 5-10 years	83	19	4	1.97	0.805

Table 3—Effects an advanced degree in sleep technology will have for community, patients, and technologists

Survey Question	Strongly Agree / Agree	Neutral	Strongly Disagree / Disagree	Mean	Std. Deviation
An advanced educational degree in sleep technology will increase the public's recognition of the sleep technology profession	67	25	14	2.26	1.039
An advanced educational degree in sleep technology will lead to career advancement	68	22	14	2.27	1.001
An advanced educational degree in sleep technology will aid in a technologists ability to provide patient education	67	26	12	2.23	1.063
An advanced educational degree in sleep technology will better prepare technologists for supervisory/leadership roles	86	15	6	1.92	0.846
An advanced educational degree in sleep technology will increase professional competence	83	16	8	1.98	0.896

Variables were measured by a 20-question internet survey (Tables 1-3). The questions used a Likert scale: 1—Strongly agree; 2—Agree; 3—Neutral; 4—Disagree; 5—Strongly Disagree. Four open-ended questions were also included in the survey.

Ordinal variables included: sleep technologist shortage; demand for qualified sleep technologists; underserved ethnic groups; underserved geographic areas; sleep disorder services cost; services access; therapeutic interventions; community education; testing equipment and devices; remote sleep testing; sleep technology educators; sleep educational programs; advanced training or specialization in

sleep; education requirements for sleep technologists; public recognition of sleep technology; career advancement; patient education; preparation for supervisory/leadership roles; and professional competence.

Statistics

Standard descriptive statistics were used to summarize the survey results. Given the unequal sample size and possible unequal variance, a *t*-test was performed with significance determined based upon $p < 0.05$ and 95% CI. Correlations were performed using Pearson correlation coefficient ($p < 0.05$).

Survey data were analyzed with the IBM SPSS statistical software package.

The Institutional Review Board at The University of North Carolina at Chapel Hill exempted this study (09-1375) from review under 45 CFR 46.101(b).

RESULTS

Reliability and Validity

Cronbach α (a coefficient of reliability) was used to measure the internal consistency of the inventory. The items in the inventory had a relatively high internal consistency (Cronbach $\alpha = 0.860$). The survey was not completed by all program directors, raising the possibility of type 2 error.

Several measures were taken to ensure validity of the results of this study. To provide content validity evidence, a small group of professionals reviewed the survey questions for appropriateness. Evidence of construct validity included internal consistency of the test questions. To further provide test validity, the participants followed a standardized procedure and were provided the same instructions for completing the survey. Additionally, all participants were identified in the same manner. These participants had the common characteristics of working within nationally accredited educational programs, having direct access to students, and having knowledge of their community and educational needs in sleep medicine.

The survey was completed by 25% (87/358) of respiratory care program directors, 48% (10/21) of electroneurodiagnostic technology program directors, and 37% (10/27) of polysomnographic technology program directors. Between-group comparisons (*t*-test) revealed no significant differences in answers among those directing respiratory care programs, polysomnographic technology, and electroneurodiagnostic programs.

The inventory was separated into three main themes, and questions were selected that were relevant to each theme: current and future community needs, current and future sleep technologist needs, and effects of an advanced degree in sleep technology on the community (**Tables 1-3**). Pearson correlation (0.01 significance level) statistics revealed a positive correlation between current and future community needs for sleep technologists, current and future educational needs for sleep technologists, and effects of an advanced degree in sleep technology will have for community, patients, and technologists ($p = 0.534$; $p = 0.355$; $p = 0.540$). The positive correlations revealed that as current and future community needs for sleep technologists increase, so do the educational needs of sleep technologists; and likewise, as sleep technologist educational needs and community needs for sleep technologists increase, the positive effects of an advanced degree in sleep technology on community, patients, and technologists also increase.

Four voluntary open-ended questions were asked of participants following the inventory. Sixty-two participants answered all four questions (see the appendix). Most program directors indicated that sleep technologists should complete formal educational pathways, earn professional credentials, and promote accreditation of clinical and educational programs.

Although most program directors understand the need for additional programs, few ideas were offered on how to reduce

the cost burden of educational programs. Participants overwhelmingly felt that higher education for sleep technologists would help the field move forward. Participants also noted that benefits to the field from an advanced degree are particularly important for several reasons: maintaining autonomy of sleep medicine; providing graduates who are responsive to community needs and proactive to raise the standard of care; and providing skills that enable graduates to establish and promote cost-effective practices in sleep medicine.

DISCUSSION

The development of a field of study depends upon the level of inherent demand for skill sets or knowledge, community interest, and possible benefits to the participants and community. Our survey shows that program directors of sleep technology educational programs overwhelmingly feel that there is an unmet demand for highly trained sleep technologists within the sleep field, that the training needs will increase, and that an advanced degree in sleep science or technology would benefit the community and the participants. In addition, survey participants perceived a current nationwide shortage of sleep technologists, and 74% of the participant educators agree that the demand for qualified sleep technologists in their geographic area would increase in the next five to ten years. None of the participants mentioned the potential loss of technologists related to portable monitoring. This is striking, given the context that more than half of the participants stated they currently have locally underserved geographic areas and ethnic groups, and 75% agreed that access to sleep disorder services would increase in the next five years. Eighty percent of educators perceived a shortage of sleep technology educators in their own geographic area. Three-quarters of these educators thought the need for more educators would grow over the next five to ten years. Moreover, 80% of these educators felt that the educational requirements for sleep technologists would grow over the next decade.

These same educators indicated that new skills sets will be needed by our future technological staff: 78% of them believed educational requirements for sleep technologists would increase in the next five to ten years. Over 90% believed that both diagnostic and therapeutic devices would advance over the next five years, and 71% believed remote sleep testing would be increasing in the next five years. These technological advances will require greater technical skills and knowledge from laboratory staff. Also, over half of the participants projected that cost of sleep disorder services would negatively impact assessment and treatment of sleep disorders in the near future. This translates into the need for greater economic efficiency in our processes and for technologists to have a greater understanding of business principles. Furthermore, program directors indicated that sleep technologists should play a greater role in community education focusing on diagnosing and treating sleep disorders. Over 80% of the study participants believed that community education about sleep disorders should increase in the next five years and that sleep technologists can be a valuable source of patient and community education. This emphasis on community education will require further skills in communication, educating strategies, and engagement of learners, not traditionally taught as part of sleep technology programs.

Potential Educational Topics

Four of five survey participants agreed that sleep technologists with advanced skills and specialization are needed. Sleep technologists are employed in a variety of settings, including hospitals, specialized sleep and epilepsy labs, private practice, educational institutions, research facilities, and equipment design, sales, and manufacturing companies. Educational requirements for these positions include associate degrees, professional credentials, and advanced degrees (i.e., Bachelor's and higher). Although these positions have common core elements, each of these employment areas will require additional skill sets. Potential tracks in business, management, teaching, study design, and innovation may foster further career development. Sleep technologists will be asked to take on a greater role in the management of sleep laboratories as an extension of current duties. This will require more business skills and an understanding of financial, legal, and ethical impact. To develop and sustain more associate degree educational programs, more advanced degree recipients will be needed to serve in roles as educators and program directors. In addition, a growing need in the areas of diagnostic and therapeutic research, and in the medical device industry will require more highly trained sleep innovators. These roles in management, leadership, higher education, research, and innovation will necessitate more advanced degrees and coursework.

Our survey also tried to assess the program directors' impression of the effect an advanced degree in sleep technology would have for community, patients, and technologists. Although most of our participants felt an advanced degree in sleep technology would benefit our community, the largest effect appeared to be for the technologists. Seventy-seven percent agreed that an advanced degree in sleep technology would improve professional competence and preparation for clinical and educational leadership roles. These program directors also indicated that advanced degrees would promote further pursuit of quality measures, such as registry and accreditation. Sleep technologists moving into roles requiring bachelor's degrees (i.e., management and teaching) may be hindered by inconsistency of skill sets. The results of this study reveal that sleep technology educators foresee a need for an advanced degree to better

qualify technologists and provide a positive impact on patient education, professional competence, attitudes of employers and coworkers, career ladders, and public recognition of the field of sleep technology.

In conclusion, this study demonstrates that directors of sleep technology educational programs feel there is a large unmet need for sleep technologists. Directors of these programs also believe that future sleep technologists will need to have greater training. Overall, the findings demonstrate that the directors feel the field will benefit from the development of an advanced degree. Further work will need to be performed to determine the impact of individuals with these degrees on the quality of care of individuals with sleep disorders.

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APPENDIX

A synopsis of the answers received follows:

Question 1: What actions should sleep technologists take to better meet the needs of patients?

- Earn professional credentials
- Promote licensure
- Complete formal and continuing education programs
- Provide more and better patient education
- Promote accreditation of labs and educational programs

Question 2: As reimbursement drops, how should educational programs address the need for more cost effective strategies?

- Increase job responsibilities
- Broaden the scope of training
- Eliminate on-the-job training
- Involve physicians and employers in technologist education
- Increase awareness of needs of education
- Decrease education cost
- Credentials
- Increase public awareness of sleep disorders

Question 3: What are the specific areas of strengths or weaknesses in sleep medicine right now?

- Strengths
 - Physician education has increased over the past ten years
 - Numbers of sleep technologists and educational programs has increased
 - Effective and adaptive diagnostic testing
 - Implementation of new state regulations supporting sleep technologists
 - AASM accredited labs
- Weaknesses
 - Few educational opportunities for sleep technologists and no advanced degree available
 - No mandate for formal education or standardization
 - Labs hiring inexperienced and uneducated techs to save money
 - Need for more well-trained technologists
 - Few AASM accredited labs
 - Lack of licensure and mandate for education
 - Lack of physician support for licensure and education mandate
 - Broaden emphasis of sleep disorders not associated with breathing related disorders
 - Promote more public awareness of sleep disorders
 - Strengthen state and national societies
 - Communication between professional associations

Public recognition of sleep medicine was listed as being strong in some communities, but weak in others.

Question 4: Do you have anything else you would like to tell us concerning the present and future of sleep technology or any other comments?

- Sleep educator training is needed
- Licensure for sleep technologists is needed
- More emphasis should be placed on the RPSGT credential
- Formal education for sleep technologists should be required
- Administrators of higher education and medical facilities should be provided education about the profession of sleep medicine