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ABSTRACT

A feasibility study was aimed at developing a strategy for implementing and utilizing the job analysis methodology which resulted from the Health Services Mobility Study (HSMS), particularly as it can be applied to the field of diagnostic radiology. (The HSMS method of job analysis starts with task descriptions analyzing the tasks that make up a job. The tasks are then rated (scaled) for their skill and knowledge requirements and arranged in groups according to their levels of skills and knowledge. This makes it possible to design job ladders based on similarities of task content, arranged in rising hierarchies of tasks according to the level of difficulty. This also forms the basis for developing curriculum objectives that are related to what is done on the job, and designing educational ladders that parallel the job ladders.) After in-depth interviews with potential users and thorough explorations of potential areas of implementation of the HSMS methodology, it was concluded that the methodology can be used in health and other work areas to develop critiera for (1) identifying job tasks and educational preparation required at different levels, (2) describing and evaluating job performance, and (3) for developing criterion-referenced tests with content validity to meet Equal Employment Opportunity Commission guidelines. Recommendations for immediate, intermediate, and long-range applications of the HSMS methodology were made. Half of this report is contained in an appendix which includes general statements on HSMS, descriptions of use of HSMS task data, HSMS methodology and application in diagnostic radiology, examples of task description and curriculum objective sheets, and explanations of HSMS curriculum objectives and how they can be used. (BL)

EXPLORING WAYS TO IMPLEMENT THE HEALTH SERVICES MOBILITY STUDY:

A FEASIBILITY STUDY

By Eileen M. Lavine and Audrey Moore

Project Title: A Feasibility Study to Develop a Strategy for Implementation and Utilization of Findings of the Health Services Mobility Study

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Submitted to Howard Rosen, Director, and William Throckmorton, Project Officer, Office of Research and Development, Employment and Training Administration.

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16. Abstracts

This feasibility study was aimed at developing a strategy for the implementation and utilization of findings of the Health Services Mobility Study, which developed a scientific, concise, behavior-oriented methodology for describing and scaling tasks, designing parallel job and educational ladders, and developing performance evaluation instruments, with application of the methodology in diagnostic radiology. After in-depth interviews and thorough exploration of potential areas of implementation, it is concluded that the methodology has valuable applications in health and potentially in all work fields. Recommendations for demonstration include immediate short range implementation in radiology departments of medical centers and large hospital systems, intermediate applications in other departments, and long-range applications in the fields of health, education, credentialing and other work areas. Federal Government commitment is necessary for support and funding, initially through support of a workshop-conference for potential participating organizations to plan specific implementation projects.

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Labor relations
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Manpower utilization
Medical personnel
Mobility
Performance
Performance evaluation
Personnel development
Professional personnel
Qualifications
Specialized training
Students
Systems analysis
Technical schools
Technicians
Universities
Upgrading

17b. Identifiers/Open-Ended Terms

Career Ladder
Cost Containment
Cost Measurement
Credentialing
Curriculum Design
Diagnostic Radiology
Health Manpower
Health Physicists
Health Services Occupations
Hospitals
Occupations
Patient Care
Proficiency Examinations
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I. SUMMARY AND RECOMMENDATIONS

The Health Services Mobility Study, begun in 1967 and completed in 1977, started with an analysis of the barriers to occupational mobility and evolved into a scientific, concise but explicit, behavior-oriented methodology for describing and scaling tasks, designing parallel job and educational ladders, and developing instruments for evaluating job performance. The final phase of the project represented an application of this methodology in the analysis of one functional health field.

The Department of Labor, the primary sponsor of the Health Services Mobility Study, gave a grant to the private, non-profit organization, Health and Education Resources, Bethesda, Maryland, to examine the feasibility and utilization of the HSMS findings. It is our conclusion that the HSMS methodology has valuable applications not only in the field of health but potentially for all work fields. The methodology developed to plan rationally for the career mobility of health personnel through improved job structures and parallel educational modules evolved into a methodology that provided much more than was originally anticipated. The meticulously detailed, behavior-oriented task analysis base of the methodology has created a useful tool for managers, educators, employee representatives and advocates. It is a highly effective tool for restructuring jobs, creating more flexible employment patterns, including new job levels, using personnel more effectively, opening educational and training opportunities through a more cost-effective modular design, and improving evaluation of applicants for jobs and their performance in those jobs.

As a result, the HSMS method can become a system for monitoring costs and the quality of the product or service. Industry is keenly aware that the key to meeting required standards for production, quality, and control is the performance of the individual worker. The HSMS methodology provides highly effective tools to identify the job and increase the skills, knowledge, and motivation of the worker. It has also developed effective quality assurance and safe practices programs so explicit that waste can be pinpointed and costs monitored and controlled.

The HSMS methodology differs from other task analysis approaches in that it is developed in greater detail and is wider in its scope. The method is effective and comparatively easy to learn. Manuals have been developed, based on application of the method to the field of diagnostic radiology, that show step by step how jobs within an organization can be defined clearly and restructured where necessary to increase productivity. The HSMS has developed curricula models in the radiologic sciences and a manual that describes how to develop a curriculum for a training or education program related to the performance requirements of a particular work area.

The Health and Education Resources staff recommends a variety of applications to be demonstrated in implementation projects designed to involve broad groups and large systems and to achieve national awareness of the broad and specific values of the Health Services Mobility Study.

These recommendations include immediate short-range implementation projects in radiology departments of medical centers and large hospital systems, intermediate applications in other hospital departments, and long-range applications in the fields of health, education, credentialing and in other work areas.

It is further recommended that the first and sustaining commitment for support and funding of implementation demonstrations come from the Federal Government through the Department of Health, Education, and Welfare and the Department of Labor. Initial support should come in the form of a national invitational workshop-conference for potential participating organizations, systems, and agencies, brought together for the purpose of planning specific implementation projects. Federal support should be continued through the funding of the selected projects.

II. INTRODUCTION

In the past decade, high attrition rates and lack of upward mobility opportunities for health personnel have been a major concern. Solutions have been sought to overcome artificial educational and credentialing obstacles that inhibit advancement and to eliminate duplicating or overlapping job functions and titles and redundant training requirements. Today, this concern has broadened to encompass the rapidly rising costs of health care and the growing demand for greater accountability and quality assurance.

During this decade, the Health Services Mobility Study (HSMS) has been conducted as a research and demonstration project to develop methods of facilitating mobility, flexibility and more effective use of health services workers. Under the direction of Dr. Eleanor Gilpatrick of Hunter College in New York City, HSMS has developed a sophisticated, highly detailed, behavior-oriented methodology for job analysis, occupational structuring, and parallel curriculum design. The research setting was the health field, but broader application can be made to other work fields. Comprehensive research and technical reports, including manuals for applying the methodology, have been published by the HSMS. The project has been funded at varying times by the Office of Economic Opportunity, the Department of Health, Education, and Welfare, and the Department of Labor, with DOL serving as principal funding agency.

Implementation of the HSMS methodology offers the possibility of realigning job structures, creating more flexible employment patterns, and designing modular educational programs so that individuals can learn to perform at appropriate levels, in response to stated employment needs, and then build on experience and further study to advance to higher levels. At the same time, employers can provide more effective supervision and achieve greater accountability by using HSMS methodology to develop criterion-referenced instruments for measuring actual performance on the job.

Such mechanisms make it possible for health care facilities and agencies to monitor and contain costs and achieve quality patient care more efficiently. This can be accomplished by allocating personnel to levels at which they can perform most effectively and by reducing the human error factor through detailed task descriptions that state job expectations explicitly, together with in-service education and quality assurance programs. Thus it is possible to control the waste of time and materials caused by repetition of incorrect procedures and damage to expensive equipment. In addition, providing more job satisfaction and opportunity for advancement through more realistic job structures can reduce costly personnel turnover.

Representatives of government agencies, professional medical and health organizations, academic institutions, and others with knowledge of or interest in these problems are in general agreement that HSMS findings have important applications for the health field and valid potential implications for other occupational areas. They have, however, expressed a need for the development of realistic strategies for utilizing the output and implementing the methodology practically and economically.

III. THE FEASIBILITY STUDY

In August 1976, Health and Education Resources (HER), a private non-profit organization located in Bethesda, Maryland, presented a proposal to the Office of Research and Development of the Employment and Training Administration, Department of Labor, for a feasibility study to develop strategies for implementation and utilization of the HSMS findings. HER staff had previously been involved in task analysis and proficiency examination development in allied health and had followed the progress of the HSMS project over the years and recognized the contribution the HSMS findings could make to the health field. The grant was awarded to HER in December 1976 for a six-month period, and later was extended to December 1977 to broaden the scope of interviews among possible participants in potential implementation strategies.

The charge to Health and Education Resources was (1) to prepare concise Summary Fact Sheets on the HSMS output for use in discussing practical applications with potential users, (2) to consult with representatives of professional organizations, hospitals, educational institutions, and government agencies in order to obtain their views as to the feasibility of implementation and the degree of their interest and possible support for such implementation, and (3) if found feasible and applicable, to develop strategies for realistic and practical implementation and utilization projects in the health field, including diagnostic radiology, the functional field to which the HSMS methodology had been applied.

The feasibility study began with a thorough review by project staff and a consultant in educational technology of HSMS output, both through reading published reports of the study and meetings with Dr. Gilpatrick to discuss the findings and methodology in detail. Other literature pertaining to task analysis and related subjects was studied also to provide further background.

A series of Summary Fact Sheets were then prepared, describing all aspects of HSMS methodology and its application in diagnostic radiology, with examples of representative task descriptions and scaling instruments. The Fact Sheet topics covered a general description of HSMS; how to use HSMS task data to restructure jobs and develop career ladders; how HSMS methodology can be applied to a functional area; results of the HSMS application in diagnostic radiology; and how task descriptions and curriculum objectives are developed. (A full set of the Fact Sheets is attached as Appendix 1.)

At the same time, an extensive list of individuals to be interviewed was prepared, and arrangements were made to meet with them in Washington, New York, Chicago, New Haven, and Princeton. These included individuals in Federal, State and local governments; hospital administrators and directors of radiology departments; radiologists; radiologic technologists; educators; and representatives of professional societies, hospital associations, labor unions, and credentialing and testing organizations. The national meeting of the American Society of Radiologic Technologists provided a meeting ground for discussions with a number of radiologists and radiologic technologists from many parts of the country. In other cases, interviews were held by telephone or views were obtained through written correspondence. (A full list of people contacted is attached as Appendix 2.)

The interviews were carried out as in-depth discussions of HSMS methodology and findings, in some cases introducing individuals to HSMS for the first time, in other cases bringing those already knowledgeable up to date on recent accomplishments and published output, especially on the HSMS functional application in radiology. The interviews elicited interest in the details of HSMS task analysis methodology and enthusiasm for its potential utilization. There was fairly uniform agreement that the HSMS findings are usable and have a practical value in a number of areas, particularly performance standards, career and educational mobility, curriculum development, credentialing, and quality assurance.

Hospitals expressed a strong concern for potential use of HSMS in several areas: cost-effective use of personnel, reduction of waste, meeting federal reimbursement requirements, and union negotiations. They expressed little real concern with providing job satisfaction or equal employment opportunities, but did recognize the possible use of HSMS for more effective screening for employment and promotion, evaluating performance on the job, and providing job-related in-service programs.

Educators viewed the task analysis base for the HSMS criterion-referenced curricula as a logical and effective way to develop realistic curricula, testing instruments, and credentialing standards. Credentialing agencies saw the potential for selecting criteria for tests to evaluate competency. In fact, the Bureau of Radiologic Technology, New York State Department of Health, is using the HSMS materials as the basis for revising the State's approved curriculum. The American Registry of Radiologic Technologists is using the materials as a resource for the revision of the Registry test to a criterion-based instrument. Health professionals, particularly in the radiologic sciences, expressed positive interest in and support for implementing HSMS findings primarily for raising the standards in education and job performance.

Federal agency representatives expressed interest in utilization of HSMS methodology for safety and quality assurance, health manpower education and training, credentialing, containing health care costs, and developing an accurate way of measuring performance and cost of services.

Key questions posed by those interviewed were how implementation projects would affect an institution directly, how they could be carried out most efficiently and without disruption to existing programs, what assurances they could have of support and cooperation, and what funding would be available from whom. Until answers can be given to these questions, the roles, qualifications, affiliations, interrelationships, and definite commitments for participation in implementation cannot be fully determined.

Project staff also met with DOL and DHEW representatives in a small group meeting to review the results of the interviews and to explore the possibilities of support for implementation strategies. Those attending were William Throckmorton, Employment and Training Administration, DOL, project officer; Thomas D. Hatch, Director, and Joseph Kadish, Associate Director, Division of Associated Health Professions, Bureau of Health Manpower, DHEW, which had supported an earlier phase of HSMS; Archer Copley, Acting Director, and John C. Clark, Deputy Director, Division of Health Services Research and Analysis, National Center for Health Services Research, DHEW. The conferees suggested that the HSMS findings might be demonstrated in a large health delivery system such as the Public Health Service, Veterans Administration, or military hospitals, possibly devising a separate project to determine the cost-saving potential of HSMS methods.

The conclusions and recommendations presented in Section V evolved directly from the interests, concerns and potential support expressed by those interviewed during the course of this feasibility study.

IV. THE HEALTH SERVICES MOBILITY STUDY

The Health Services Mobility Study began in 1967 as a project funded by the Office of Economic Opportunity to investigate the impediments to upward occupational mobility in New York City municipal hospitals and to suggest means of overcoming those obstacles. After studying the problems of skill shortages and credentialing, the project then undertook to design a method to promote occupational mobility by tying curriculum design to job and task requirements in an interrelated system. Subsequent phases were funded by the Manpower Administration (now Employment and Training Administration) of the Department of Labor, the principal sponsor, and by the Health Services and Mental Health Administration and the Division of Allied Health Manpower (now Division of Associated Health Professions) of the Bureau of Health Manpower of the Department of Health, Education, and Welfare. HSMS was sponsored by the City University of New York through its Research Foundation, and the Hunter College School of Health Sciences, where the HSMS Director, Dr. Eleanor Gilpatrick, holds the post of Associate Professor of Economics.

HSMS developed, field tested, and applied a job analysis method that incorporated task identification and description, rating of tasks for skill and knowledge requirements, and grouping of tasks into interrelated hierarchies. The method includes processes for using task data to design job ladders, develop curriculum objectives and educational ladders paralleling job ladders, and construct evaluation instruments and proficiency tests. The HSMS method was pilot-tested in an ambulatory care community health center and given a full-scale application in diagnostic radiology, including physicians' tasks. A shortened version of the method was subsequently developed and applied in radiation therapy and diagnostic ultrasound to the technologist, technician, and aide functions. A curriculum has been developed for these three levels in diagnostic radiology.

A brief description of HSMS methodology is given on the following pages. Recent publications of HSMS describe in detail components of the HSMS method of task analysis, job ladder design, and curriculum development for use as a system or in part to structure work, evaluate work performance, develop job ladders and lattices, design job-related educational programs and/or create work-related test instruments. (All HSMS publications are listed in the Summary Fact Sheets in Appendix 1. Bibliographical materials used by the HSMS during the study period and by the HER feasibility study staff are given in Appendix 3 to provide full references for those wishing additional background information.)

How It Is Done

The HSMS method begins with the identification and description of a task,* which is viewed as a work activity in which the "performer" combines technology, knowledge, materials, and equipment with skills to produce units of output. The steps or elements of the task are described in logical sequence and include other acceptable ways of doing the task and possible contingencies. HSMS guidelines enable those who are not practitioners of

* Dr. Gilpatrick defines a task as follows: "A task is a series of work activities (elements) which are needed to produce an identifiable output that can be independently consumed or used, or that can be used as input in a further stage of production by an individual who may or may not be the performer of the task....The component steps of a task are its elements. They include the steps needed to initiate the task, carry it out, and terminate it. The elements are the individual small units of work, whether physical and/or mental, which produce the output." This definition differs somewhat from that of other task analysis methodologies which identify each basic element of work behavior as a task.

an occupation to serve as task analysts and interview "performers" about their tasks. They can then develop descriptions written in objective behavioral terms, including the output of the task, materials or tools used, recipients and co-workers involved, and a step-by-step listing of all the elements of steps in the task. A knowledgeable task analysis director makes a literature search and reviews task identifications for discrepancies and omissions. Critical review by outside professionals checks correctness of language and sequence and assures that the tasks reflect national standards of practice.

In the shorter HSMS method recently devised for institutions with limited time and resources, some task descriptions are used as models when a series of tasks are similar in basic structure. Other related tasks are then given only in summary form, referring back to the models for the details.

The HSMS method provides scales for rating the tasks on the skills and knowledge required to carry out each task. HSMS defines a skill as a teachable behavioral attribute displayed when a person carries out a mental or physical activity in performing a task. Knowledge is defined as the detailed information, facts, concepts, and theories that are parts of specific disciplines or subject areas, and information on how things function and/or how to use them. Skills require practice if they are to be learned; knowledge is learned primarily through didactic means.

Sixteen skills are identified by HSMS: three are manual, two are interpersonal, three relate to precision in the use of language, two deal with decision making, four cover general intellectual skills, and two are responsibility skills related to recognition of the consequences of error in task performance. The HSMS method assumes that the activity used in performing a task can be evaluated for the degree and amount of skill it requires, and that the skills can be learned in increments. HSMS also has a scale for task frequency for use in a specific institution.

A similar scaling method is used to measure tasks for knowledge, using a taxonomy of knowledge categories in natural sciences, engineering and technology, social sciences, mathematics, humanities and the arts, and miscellaneous disciplines. The principles for the knowledge scale involve the amount of knowledge and the depth of understanding needed in the category. A scale value attached to a task indicates that knowledge in that category is consciously applied to some degree and that it is learnable and can thus be included in a curriculum.

When the tasks have been scaled for skill and knowledge requirements, the HSMS method uses a statistical technique called factor analysis, in conjunction with a computer process, to assign tasks to groupings with related skills and knowledges.* Thus tasks requiring similar skills and knowledge at similar scale values are assigned to corresponding and appropriate job levels. These groupings are then used to recommend job ladders, which are arrangements of jobs in promotional steps derived from the task

* A rationale for the statistical procedures utilized by HSMS in its task analysis method was prepared, at the suggestion of the HSMS Advisory Panel, by Dr. Earl E. Davis, former Chief Consultant of HSMS, in January 1976, entitled "Some Notes on the Statistical Method Utilized by the Health Services Mobility Study," including a detailed bibliography. Two independent scholars in research methods and statistics were asked to judge the appropriateness and intrinsic worth of the methodology. They were Philip R. Merrifield, Professor of Educational Psychology at New York University, and Mark I. Appelbaum, Associate Professor of Psychology and Associate Dean of the Graduate School, University of North Carolina at Chapel Hill. These papers are being published in an HSMS Research Report.

groups. In diagnostic radiology, for example, the HSMS job ladder recommendations show a quality assurance career line from aide to technician and then to radiologic technologist or radiation physicist; a patient care career line moves from aide and technician to radiologic technologist or to clinical or emergency care nursing specialties. Job lattice recommendations offer crossover and promotional options to alternative specialties. The quality assurance and patient care technicians both have sufficiently transferable training that is relevant (although different in each case) for continuing towards radiologic technology as well as towards physicist or nursing occupations. Individuals can make a decision at the entry level to change direction from machine-oriented to people-oriented work according to their own needs, interests, and abilities, without wasting much training investment.

In this way, it is possible to avoid unnecessary overlapping of tasks and uneconomical assignment of low-level tasks to higher-level titles. At the same time, the individual's training for and experience in a job at one level is preparation for the next higher level within a related category. This is a key advantage of the HSMS method, particularly in the health field.

The HSMS task data and analytic techniques make it possible to specify a set of educational objectives, offer a structured set of intended learning outcomes in the form of curriculum objectives, and arrange these to provide an educational ladder. The task descriptions can be used as instructional materials in an educational program. The curriculum objectives describe what is to be learned to perform each task, specifying the type of skill or area of knowledge to be mastered, the level of competence, and the task activities in which the content must be demonstrated or applied.

By presenting the work behavior in combination with the skill or knowledge discipline in the curriculum objectives, the method assures job relevance, an academic context, and a focus on the desired end product.

The HSMS curriculum objectives also provide materials for selection of proficiency test items, thus providing tests with built-in content validity to measure competence in a particular work-related skill or knowledge at a known level of difficulty. The tests can thus be used to evaluate student performance, diagnose inadequate curriculum content, give credit for advanced standing, and make possible greater employability for graduates. If the same base were used for credentialing in one occupational field, with schools across the country using similar curriculum objectives, the mobility and employability of personnel in the field across state borders would be enhanced.

Task descriptions reflecting actual and/or desired job performance can also be used to develop instruments to set specific departmental goals and standards to assess overall functioning in a department, to pinpoint tasks being carried out below acceptable levels, and to evaluate individual performance.

The HSMS methodology in these ways provides valuable techniques and tools for hospitals and other health care institutions seeking ways to achieve greater accountability, more flexible staffing patterns, and cost-effective quality health care. The methodology can be used in health and other work areas to develop objective criteria for identifying job tasks and educational preparation required at different levels, for describing and evaluating job performance, and for developing criterion-referenced tests with content validity to meet Equal Employment Opportunity Commission guidelines.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Values of the HSMS

Job and task analysis is not new and some basic principles obtain for all methodologies dealing with such analysis. In our opinion, the HSMS methodology has certain special characteristics and breadth of application that are not common in most job and task analysis methods. It is a sophisticated, rational and reasonable method, meticulously conceived and executed. Although it employs techniques used in other settings, it applies them more concisely and in greater detail.

This method can be used in health and any other occupational field. It develops detailed, in-depth descriptions of jobs by analyzing the tasks performed and the elements that comprise those tasks. The analysis includes not only the appropriate ways to carry out a specific task but the knowledges and skills required, including human interaction skills, rarely approached elsewhere. It describes the interrelationship between "performers," and defines the product or service that one receives from another. The knowledges and skills are analyzed and assigned values.

Tasks are described in terms of their elements and "tracked" so that their appearance and reappearance in the overall organizational structure can be seen in terms of "clusters" or "families." Thus, it is possible to show ways in which performers with certain recognized groups of knowledges and skills can be used in other categories of work that may require the same or similar knowledges and skills.

Some examples of specific applications are:

A hospital can transfer a performer laterally from one department which may be closing down or overstaffed to another which may be expanding, where the person can use similar skills but in a different setting.

- A performer who shows aptitude and interest for a nurses aide training program can be evaluated for entry into such a program, and curriculum modules can be developed building on present level experience at less cost than a program that begins from base zero without taking account of past experience and acquired skills.

- In considering employment of minority workers, the HSMS detailed job descriptions create a firm base for fair procedures for hiring, supervision, evaluation, promotion, transfer, or demotion. The methodology also can be valuable in union negotiations.

- By giving curriculum objectives based on tasks actually performed on the job, HSMS enables employers and educators to develop educational modules that allow the worker, whether skilled or unskilled, technical or professional, to enter at the level of education appropriate to his/her accumulated work and educational experience.

- Educational systems can be developed to include a variety of entry and exit points all based on job performance criteria: short-term programs to enable the worker to move ahead in steps as work and funds permit, and long-term programs with a clear articulation between short-term, two-year associate degree, four-year baccalaureate, and graduate programs.

The HSMS method is based on sound, scientific principles which have broad application. Designed originally to fill the need for an upgrading process absent in the health industry, it can be used in additional ways within the health field and across all occupational fields. It is as strong in its educational component as in its task analysis component. The two are melded together in a manner that results in a doubly effective tool for all fields. It is a statistically viable method that requires no special statistical methods for the health field to implement its findings.

The HSMS methodology has produced a bonus unlooked for at its inception in 1967. It has produced a tool for monitoring and controlling quality, safe practice, and costs effectively. This can be done through the method's ability to pinpoint exactly where human error takes place, when mechanical processes fail, where gaps and overlaps exist in task performance, when unnecessary repetition of procedures occurs, and how materials are wasted. This has far-reaching implications for review of health care standards and for payment for health services.

B. Feasibility and Applicability of the Health Services Mobility Study

It is the opinion of the Health and Education Resources staff that the HSMS methodology and findings are viable and valuable and that their practical applications can be demonstrated effectively and economically. While broad application can be made to all work fields, a specific series of approaches is suggested here to illustrate applications we consider particularly useful. They are ranked in order of practicality based on cost effectiveness and on their sequential effects; that is, how the knowledge and experience gained from one implementation project may enhance the outcome of another project.

In all instances, whatever the scope of an implementation project, complete involvement and support at all levels in the participating facility, institution, or agency is basic to success. Such support must come from the top down and be carefully built up from the bottom. It is our strong recommendation that any implementation project must include this in selecting the project criteria. In addition, it is important to choose more than one facility for any implementation project, not only to demonstrate a degree of validity for the process but also to aid in wider acceptance of any beneficial learning and change that may result. To this end, the choice of several different geographical locations across the country should increase both diversity of locale and broader awareness of applicability.

Where the phrase hospital/hospital system is used, other types of large health facilities such as a health maintenance organization or other primary care facility might also be used. We feel that the first application should be in hospitals, primarily in large medical teaching centers or groups of hospitals incorporating large enough numbers of individual staff members and volume of services for a comprehensive and valid demonstration.

No funding amounts are suggested at this time. They can be developed more appropriately when the various options have been reviewed in detail and the selected implementation strategies investigated with potential participants, sponsors, and funding bodies.

1. Immediate Applications

Immediate, short-range implementations should be designed to show the value and applicability of the HSMS methodology and findings to the health field. By "health field" we mean health facilities, agencies, systems, and institutions both for the delivery of health services and for the training and education of health performers at all levels, skilled and non-skilled.

a. Radiology Department(s) of Large Hospital(s) or Hospital System(s)

An implementation project in this setting would apply the HSMS methodology to:

(1) Writing accurate detailed job descriptions for all positions in the department(s), based on the HSMS task descriptions.

(2) Reviewing and restructuring jobs as needed for more effective use of personnel, creating new job levels where desirable, and opening opportunities for personnel to move vertically and horizontally.

(3) Developing an effective quality assurance and safe practices program to reduce waste and assure quality and safe practices. This provides two important demonstration opportunities; one, the creation of a quality assurance technician or technologist job level where the volume of work makes it feasible (this means special responsibility assigned by the department administrator and does not indicate special credentialing); two, the demonstration within a relatively short period of the cost-saving capabilities of the applied HSMS methodology and findings.

(4) Developing in-service education programs that meet clinical needs.

(5) Developing criterion-referenced evaluation instruments for job candidates and job performance.

The major work has been completed in analyzing tasks, writing job descriptions, and developing job structures in radiology departments of large hospitals. The method for adapting them to the particular requirements of an individual radiology department exists in the HSMS methodology. This would reduce start-up time and costs and would be a practical approach in a shorter period of time.

b. At the simplest level, but one that would have far-reaching effect for a large system such as the Public Health Service hospitals, VA, or military hospitals, HSMS can be used for the single goal of writing accurate and detailed job descriptions for the radiology department. This would affect not only the use of personnel and the supervisory and evaluation processes, but could also be valuable for tenure determinations and thus affect the long-range quality of staff performance, one of the continuing problems of civil and military service systems.

2. Intermediate Applications

a. Hospitals and Hospital Systems: All Departments

A common-sense continuation of the Immediate Application project would be to extend the successful application in radiology to as many other departments within a facility as the institution has the capability and desire to implement. Suggested points might be housekeeping, dietetics, clinical laboratory. The latest HSMS publications are, in effect, manuals describing in detail how to carry out the task analysis methodology in other fields. It might be particularly useful where several hospitals are merging, or where a hospital has been newly organized or is expanding.

b. Cost-Monitoring/Cost-Reduction Evaluation

An effective starting point to determine whether HSMS can help contain costs would be through radiology departments, using the already existing task descriptions and other HSMS materials in this area. The goal would be to reduce costs through the application of a quality assurance program alone or together with other HSMS recommendations described under Immediate Application a. The method could also be applied to ~~providing a rational~~ and accurate way for measuring health care services performed by providers in order to determine realistic third-party payments.

c. Educational Institutions: Radiologic Sciences

Educational institutions teaching the radiologic sciences would be an ideal setting for implementing curriculum development, using the HSMS method of designing criterion-referenced curriculum objectives based on clinical task performance and HSMS curricula models. This should include development of a modular approach to educational programs related to clinical need and well articulated so that each module represents a complete credit unit that becomes a building block toward the next level. An implementation project should include academic four-year and two-year degree-granting institutions and non-academic technical education centers granting certificates.

d. Hospitals, Educational Institutions and Credentialing Bodies

An optimum project design would demonstrate applicability and value of the HSMS methodology to cooperative efforts by hospitals and affiliated educational institutions and would include the standard-setting and credentialing entities concerned. This would indicate ways to maximize the working relationships of both types of institutions and how to strengthen these relationships to improve their planning, operation, and delivery of services. A project could include the cooperative development of in-service and educational institution programs based on clinical need, work-study programs, apprentice programs, released time from work for study, and shared-time programs for pairs of people sharing job responsibility and study on an alternating basis. Where a group of health and educational facilities is close enough geographically, a consortium approach can be developed. The involvement of these groups with credentialing bodies may make it possible to combine their common concern for continuing improvement of educational, credentialing, and performance standards into a first-time opportunity for demonstrating practically how such standards could be improved through joint effort.

3. Long-Range Applications

a. In the Health Field:

(1) Further applications should be transposed from the initial hospital experience to additional large hospitals, primary care centers, and HMOs, with similar goals and results projected.

(2) Another application, and a most challenging one, would be the use of HSMS methodology to establish a base for

determining appropriate reimbursement for health care services.

(3) The quality assurance and safe practices program previously described could be applied on a long-term basis and on a larger scale.

b. In Education:

Application to curriculum revision in programs for the allied health sciences, including health care administration, over a lengthy period could demonstrate the advantages of a modular, well-articulated curriculum design which divides and assigns responsibility for different levels of learning to each type of educational institution: training centers, community colleges, baccalaureate, and graduate institutions. The goal would be raising educational standards by developing consistent curricula related to performance requirements and based on objective, realistic job descriptions. This can result in clear articulation between the non-academic certificate technical training centers and academic institutions, as well as between two-year and four-year academic degree programs. It can also lead to improved teaching, through specifically designed curriculum objectives, and better prepared graduates.

c. In Credentialing:

HSMS could be applied to the design of more accurate proficiency and equivalency tests and determining national performance standards.

d. In Other Fields:

Since many steps are the same in all fields; i.e., planning, inventory, hiring, equipment use, evaluation, etc., application could be demonstrated in industry by selecting appropriate areas for pilot projects, studying basic models of tasks, and testing use of the task analysis methodology.

e. The HSMS methodology could be applied to the development of descriptive content for Civil Service classifications and for evaluations for tenure, promotion, and salary increments.

f. The methodology for task analysis and descriptions could ultimately be used for future revision of the Dictionary of Occupational Titles.

g. Flexible working patterns such as part-time employment and work sharing may be created more easily, with the detailed job descriptions developed under the HSMS system delineating the exact responsibilities of the individuals holding each job.

C. Where Do We Go Now?

In considering implementation projects for the immediate and intermediate stages in the health field, it is probable that such projects could be run sequentially or concurrently. However the impetus for initiating such projects must be addressed first.

The Federal Government could encourage non-governmental groups to adopt and adapt the HSMS approaches in various types of health and educational institutions without federal dollars. The HSMS documents are in the public domain and available through ERIC and NTIS. But it is our opinion, based on observations and discussions during interviews, that, unless funds are available from the government, little will be done.

individual components of the methodology that have been adapted so far, such as a quality assurance program, cost reduction effort, and curriculum and credentialing revisions, have been useful to those who have carried them out, and can be replicated by others. But nothing has been done on a systematic or widespread basis.

There must be a commitment by the Federal Government, or each institution will have to go ahead on its own at a considerably higher cost, not a practical approach in terms of time or money. Once the HSMS methodology has been demonstrated in a practical application and on a scale that reaches a substantial group, it will be easier to use and to apply to other settings. Because it is detailed and far reaching, the methodology needs to be applied in order to explore its full potential. When the short-range and long-range benefits are demonstrated, administrators of health care facilities will be able to choose as much of the method as fits their needs. At this time, the HSMS methodology and findings are being studied by the Health Care Financing Administration and the National Institute of Drug Abuse of DHEW for potential utilization.

It is possible that a foundation might assume responsibility for supporting one aspect of a demonstration, or a professional testing service or other group might be interested in implementing part of the project. But it is unlikely that any of these would sustain a continuity of effort or implement applications of broad scope or depth. It is more feasible for government or a large organization, association, or system to initiate implementation. Otherwise it would take years and much duplication of resources.

A full government commitment to implementation on a continuing basis would demonstrate concern and support for improved quality of education, employability, credentialing, and performance. A Federal Government commitment could create a meeting of the workplace and academia, beginning with a short-term project and adding on units.

Health and Education Resources suggests that the first step should be a national invitational workshop-conference to determine which of the implementation strategies would be most viable and in what order and relationship they should be organized. A workshop-conference would provide an opportunity to bring together representatives of different groups likely to be interested in participating in planning and implementation: hospital administrators and trustees, directors of hospital medical departments (such as radiology), educators, and representatives of professional associations, credentialing bodies, unions, insurance companies, related health groups, and concerned Federal, State and local government agencies.

Such a conference would build on the contacts and knowledge gained during the feasibility study, and would enable participants to analyze mechanisms for developing utilization models in different settings, identify individuals and institutions to take part in implementation projects, and explore the scope of implementation, possible consortium arrangements, training programs, budgeting, funding sources, and logistics.

Proposals for implementation strategies would develop from this informational workshop-conference, which also could result in preparation of materials and aids for utilizing HSMS findings and disseminating information about the methodology to interested persons and groups around the country.

From this, a second-phase strategy could be developed as a three-to-five year project in radiology departments of large hospitals and hospital systems, and radiologic sciences departments of affiliated educational institutions, with the close involvement of professional societies and credentialing bodies. The existing task descriptions in diagnostic radiology (and the shortened versions in radiation therapy and medical ultrasound) could be applied directly to the review of existing jobs and personnel structures, reclassification of personnel to delete obsolete job titles and realign job levels, and to measurement of staff performance against established criteria. Related curriculum objectives could be used by the academic institutions to design building block educational programs, evaluate student performance, and set up continuing education programs to meet designated areas of weakness.

The third stage of a proposed implementation strategy would involve application of the HSMS methodology to one or more other health areas. With the publication of HSMS Research Report No. 11 ("Writing Task Descriptions and Scaling Tasks for Skills and Knowledge: A Manual"), it appears to be feasible for such an application to be carried out in a two-to-three year period, starting simultaneously with or soon after phase two. Training workshops could teach techniques of task analysis and scaling of skills and knowledge to a selected group of persons who would then develop task descriptions and scaling in several selected occupational areas in participating institutions.

An important component of all implementation strategies developed should be the dissemination of information to others who may be interested in application techniques. Manuals, audiovisual aids, examples of tools and instruments used to apply the methodology, and other useful materials could be developed during and after implementation projects for such purposes.

HEALTH and EDUCATION RESOURCES

HER

a non-profit organization for the development of programs and communications in health, education and social services
9650 Rockville Pike, Bethesda, Md., 20014 (301) 530-6055

Dallas Johnson, President

May 5, 1977

Mr. William Throckmorton
Office of Research and Development
Employment and Training Administration
U.S. Department of Labor
Washington, D.C. 20213

Dear Mr. Throckmorton

Attached is a complete set of Fact Sheets summarizing the Health Services Mobility Study (HSMS), which we have developed as part of the feasibility study being conducted by Health and Education Resources, under Grant No. 24-24-77-06, to develop a strategy for implementation and utilization of findings of HSMS.

The Summary Fact Sheets cover the following topics

(1) General statement on HSMS - its prime focus, possible area of use, objectives, methodology, and potential impact;
(2) Use of HSMS task data to restructure jobs, develop career ladders, and evaluate performance;
(3) HSMS methodology, with examples of Skill Scale, Knowledge Classification System, Knowledge Scale, and HSMS job structure and career ladder recommendations in diagnostic radiology;
(4) Application of HSMS task data in diagnostic radiology, including key findings of this application;
(5) Sampling of the product of the HSMS job analysis methodology, with examples of task description and curriculum objective sheets;
(6) Explanation of HSMS curriculum objectives and guidelines and how they can be used.

These Fact Sheets are serving as background data for in-depth discussions about the procedures and implications of HSMS with individuals who may be interested in participating in the implementation process.

Sincerely.

Dallas Johnson
President
Project Director

HER/bmr
Enclosure

Exploring ways to implement

THE HEALTH SERVICES MOBILITY STUDY

methodology to analyze jobs, create job and career ladders, develop curriculum objectives, and evaluate performance

The HEALTH SERVICES MOBILITY STUDY (HSMS) has been involved in research in the health manpower field since 1967. HSMS is sponsored by the City University of New York through the Research Foundation and Hunter College. Funding for HSMS has come primarily from the Employment and Training Administration of the U.S. Department of Labor, as well as the Office of Economic Opportunity, and the Health Services and Mental Health Administration and the Bureau of Health Manpower, both of the Department of Health, Education, and Welfare. The Director of the Project, Dr. Eleanor Gilpatrick, holds the rank of Associate Professor at the Hunter College School of Health Sciences.

The prime focus for implementing HSMS findings is in immediate use of the results of the first full-scale application of the HSMS task analysis methodology to an entire functional area, diagnostic radiology.

Publications of HSMS describing this application include recommendations on job structures and career ladders that can take individuals from entry-level jobs to professional levels, and suggestions on curricula to parallel the job ladder recommendations to create educational ladders. The job descriptions and task analysis results in diagnostic radiology can be used by:

* Employers - hospital management - to write new and revised job descriptions, to create new job structures that will save costs by making optimum use of more highly trained and more expensive employees and still have all the work carried out competently, to assign new work activities to appropriate staff, to hold down personnel costs; to fulfill legislative and court mandates for quality assurance and job-related staffing policies, ensuring that tests of employment are related to adequate performance on the job and meet EEOC and Title VII guidelines.

* Employees - professional associations, unions - to provide an opportunity to move ahead within an institution, to enter the job market early and earn income while continuing to study and train for higher level jobs without having to start all over again.

* Educational institutions - to provide job-related curricula in proper sequences tied to clinical practice; to develop curricula for new technologies and emerging occupations (such as in radiation therapy and ultrasound); to provide instructional materials describing work as it should be done and pinpointing what must be taught to achieve quality standards.

* Government - to promote public safety, quality assurance, career mobility, and maximum utilization of employed individuals, and to help implement and enforce EEOC and Title VII requirements.

A second area for potential implementation of HSMS is through application of the methodology developed by the Study to other functional areas of health services. Implementation of the broad and comprehensive methodology is appropriate for large institutions or groups of institutions. Partial application of components of the methodology also is possible: use of the task definition and of the skill and knowledge scales, for example, to identify job requirements, to structure jobs and design job sequences, to make an inventory of staff knowledges and skills, to relate task behavior to curriculum objectives.

A Brief View of HSMS Objectives

Major goals of the HSMS task analysis method are:

1. Design of job ladders - a logical arrangement of jobs from one level to another within an interrelated grouping or family of tasks. As a result, an individual's training for and experience in a lower-level job is preparation for the next job level; the additional education and training needed are kept to a minimum.

2. Design of educational ladders provides a sequence of study to parallel the job sequence. One student could exit to a job while others continue studying for jobs at higher levels; that first student could reenter a study program without having to start all over again, and could move further up the ladder.

3. Design of instruments to evaluate performance on the job with task data used in evaluation.

4. Use of task and curriculum data for creation of job-relevant proficiency examinations.

HSMS assigns tasks to groupings that require related skills and knowledges, and assigns the tasks within each grouping to job levels. The tasks within each job level in a given grouping would require similar levels of the skills and knowledges that characterize the group.

Using the results to create job and educational ladders means that employees can be trained to reach their maximum potential and can also have income-producing jobs along the way that reinforce their training. Employees can support themselves, and institutions can have the benefit of their training at one level while they prepare to move up to the next level.

The HSMS approach also makes it possible to uncover lattice or cross-over possibilities, especially at early stages where the investment in specialized training is not great. By learning basic concepts or skills, a person is able to do other jobs that may be in a different context but require similar skills and knowledge. Thus individuals might be able to move upward in another area offering more opportunities for advancement.

Potential Impact

The HSMS methodology can provide valuable techniques and tools for hospitals and other health care institutions that are seeking ways to meet the demand for more accountability, to develop more flexible staffing patterns, and to achieve cost-effective health care. This methodology can be used to develop objective criteria for identifying job tasks and educational preparation at different levels, describing and evaluating satisfactory performance, and developing criterion-referenced tests with content validity, to meet requirements of the Fair Labor Standards Act, Equal Pay Act, Equal Employment Opportunities Commission (EEOC) regulations, Title VII of the Civil Rights Act, and Executive Orders 11246 and 11375 concerning Affirmative Action Programs.

HEALTH SERVICES MOBILITY STUDY

How to Use HSMS Task Data to Restructure Jobs, Develop Career Ladders and Evaluate Performance

Volume 1 of HSMS Research Report No. 8 presents the results of the HSMS job analysis method as it was applied to diagnostic radiology. Chapter 3 in this volume is directed to the hospital or department administrator and suggests how the data and results can be used by an individual institution to make rational use of manpower:

Analysis of Job Structures

1. Data Preparation: How to decide on job titles to be examined, identify tasks being carried out in those titles, analyze the pattern of distribution of the tasks in terms of overlaps across jobs, levels of tasks and groupings of tasks; how ~~to analyze~~ overlapping of tasks and appropriate allocations of tasks to job titles by levels and factors.

2. Task Overlap: This occurs when the same task is found in more than one job title, and is most important where the jobs are at different levels. Allocation of low-level tasks to high-level titles is not economic. Specific examples of wasteful practices are cited in the report. In-house analysis of overlap data can result in separation of necessary from unnecessary task overlaps and a more economic restructuring of jobs.

3. Job Structure by Task Level and Factor: How to allocate tasks at the same level to jobs at that level, using the percentage distributions and task frequency data to examine whether the current allocations are sound.

4. Creation of New Jobs: If the institution wishes to restructure new jobs, the Manual sets guides for how to do this.

Analysis of Cost Aspects of Career Mobility Programs

1. Costs of educational program - classroom instruction, clinical practice;

2. Trainee costs to enable them to maintain income while studying;

3. Salary for relief employees who fill posts of trainees while they study;

4. Waste incurrred if trainees fail.

Example of HSMS Recommendation: Hospitals could stop producing their own educational programs and combine into city-wide or system-wide consortia to purchase educational programs from academic institutions offering credits towards degrees. Students could remain in their jobs and be given released-time training, so they maintain an income source, hospital retains services of current staff, and educational institution can use its plant to maximum efficiency.

Selection Criteria for Trainees

Gives suggestions for selecting trainees for upgrading.

How to Use Task Data for Performance Evaluation

HSMS task descriptions or extended task names can be used to assess whether an institution is achieving its goals, to pinpoint which tasks are being carried out below acceptable levels, and to evaluate an individual's performance. The chapter discusses ways to:

1. Select HSMS tasks to be included in the review, employees to be rated, and persons who will rate the work from past experience or observation.

2. Use HSMS task descriptions to reflect actual and/or desired performance at the institution.

3. Develop rating instruments to assess the performer's outputs or performance.

4. Graph results of ratings to show the quality of performance of individuals and the institution. It is then possible to pinpoint problem tasks and problem performers, to diagnose what it is about the quality of the performance or output that has led to inadequate results, and to design remedial programs through training or reorganization.

The following documents are currently available from this office upon prepayment by check made out to the Health Services Mobility Study. Please indicate your choices and enclose prepayment.

No. of Documents	Document ID	Name and Description	Unit Price
______	Research Rpt. No. 1	Train Practical Nurses to Become Registered Nurses: A Survey of the PN Point of View, 1968. (Includes supplement.)	$15.00
______	Research Rpt. No. 2	The Occupational Structure of New York City Municipal Hospitals, 1970 (hardbound).	$15.00
______	Research Rpt. No. 4 & 5	Suggestions For Job and Curriculum Ladders in Health Center Ambulatory Care: A Pilot Test of the Health Services Mobility Study Methodology, 1972 (indicative results).	$15.00
______	Working Paper No. 11	The Design of Curriculum Guidelines for Educational Ladders Using Task Data, 1973. (Design of curriculum objectives.)	$10.00
______	Technical Rpt. No. 11	Final Report for the Period October, 1967 Through March, 1972. (Overview of task analysis methods.)	$10.00
______	Technical Rpt. No. 12	First Progress Report For Phase Four: April 1, 1972 to March 15, 1973. (Overview of the HSMS methodology.)	$10.00
______	Technical Rpt. No. 13	An Introduction To The Work of The Health Services Mobility Study As of April, 1975.	$ 5.00

Mail to: Dr. Eleanor Gilpatrick, Director
Health Services Mobility Study
302 West 12 Street New York, N. Y. 10014

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Organization______________________________

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If the following documents would be of interest to you, please so indicate and we will advise you when they become available. Documents marked with asterisk can be ordered now with check made out to the Health Services Mobility Study. Prepayment is required for available documents.

Book Order or Check if Interested	Document ID	Name and Description	Actual (*) or Expected Price
	Research Report No. 7	Task Descriptions In Diagnostic Radiology. The approved, full descriptions of all tasks.	
____	Vol. 1	Medical Tasks: What the Radiologists Do.	$35.00*
____	Vol. 2	Radiologic Technologist Examination Tasks Dealing with Patient Procedures.	$45.00*
____	Vol. 3	Machine-Related, Patient care and Administrative Tasks. (Includes Quality Assurance)	$25.00*
____	Vol. 4	Index of Tasks by Code No. (Summary of all tasks and location by volume.)	$ 5.00*
	Research Report No. 8	Using Task Data in Diagnostic Radiology. (Based on Research Report No. 7.)	
(Describes scaling, factor analysis, how to use data for ladders)	Vol. 1	Job Ladders in Diagnostic Radiology: Assigning Tasks to Jobs. Safe Practice and Radiation Health Protection Aspects of Tasks.	$15.00*
____	Vol. 2	Curriculum Objectives for Radiologic Technology. (Describes methodology for developing curriculum behavior objectives)	$25.00
____	Working Paper No. 12	Using Task Data For Performance Evaluation and Proficiency Testing. Theory of Criterion-Referencing vs Norm-Referencing; Task Data as Inputs to Testing and Evaluation.	$20.00
____	Research Report No. 9	The Technologist Function in Fields Related to Radiology: Tasks in Radiation Therapy and Diagnostic Ultrasound. (Describes shortened method of task analysis in Ch. 1)	$25.00*
	Research Report No. 10	Job Ladders in Radiology, Radiotherapy, and Ultrasound?	
____		What Task Analysis Shows. Skill and Knowledge Data.	$10.00
	Research Report No. 11	The Health Services Mobility Study Method of Task Analysis and Curriculum Design.	
____	Vol. 1	Basic Tools: The Concepts, Task Identification, Skill Scales and Knowledge System.	$15.00*
____	Vol. 2	Writing Task Descriptions and Scaling Tasks for Skills and Knowledge: A Manual.	15.00* $25.00
____	Vol. 3	Using the Computer to Develop Job Ladders.	$25.00
(Scholars' review)	Vol. 4	Developing Curriculum Objectives from Task Data: A Manual.	$15.00

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HEALTH SERVICES MOBILITY STUDY

The HSMS Methodology in Practice

Some preliminary training is required for a Project Director and the job analysts to acquaint them with the HSMS methodology, the computer work, and interview techniques. Basically, the procedure to be followed in applying the methodology to a functional area is as follows:

1. Director and job analysts learn in detail about the general content of the field.

2. Information about the task analysis is given to all managerial levels; if unions are involved, their cooperation is obtained; performers (i.e., individuals performing the selected jobs in the institution) are informed about the task analysis.

3. Team analysts interview performers about their work and observe tasks that may be hard to describe. A team of analysts consists of two or more persons to ensure reliable and accurate data; they are expected to submit data on which they agree.

4. As they collect task information, the analysts divide the activities into separate tasks. Then they write their task descriptions on Task Identification Summary Sheets. Whenever possible, they refer to models of similar tasks.

5. The director reviews the task descriptions to make sure that they conform to HSMS definitions, and that they are logical and clear. New tasks receive new code numbers; tasks that overlap with tasks already on file receive the same code number, and the original description is used. The director revises preliminary task descriptions to incorporate literature in the field and any desired behaviors, such as attention to patient safety, treating the patient with dignity, or giving full explanations to patients.

6. Revised task descriptions are submitted to experts for review, such as a supervisor at the institution, and outside experts who have had "hands-on" experience and who also have an overview on how the work is done nationally. Reviewers check on correct use of terminology, procedures, sequences, acceptable alternatives, and indicate any omissions of tasks or procedures.

7. Analysts scale tasks for skill and knowledge requirements. These data are then checked carefully. The task data then go through a factor analysis which results in a grouping of tasks so that they can be allocated to job levels within groups that require similar skills and knowledges.

Skill and Knowledge Scales

The HSMS method includes a set of skill scales, a knowledge classification system and a knowledge scale that can be used to rate and compare requirements of one task with any other. Each task requires skills and knowledge at particular levels to be carried out. The skills and knowledge categories are learnable, so that all the rungs on the job ladders to be created can be reached through training and education.

A skill is shown in the carrying out of a mental or physical activity, and can be evaluated by its degree or level. Knowledge is knowing how or why things function or what to do to things to make them work. Using the knowledge requires skills. Skills require practice if they are to be learned. Knowledge is learned primarily through didactic means. Skills may be introduced in a classroom, but actual mastery does not take place until there is practice.

Each scale has a name, an overall statement of its content, and an indication of the criteria used for scaling. Each scale value (which can range from 0.0 to 9.0) has a descriptive statement indicating the behavior for that value.

Skills - The HSMS method identifies 16 learnable skills:

a. Manual skills - Locomotion, Object Manipulation, Guiding or Steering

b. Interpersonal skills - Human Interaction, Leadership

c. Language skills - Oral Use of a Relevant Language, Reading Use of a Relevant Language, Written Use of a Relevant Language

d. Decision-making skills - Decision Making on Methods, Decision Making on Quality

e. General intellectual skills - Figural Skills, Symbolic Skills, Taxonomic Skills, Implicative Skills

f. Skills involving responsibility for errors - Financial Consequences of Error, Consequences of Error to Humans

Knowledge Classification System - A specialized taxonomy of knowledge categories, each representing a subject area conceived of in incremental, transferable units. Each category is assigned an eight-digit code. Each task is assigned to all the categories actually required to perform the task at a scale value above zero on the Knowledge Scale.

Knowledge Scale - A single scale is used to measure the levels of all knowledge categories in the System. The minimum condition needed for a category to be identified for a task at a non-zero level on the Knowledge Scale is that the knowledge must be consciously applied in the task and must represent a learning effort sufficient to be considered for curriculum purposes. This means that the person must be able to explain how the knowledge in the category is used in the task, but does not necessarily have to think about the use of the knowledge each time the task is done.

Scaling is based on breadth of knowledge, or amount of detailed knowledge the performer must know about the category, and depth of understanding, or comprehension of the "hows," "whys," and "for whats" of the detailed information covered by the category.

These skill and knowledge categories and scales can be used as a common reference base for any occupational area, to design job sequences and to show relationships among tasks. (See attached examples of a skill scale and Knowledge Classification System.)

Designing the Career Ladder

When the tasks have all been scaled for their skill and knowledge requirements, the HSMS methodology then uses statistical methods to group the tasks so those with interrelated skill and knowledge values group together in increasing order. These then form clusters or hierarchies so that it is possible to break them into job levels and design a career ladder.

(See attached Summary of Job Structure and Career Ladder Recommendations for Diagnostic Radiology.)

HSMS HUMAN INTERACTION SKILL SCALE

This skill refers to the degree of sensitivity to others required of the performer in the task being scaled. The skill involves the performer's perception of the relevant characteristics or state of being of the other person(s), the performer's attention to feedback as the interaction occurs, and the performer's appropriate modification of his behavior so as to accomplish the task. The skill is involved if the task requires any personal contact or interaction with others.

The level of the skill rises as the degree of perceptiveness and sensitivity required of the performer rises, and as the subtlety of the feedback to which he or she must respond increases. The scale level is not determined by the level of knowledge required.

SCALE VALUE	DESCRIPTIVE STATEMENT
0	The task does not require the performer to be in contact with or to interact with other people.
1	The task requires the performer to be in only general contact with other people. Very little sensitivity to or perception of the other person(s)' relevant general characteristics or state of being is required, and little awareness of very obvious feedback is required for the performer to adjust his behavior to perform the task.
3	The task requires the performer to interact with others in the performance of the task. The performer is required to be somewhat sensitive to or perceptive of the other person(s)' relevant general characteristics or state of being, and to be aware of very obvious feedback so as to adjust his behavior accordingly.
5	The task requires the performer to interact with others in the performance of the task. The performer is required to be quite sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of fairly obvious feedback so as to adjust his behavior accordingly.
7	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of fairly subtle or complex feedback so as to adjust his behavior accordingly.
9	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of very subtle or very complex feedback so as to adjust his behavior accordingly.

SAMPLE PAGE FROM HSMS KNOWLEDGE CLASSIFICATION SYSTEM

	1 2 3 4 5 6 7 8
10000000	NATURAL SCIENCES
11000000	BIOLOGICAL SCIENCES
11100000	# History of the biological sciences*
11200000	# Genetics (For molecular and microbial genetics see Molecular biology.)*
11300000	# Evolution*
11400000	# Biogeography*
11500000	# Ecology (Includes ecosystems and conservation.) (For the physical aspects of air polution see GEOSCIENCES, CHEMISTRY, PHYSICS, and ENGINEERING AND TECHNOLOGY; for the health aspects of pollution see Community health and preventive medicine and Epidemiology.)
11600000	# Botany*
11700000	Zoology
11710000	# Invertebrate zoology*
11720000	# Vertebrate zoology (through mammalia, but excluding humans)*
11730000	Human zoology
11731000	Normal structure and function (The categories listed below include both anatomy and physiology except where otherwise specified.)
11731100	# Regional anatomy (Includes head and neck, thorax (back) and abdomen, pelvis and perineum, lower and upper limbs, and skeleton.)
11731200	# Topographic anatomy (relation of external manifestations to internal structure and function, e.g., location of pressure points, surface appearance of joints, muscles and bones.)
11731300	# Hematopoietic system (Includes blood, red and white blood cells, platelets, and bone marrow, liver and spleen in their blood-forming function.)

Scale 18. LEVELS OF KNOWLEDGE
p. 1 of 2

This scale refers to the level of knowledge in a given subject category required of the performer in the task being scaled. The knowledge categories which are required for each task are identified, and each category is rated with this scale. To be rated above zero on the scale the task must require knowledge beyond the simple memorization of the overt steps of the task.

The scale rises with the amount of detailed knowledge which must be consciously applied and with the depth of understanding required in the subject area, in terms of the subject area's content, the structure of its ideas, and its uses. "Detailed knowledge" covers such things as technical or special terms or facts. "Consciously applied" means that the performer is able to (but need not) articulate his use of the knowledge in the task situation.

The level of knowledge for a category is not determined by the level of any intellectual skills required, nor by the level for any other knowledge category required for the task, nor by the level of the category required for any other tasks of the job involved.

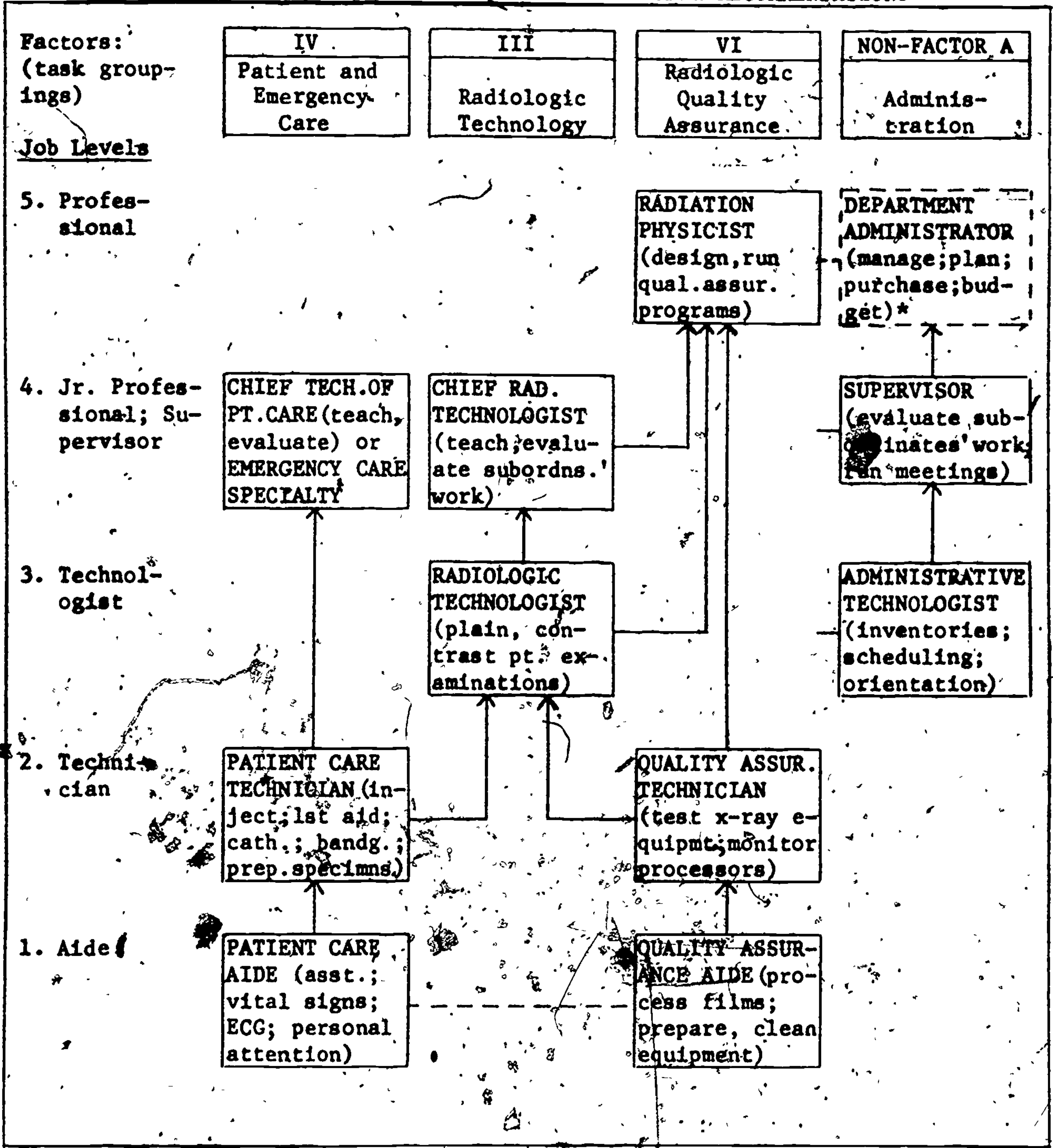
SCALE VALUE	DESCRIPTIVE STATEMENT
0.0	The task does not require the performer to consciously apply knowledge in this subject category which has been gained in a learning experience requiring more than the memorization of the overt steps of the specific task being scaled.
—	
1.5	The task requires that the performer consciously apply a limited amount of detailed knowledge in this subject category, including such things as technical or special terms or facts.
—	
2.5	The task requires that the performer have a general awareness of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a limited amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
—	
3.5	The task requires that the performer have a general awareness of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
—	
—	
—	

(continued on next page)

Scale 18. LEVELS OF KNOWLEDGE (continued)
p. 2 of 2

SCALE VALUE	DESCRIPTIVE STATEMENT
5.5	The task requires that the performer have a considerable degree of understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this area, including such things as technical or special terms or facts.
—	
—	
7.0	The task requires that the performer have a considerable degree of understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a very great amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
—	
8.0	The task requires that the performer have a very deep understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
—	
9.0	The task requires that the performer have a very deep understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a very great amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.

SUMMARY OF JOB STRUCTURE AND CAREER LADDER RECOMMENDATIONS



* Tasks in box with asterisk (*) not covered by data.
Note: For task content see Appendix E.

HEALTH SERVICES MOBILITY STUDY

Applying HSMS Task Data in Diagnostic Radiology

Two publications issued by HSMS represent the first application of the task analysis method to an entire functional area, and can be used by a single hospital or group of institutions for job structuring and by educational programs in developing job-related curriculum.

Research Report No. 7 - "Task Descriptions in Diagnostic Radiology" - four volumes. These are the "core" documents, presenting 368 "normative" task descriptions in numerical order by code number, with listings arranging the tasks by specialty or function. (The task descriptions can serve as instructional materials for educational programs, for in-house quality assurance programs, and as checklists for performance evaluation.)

Vol. 1 - Medical Tasks: What the Radiologist Does
Vol. 2 - Radiologic Technologist Tasks Dealing with Patient Procedures
Vol. 3 - Machine-Related, Patient Care and Administrative Tasks: What Radiologists, Technologists, Nurses and Physicists Do to Run Things and Look After Patients and Equipment
Vol. 4 - Index of Tasks by Code Number and Extended Name

Research Report No. 8 - "Using Task Data in Diagnostic Radiology"

Vol. 1 - Job Ladders: Assigning Tasks to Jobs
Vol. 2 - Curriculum Objectives for Radiologic Technology

Volume 1 shows the assignment of tasks to jobs by level, indicates how tasks relate to one another, and makes recommendations on job ladders, lattices and job structuring. It summarizes the skill and knowledge data related to the tasks in Research Report No. 7. It tells the hospital administrator how to use the data for assigning tasks to titles and jobs, suggests possible career ladders and shows how to use the data for performance evaluation. One chapter highlights the safe practice and quality assurance content of the task descriptions.

Volume 2 presents curriculum guidelines and behavioral curriculum objectives for use in educational programs for the radiologic technologist, including suggestions for educational ladders to parallel the job ladders. Research Report No. 7 serves as instructional materials in connection with this volume.

Key Findings of HSMS Application of Job Analysis Method in Diagnostic Radiology:

1. Two career ladders are identified, both starting at the entry (aide) level:

a. One ladder deals with quality assurance in materials and equipment at the aide level. It proceeds to technician level in radiologic quality assurance, then enters the radiologic technologist level, with options to continue into supervision and education or to branch out and upwards towards the job of radiation physicist. The new job of quality assurance technician identified here offers an upward step for the aide and is an entry point to move on to examination procedures. This job could be developed at institutions large enough to support this specialty.

b. A second career ladder deals with patient-oriented activities at the aide level, proceeds to a technician level in patient care, then enters the radiologic technologist level with options to continue into supervision and education or to branch out and upwards toward specialized nursing or emergency patient care.

2. The radiologic technologist's patient examination tasks combine many patient care skills and knowledge, quality assurance (technical) skills and knowledge, and major helpings of anatomy and physiology. Thus, either or both of the two job ladder sequences are possible, but each requires different sequences of curriculum. These are provided in Volume 2.

3. The HSMS method of curriculum development has produced curriculum objectives covering all the work at the aide, technician and technologist levels. These can be arranged in curricula for five different jobs, a single job, or any combination of these. The curriculum sequences allow individuals to exit, if they wish, as fully qualified aides or technicians in either patient care or quality assurance. The curriculum objectives are presented in units that can be arranged in any sequence. These can parallel job sequences or can be arranged to reflect rising levels of difficulty or in any combination of these. All the curriculum objectives are geared to the clinical performance of the tasks identified.

4. The role of the radiation physicist in diagnostic radiology has been defined as a professional level occupation, involving planning and running quality assurance programs.

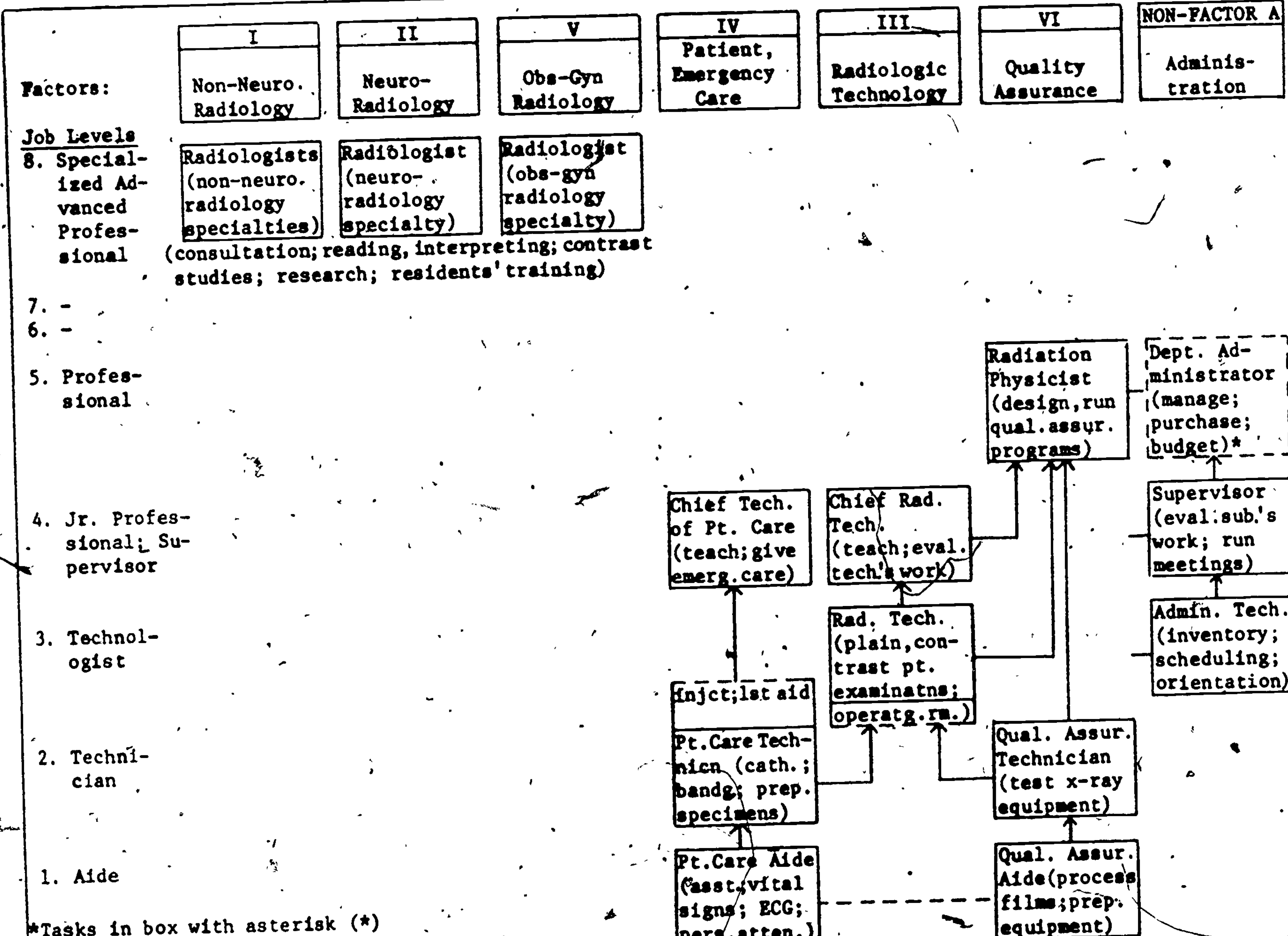
Coverage

The 368 tasks described in Research Report No. 7 comprise all the tasks likely to be found in a department of diagnostic radiology in a major hospital center, including the tasks in a full-scale quality assurance program. These include not just the most typical tasks but also important rare or difficult procedures, emergencies, contingencies, and the best possible practice. The data are normative and descriptive. Every effort was made to include every procedure carried out by radiologists, radiologic technologists and technicians, the body of tasks describing work with diagnostic X-ray equipment for the purpose of preventive maintenance, quality assurance and radiation protection, and such areas as first aid, record keeping, film processing, administration, nursing, housekeeping and preparation of materials. Some new procedures are also covered, such as computerized transverse axial tomography; ECG monitoring in the angiography room and application of manual pressure and pressure bandages after percutaneous catheterization are also included.

The forthcoming HSMS Research Reports 9 and 10 cover the technologist function in fields related to radiology - radiation therapy, a growing field with a number of formal training programs and few texts; and diagnostic ultrasound, a "new career" which has few standardized procedures and some unresolved questions concerning personnel qualifications, training and job duties.

The task identifications in diagnostic radiology were carried out at Montefiore Hospital and Medical Center and Mount Sinai Hospital and Medical Center; in radiation therapy, at Memorial Sloan-Kettering Cancer Center and Montefiore; in ultrasound, at St. Luke's Hospital and Downstate Medical Center of State University of New York, all in New York City.

SUMMARY OF FACTOR STRUCTURE OF TASKS BY JOB LEVEL: DIAGNOSTIC RADIOLOGY CAREER LINES



*Tasks in box with asterisk (*) not covered by data.

Note: For task content see Appendix E.

HEALTH SERVICES MOBILITY STUDY

Task Description Sheets and Curriculum Objectives

The HSMS method of job analysis starts with task descriptions analyzing the tasks that make up a job. HSMS defines a task as a series of work activities (called elements) that result in an identifiable, usable product or service, or what HSMS calls "output." To do this, the "performer" combines knowledge and skills, together with existing technology, materials and equipment, and may deal with a patient or a co-worker in carrying out the task.

Attached are samples of Task Description Sheets for tasks in the Quality Assurance and Patient Care groupings. At the top right of page 1 of each Sheet is the Code Number of the task. This number stands only for the contents of this single task, regardless of the job title in which it may be found, the institution or the industry. Some tasks, such as administrative and nursing activities, are generic and can be found in many departments and in different institutions. This type of task is called an "overlap" task; it always has the same code number.

The basic aspects of the task appear in Items 1 through 5 on the left of the Task Description Sheet. These help the task analysts focus on the specifics of the task and also help to differentiate one task from another. These items cover (1) the output of the task - or what results from the activity in terms of a product or service, such as "radiograph checked for proper ID information" or "patient's ECG monitored"; (2) what is used in the task (such as radiographs, computer printout of scan, requisition sheet); (3) and (4) the people involved in the task (such as patient, radiologist, technologist); (5) the name of the task, summarizing the task in a paragraph called the <u>extended task name</u>, with an initial underlined portion of the key features of the task called the <u>abbreviated task name</u>.

On the right of the first page of the Task Description Sheet, and continuing for as many pages as necessary on continuation sheets, are the <u>elements</u> of the task, describing exactly how it is done. These cover <u>how to</u> initiate and end the activity, the basic steps to be carried out, contingencies, decisions, record keeping, and delegation of duties when they are part of the task.

In the HSMS methodology, the tasks are then rated for their skill and knowledge requirements. The tasks are arranged in groups according to their levels of skills and knowledge. This makes it possible to design job ladders based on similarities of task content, arranged in rising hierarchies of tasks according to the level of difficulty. This also forms the basis for developing curriculum objectives that are related to what is done on the job, and designing educational ladders that parallel the job ladders.

Curriculum Objectives

Curriculum objectives are written for each skill and knowledge category for a job level at the scale values needed. They specify what a graduate of an educational program at the stated level must be able to do; i.e., to demonstrate mastery of a specific subject area or to carry out a specified skill in relation to certain tasks.

The Curriculum Objective Sheet (see examples) gives the type of objective (skill, knowledge or procedure), the skill and knowledge factor (or grouping) of the task (IV is Patient Care, III is Radiologic Technology, VI is Quality Assurance), the number of the curriculum objective, the specific skill or knowledge, the scale value, the occupation or job title to which the objective applies, the job level to which it applies, the tasks by number code for which the objective is preparation, any cross references, such as whether the skill or knowledge category at this or other value is covered in other objectives for other job levels.

The body of the Curriculum Objective Sheet describes the specific way in which that skill or knowledge is to be used in the task. Thus together the curriculum objectives indicate the course content, and the task descriptions become instructional materials for the given objective.

Two curriculum outlines are presented in the Research Report No. 8, each showing how the Radiologic Technologist occupation can be reached in three stages from aide to technician to technologist. One is a sequence from quality assurance and the other from patient care entry levels. These outlines present the numbers of the tasks and the related curriculum objective numbers according to skill or knowledge category; they show which tasks are those of the aide, technician and technologist. These are indexes for the curriculum objectives, but the instructor is free to select and arrange the objectives in any way.

Proficiency Examinations

The behavioral objectives in the Curriculum can be used to design valid proficiency test instruments. Traditional methods which use task data as inputs to proficiency test construction provide no clear-cut guidelines for content selection and rely on experts in the occupation who are not trained in job analysis or test construction. The HSMS methodology provides a common frame of reference for the work activities of an occupation. There is a taxonomy of the skills, knowledges and procedures required, and an objective method for arriving at behavioral objectives from which test content can be selected. The test items thus truly reflect work behaviors rather than classroom behaviors which may or may not be relevant to what people do on the job.

The following attachments give examples of task descriptions with related curriculum objective sheets and explanatory scale sheets:

A. Two tasks of the technician in patient care -

18 - Drawing blood from any non-pediatric patient's vein on orders

#308 - Setting up and monitoring any patient's electrocardiogram during special procedure
with samples of curriculum objective sheets for:
Skill objective - Human Interaction - scale value 3.0
Knowledge objective - Topographic Anatomy - scale value 1.5

B. Two tasks of the technician in quality assurance -

78 - Checking and jacketing patient's radiographs, ultrasonograms, and/or C.T.T. scans with requisition sheets and prior diagnostic materials and placing for filing and interpreting

#527 - Retrieving, displaying and making photographs, printouts, and/or magnetic tape records of computerized transverse axial tomographic (C.T.T.) scans
with samples of curriculum objective sheets for:
Skill objective - Human Interaction - scale value 1.0
Knowledge objective - Regional Anatomy - scale value 3.5

C. An example of a curriculum objective sheet for Knowledge Category 11731100, scale value 3.5, for Radiologic Technologist, on preparing a patient for a radiogram. In this case, the same descriptive language appears in 70 task descriptions, but rather than using a curriculum objective for all 70 tasks the language has been condensed so that this one sheet can be used for the same knowledge at the same scale value (3.5) for all these tasks. This is done for all the objectives wherever possible.

D. Examples of Skill and Knowledge scales, indicating the scale values under each heading to show the descriptive language used by the raters in determining the scale value of the skill or knowledge.

A Shorter Form of HSMS Task Analysis

The application of the HSMS task analysis method in a modified, shorter form is reported in Research Report No. 9. It presents technologist tasks in radiation therapy and diagnostic ultrasound. What makes the method shorter is that a good deal of redundant description across tasks is eliminated.

In Research Report No. 9, there are only a limited number of full-scale task descriptions. These serve as models for a series of tasks that are similar in basic design. Task summaries are used for the remaining tasks. These task summaries are less detailed but still have enough data for rating tasks for skill and knowledge requirements.

TASK DESCRIPTION SHEET

Task Code No. 78

This is page 1 of 2 for this task.

<table>
<tr><td>

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Patient's radiographs, scans or ultrasonograms checked for proper ID information; requisition sheet checked for signatures and proper logging; diagnostic materials jacketed with requisition sheets and requested prior radiographic materials, marked with identification; materials placed in the file room or for interpreting.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Radiographs (approved for quality); C.T.T. scans or ultrasound photos; computer print-outs of scans; requisition sheets; holders, jackets and envelopes for materials; pen; file folders; prior diagnostic materials requested; view boxes; felt marker; log book

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Clerk; technologists; radiologists; other physician

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

<u>Checking and jacketing patient's radiographs, ultrasonograms, and/or C.T.T. scans with requisition sheets and prior diagnostic material, and placing for filing or interpreting</u>, by matching films and prints with requisition sheets and any prior diagnostic materials requested; checking for signatures, proper logging and identification; placing in proper sequence; inserting in jackets and/or envelopes; marking jackets with identification; placing for interpreting or filing.

</td><td>

List Elements Fully

Performer jackets radiographs and other diagnostic materials such as photographs of C.T.T. scans, ultrasonograms, computer print-outs as a result of:

a. ~~Decision to jacket own work.~~
b. Regular assignment.
c. Assignment to prepare for work after change of shift.

1. Performer may take radiographs from pile of films already judged for acceptable quality and awaiting jacketing; may find radiographs on view boxes; may find photographs that were allowed to dry; may find computer print-outs awaiting jacketing; or performer may have set own work aside after examination and processing.

2. If not already done, performer reads radiographs on view boxes or inspects photographs and print-outs to ascertain the patients' names and log numbers; groups any that are for the same patient; arranges scans and serial films in numerical order as appropriate.

3. Locates the requisition sheet for each patient for whom there are radiograph(s), photographs or scans and places with appropriate diagnostic materials.

   a. If requisition sheet will be sent later, omits this step.

OK-R; ;R;RR

b. Check here if this is a master sheet. (X)

</td></tr>
</table>

TASK DESCRIPTION SHEET (continued)

Task Code No. 78

This is page 2 of 2 for this task.

List Elements Fully	List Elements Fully
b. May check that required signatures (technologist's, ~~clinician~~'s and/or radiologist's) are present on requisition sheet. c. If any signature is missing, signs for work done personally and/or arranges to have technologist or physician sign. Records relevant information on scans, ultrasonograms, and/or amount and sizes of radiographs on requisition sheet. d. Checks that scan or ultrasound photographs are properly coated with print coater and are dry, or arranges to have photographs given protective coating and dried. e. If any materials are not completely identified, performer makes sure what the radiograph or other record is and who the patient is. Checks on the missing information. Writes in missing information such as patient's name, date, (R or L marker for radiographs) on appropriate corner or back of each radiograph or photograph with felt marker or pen, checking with technologist and/or information on requisition sheet. f. If any material is not identifiable, performer judges which technologist was involved and obtains the missing information. Sets aside materials for which no reliable information can be obtained. 4. Performer may take requisition sheets to clerk and check that the information in the log book corresponds with the information on the requisition sheets, or has clerk do this. 5. For each patient's materials, such as ultrasound or C.T.T. scan photographs, performer places in appropriate order by reading identification numbers. Slips each photograph into transparent pocket in holder in correct order.	Places computer print-out into appropriate envelope. Puts each patient's radiograph(s) into film jacket or envelope; puts jacketed materials and requisition form for each patient into larger jacket or envelope. May write identification information on envelope. 6. If requisition form includes request to have earlier radiographs, scans, or ultrasonograms included, may locate and include in envelope. If new patient, performer may prepare file folder and include with other documents. 7. Places to be delivered for interpreting or brings to appropriate location to receive further processing or to be filed.

(Quality Assurance)

TASK DESCRIPTION SHEET

Task Code No. 527

This is page 1 of 7 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed; C.T.T. equipment set up for viewing and recording of scans; scans located on disc or tape, viewed as display; controls adjusted; scan displays photographed; scans printed out; scans recorded on magnetic tape; scans presented for review by radiologist; scan records placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requisition sheet or orders; C.T.T. display and viewing unit(s), control panels, computer; teletype, line printer, paper; camera, film; program and data discs and/or magnetic tape reels, cassettes; operator's manual; absorption coefficient charts; log book; jacketed materials; marking pen; scissors; pen; write enable ring; protective case

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant conditions; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Radiologist or other physician

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Retrieving, displaying and making photographs, print-outs and/or magnetic tape records of computerized transverse axial tomographic (C.T.T.) scans, by reviewing requests; preparing equipment; locating scans on disc or tape; viewing scans on display and adjusting as requested by radiologist or as ordered; making photographs of scan displays; making line print-outs of scans; recording scans on magnetic tape, as ordered; presenting for review; discussing, continuing as ordered; placing scan records for use.

List Elements Fully

Performer retrieves, views and records computerized transverse axial tomography (C.T.T.) scans after they have been stored on magnetic disc or tape as a result of:

a. Request of radiologist or other physician as a part of reading and interpreting function of the physician.
b. Written or oral requisition that record(s) be made, duplicated, or otherwise retrieved.

C.T.T. scans may be produced and viewed with equipment such as E.M.I., A.C.T.A., or similar scan equipment, depending on facilities at institution. Scans may be referred to as C.T.T., C.T. or C.A.T. scans.

1. Performer determines the particular scan(s) to be viewed and/or recorded as listed by patient's name and identification number, the scan(s) record or file number(s), the disc or tape name or number on which scan(s) appear, or the date(s) on which the scan(s) were made.

   a. May note location of scans on disc or tape as written on order form.
   b. May look up location of scans on disc or tape in log book, in patient's chart, on tape or disc label.
   c. May plan to print tape or disc directories in order

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

Task Code No. 527

This is page 2 of 7 for this task.

List Elements Fully	List Elements Fully
to search for the scans required; may decide to use visual search options on a tape or disc. May use computer to perform search. d. Depending on the information available, performer obtains the appropriate disc(s) or tape(s) from storage, if not already loaded on disc or tape drive unit, or obtains the discs or tapes that may contain the scans involved. 2. Performer reviews what is required by reading the requisition and/or discussing with the physician involved. a. May note the type of records to be made, such as line print-out, photographs of visual display, recording of disc data on magnetic tape. Notes any orders on use of viewing options. Notes whether more than one copy of each print-out or photograph is requested. b. If performer is to retrieve scan images for viewing by physician, determines preferences for viewing options. c. If referring physician has requested that prior films, ultrasonograms, prior scans, and test results already on file be sent with the C.T.T. scan records ordered, and if not already with patient's jacketed material, performer arranges to have these delivered. d. If performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to proceed properly, notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.	3. When performer is clear about what is required, prepares for viewing and recording as appropriate to equipment: a. Performer makes sure that the C.T.T. power supply, computer, disc or tape drive, teletype and viewing units are turned on, warmed up, and ready for use. Checks that controls are unlocked. i) Makes sure that teletype (and line printer if separate) are set to operate and are on line position. ii) If appropriate, sets controls to viewing position. b. If not already done, checks paper supply in teletype and line printer if separate. May check whether printing is faint, whether carbon ribbon needs changing. If appropriate, obtains additional paper and/or carbon ribbon. Loads as appropriate to equipment; advances paper or ribbon and checks that unit is operative. c. If the system programs are permanently on each data disc, performer loads the system programs by loading the proper magnetic disc to be examined into the disc drive unit. If the scan data are on magnetic tape but programs are on disc, performer loads an appropriate disc into disc drive unit: i) Places disc into disc drive unit. Checks that unit is set to run and that other switches are in proper position. Checks that ready light is on, and that computer is set to receive input data. ii) Sets selector to viewing rather than scanning position.

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TASK DESCRIPTION SHEET (continued)

Task Code No. 527

This is page 3 of 7 for this task.

List Elements Fully	List Elements Fully
iii) Checks that teletype message indicates that equipment is ready to receive input data, such as "Program Number?" d. If the scan data to be examined are on magnetic tape, performer obtains appropriate tape and loads into tape unit: i) Places empty tape reel and tape to be examined into appropriate positions on unit. Threads as appropriate so that tape will be wound on takeup reel. Sets appropriate switch such as load switch. ii) May use teletype to enter code that will wind tape into initial position. iii) Checks that teletype message indicates that computer is ready for input data such as "Scan Code?" or "Tape Code?" and beep sound. If appropriate, types in code to set computer to viewing mode. e. If, in preparing for viewing procedure, the teletype does not indicate that the computer is ready to receive input data with message such as "Program Number?" or "Scan Code?" or "Tape Code?" and beep sound, performer may reset or reload the program(s) in the computer's memory as appropriate to equipment. May do any or all of following: i) If the teletype does not print appropriate message, performer may check teletype, computer settings and switches as appropriate; may reset program by setting switches to settings which initiate a self examination check, and then reset and re-	start, following appropriate steps for switches and controls. May try a new disc. ii) If the program must be reloaded using system programs on separate cassette or tape reel, performer inserts program cassette or tape reel in proper place in tape drive unit. May rewind tape as appropriate. iii) If appropriate, performer may erase irrelevant information from computer's memory (initialize) to prepare for loading of system programs. Enters appropriate code on teletype; sets switches as appropriate, and sets to enter, run and load. Checks that appropriate light comes on. iv) If appropriate, sets controls to load system loader and/or program(s). Checks or sets appropriate switches. Checks that cassette is rewound and ready. Sets for load and run. v) Performer has program read in by setting appropriate switches and activating. Checks for appropriate operating signals. When the program has been read in as indicated by light or teletype message, performer may check that contents of display registers are appropriate. vi) If appropriate, rewinds program tape or cassette using proper controls. Removes and stores tape or cassette. vii) Checks that computer is ready by activating as appropriate. Checks that teletype message asks for input data such as "Program Number," "Scan Code?" or "Tape Code?" and beep sound. If appropriate, types in code to set computer to viewing mode.

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TASK DESCRIPTION SHEET (continued)

Task Code No. 527

This is page 4 of 7 for this task.

List Elements Fully	List Elements Fully
viii) If there is still problem, arranges to have equipment checked out as appropriate or decides to do personally. f. If not already done, performer checks whether camera unit is loaded with adequate film supply. May check film supply indicator, or opens back of camera and inspects. i) If camera uses Polaroid film cassette containing film for eight exposures, notes number of unexposed films remaining and provides additional package (s) from storage area. Reloads when appropriate. ii) If loading Polaroid film package, performer opens camera and package containing film. Handles carefully and removes film pack from bag. Discards any moisture absorbing paper and inserts film pack in camera as appropriate in relation to light shield and restraining spring. Checks position of tabs. Closes camera. Checks and removes safety cover by pulling out tab. Rechecks and readjusts if needed. iii) If camera uses roll film and there is insufficient supply in camera, performer arranges to have roll film cassette loaded, or decides to do personally. When loaded roll film cassette is obtained, checks loading in subdued light. May check that end of film is cut correctly and is properly threaded and attached to takeup spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks	into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover. If there is an adequate film supply, checks that film is properly loaded. Advances film to compensate for any exposure of film due to installation or check. Removes dark slide from camera lens if appropriate. g. If performer must search for scan file or record number(s) in order to view, may print out tape or disc directories to list the record labels on a given tape or disc: i) May type out the code(s) to call the appropriate program or subroutines to list the record labels on the tape or disc so that the record (scan) numbers may be located. ii) Performer may request and receive information listing all the tape files with the same patient's code. iii) Performer may use subroutine code numbers or search selector to move the records on the tape or disc into display on TV monitor or cathode ray tube and provide a visual search for the scans being sought. Performer reads the record labels being displayed. iv) Performer notes the tape, disc and/or record number(s) that will be required so that the scan(s) of interest may be viewed. h. Once performer knows which disc(s) or tape(s) to read, mounts as ap-

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List Elements Fully	List Elements Fully
propriate if not already done, as described. i. Once performer knows which file, or record (scan) number(s) to read from the mounted disc or tape, performer enters code to call the first scan to be viewed, or uses selector to move the scan of interest to the display. j. If physician will determine how display and/or what records will be made, performer notifies physician that scan(s) is (are) ready for viewing. May provide absorption coefficient charts. 4. Performer adjusts the visual display according to orders on requisition, standard orders, or request of physician: a. If viewing the scan in a white-gray-black scale on TV monitor or cathode ray tube, uses controls on viewing unit or calls appropriate subroutines by typing code numbers on teletype to adjust display as requested or decided: i) Checks that identification information showing on display is correct. ii) Performer may note the appropriate density levels for the material under examination and the information required, or checks the settings appropriate for display so that the picture to be viewed provides even steps of intensity change along a gray scale from black to white. iii) Sets the window (display) width as appropriate to the type of density range needed, i.e., such that all values above the range will be undifferentiated at one extreme, such as white, and all values below the range will be	undifferentiated at the other extreme, such as black. iv) Sets the window level (mean) to correspond to the median density value desired for the median or center gray-tone within the range. v) Performer adjusts the window mean (level) and/or window width by using appropriate manual controls or subroutines until the picture displayed demonstrates the sharpest density gradation for the tissues in the area of interest and the possible pathological material involved, or follows radiologist's or clinician's orders. vi) Depending on options available, performer may note or set controls to read the density value at any point in the picture, at request of radiologist or when evaluating picture personally. May use controls to blacken all picture elements (points) at a given display level, have them flicker, outline them. May use controls as appropriate to magnify an area or otherwise modify the display of the two contiguous "slices." b. If viewing the scan as a color display, performer may call a preselected color scheme or spectrum, with each color corresponding to a display level, by calling subroutine with teletype; may create new color representation as appropriate by defining intensity factors for the base colors of the TV color monitor. i) Depending on equipment, performer uses options to vary color display as described, such as flicker, magnification, making

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TASK DESCRIPTION SHEET (continued)

Task Code No. 527

List Elements Fully	List Elements Fully

all picture points of a given display level turn a particular color.

ii) Follows orders or requests to adjust window width and level in terms of color contrasts rather than black-gray-white contrasts, with colors representing given density levels as selected.

5. Performer may photograph a given display as requested by physician, or adjusts each display and makes photographs according to orders on requisition:

a. When a black-gray-white display is obtained of which a permanent photographic record is desired, performer may proceed as follows:

i) Checks that roll film, Polaroid, or other camera is loaded if not already done.

ii) Sets any appropriate control to "photograph" setting.

iii) May set shutter and aperture as appropriate.

iv) If appropriate, swings camera into position and checks that appropriate light is on.

v) Operates camera exposure control.

vi) If Polaroid or other automatic processing camera is used, waits for exposure to be completed, pulls out tabs as appropriate, and waits for film processing to take place. Peels off or separates developed print from negative without letting print come in contact with negative. Discards tabs and negative as appropriate, avoiding any contact with caustic jelly. May fold and wrap negative to discard.

vii) Continues with additional photographs as described.

viii) If roll film is used, when all photographs have been taken, performer may remove as appropriate and place for processing, or decides to do personally.

ix) When each processed photograph is ready, checks that photo has the same appearance as the display being viewed. If not, reports to proper staff member.

x) If the film used requires a coat of fixer, may accumulate the developed photographs and have them coated with fixer, or decides to do personally.

xi) If, during the course of procedure, camera needs reloading, performer reloads Polaroid pack or roll film as described.

xii) If identification information photographed with display is not sufficient, performer may use marking pen to write in additional information such as window width and level (mean) or other option selected.

b. If a color camera is available, performer may make color photographs of display following similar steps to those for black-gray-white photographs.

6. Performer may make a line print-out of a given scan (giving the relative density or absorption coefficients of the picture points) when requested by physician or according to requisition.

a. May make print-out without recourse to visual display by typing the appropriate codes to call the scan and to call subroutine or program to make print-out.

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TASK DESCRIPTION SHEET (continued)

Task Code No. 527

This is page 7 of 7 for this task.

List Elements Fully	List Elements Fully
b. If appropriate, performer views the display and may use controls to specify which of the pair of scans and which of the rows and columns of the display are to be printed. c. Performer tears off printed output as appropriate and sets aside for review by physician or placement with other records ordered. 7. If scan data are on magnetic disc and performer is to transfer the scan data from disc to magnetic tape, performer may proceed as follows: a. If not already done, performer checks that magnetic tape unit is loaded as appropriate, as described earlier. May fit a "write enable" ring to the tape reel. b. May refer to log book and enter or check tape directory (identification data) and code numbers. May set appropriate controls to enter tape label information. c. Enters appropriate code to transfer the scan data from the disc to permanent record on magnetic tape. d. May defer transfer to tape until all the scans for a patient have been reviewed. e. May operate controls to obtain print-out giving record labels or tape directory information showing tape contents. May attach to tape reel; may write in other identifying information. 8. When the performer has displayed and made any permanent records ordered for first scan, continues with any other scans as ordered. a. Performer operates controls as appropriate to resume viewing. b. Repeats display, adjustment of display options, photography,	printing and taping from disc as ordered or requested. c. May discuss the display options at any time. May make multiple copies of photographs and print-outs if so ordered. 9. Depending on orders, performer terminates procedure as appropriate: a. If ordered, performer brings C.T.T. scan photographs, computer print-outs and, possibly, absorption coefficient charts to physician for review. Repeats or continues with viewing and recording procedures if so ordered. b. May decide to personally jacket scan photographs, line print-outs, requisition sheets, and related materials; and/or record information in log book, or arranges to have this done, depending on institutional procedures. Continues as ordered. c. When procedure is completed, performer may unload disc and store. d. May reset and rewind magnetic tape using appropriate controls: i) When tape drive has stopped, completes rewind operation. ii) Removes tape reel from unit. Closes unit door. iii) May place in protective case. iv) Returns tape to file storage, or places for return in appropriate location. e. When completed, performer may indicate to appropriate staff person when the performer is ready to proceed with next task. 68

(PATIENT Care)

TASK DESCRIPTION SHEET

Task Code No. 18

This is page 1 of 2 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.) Blood drawn from patient's vein for blood work up; vacutainers or test tubes filled with blood; containers labeled; inability to find vein reported; record entered; arrangement made for samples to be prepared and taken to laboratory.	**List Elements Fully** Performer draws blood from non-pediatric patient's vein: a. On orders. b. As regular part of examination procedure. c. At request of co-worker. 1. Performer reviews MD's orders, has standard order such as on check list, or listens to specific request for blood for tests and/or special labeling. Performer consults check list to determine for any test to be done the amount of blood, whether an anti-coagulant is needed and/or the color of the vacutainer. May call lab if check list is not available. 2. Has lab slips, labels and materials prepared for tests by subordinates, or decides to prepare personally, including syringes and test tubes or vacutainers, needles, anti-coagulants, iced container. 3. Labels blood sample containers, making sure that lab slips are properly filled out. May mark date, time, and specific location from which blood is to be taken. 4. Explains to patient what will be done. Selects arm and vein from which to draw blood, depending on visibility of blood vessels. 5. If performer is unable to obtain sample because of diffi- OK-RP;RR;RR
2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.) Patient's chart, check list, or MD's orders; telephone; tray with tourniquet, marking pencil, alcohol swabs, sterile needle, sterile vacutainers or syringes and sterile test tubes; anti-coagulants; band-aids; labels, lab slips; iced container	
3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )	
4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions. Any non-pediatric patient; co-worker; MD or supervisor	
5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words. Drawing blood from any non-pediatric patient's vein on orders by determining amount needed for tests ordered; finding vein, inserting needle and drawing proper amount of blood into syringes or vacutainers; reporting inability to find vein; arranging to have specimens prepared and sent to lab; recording. 69	6. Check here ~~if this~~ is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

Task Code No. 18

This is page 2 of 2 for this task.

List Elements Fully	List Elements Fully
culty in finding vein, reports this to supervisor or physician. 6. Applies tourniquet to inflate vein, instructing patient to make a fist. 7. Locates and may mark point for insertion; swabs with alcohol. Checks needle. Ejects air equal to amount of blood to be drawn. Inserts needle; checks for blood by pulling back slightly on plunger. Draws blood into appropriately labeled vacutainer(s) or syringe(s) in amount specified for tests. Removes tourniquet and then needle. 8. Gives vacutainer(s) or syringe(s) to co-worker to prepare for lab, or decides to do personally. 9. Swabs puncture with alcohol swab; compresses area; may put on bandaid.	

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(Patient Care)

TASK DESCRIPTION SHEET

Task Code No. 308

This is page 1 of 3 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

ECG and pressure monitoring equipment set up, standarized; patient's ECG monitored; emergency signs reported at once; film placed for processing.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requisition sheet;electrocardiograph and/or multichannel machine with oscilloscope,audio, printed or film recording capabilities,hook-up channels for blood pressure,synchronization with pressure injector,cineradiography equipment;stopcock,transducer;synchronization cables;electrodes;electrode pads;hospital gown,gloves,mask; scissors;lead apron;cardiograph paper;pen

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Physician,radiologist in charge;charge nurse; any patient;radiologic technologist;cardiac or special procedure team

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Setting up and monitoring any patient's electrocardiogram during special procedure, by reviewing orders; setting up equipment for oscilloscope,audio, paper or film recording of cardiograms, multichannel monitoring including arterial or heart pressure, synchronization with cineradiography, pressure injector; standardizing equipment; determining changes to report; monitoring; reporting significant changes in ECG and/or pressure; removing equipment when ordered; placing film for processing.

List Elements Fully

Performer sets up for and carries out continuous monitoring of a patient's electrocardiogram (ECG) as a result of:

a. Regular assignment.
b. Request.

1. Performer receives or obtains the ECG requisition form, patient's identification information and any appropriate clinical information on a patient scheduled for a procedure requiring ECG monitoring, such as angiography, or is assigned to ECG monitoring for a given procedure as a result of assignment on a team, such as angiography suite team.

   a. If appropriate, performer checks the examination called for and the purpose. Notes the procedure room assigned and its location. Checks the time for the scheduled procedure. If appropriate;notes the time to report for preliminary preparations or instructions.

      i) Performer reads patient's name, identification number, sex, age, weight, and height.

      ii) Notes name of attending radiologist, other physician in charge, anesthesiologist and/or

DK-RP;RR;RR

6. Check here if this is a master sheet... (X)

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TASK DESCRIPTION SHEET (continued)

Task Code No. 308

This is page 2 of 3 for this task.

List Elements Fully	List Elements Fully
charge nurse or supervisor, other members of team. b. When appropriate, reads any written orders or notes physician's oral instructions. May contact staff to receive more detailed orders, information or to check on type or availability of equipment. i) Notes type of equipment to be used, whether permanent film or paper ECG record will be made, whether ECG will be recorded with and coordinated to cineradiography filming, will be synchronized to trigger pressure injection equipment at precise point in cycle. ii) Notes whether blood pressure will be monitored and/or recorded during catheterization procedure on multichannel equipment. iii) Notes appropriate sterile procedures required, appropriate personal shielding for the examination. c. Performer checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment, room to be used and the procedure involved. 2. At appropriate time, performer goes to procedure room to prepare equipment and materials for the procedure: a. Performer may report to the charge nurse or supervisor. Checks name of patient. Asks about specific precautions in dealing with patient or equipment. b. Performer may receive a clean hospital gown, cotton "boots," cap and mask. Dons these before entering	sterile area or touching sterile surfaces. i) Washes hands as and when appropriate. ii) Carries out appropriate steps to maintain the integrity of the sterile areas or surfaces. c. Checks that everything needed for ECG monitoring is available in room or has materials assembled. d. May decide to clean ECG equipment or arranges to have this done. e. Makes sure that machine is adequately loaded depending on type of machine, with paper or film. f. Positions equipment as appropriate for viewing of oscilloscope image, listening to audio signal (if used), with leads properly attached and out of the way of other team members who will be engaged in other aspects of procedure. Puts on leaded apron. 3. Performer standarizes the ECG machine using appropriate dial(s): a. Adjusts visual display on oscilloscope screen so that the tracings are appropriately centered and clear. Adjusts sweep dial to provide image of appropriate number of waves. b. May adjust audio heart rate controls as appropriate. c. If electrocardiogram tracings will be recorded on paper or film, performer standardizes as appropriate. May set marker button to identify each cardiogram lead by code number or marks by hand. d. May check that other modes such as pressure monitoring channel are operative.

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TASK DESCRIPTION SHEET (continued)

Task Code No. 308

This is page 3 of 3 for this task.

List Elements Fully

4. Performer determines which leads will be used for monitoring and the sites at which electrodes will be applied on patient's body.

   a. If not already done, has patient prepared for ECG monitoring and electrodes applied, or decides to do personally.
   b. When the equipment has been set up and patient has electrodes in place, performer checks that ECG monitoring equipment is functioning properly.

      i) Introduces self to patient if coherent; checks patient's identification against requisition sheet. Explains what will be done.
      ii) Performer may notify appropriate physician when ready. Notes orders based on MD's review of visual, printed and/or audio displays. Adjusts controls as ordered. Has electrodes repositioned if so ordered or decides to do personally.
      iii) Notes the appearance of the wave patterns on oscilloscope screen, electrocardiograph paper and/or audio sounds of heart rate or rhythm.
      iv) If not already done, determines what ECG changes are to be brought at once to physician's attention.

   c. If blood pressure will be monitored, performer notes at what point in procedure stopcock and transducer will be attached to the catheter. Determines what to look for in display of pressure monitoring and what changes are to be brought at once to physician's attention.
   d. When patient and equipment have been appropriately set up, performer sets equipment to continuous monitoring mode.
   e. If appropriate, at proper time during the procedure, performer may connect synchronization cable from cineradiography camera equipment to ECG equipment.
   f. May connect cable from ECG equipment to automatic pressure injector. Depending on orders, may set equipment to inject at specified point in successive cardiac cycles, or may assist while this is done by co-worker (radiologic technologist).

5. Throughout procedure and until told to terminate, performer pays attention to the visual, audio or written cardiogram of patient and/or pressure tracings if this is being monitored by performer.

   a. Notes any changes of pattern as directed.
   b. Immediately notifies physician when any known emergency signs or unusual reading occurs, based on predetermined guidelines.
   c. On orders, performer may reposition electrodes, reset machine using appropriate controls.

6. When informed that ECG monitoring is to be terminated, performer may remove electrodes, discard disposable pads and turn off equipment, or has this done. Has patient's skin cleaned where electrodes were attached.

7. If ECG record has been made on film (but not on cine film) performer may advance film on take-up spool; cuts film and removes cartridge from camera. Attaches appropriate identification information and arranges to have processed as appropriate.

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CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 27

Skill or Knowledge Category Human Interaction Skills Scale Value 3.0

Occupation Patient Care Technician Level 2

Refers to Task Code No(s).: 18 33 133 156 198 280 298 299 308 522

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. Explaining to patient what will be done to draw blood sample; taking sample (Task 18).

2. Explaining to patient and any accompanying family member what will be done in removal of sutures; explaining how to take any medication prescribed (Task 33).

3. Explaining to patient name and purpose of medication to be taken orally or injected and possible side effects; asking about allergies; injecting or administering medication (Tasks 133, 198, 298, 299).

4. Explaining what will be done in cleansing and dressing of wound, burn, or opening for catheter, or in applying pressure dressing (Tasks 156, 522).

5. Discussing possible causes for unusually high radiation exposure reading on performer's radiation detection (dosimeter) badge and possible transfer to other work (Task 280).

6. Explaining to patient what will be done to monitor patient's ECG (Task 308).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction, and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:

Lower scale value appears in: 20 21 22 23 24 25.

Same scale value appears in: 26 28 29 30 31.

Higher scale value appears in: 32 33 34 35 36.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 21
Skill or Knowledge Category Human Interaction Skills Scale Value 1.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 173 178 187 276 523 524 525 527 534 536 538 553 554 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. Requesting that co-worker or staff member sign record or form (Task 78).

2. Informing repair service staff of problem with equipment or supplies and relevant information, and/or informing appropriate staff that unit or materials are not to be used until repaired (Tasks 173, 178, 187, 276, 523, 525, 534, 536, 538, 556).

3. Informing co-worker of radiographs that were spoiled by being jammed in processor or in machine when it was opened (Task 276).

4. Informing co-worker or staff member of supplies that should be replenished or replaced (Task 524).

5. Explaining to physician or co-worker what is missing on request for retrieving computerized transverse axial tomography scans, such as improper authorization, incomplete information (Task 527).

6. Reporting unusually high personnel dosimeter exposure readings to appropriate supervisor(s) (Task 553); and/or informing the individual(s) involved; notifying or arranging for personal interviews and reports (Task 554).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction, and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 20 21 22 24 25.
Higher scale value appears in: 26 27 28 29 30 31 32 33 34 ~~35 36~~.

(Example of how the same language in many tasks can be collapsed, with one curriculum objective used for a group of tasks)

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor III No. 165
Skill or Knowledge Category 11731100 Scale Value 3.5
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 373 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 (*continued below)
Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Regional Anatomy (includes head and neck, thorax and abdomen, pelvis and perineum, lower and upper limbs, and skeleton; internal structure and connections between major parts, systems, and sections of the body).

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. After reading requisition sheet indicating area of interest, being able to select appropriate film size, patient positions and centering to demonstrate the part of the body involved; being able to consider internal structures in relation to patient positions, taking account of patient's age, sex, size and body type as appropriate for the area of interest (all tasks listed).

2. Considering appropriate shielding for radiosensitive tissue by considering the direction of the central ray and the proximity of tissues in the area of interest to radiosensitive tissues (all tasks listed).

3. Positioning patient in relation to film and x-ray beam to obtain views requested; selecting technical factors appropriate to the area of interest and tissue type involved (all tasks listed).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 163
Same scale value appears in: 164.
Higher scale value appears in: 166 167 168.

* 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor IV No. 170
Skill or Knowledge Category 11731200 Scale Value 1.5
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 18 308

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Topographic Anatomy (relation of external physical manifestations to internal structure and function of parts of the body)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Selecting appropriate site for drawing sample of venous blood (Task 18).

2. In setting up patient for ECG, being able to locate appropriate points for placement of electrodes (Task 308).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in 169 171.
Higher scale value appears in: 172 173 174 175 176.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor VI No. 164
Skill or Knowledge Category 11731100 Scale Value 3.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 527

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Regional Anatomy (includes head and neck, thorax and abdomen, pelvis and perineum, lower and upper limbs, and skeleton; internal structure and connections between major parts, systems, and sections of the body)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In checking and jacketing patients' radiographs, being able to match requisition with the area demonstrated on radiographs and right or left designation when information is missing (Task 78).

2. In retrieving, displaying and copying computerized transverse axial scans, being able to select display controls so that picture demonstrates the area of interest requested with appropriately sharp density gradation for the tissues in the area of interest (Task 527).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 163.
Same scale value appears in: 165.
Higher scale value appears in: 166 167 168.

HEALTH SERVICES MOBILITY STUDY

Curriculum Objectives and Guidelines

The HSMS method of task analysis and curriculum design makes it possible to provide materials for use in specific stages of the educational process. These materials are discussed in Research Report No. 8, Volume 2, entitled "Curriculum Objectives for Radiologic Technology." This volume comprises Chapters 6-9 of Report No. 8.

Chapter 6 is an introduction to the HSMS curriculum design method. It presents the basic concepts and definitions, a brief summary of the method, and a description of the curriculum objectives. It explains how curriculum objectives are written.

Chapter 7 presents the HSMS curriculum guidelines for diagnostic radiology from the entry level to the technologist level. The guidelines are presented in terms of stages of the educational process:

1. Selection of educational objectives - deciding what the institution will teach and what goals and values it will try to achieve.

2. Curriculum development - selecting and structuring curriculum content. The content selected is the language of the task descriptions, the disciplines of the Knowledge Classification System, and the skills. The structuring of the content into an organized set of intended learning outcomes is reflected in the HSMS curriculum objectives. These can be sequenced in educational ladders to parallel job ladders.

3. Program design - dividing and arranging a curriculum into sequences and/or units appropriate to the content, the time requirements, and the structure of the educational institution. This includes arranging the curriculum into one or more educational ladders; for example, in patient care and in quality assurance. Curriculum outlines are given in detail in tables in Chapter 8, with suggestions on overall sequences that are related to job content.

4. Instructional planning - suggesting ways to use task descriptions and to teach skills in classroom.

5. Evaluation - showing how HSMS curriculum objectives can be used to evaluate students by providing competency standards for each objective; also showing how HSMS curriculum objectives can be used for proficiency test items with built-in content validity.

Chapter 7 also describes ways to use HSMS curriculum objectives as a common frame of reference for discussions about new curricula, curriculum overlap, credit for advanced standing, articulation of programs, justification or elimination of course work, or diagnosis of inadequate curriculum content.

Chapter 8 of Research Report No. 8 presents the curriculum outlines for the educational ladders. It suggests an ordering of the curriculum objectives to parallel the job ladder sequences recommended in Volume 1. Chapter 9 presents the 351 curriculum objectives in order.

APPENDIX B

Persons Interviewed During HER Feasibility Study

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE:

Mark Barnett, Associate Director, and Michael Audet, Division of Training and Medical Applications, Bureau of Radiological Health, Food and Drug Administration

Harris S. Cohen, Ph.D., Chairman, Public Health Service Subcommittee on Health Manpower Credentialing

Thomas Hatch, Director, and Joseph Kadish, Associate Director, Division of Associated Health Professions, Bureau of Health Manpower, Health Resources Administration

*Edward Hinman, M.D., Director, Hospitals and Clinics Division, Bureau of Medical Services, Health Services Administration *Admiral E.H., M.D.

Gerald Rosenthal, Director, National Center for Health Services Research; Archer Copley, Acting Director, and John C. Clark, Deputy Director, Division of Health Services Research and Analysis, NCHSR.

William Abelow, Executive Director, and Rosemary Lauricella, Administrative Assistant, League of Voluntary Hospitals and Homes, New York City

Romeo Adams, Assistant Administrator, New York University Medical Center, NYC

Robert Becker, Director, Chicago Office, American College of Radiology (substituting for William Stronach, Executive Director, who was unable to make scheduled appointment)

Earl Brant, M.D., Director of Radiology, Lenox Hill Hospital, New York City

Sr. Hilda Brickus, S.S.M., Associate Professor, Department of Radiologic Sciences, St. Louis University, St. Louis, Mo. (1)

James Carter, Radiologic Technologist, Audie Murphy VA Hospital, San Antonio, TX (1)

Robert Coyle, Executive Director, Joint Review Committee on Education in Radiologic Technology, Chicago

Candido De Leon, President, Hostos Community College, The Bronx, N.Y.

Michelle Doran, Director of Labor Relations, Boston Hospital for Women, Jamaica Plains, Mass. (interviewed in Washington)

Trudi Dourdounas, R.T., Chairman, Radiologic Technology Department, Hostos Community College of City University, The Bronx, N.Y.

Martin Egelston, Manager, Division of Medical Services; and Dan Thomas, Staff Specialist, American Hospital Association, Chicago

Vercie Eller, Ed.D., Director of Health Programs, Dept. of Community Colleges, State Board of Education, Raleigh, N.C. (by telephone)

John Fauser, Assistant Director, Department of Allied Medical Professions and Services, American Medical Association, Chicago

Howard Goldman, Director, Bureau of Radiological Technology, New York State Department of Health, Albany, N.Y. (by telephone)

Harold M. Goldstein, Professor, Department of Economics, Northeastern University, Boston, Mass. (interviewed in Washington, D.C.)

Elliot Greenberg, M.D., Director of Radiology, Mt. Sinai Medical Center, NYC

LaVerne Gurley, R.T., Professor, Center for Health Sciences, College of Allied Health, University of Tennessee, Memphis, Tenn. (1)

(1) Interviewed in Washington, D.C. during meeting of American Society of Radiologic Technologists.

Jane Houls, Managing Director, Center for Occupational and Professional Assessment, Educational Testing Service, Princeton, N.J.; also interviewed at ETS were Tobi Friedman, Health Affairs; William Kastrinas, who developed radiologic technology proficiency examinations, and Skip Livingston, researcher involved in those exams.

Leon Davis, President, and Moe Foner, Executive Director, Local 1199, Drug and Hospital Union, New York City

Moe Katz, Vice President for Planning, Montefiore Hospital and Medical Center, The Bronx, N.Y.

Ward Keller, R.T., Executive Director, and Marilyn Fay, Education Director, American Society of Radiologic Technologists, Chicago

Richard Kessler, M.D., Dean for Academics, Northwestern University Medical School, Chicago

Aaron Korngold, Administrative Chief of Services and Director of Research, and A. Suster, M.D., Chief of Radiology, Brooklyn VA Hospital, Brooklyn, N.Y.

Sheila Loughlin, Blue Cross Association, Chicago

Roland McGowan, Executive Director, American Registry of Radiologic Technologists (1)

Michael McGarvey, Ph.D., Vice President for Health Services, Hunter College of City University of New York, New York City

James Ohnysty, R.T., Director of Programs, Greenville Technical College, Greenville, S.C. (1)

Barbara Pryor, Acting Chief, Continuing Education Division, Education Services, Veterans Administration, Washington, D.C.

Gale Ramsby, M.D., former Director of Radiology, West Haven (Conn.) VA Hospital, now in private practice and associated with Univ. of Connecticut Medical Center

Lillian Roberts, Associate Director, and Jessica Romm, Staff Specialist for Health, District Council 37, American Federation of State, County and Municipal Employees, New York City

Sumner Rosen, Professor of Economics, Columbia University, New York City

William Samuels, Executive Director, American Society of Allied Health Professions, Washington, D.C.

LeRoy Sparks, R.T., Radiologic Sciences Professor, Downstate Medical Center, Brooklyn, N.Y.

Lillian Terris, Ph.D., Executive Director, Professional Examination Service, New York City

Thomas Thompson, M.D., Associate Dean, Allied Health Education, Duke University School of Medicine, and Radiologist at Durham VA Hospital, Durham, N.C. (1)

Mary Vahey, R.T., Director of Education, Program for Radiologic Technology, Helene Fuld Hospital, Trenton, N.J. (1)

Richard Weathers, R.T., Administrator, Department of Radiology, New York University Medical Center, New York City

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