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ABSTRACT

To obtain baseline information about the relationship among performances in education programs, certification examinations, and working situations, the 358 cytotechnologists who took the 1965 certification examination in exfoliative cytology were selected for study. Based on questionnaires and other information concerning education and clinical experience, some conclusions were: (1) Almost all of the 306 cytotechnologists for whom information about college science courses was available had credit hours on at least one basic biological science; more than 60 percent took courses in inorganic chemistry, bacteriology, and mathematics; half or fewer had credit in anatomy, physiology, organic chemistry, physics, and other science courses, (2) There was a tendency for those who passed the certification examination to have credit hours in a greater variety of science courses and to receive satisfactory grades in these courses than those who failed the certification examination, (3) There was a direct relationship between evaluations of clinical study and performance in the certification examination, and (4) A higher percentage of failures occurred among cytotechnologists who began their clinical study between 1958 and 1961. (JK)

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REPORT

of a

National Study of Cytotechnologists: Education and Performance Relationships

CONDUCTED BY

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Report of a National Study of Cytotechnologists: Education and Performance Relationships

CONTENTS

INTRODUCTION

Do current education programs in medical technology adequately prepare students to meet present and future demands in the profession? Do certification procedures adequately test whether or not the medical laboratory personnel will perform well in the laboratory? Questions such as these prompted the National Council on Medical Technology Education in 1964 to obtain baseline information about the relationship among performances in education programs, certification examinations and working situations.

The Council was founded in July 1964 to implement, nationally, the recommendations of the Alabama Project prepared two years earlier. That project made significant contributions to education programs for medical technologists and cytotechnologists in Alabama by developing teaching methods, faculty, and related resource material; by strengthening affiliations between schools of medical technology and Alabama universities; enlarging recruitment efforts for student medical and cytotechnologists; and scheduling program reviews. The success of the Alabama Project encouraged national application of its achievements to the improvement of medical technology education elsewhere.1/

When the Council first met in 1964, they immediately recognized a need for additional information prior to broad implementation of the Alabama Project recommendations. Consequently, they undertook a program of inquiry designed to elicit general statements of adequacy regarding medical laboratory personnel education and certification programs, and to weight these factors against general statements about job performance of the people who completed this preparation.

The NCMTE program includes three studies. The first, involving medical technologists, was reported in August 1967. The second study pertains to certified laboratory assistants and is scheduled for completion late in 1968. The third study is reported in the following pages which summarize the findings and performance relationships for cytotechnologists.

The 358 cytotechnologists selected for this study constitute the entire group who took the 1965 certification examination in exfoliative cytology given by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists. Questionnaires completed and returned by the cytotechnologists supplied information about their education and clinical work situations. Additional data concerning their educational preparation and certification records were obtained from the office of the Registry of Medical Technologists (ASCP). Information about the clinical study programs (schools of cytotechnology) was provided by the office of the Board of Schools of Medical Technology (ASCP). Job performance evaluations for the cytotechnologists were submitted by their immediate supervisors at the time the study was conducted. These supervisors also provided information about their own education and experience.

Information from these sources is tabulated and reported in detail in the section of this report entitled "Findings". The methodology employed in obtaining and evaluating data is described in Appendix A. Copies of the questionnaires used appear in Appendices C and D.

The Council staff wish to express their gratitude to Dr. Wellington B. Stewart, Chairman of the Board of Registry of Medical Technologists (ASCP); Dr.Elwood E. Baird, Chairman of the Board of Schools of Medical Technology (ASCP); and their respective office executives, Mrs. Ruth Drummond and Mrs. Anne Brindley, for assistance in obtaining educational background data. In addition, Mr. Robert Sullivan and Miss Marguerite Inglis of the Yalem Scientific Computer Center of St. Louis University, St. Louis, Missouri gave invaluable assistance in computing the findings and statistical detail. Mrs. Arline Howdon, CT(ASCP) and Mrs, Irma Rube, CT(ASCP) gave generously of their time and knowledge by advising in the preparation of questionnaires and interpretation of findings. The cytotechnologists and laboratory supervisors are gratefully acknowledged for diligently completing the lengthy questionnaires, thus making this study possible.

1/ An account of the Alabama Project and the history of the National Council on Medical Technology Education is presented in Appendix B of this report.

Finally, acknowledgment must be given to four projects which were conducted between 1959 and 1965 because they provide information that gives added meaning to this report. In 1959, the Alabama Project, mentioned earlier, began its program of ascertaining the status of medical and cytotechnology education in that state. Its contributions are summarized in the section entitled "History" (Appendix B).

Two of these projects began in 1961. In September of that year, the Cytology Field Project of the National Committee for Careers in Medical Technology Education was started for the purpose of obtaining information about all phases of education in schools of cytotechnology including recruitment, curricula, teaching aids and the like. The results of site visits to all cytotechnology programs accredited by the Council on Medical Education of the American Medical Association reported by the Field Consultant, Miss Ellen Anderson, MT(ASCP), enhance and, to some extent, are substantiated by the findings reported in these following pages.

The other project in 1961 was a conference entitled "Clinical Cytology and the Pathologist". The conference report contains a systematic and lucid review of the history of organizational activities in the development of clinical cytology, the status of education and certification programs in cytotechnology and cytopathology, and a prediction of future education programs and practice of clinical cytology. This is relevant because the need for implementing some of the recommendations from this conference is supported by findings of the study herein reported. In retrospect, it is possible that the interest stimulated by the Alabama Project, Cytology Field Project and Clinical Cytology conference generated an awareness among those responsible for cytotechnology education which resulted in curricular, accreditation and certification changes evident in these findings.

This increased awareness is evident in the conference held in 1965 entitled "Workshop on Cytology Training for Cytotechnologists and Pathologists". This meeting was held to discuss certain problems pertaining to recruitment and education of cytotechnologists and specialty education for pathologists with the specific request that consideration be given to recommendations for changes in education requirements to be referred to the Board of Schools of Medical Technology (ASCP) and the A.M.A. Council on Medical Education. The report which summarizes workshop discussions, contains consensus regarding the type and amount of pre-clinical study, the length of cytotechnology clinical study, student enrollment, and continuing education needs and programs which are supported by findings of this cytotechnologist study report.

The review of these four projects also reveals the outstanding and continuing support given by the American Cancer Society, Cancer Control Program of the U. S. Public Health Service, American Cytology Society, College of American Pathologists, American Society of Clinical Pathologists, and National Committee for Careers in Medical Technology which has been and must again be acknowledged.

CONCLUSIONS

1. In General

A. Primary Objectives: Relationship among Certification Examination Performance, Job Performance, and Pre-Clinical and Clinical Study Grades.

This study finds certain relationships among the performance of cytotechnologists in their certification examination, pre-clinical study, clinical study,1/ and their work. This conclusion is based on the following determinations:

There is a tendency for the cytotechnologists who passed the 1965 certification examination to have a greater variety of science courses in their pre-clinical study than those who failed it.

There is a tendency for the cytotechnologists who passed the 1965 certification examination to receive satisfactory (A,B, and C) grades in college science courses and for those who failed to receive unsatisfactory (D and F) grades, especially in inorganic chemistry, zoology-botany-biology, and mathematics.

Significantly more of those who passed the 1965 certification examination attended clinical study programs accredited by the Council on Medical Education of the American Medical Association than those who failed it.

Significantly more of those who passed the 1965 certification examination were rated "excellent" or "good" by the directors in the clinical study programs than were those who failed it.

There is no statistically significant difference between the job performance ratings given by laboratory supervisors to cytotechnologists who passed the 1965 certification examination and those who failed it.

B. Related Objectives: Cytotechnology Education in Perspective

This study presents statistically significant evidence supporting the following conclusions:

Pre-clinical science courses for which grades may be indicators of success or failure in the 1965 certification examination are inorganic chemistry, zoology-botany-biology, and mathematics. The omission of courses in anatomy and bacteriology from pre-clinical study programs may contribute to failure in the certification examination.

Clinical study programs in laboratories accredited as schools of cytotechnology by the A.M.A. Council on Medical Education appear to be more successful in fulfilling the objectives of preparing cytotechnologists to pass the certification examination than are those which are not so recognized.

1/ "Pre-clinical study" refers to the academic study of physical, biological and medical sciences and elected liberal arts courses in a college or university accredited by an agency recognized for such purposes by the American Council on Education and the National Commission on Accrediting.

"Clinical study" refers to the period of training in cytotechnology in a medical laboratory accredited for such a purpose by the Council on Medical Education of the American Medical Association.

The cytotechnologists' performance in the practical study of cell morphology and cytotscreening is rated higher than in the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques.1/

Women were more successful in passing the 1965 certification examination than men.

The cytotechnologists in this study who began their clinical study between 1958 and 1961 did not perform as well on the 1965 certification examination as did those who began later. Some of the reasons for improved performance in the later period, 1962 through 1964, are surmised to be the following:

1. awareness of the need to develop cytotechnology education programs stimulated by the Alabama Project (1959-1962), Cytology Field Project (1961-1963), and the workshop entitled "Clinical Cytology and the Pathologist" (1961);

2. implementation of higher standards for basic prerequisites in the accreditation of schools of cytotechnology after 1961;

3. introduction into the 1965 certification examination of some questions pertaining to information not presented in earlier educational programs.

The following findings are important to the perspective of cytotechnology education but are not statistically significant in their distributions:

Cytotechnologists who took more than the minimum requirements of college science courses in pre-clinical study appear to be more adequately prepared for cytotechnology than those who took the minimum or were accepted on the basis of their experience in the specialty.

The clinical programs, reviewed in this study, that appear to be more successful in fulfilling the objectives of preparing cytotechnologists to pass the certification examination are in laboratories having a teaching supervisor with more than five years of experience; staffed by from three through five personnel most of whom are ASCP-certified; accredited capacity, enrollment and graduation of from five through eight students; having a total teaching program comprised of from 840 through 2,080 hours; and having a service workload of from 20,000 through 50,000 cases per year.

The cytotechnologists indicated their satisfaction with cytotechnology education programs by stating that they prepare them adequately to perform the duties assigned to them in their work. It should be noted, however, that the small group adding comments to this inquiry indicated that a weakness in cytotechnology education programs may be insufficient instruction in endocrinology.

1/ This conclusion is based on the assumption that the first six months of the clinical study program are devoted primarily to the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques and the second six months primarily to the practical application and study of cell morphology and cytoscreening. The cytotechnologists were rated higher in the second six months of clinical study than in the first six months. It should be noted that, in most cases, the ratings for the second six months were given by a different person than those for the first six months. In most cases, the second six months of study was in an institution that is not an accredited school of cytotechnology. See Appendix E for requirements for certification in Exfoliative Cytology.

The content of the 1965 certification examination questions appears to be appropriate for determining the extent to which candidates are prepared to practice cytotechnology because 74% of the items pertain to interpretation of cell morphology and 20% to related basic sciences. The examination may be improved, however, by the addition of questions concerning cytopreparatory and staining techniques.

The majority of cytotechnologists utilized, in their work, instruction in cytopreparatory, staining and microscopic techniques with the exception of cell filtration, staining methods for hormonal and cytogenetic studies, electron and acridine orange fluorescence microscopy.

Instruction in the use of identified quality control measures 1/ appears to be given at an acceptable level to the majority of cytotechnologists with the exception of that involving the separation of staining hypercellular fluids from other specimens.

The cytotechnologists, in their work, seem to use quality control measures at an acceptable level with the exception of the frequency of changing stains and alcohol solutions in staining procedures and the separation of staining hypercellular fluids from other specimens.

The majority of cytotechnologists appear to have sole responsibility for determining normal morphology in their microscopic examinations of specimens because the findings show that two-thirds of them do not have any of their negative slides reviewed by pathologists after they have examined them.

C. Inconclusive Observations

Lack of information about clinical lecture content precludes conclusive statements regarding the subject matter presented to students in cytotechnology programs.

The extent to which cytotechnologists supervise other technical personnel in the use of quality control measures, and cytopreparatory and staining techniques is not revealed by this study even though they stated that they learned most of these measures and techniques now done by someone else at their place of employment.

II. Pre-Clinical Program
(Basis for conclusions and tables appear on pages 15-24.)

Information about college science courses taken in pre-clinical study programs was available for 85% (306) of the 358 cytotechnologists selected for this study. In fulfilling the Registry requirements for certification, almost all of the 306 cytotechnologists had credit hours in at least one basic biological science (zoology, botany, biology). More than 60% took courses in inorganic chemistry, bacteriology, and mathematics. Half or fewer of them had credit hours in anatomy, physiology, organic chemistry, physics, quantitative analysis, qualitative analysis, genetics, embryology, histology, and biochemistry (in descending order of frequency).

1/ The quality control measures are identified in "Findings, E. Characteristics of Cytotechnologists", section on "Working Environment".

There appears to be a tendency for those who passed the 1965 certification examination to have credit hours in a greater variety of science courses and to receive satisfactory (A,B, and C) grades in these courses than those who failed it. This conclusion is based on four findings.

1. Significantly more of those for whom college course information was available passed the 1965 certification examination and more of those for whom it was not available failed it. The latter group is composed of 52 persons who presumably qualified by verification of their experience in cytology because no science course information was available for them.

2. Proportionately more of those who passed the certification examination had more credit hours in science courses than did those who failed. This difference is not statistically significant.

3. Significantly more of those who failed the 1965 certification examination received unsatisfactory (D and F) grades in inorganic chemistry, zoology-botany-biology, and mathematics, particularly those completing one through four credit hours.

4. Significantly more of the cytotechnologists who failed the 1965 certification examination but had satisfactory (A,B, and C) grades did not have any credit hours in anatomy and bacteriology.

Twenty-seven of the cytotechnologists commented about the adequacy of their education program in preparing them for their work. One-third of them stated a need for more science courses such as endocrinology, histology and chemistry, mentioning endocrinology most frequently.

III. Clinical Program

(Basis for conclusions and tables appear on pages 25-36.)

There is a direct relationship between the result of evaluations of students completing their clinical study in cytotechnology and their subsequent performance in the 1965 certification examination. Despite the subjective nature of the evaluation, significantly more of the cytotechnologists rated "excellent" or "good" in their clinical study passed the 1965 certification examination than those who were rated "fair" or "poor".

The cytotechnologists apparently perform better in practical application than didactic instruction because significantly more of those evaluated on two forms were rated "excellent" during the second half than during the first half of the clinical study period.1/ The effects of cytologic experience during the first 6 months, and of having two evaluations by different pathologists could not be ascertained in this study.

There is a tendency for the cytotechnologists in this study to perform better in the 1965 certification examination if the clinical study programs in schools of cytotechnology include the following:

1. a teaching supervisor with more than five years of experience;
2. from three through five personnel on the staff, most of whom are ASCP-certified;
3. accredited capacity, enrollment and graduation of five through eight students;
4. 840 through 2,080 hours comprising the total program; and
5. a service workload of from 20,000 through 50,000 cases per year.

1/ The explanation of forms used by clinical program directors is in "Findings:B. Performance in Clinical Study". The terms "didactic" and "practical" are applied to portions of the twelve month clinical program on the assumption that the first six months of clinical study are devoted primarily to the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques and the second six months primarily to the practical application and study of cell morphology and cytoscreening.

Although a small portion (16%) of the 358 cytotechnologists started their clinical study between 1958 and 1961, significantly more of this group failed the 1965 certification examination. Some of the reasons for this failure and subsequent improved performance in the period between 1962 and 1964 are surmised to be the following:

1. 13 of the 19 persons in this fail group were men who failed the examination;

2. realization of the need to develop cytotechnology education programs stimulated by the
   a. Alabama Project (1959-1962) which included a review of schools of cytotechnology and offered assistance in the development of their programs;
   b. Cytology Field Study (1961-1963) which obtained information about all phases of cytotechnology education throughout the country;
   c. workshop, "Clinical Cytology and the Pathologist", (1961) that enabled a discussion of the present and future potential in the education and practice of cytotechnology and cytopathology;

3. implementation of higher standards for basic prerequisites in the accreditation of schools of cytotechnology after 1961;

4. introduction, into the 1965 certification examination, of some questions pertaining to information not presented in earlier educational programs.

Comments about the adequacy of educational programs in preparing cytotechnologists for the duties they perform in their work were made by 27 study participants of whom 21 mentioned deficiencies even though they indicated they felt adequately prepared for their work. Replies from the six persons who said their education programs were inadequate indicated a need for increased emphasis on cytoscreening in the second half of the program and additional instruction in processing and screening non-genital specimens.

Information about the curriculum content of the clinical study program is limited. The annual reports of the schools of cytotechnology only listed the total number of lectures given in the entire program and divided them into didactic and practical segments. The cytotechnologists provided estimated numbers of lectures they received in the general subjects of basic sciences, cytology and cytopreparatory techniques, as well as an approximate number of quizzes and/or examinations during their clinical program. The largest number of lectures were in cytology and the smallest number in basic sciences. The number of cytopreparatory lectures varied more than the others, but more than ten were given in most instances. Quizzes and/or examinations appear to have been given weekly in the programs attended by the cytotechnologists in this study.

The quality control measures and techniques taught in the clinical programs appear to be used in their work by the majority of cytotechnologists, therefore the clinical education program apparently is meeting the needs of the practice of cytotechnology. The major deficiencies are in the use of quality control measures applicable to changing and filtering stains and alcohol solutions used in staining procedures and separating the staining of hypercellular fluids from other specimens.

IV. Certification Examination

(Basis for conclusions and tables appear on pages 37-39.)

The content of the written and practical sections of the examination apparently is appropriate for fulfilling the objectives of the examination to determine and subsequently certify an individual's readiness to practice cytotechnology effectively. This conclusion is based on the observation that 74% of the questions are related to cell morphology and 20% to pertinent basic sciences. It is noted, however, that the number of questions on techniques is limited and could be augmented to improve the testing in this area.

The difference in the minimum raw scores necessary for passing the two sections of the examination may reduce its effectiveness, therefore it may be advisable to increase the minimum raw score for the written section to the same standard raw score established for the practical section.

V. Working Environment

(Basis for conclusions and tables appear on pages 40-89.)

The cytotechnologists in this study had been working three years or longer in laboratories throughout the country. Two-thirds of them were situated in hospitals that were larger than the average hospital in the United States. The mean bed capacity of 537 for hospitals in this study is compared with 132 for all non-federal short term general and other special hospitals in the country. The mean bassinet capacity of 51 for the study hospitals is compared with 20 throughout the United States in the above mentioned classifications. Almost all of the remaining one-third of the cytotechnologists worked in independent laboratories.

The types of positions held by the cytotechnologists are almost equally divided between supervisory, non-supervisory and sole cytotechnologist. About one-third of them said they were teaching cytotechnology but most were assisting rather than supervising in educational programs.

Most of the cytotechnologists indicated that their duties were defined by their immediate supervisors and that they felt that they have the responsibility to exercise independent judgment in the performance of their duties.

From half to two-thirds of the cytotechnologists are maintaining good quality control practices by identifying and verifying specimens through use of accession numbers and regular reference to patients' names and case numbers. The quality of staining is controlled at an acceptable level by three-fourths of the cytotechnologists who observe each batch of stained slides for the definition of intra-nuclear structure and intensity of nuclear staining as well as morphological study.

Other quality control measures that are applicable to staining procedures are not used as extensively as is thought advisable. These include the filtering and changing of stains and alcohol solutions used in staining procedures. 1/ Precautions to minimize cellular contamination by separately staining hypercellular fluids are not observed, personally, by the majority of cytotechnologists in this study.

The cytotechnologists are involved primarily in microscopic morphology rather than cytopreparation and staining techniques. The latter appear to be the responsibility of other technical assistants.

Participation in some form of continuing education was indicated by three-fourths of the cytotechnologists. The programs attended by the largest number were those presented on a regional basis.

1/ It should be noted that limitations of the study required literal interpretation of replies and could not account for the size of the workload undertaken by the cytotechnologist participants. It is possible that some or all of them were practicing good quality control in this respect even though their answers did not indicate this. For example, a cytotechnologist working in a laboratory with a workload that justified staining slides twice a week may have changed these solutions each time slides were stained but answered the questions as "twice a week" rather than "each batch of slides" (the advisable frequency).

VI. Job Performance Rating

(Basis for conclusions and tables appear on pages 90-108.)

The job performance of the cytotechnologists was evaluated by their laboratory supervisors of whom two-thirds were physicians and almost all of the remaining were ASCP-cytotechnologists. The total working experience for two-thirds of the supervisors was more than five years during which three-fourths of them held two or fewer positions prior to their present positions. About three-fourths of them said their current positions were in hospitals and slightly more than half had titles of Laboratory Director. Teaching responsibilities were included in the positions held by 17% of the laboratory supervisors. Three-fourths of them said they had formal education in cytotechnology and cytopathology including 28% who indicated attendance at a school of cytotechnology and 46% in a pathology residency. Participation in continuing education was designated by 87% of the laboratory supervisors of whom most said they attended professional meetings.

The supervisors evaluated the job performance of 158 of the 358 cytotechnologists in 60 items involving skills, dependability, reliability, initiative, and personal relations. Statistical comparison shows no significant difference between the rating for cytotechnologists who passed and those who failed the 1965 certification examination.1/ There is, however, a statistically significant difference in the distribution of ratings for those who passed and failed the certification examination in seven job performance items, of which three are related to technical aspects of their work and four are non-technical in nature but do affect their job performance. Significantly more of the cytotechnologists who passed the examination were rated "excellent" in these seven items than those who failed it. It is of particular interest to note that one of the latter refers to personnel temperament: "Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology".

A significant portion of the cytotechnologists received ratings in six of the 60 items that varied from the norm for the entire group. Significantly fewer of them were rated "excellent" in five of these items of which one is technically related, one is non-technical in nature, and three pertain to participation in continuing education. The ratings of these three items on continuing education contradict the finding that three-fourths of the cytotechnologists indicated their participation in such programs. Significantly fewer of the cytotechnologists were rated "excellent" in one item which is technically related.

The subjectiveness inherent in the supervisors' evaluation should not be totally disregarded. Unfortunately, the scope of this report does not permit measurement of the extent to which these findings reflect more critical value judgments by the supervisors toward technical aspects of the laboratory work than those toward non-technical aspects.

1/ Of the 158 cytotechnologists rated for job performance, 141 passed and 17 failed the 1965 certification examination.

RECOMMENDATIONS

The following recommendations are based on the information obtained and conclusions derived during this study.

It is recommended that

1. the Board of Schools of Medical Technology (ASCP) and the A.M.A. Council on Medical Education consider the following in the next revision of Essentials for Schools of Cytotechnology:
   a. a minimum staff of three persons, most of whom are ASCP-certified cytotechnologists;
   b. a minimum capacity of five students; and
   c. increasing the number of credit hours in biological and medical science courses required for admission to the schools of cytotechnology.

2. the Board of Registry of Medical Technologists (ASCP)
   a. revise the requirements for certification in exfoliative cytology to
      1) provide that attendance at a school of cytotechnology accredited by the Council on Medical Education of the A.M.A. is mandatory for candidates for this examination; and
      2) delete the prerequisite of substitution of experience obtained prior to 1960 for attendance at an accredited school of cytotechnology;
   b. revise the examination for certification in exfoliative cytology to include additional testing in cytopreparation and staining procedures.

3. clinical programs in cytotechnology education be strengthened through additional instruction in quality control measures pertaining to staining procedures.

4. cytotechnology education programs, either pre-clinical or clinical, be strengthened by increasing emphasis on endocrinology.

5. further studies be undertaken to determine
   a. the content of curricula and course work (lectures) in schools of cytotechnology;
   b. the utilization of quality control measures in cytotechnology, the extent to which cytotechnologists are prepared to exercise judgment, and the contribution of both to the performance of laboratory work in this specialty;
   c. the extent to which cytotechnologists supervise other personnel in the laboratory involved in cytopreparatory and staining procedures;
   d. the frequency with which laboratory directors confer with cytotechnologists regarding results of cytoscreening and cytodiagnostic interpretation;
   e. the degree of latitude employed by laboratory supervisors in judging cytotechnologists' performance relating to both technical and non-technical aspects of this laboratory work and if cytotechnologists generally perform or fail to perform within the expectations and demands of their supervisors.

CONTENTS OF FINDINGS

A. PERFORMANCE IN PRE-CLINICAL STUDY

Information about college science courses taken by 85% (306) of the cytotechnologists was available in the office of the Registry of Medical Technologists (ASCP). Almost all (97%) of these cytotechnologists had credit hours in zoology, botany and/or biology. Eighty percent of them took inorganic chemistry. Bacteriology and mathematics courses were taken by 61% of this group. Half or fewer of them had credit hours in anatomy, physiology, organic chemistry, physics, quantitative analysis, qualitative analysis, genetics, embryology, histology, and biochemistry. (Table 1)

Evaluation of pre-clinical study performance of these cytotechnologists is based on the credit hours and grades they received in the above mentioned physical, biological and medical science courses taken in college prior to entering clinical study programs. Grades of A,B, and C were grouped arbitrarily as "satisfactory" performance and those of D and F as "unsatisfactory" for purposes of this study. This evaluation was made on 37% (133) of the cytotechnologists for whom college transcripts of credit hours were available.1/ Eighty-seven percent of the 133 cytotechnologists passed the 1965 certification examination and 13% failed it.

Analysis of these data for 133 cytotechnologists shows that significantly more of those who failed the 1965 certification examination received unsatisfactory grades in inorganic chemistry, zoology-botany-biology, and mathematics, particularly those completing one through four credit hours. (Table 2) Significantly more of the cytotechnologists who failed the certification examination but had satisfactory grades did not have any credit hours in bacteriology and anatomy courses. (Table 3) Significantly more 2/ of the cytotechnologists who were also M.T.(ASCP) had satisfactory grades in organic chemistry and more of those who were not so certified had unsatisfactory grades in that course. (Table 4)

Only credit hours (no grades) were available for 48% (173) of the cytotechnologists on special Registry forms.1/ Eighty-nine percent of the 173 cytotechnologists passed the 1965 certification examination and 11% failed it. In comparing the number of persons who passed with those who failed the examination, there is no statistically significant difference in the various courses they took.3/ Proportionately, however, more of those who passed had more credit hours in the science courses than did those who failed. (Table 5) The comparison of cytotechnologists with and without M.T.(ASCP) certification shows that a larger percent of those who are M.T.(ASCP)C.T. have taken the listed science courses with the major exception of mathematics. It is possible, though, that the credit hours taken in mathematics were omitted from the Registry forms because this course was only recently a requirement for M.T.(ASCP) certification.4/ (Table 6)

Information about college courses was not available for 15% (52) of the cytotechnologists. Most (45) of them received their training in cytotechnology prior to 1960. Verification of their experience under the direction of recognized physicians in cytology qualified them for taking the certification examination.

Of the 306 cytotechnologists for whom college course information was available, 88% passed the 1965 certification examination and 12% failed. Of the remaining group (52) for whom no information was filed, 71% passed and 29% failed. This difference is statistically significant in that more of those for whom credit hours data were available passed the examination and more of those for whom they were not available failed it. 5/

1/ The procedure for entering these and related data is described in the Appendix.
2/ This distribution is significant at 0.10 probability level but not at 0.05 probability level. The probability level for outstanding findings chosen for this report is 0.05.
3/ $X^2 = 1.61$; df = 13, $X^2 = 22.36$
4/ The Registry form contains a list of only the science courses included in the requirements for certification. Mathematics was not listed prior to 1962 on the medical technologist forms, unless it was added incidently in the compliation of credit hours.
5/ $X^2 = 10.61$; df = 2, $X^2 = 5.99$.

TABLE I

COLLEGE SCIENCE COURSES TAKEN BY 306 CYTOTECHNOLOGISTS

College Science Courses	Percent of 306 Cytotechnologists[a] taking courses			Percent of 133 Cytotechnologists[a] taking courses and with A,B,C and D,F grades						Percent of 173 Cytotechnologists[a] taking courses		
	Total	Pass Exam[b]	Fail Exam[b]	Total	Pass Exam[b]	Fail Exam[b]	A,B,C grades	D,F grades	A,B,C & D,F grades	Total	Pass Exam[b]	Fail Exam[b]
	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[d]	%[d]	%	%	%	%
Chemistry:												
Inorganic Chemistry	80	71	9	81	69	12	71	30	20	79	73	6
Organic Chemistry	35	32	3	37	32	5	29	17	10	33	32	1
Quantitative Analysis	29	27	2	29	28	X[e]	26	11	8	29	27	2
Qualitative Analysis	28	24	4	25	19	6	21	5	X[e]	30	28	2
Biochemistry	10	10	X[e]	14	13	X[e]	12	2	X[e]	8	8	X[e]
Biological & Medical Sciences:												
Zoology-Botany-Biology	97	86	11	95	84	11	92	20	17	99	88	11
Bacteriology	61	55	6	61	56	5	57	10	6	61	54	7
Physiology	46	42	5	47	42	5	42	5	0	46	41	5
Anatomy	50	46	4	45	41	4	42	5	2	54	50	5
Histology	24	22	2	23	22	X[e]	22	2	X[e]	25	23	2
Genetics	26	23	3	29	26	3	25	6	2	24	22	2
Embryology	25	22	3	20	19	1	17	4	X[e]	29	26	3
Mathematics	61	55	6	70	59	11	62	25	17	53	51	2
Physics	34	30	4	38	32	6	33	14	9	31	29	2

a. Information about college science courses was not available in the Registry of Medical Technologists (ASCP) office for 52 of the 358 cytotechnologists. The figures in this table applicable to the 306 cytotechnologists combine those for 133 for whom actual college transcripts of credit hours and grades were filed, and 173 whose college transcript credit hours (no grades) were available from a permanent record form filed in the Registry office. The figures applicable only to 133 and 173 cytotechnologists, respectively, are given under the appropriate headings in this table.
For example: Of the 306 cytotechnologists, 80% took inorganic chemistry including 71% who passed and 9% who failed the 1965 certification examination. Of the 133 cytotechnologists, 81% took inorganic chemistry including 69% who passed and 12% who failed the 1965 certification examination; and also including 71% who received A,B,C grades, 30% who received D,F grades, and 20% who received both A,B,C and D,F grades in this course. Of the 173 cytotechnologists, 79% took inorganic chemistry including 73% who passed and 6% who failed the 1965 certification examination.

Footnotes for Table 1
(continued)

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. The figures from which the percents were calculated for Total, Passed Exam, and Failed Exam for 306 and 133 cytotechnologists, respectively, are adjusted to exclude the duplication of individuals who received both A,B,C and D,F grades when they repeated courses (see footnote d).

d. The figures used for calculating the percents for A,B,C and D,F grades include all of the 133 cytotechnologists receiving these grades. Some of these cytotechnologists who received D,F grades repeated the particular course and received A,B,C grades. The group doing this is represented in the "ABC & DF Grades" column. The percents in this column represent the adjustment necessary to account for duplication of individuals in the two previous columns to derive the actual number of people taking the particular courses. (Total, Pass Exam, Fail Exam columns)

e. X = Less than 1%.

TABLE 2

CREDIT HOURS AND GRADES
From
COLLEGE TRANSCRIPTS SHOWING SCIENCE COURSES
Taken By
133 CYTOTECHNOLOGISTS[a]

College Science Courses	Percent of 133 Cytotechnologists with A, B, C Grades[b]			Percent of 133 Cytotechnologists with D, F Grades[b]		
	Took Course	Credit Hours		Took Course	Credit Hours	
		1 thru 4	5 or more		1 thru 4	5 or more
	%	%	%	%	%	%
Chemistry:						
Inorganic Chemistry	71	20	52	30	18[d]	12
Organic Chemistry	29	11	18	17	8	10
Quantitative Analysis	26	20	7	11	9	2
Qualitative Analysis.....	22	17	5	5	2	2
Biochemistry.....	12	11	2	2	2	X[c]
Biological & Medical Sciences:						
Zoology-Botany-Biology.....	92	11	82	20	13[d]	7
Bacteriology.....	57	38	19	10	8	2
Physiology.....	42	36	6	5	5	X[c]
Anatomy	41	22	20	5	4	2
Histology	22	19	3	2	2	0
Genetics.....	24	23	X[c]	7	7	0
Embryology.....	17	15	2	4	4	0
Mathematics	62	23	38	25	16[d]	9
Physics	32	14	19	14	8	6

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portion of 133 cytotechnologists who received A, B, and C grades and the portion of the same group (133 cytotechnologists) who received D and F grades in the science courses listed. The ABC group includes cytotechnologists who repeated courses because of previous failing grades.

c. X = Less than 1%.

d. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
Inorganic Chemistry: $X^2 = 11.99$; df = 2, $X^2 = 5.99$
Zoology-Botany-Biology: $X^2 = 25.04$; df = 2, $X^2 = 5.99$
Mathematics: $X^2 = 6.28$; df = 2, $X^2 = 5.99$

TABLE 3

CREDIT HOURS AND GRADES
From
COLLEGE TRANSCRIPTS SHOWING SCIENCE COURSES
Taken By
133 CYTOTECHNOLOGISTS[a]
According To
1965 CERTIFICATION EXAMINATION[b] PERFORMANCE

College Science Courses	Percent of 133 Cytotechnologists With A, B, & C Grades[c] & Credit Hours						Percent of 133 Cytotechnologists With D & F Grades[c] & Credit Hours					
	0		1 thru 4		5 or more		0		1 thru 4		5 or more	
	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail
	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
Chemistry:												
Inorganic Chemistry.....	29	29	18	29	53	41	73	47	17	24	9	29
Organic Chemistry.....	71	71	12	6	17	24	82	88	9	0	9	12
Quantitative Analysis.....	71	94	22	6	8	0	92	71	6	29	2	0
Qualitative Analysis	80	65	16	29	4	6	97	88	2	6	2	6
Biochemistry	87	94	11	6	2	0	97	100	2	0	X[d]	0
Biological & Medical Sciences:												
Zoology-Botany-Biology	6	18	10	12	84	71	84	59	12	18	4	24
Bacteriology	38	76[e]	42	12	20	12	91	88	7	12	3	0
Physiology	56	71	38	24	6	6	96	88	3	12	X[d]	0
Anatomy.....	54	88[e]	23	12	22	0	97	82	2	18	2	0
Histology.....	76	94	21	6	3	0	98	100	2	0	0	0
Genetics	76	76	23	24	X[d]	0	93	94	7	6	0	0
Embryology	81	94	16	6	3	0	97	94	3	6	0	0
Mathematics.....	40	29	24	18	36	53	75	76	16	12	9	12
Physics.....	69	59	14	12	17	29	85	94	9	6	7	0

Footnotes for Table 3

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portion of 116 and 17 cytotechnologists who passed and failed (respectively) the 1965 certification examination and received A, B, C grades and D, F grades in the science courses listed.

d. X = Less than 1%.

e. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
Anatomy: $X^2 = 6.83$; df = 2, $X^2 = 5.99$
Bacteriology: $X^2 = 8.81$; df = 2, $X^2 = 5.99$

TABLE 4

GRADES FROM COLLEGE TRANSCRIPTS FOR SCIENCE COURSES
Taken By
133 CYTOTECHNOLOGISTS[a]
According to
TYPE OF CERTIFICATION[b]

College Science Courses	Percent of 133[c] Cytotechnologists with grades[d] of		Percent of 100 CT(ASCP) with grades[d] of		Percent of 30 MT(ASCP)CT with grades[d] of	
	ABC	DF	ABC	DF	ABC	DF
	%	%	%	%	%	%
Chemistry:						
Inorganic Chemistry	71	30	62	33	97	20
Organic Chemistry	29	17	20	19[e]	63[e]	13
Quantitative Analysis	26	11	14	10	70	13
Qualitative Analysis	22	5	17	6	40	0
Biochemistry	12	2	8	2	27	3
Biological & Medical Sciences:						
Zoology-Botany-Biology	92	20	92	25	93	3
Bacteriology	57	10	51	9	80	13
Physiology	42	5	37	7	60	0
Anatomy	41	5	40	6	50	3
Histology	22	2	18	1	37	3
Genetics	24	7	25	8	23	3
Embryology	17	4	17	4	20	3
Mathematics	62	25	58	27	70	10
Physics	32	14	27	12	50	20

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. The Board of Registry of Medical Technologists (ASCP) gives examinations for certification of medical technologists (M.T.(ASCP)). Individuals so certified may also qualify for and take the examination for cytotechnologists. There were 52 M.T.(ASCP) who took the 1965 cytotechnologists' certification examination of whom 30 had transcripts of credit hours and grades in their files in the Registry office. Certification in both areas is designated as "M.T.(ASCP)C.T.".

c. Three of the 133 people were certified as H.T.(ASCP)C.T. They took the following courses and had the indicated grades:

Inorganic Chemistry	2 in ABC group 1 in DF group
Zoology-Botany-Biology	3 in ABC group 0 in DF group
Physiology	1 in ABC group 0 in DF group
Bacteriology	1 in ABC group 0 in DF group
Mathematics	3 in ABC group 1 in DF group
Physics	1 in ABC group 1 in DF group

d. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portions of the respective groups of cytotechnologists (133; 100; 30) who received A, B, and C grades and D and F grades in the science courses listed. The ABC groups may include cytotechnologists who repeated courses because of previous failing grades.

Footnotes for Table 4
(continued)

e. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.10 probability level. It is noted that the probability level for outstanding findings chosen for this report is 0.05. The Kolmogorov-Smirnov formula was used.
Organic Chemistry: $X^2 = 5.68$; df = 2, $X^2 = 4.61$ (0.10 probability level)

TABLE 5

CREDIT HOURS FROM REGISTRY FORM[a] FOR COLLEGE SCIENCE COURSES
Taken By
173 CYTOTECHNOLOGISTS
According To
1965 CERTIFICATION EXAMINATION[b] PERFORMANCE

College Science Courses	Percent of 173 Cytotechnologists with credit hours of		Percent of 154 Passing[b] cytotechnologists with credit hours of		Percent of 19 Failing[b] cytotechnologists with credit hours of	
	1 thru 4	5 or more	1 thru 4	5 or more	1 thru 4	5 or more
	%	%	%	%	%	%
Chemistry:						
Inorganic Chemistry	12	67	12	70	16	42
Organic Chemistry	10	24	12	21	0	11
Quantitative Analysis	19	10	19	10	16	5
Qualitative Analysis	26	5	27	10	16	0
Biochemistry	5	3	5	3	0	5
Biological & Medical Sciences:						
Zoology-Botany-Biology	13	91	8	90	5	95
Bacteriology	39	22	37	23	53	11
Physiology	37	9	37	3	37	5
Anatomy	35	18	36	19	32	11
Histology	23	1	24	1	16	0
Genetics	23	X[c]	24	X[c]	16	0
Embryology	27	2	27	3	32	0
Mathematics	17	36	18	40	11	11
Physics	8	23	9	23	0	21

a. Registry Forms were sources of data for 173 cytotechnologists who did not have college transcripts in their individual files. The Registry Form is used by the office of the Registry of Medical Technologists (ASCP) as a permanent record summarizing the college science course credit hours taken by applicants for certification examinations. The credit hours for courses with passing grades of A, B, C, and D are transferred from college transcripts to this form. For purposes of this study it is not possible therefore to separate satisfactory (A, B, and C) and unsatisfactory (D and F) performance.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. Of this group of 173 cytotechnologists who took the 1965 certification examination, 154 passed and 19 failed it. These people are represented as "Passing" and "Failing" cytotechnologists in this table.

c. X = Less than 1%.

TABLE 6

COLLEGE SCIENCE COURSES TAKEN BY 173 CYTOTECHNOLOGISTS[a]
According To
TYPES OF CERTIFICATION[b]

College Science Courses	Percent of 173[c] Cytotechnologists who took courses	Percent of 153 CT(ASCP) who took courses	Percent of 16 MT(ASCP)CT who took courses
	%	%	%
Chemistry:			
Inorganic Chemistry	79	78	94
Organic Chemistry	35	29	94
Quantitative Analysis	29	24	81
Qualitative Analysis	30	27	56
Biochemistry	8	6	25
Biological & Medical Sciences:			
Zoology-Botany-Biology	98	99	88
Bacteriology	61	58	88
Physiology	46	52	50
Anatomy	54	54	63
Histology	24	24	25
Genetics	24	24	31
Embryology	29	29	38
Mathematics	54	57	31
Physics	31	28	69

a. Registry Forms were sources of data for 173 cytotechnologists who did not have college transcripts in their individual files. The Registry Form is used by the office of the Registry of Medical Technologists (ASCP) as a permanent record summarizing the college science course credit hours taken by applicants for certification examinations. The credit hours for courses with passing grades of A, B,C, and D are transferred from college transcripts to this form. For purposes of this study it is not possible therefore to separate satisfactory (A, B, and C) and unsatisfactory (D and F) performance.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. Three of the 173 people were certified as H.T.(ASCP)C.T. Three had courses in zoology-botany-biology. Two had courses in inorganic chemistry, and bacteriology. Courses in quantitative analysis, qualitative analysis, organic chemistry, biochemistry, physiology, anatomy, histology, and mathematics were each taken by one person.

c. One of the 173 people did not pass the certification examination, therefore is not included in any of the certification groups.

B. PERFORMANCE IN CLINICAL STUDY

The cytotechnologists' clinical study 1/ performance is rated by the director of the program. These evaluations for 358 study participants, filed in the office of the Registry of Medical Technologists (ASCP), are summarized in Table 7 including a tabulation of those who passed and failed the 1965 certification examination for each performance level. These levels are classified as "excellent", "good", "fair", and "poor" for the entire period of study in one institution. The ratings are not divided according to cytotechnology subject matter.

The clinical study program recognized by the Board of Registry of Medical Technologists (ASCP) consists of a minimum of 12 months of study completed in one of two ways: (1) 12 months in one medical laboratory accredited as a school of cytotechnology by the A.M.A. Council on Medical Education; or (2) a combination of 6 months in an accredited school of cytotechnology and at least 6 months in another medical laboratory under the supervision of a physician recognized in the field of cytology. The programs for 45 of the cytotechnologists in this study varied from this scheme because they received their training prior to 1960.2/ Because of this variation in clinical study programs for all of the study participants, 42% (151) of them were evaluated once (on one form) and 58% (207) twice (on two forms).

Almost half (47%) of the cytotechnologists for whom one form was used were evaluated as "good" and slightly fewer (40%) as "excellent". Significantly more of this group who were rated "excellent" passed the 1965 certification examination.

More than half of those evaluated on two forms were rated as "good" during the first half of the study period and "excellent" during the second half. This difference in distribution is statistically significant. Significantly more of those rated above "fair" during the first half of the program passed the examination. The differences in these distributions in the second half of the program are not statistically significant.3/ However, a comparison of ratings on both forms shows that significantly more of those rated above "fair" on both passed the certification examination.

1/ The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 313 of the people in this study. The school of cytotechnology programs vary in length from six through 12 months. The remaining 45 people were trained under the direction of pathologists or other physicians recognized in the field of cytology prior to 1960, before schools were accredited by the A.M.A. Council on Medical Education.

2/ These people were qualified to take the certification examination under the following "grandfather clause" in the Registry requirements:

> "High school graduates who completed six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology."

3/ $X^2 = 0.96$; $df = 2$, $X^2 = 5.99$ (0.05 probability level)

TABLE 7

RATING OF CYTOTECHNOLOGISTS' PERFORMANCE
In
CLINICAL STUDY[a]

Item	Total in Study		Passed Exam[b]	Failed Exam[b]
	N[c]	%[c]	%[d]	%[d]
Number and Percent of Cytotechnologists	358	100	86	14
Performance rating for clinical study[e]				
1. One rating form used for 12 months of study	151	42	81	19
Rating of Excellent	61	17	92[h]	8
Good.....	71	19	80	20
Fair.....	17	5	47	53
Poor.....	1	X[f]	100	0
No rating	1	X[f]	0	100
2. Two rating forms used for 12 months of study	207	58	89	11
a. One form used for first 6 months of study				
Rating of Excellent	59[g]	16	98	2
Good.....	116	32	90[i]	10
Fair.....	24	7	67	33
Poor.....	2	X[f]	50	50
No rating	6	2	100	0
b. One form used for second 6 months of study				
Rating of Excellent	106[g]	30	92	8
Good.....	76	21	89[i]	11
Fair.....	18	5	78	22
Poor.....	0	0	0	0
No rating	7	2	86	14

a. The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 313 of the people in this study. The school of cytotechnology programs vary in length from six through 12 months. The remaining 45 people were trained under the direction of pathologists or other physicians recognized in the field of cytology prior to 1960, before schools were accredited by the A.M.A. Council on Medical Education.

b. The terms "Passed Exam" and "Failed Exam" refer to passing and failing the 1965 certification examination for cytotechnologists given by the Registry of Medical Technologists (ASCP).

c. The summations of N (number) and % (percent) for the Total in the Study follow the vertical dimension of the table. All percents are based on 358 people.

d. The summations of % (percent) for the Passed Exam and Failed Exam groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column. For example: 61 of the people were rated excellent on one form of whom 92% passed the 1965 certification examination and 8% failed.

e. One rating form was used for those people who completed their training program in one institution (usually 12 months).
Two rating forms were used for those people who completed their training program in two institutions (usually six months in each institution).

Footnotes for Table 7
(continued)

f. X = Less than 1%.

g. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
$X^2 = 22.34$; df = 2, $X^2 = 5.99$

h. Calculation of chi square test for distribution using the Kolmogorov-Smirnov formula. 0.05 probability level.
$X^2 = 7.50$; df = 2, $X^2 = 5.99$

i. Calculation of chi square test for distribution using the Kolmogorov-Smirnov formula. 0.05 probability level.
$X^2 = 7.14$; df = 2, $X^2 = 5.99$

C. CHARACTERISTICS OF SCHOOLS OF CYTOTECHNOLOGY

The cytotechnologists surveyed were enrolled for clinical study in laboratories accredited as schools of cytotechnology by the Council on Medical Education of the American Medical Association. The Board of Schools of Medical Technology of the American Society of Clinical Pathologists, with advice from a special committee, assists the Council in the accredition of these laboratories. Information about the 82 schools accredited in 1964-65 was obtained from the school directors' annual reports for that period which are filed in the office of the Board of Schools of Medical Technology (ASCP). Eighty-seven percent (313) of the 358 cytotechnologists attended 72 of the 82 accredited schools.

The characteristics of the schools of cytotechnology are presented in Table 8 as they apply to two populations. The first is composed of the 82 schools as individual institutions or programs. The second is represented by the 313 cytotechnologists who attended 72 of the 82 institutions. The latter population (313) was derived to enable identification and comparison of the separate characteristics represented by the people who passed the 1965 certification examination and those who failed it. The distribution of replies for the second population may appear to be magnified because of the number of students attending individual schools. For a particular characteristic, a comparison of the number and percent of individual schools and the number and percent represented by the cytotechnologists will enable the reader to account for the extent to which the response frequency has been affected. The following summary of school characteristics is based on the first population, except when referring to comparisons of those represented by students who passed and failed the certification examination.

LOCATION

The schools of cytotechnology were located in 32 states, the District of Columbia and Puerto Rico. Those having the largest number were North Carolina (10%), Ohio (10%), Pennsylvania (10%), New York (6%) and Texas (6%). The schools represented by students who failed the 1965 certification examination were located in 17 of the 32 states, the District of Columbia and Puerto Rico. Those in Georgia, North Carolina, Ohio, Tennessee and Texas had a larger percent of students who failed the examination than the norm for the entire group.1/

SIZE

The school size is classified according to accredited capacity, enrollment and number of students graduating. Approximately half (44%-52%) of the schools had one through four students and slightly more than one-fourth (27%-28%) had five through eight students in these three classifications. The schools accredited for, enrolling and graduating from five through eight students had a larger percent of students who passed the certification examination than the norm for the entire group.1/

STAFF

Almost all (95%) of the school directors were certified either in anatomic pathology or in both clinical and anatomic pathology. The schools directed by those certified only in anatomic pathology had a higher than normal percent of students who passed the certification examination.1/

Three-fourths of the schools had teaching supervisors who were certified as C.T.(ASCP) and almost all of the remainder were M.T.(ASCP), most of whom were also C.T.(ASCP). The percent of the latter group with students who failed the certification examination was higher than normal.1/

1/ The chi square test for distribution could not be applied in all instances in this section on schools because the N in several of the fail groups is less than 5. The distribution of 87% of the group passing and 13% failing the 1965 certification examination constitutes the norm for the entire group.

More than one-third (37%) of the teaching supervisors had from six through ten years of experience. The length of experience for almost half of them was divided between three and five years (27%) and 11 through 15 years (22%). Those with supervisors having five years or less experience had a higher than normal percent of students failing whereas those with 11 through 15 years had a higher than normal percent passing the 1965 certification examination. The annual reports did not specify the nature of this experience.

Almost half (43%) of the teaching supervisors had Bachelor's degrees and training in cytotechnology. Somewhat fewer (39%) had cytotechnology training but no academic degrees. The group with higher than normal percent of passing students had only cytotechnology experience (no formal training) whereas those with higher percent of failing students had Master's degrees and cytotechnology training.

Technical assistants 1/ and people certified as C.T.(ASCP) who may or may not have academic degrees comprise the staff for about three-fourths of the schools. Slightly more than one-third (38%) of the schools had technical personnel who had academic degrees but were not ASCP-certified. There is a tendency for the schools with from three through five people in each of the personnel categories to have a higher than normal percent of students who passed the 1965 certification examination.

EDUCATION PROGRAM

About half (46%) of the schools were initially accredited by the A.M.A. Council on Medical Education between 1958 and 1960.2/ The admission requirement was two years of college for all but five of the schools. The latter stipulated either three or four years.

The program in two-thirds of the schools was six months in length and in almost all of the remaining schools was 12 months. As may be expected, consequently, the students in almost two-thirds (62%) of the schools spent from 840 through 1,040 hours in the training program, and those in most of the remainder (28%) spent up to 2,080 hours. Significantly more of the students in programs requiring up to 2,080 hours passed the certification examination, whereas more of those in programs requiring an excess of 2,080 hours failed the 1965 certification examination. Almost two-thirds of the schools divided their programs so that the students had a maximum of 260 hours of didactic instruction (62%) and from 521 through 1,000 hours of practical instruction (59%). There is a higher percent of students than normal from these particular programs who passed the certification examination.

Almost three-fourths (71%) of the schools had a laboratory workload of from 10,000 through 50,000 cases for cytologic examination. Those with from 20,000 through 50,000 had a higher percent of students passing the examination than normal. The major portion of cases was classified as female genital with the remainder from the respiratory tract, effusions, gastrointestinal and urinary tracts and breast (in decreasing order of case volume).

Almost all (93%) of the schools gave certificates to students completing their programs.

FINANCES

The students in one-fourth of the schools paid tuition. Those in almost three-fourths (73%) of the schools received stipends. Student scholarships were available in about one-third (37%) of the schools. Most of the stipends and scholarships were for $225 per month which is the amount given by the American Cancer Society and U.S. Public Health Service. It is difficult to ascertain the source of this student aid, however, because it was indicated by only a limited number of schools.

1/ The term "technical assistant" was not defined in the annual reports.

2/ The Board of Schools of Medical Technology (ASCP) started accrediting schools in 1958. This activity was transferred to the A.M.A. Council on Medical Education in 1963. The A.M.A. Council is assisted by the Board of Schools in conducting the accreditation program. The years appearing in the table are those given by the school directors on the annual report forms.

TABLE 8

CHARACTERISTICS OF SCHOOLS OF CYTOTECHNOLOGY

Item	All Schools of Cytotechnology		72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a]			
			Total in Study		Passed Exam	Failed Exam
	N[b]	%[b]	N[c]	%[c]	%[d]	%[d]
Number and percent of schools of cytotechnology.....	82	100	313	100	87	13
1. Location of Schools						
California	4	5	25	8	88	12
Colorado	1	1	7	2	86	14
District of Columbia	1	1	2	X[m]	0	100
Georgia.....	2	2	5	2	60	40
Illinois	2	2	16	5	100	0
Indiana.....	2	2	4	1	75	25
Louisiana.....	1	1	10	3	90	10
Michigan	2	2	7	2	86	14
Missouri	1	1	1	X[m]	0	100
Nebraska	1	1	6	2	83	17
New York	5	6	19	6	100	0
North Carolina	8	10	26	8	73	27
Ohio	8	10	16	5	75	25
Oklahoma	1	1	9	3	89	11
Pennsylvania	8	10	28	9	82	18
Tennessee.....	2	2	14	4	71	29
Texas.....	5	6	15	5	80	20
Virginia	3	4	14	4	93	7
Washington	3	4	7	2	86	14
West Virginia.....	1	1	7	2	86	14
Puerto Rico.....	1	1	6	2	83	17
Other[e]	20	24	69	22	100	0
2. Schools initially accredited in						
1948 through 1957.....	11	13	55	18	82	18
1958 through 1960.....	38	46	160	51	88	12
1961 through 1965.....	33	40	98	31	88	12
3. School Director						
a. Certified in						
anatomic pathology only	35	43	140	45	90	10
clinical pathology only	0	0	0	0	0	0
anatomic & clinical pathology	43	52	162	52	83	17
neither given	4	5	11	4	100	0
b. Change in director during the year						
Yes	10	12	36	12	92	8
No.....	70	85	275	88	87	13
No reply.....	2	2	2	X[m]	50	50

TABLE 8
(continued)

Item	All Schools of Cytotechnology		72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a]			
			Total in Study		Passed Exam	Failed Exam
	N[b]	%[b]	N[c]	%[c]	%[d]	%[d]
4. Teaching supervisor						
a. Certified as						
C.T.(ASCP)	62	76	248	79	88	12
M.T.(ASCP)C.T.	11	13	26	8	73	27
M.T.(ASCP)	5	6	24	8	88	12
M.D.	3	4	14	4	93	7
None	1	1	1	X[m]	0	100
b. Years of experience[f]						
3 through 5 years	22	27	68	22	79	21
6 through 10 years	30	37	113	36	90	10
11 through 15 years	18	22	70	22	93	7
16 through 20 years	8	10	41	13	83	17
21 years or more[f]	1	1	16	5	81	19
No reply	3	4	5	2	80	20
c. Academic preparation						
Cytotechnology experience only	5	6	19	6	90	10
No degree, cytotech. training	32	39	121	39	87	13
Bachelor's degree, cytotech. training	35	43	127	41	88	12
Master's degree, cytotech. training	5	6	26	8	77	23
M.D.	3	4	14	4	93	7
Other[g]	2	2	6	2	83	17
5. Certificate granted by schools						
Yes	76	93	297	95	87	13
No	5	6	15	5	93	7
No reply	1	1	1	1	100	0
6. Tuition charged by schools						
Yes	20	24	101	32	88	12
No	57	70	191	61	86	14
No reply	5	6	21	7	91	9
7. Stipend paid by schools						
Yes	60	73	264	84	88	12
No	21	26	48	15	83	17
No reply	1	1	1	X[m]	100	0
8. Scholarship awarded by schools						
Yes	30	37	127	41	89	11
No	51	62	183	58	86	14
No reply	1	1	3	1	67	33
9. Room &/or board provided by schools						
Yes	15	18	45	14	87	13
No, none	67	82	268	86	87	13

TABLE 8
(continued)

Item	All Schools of Cytotechnology		72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a]			
			Total in Study		Passed Exam	Failed Exam
	N[b]	%[b]	N[c]	%[c]	%[d]	%[d]
10. Technical staff in schools						
a. With degree: C.T.(ASCP) ...	61	74	252	81	87	13
1 person	29	35	95	30	86	14
2 people	15	18	67	21	81	19
3 through 5 people	15	18	76	24	90	10
6 people or more[h].....	2	2	14	5	100	0
0 people	21	26	61	19	89	11
b. With degree: Non-ASCP	31	38	116	37	89	11
1 person	13	16	49	16	92	8
2 people	6	7	22	7	77	23
3 through 5 people[h].....	12	15	45	14	91	9
0 people	51	62	197	63	86	14
c. Without degree: C.T.(ASCP)	58	71	245	78	88	12
1 person	23	28	77	25	86	14
2 people	18	22	71	23	86	14
3 through 5 people	15	18	75	24	95	5
6 people or more[h].....	2	2	22	7	82	18
0 people	24	29	68	22	82	18
d. Other technical assistants	58	71	197	63	86	14
1 person	27	33	78	25	81	19
2 people	19	23	65	21	85	15
3 through 5 people	8	10	34	11	91	9
6 people or more[h].....	4	5	20	6	100	0
0 people	24	29	116	37	89	11
e. Other employees in schools	52	63	229	73	90	10
1 person	34	42	137	44	88	12
2 people	7	9	38	12	97	3
3 through 5 people	9	11	43	14	84	16
6 people or more[h].....	2	2	11	4	100	0
0 people	30	37	84	27	80	20
11. Years of college required for admission						
2 years.....	77	94	291	93	88	12
3 years.....	2	2	3	1	0	100
4 years.....	3	4	19	6	90	10
12. Length of training						
6 months.....	54	66	208	66	89	11
12 months.....	23	28	90	29	82	18
6 through 12 months	5	6	15	5	93	7

TABLE 8
(continued)

Item	All Schools of Cytotechnology		72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a]			
			Total in Study		Passed Exam	Failed Exam
	N[b]	%[b]	N[c]	%[c]	%[d]	%[d]
13. Hours spent in training						
a. Total						
840 through 1040 hours.....	51	62	157	50	96	4
1041 through 2080 hours.....	21	26	78	25	92[n]	8[n]
2081 hours or more[i].....	6	7	10	3	60[n]	40[n]
Other[j]	1	1	8	3	88	13
No reply	3	3	60	19	60	40
b. Didactic instruction						
0 hours.....	3	4	10	3	90	10
1 through 130 hours.....	31	38	102	33	85	15
131 through 260 hours.....	20	24	73	23	90	10
261 through 520 hours.....	13	16	49	16	84	16
521 hours or more[i]	15	18	79	25	87	13
c. Practical instruction						
0 hours.....	3	4	10	3	90	10
1 through 520 hours.....	14	17	63	20	83	17
521 through 1000 hours	48	59	141	45	91	9
1001 hours or more[i]	17	21	99	32	84	16
14. Number of students per school						
a. Accredited capacity in 1964						
1 through 4 students	43	52	100	32	86	14
5 through 8 students	22	27	107	34	92	8
9 students or more[k].....	17	21	106	34	83	17
b. Enrollment in 1964						
0 students	10	12	17	5	82	18
1 through 4 students	36	44	95	30	81	19
5 through 8 students	22	27	92	29	91	9
9 students or more[k].....	14	17	109	35	89	11
c. Graduating in 1965						
0 students	13	16	26	8	85	15
1 through 4 students	36	44	108	35	84	16
5 through 8 students	23	28	99	32	92	8
9 students or more[k].....	10	12	80	26	85	15
15. Number of cases processed in lab. in 1964						
a. Female Genital						
500 through 10,000 cases	29	35	111	35	87	13
10,001 through 20,000 cases	31	38	101	32	84	16
20,001 through 30,000 cases	11	13	43	14	93	7
30,001 cases or more[l].....	11	13	58	19	88	12

TABLE 8
(continued)

Item	All Schools of Cytotechnology		72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a]			
			Total in Study		Passed Exam	Failed Exam
	N[b]	%[b]	N[c]	%[c]	%[d]	%[d]
15. Number of cases processed in lab. in 1964 (continued)						
b. Respiratory tract						
34 through 500 cases...	35	43	120	38	86	14
501 through 1,000 cases...	18	22	66	21	82	18
1,001 cases or more[l]	29	35	127	41	91	9
c. Gastrointestinal tract						
0 cases.....	4	5	16	5	75	25
2 through 50 cases.....	33	40	91	29	87	13
51 through 100 cases.....	18	22	85	27	82	18
101 through 500 cases.....	24	29	110	35	94	6
501 cases or more[l]	3	4	11	4	73	27
d. Effusions						
0 cases.....	1	1	2	X[m]	100	0
20 through 100 cases.....	33	40	101	32	82	18
101 through 200 cases.....	25	30	98	31	92	8
201 through 500 cases.....	20	24	93	30	86	14
501 cases or more[l]	3	4	19	6	90	10
e. Urinary tract						
0 cases.....	1	1	4	1	75	25
34 through 50 cases.....	43	52	138	44	83	17
51 through 100 cases.....	16	20	76	24	88	12
101 through 500 cases.....	18	22	84	27	91	9
501 cases or more[l]	4	5	11	4	100	0
f. Breast						
0 cases	8	10	29	9	86	14
2 through 25 cases.....	40	49	144	46	87	13
26 through 50 cases.....	16	20	70	22	87	13
51 cases or more[l]	18	22	69	22	87	13
g. Total number of cases processed in 1964						
3,800 through 10,000 cases	23	28	77	25	86	14
10,001 through 20,000 cases	36	44	134	43	85	15
20,001 through 50,000 cases	22	27	83	27	92	8
50,001 cases or more[l].....	2	2	19	6	84	16

a. The characteristics of schools of cytotechnology are presented as they apply to two populations: (1) 82 schools as individual institutions or programs; (2) 313 schools represented by 313 people who attended the 72 individual institutions. The latter population (313) was derived to enable a comparison of the separate characteristics represented by the people who passed the 1965 certification examination and those who failed. Duplication of particular characteristics can be identified by associating the N (number) for the "Schools of Cytotechnology" (82) with the N (number) for the "Total in Study" (313). For example: 4 Schools of Cytotechnology in California are represented by 25 schools attended by 25 people.

Footnotes for Table 8
(continued)

b. The summation of N (number) and % (percent) for the Schools of Cytotechnology follow the vertical dimension of the table. All percents are based on 82 schools.

c. The summations of N (number) and % (percent) for the Total in Study follow the vertical dimension of the table. All percents are based on 313 schools.

d. The summations of % (percent) for the Pass and Fail groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Total in Study). For example: 25 of the programs are located in California of which 88% represent the people who passed the 1965 certification examination and 12% represent those who failed.

e. "Other" includes 13 states each of which represents less than 5% of the Total and Pass groups.

f. The report form providing information about the schools did not specify the type of experience, i.e. that it was restricted to cytotechnology. The maximum number of years of experience for the Total and Pass groups is 23, for the Fail is 20. The minimum number of years of experience for all three groups is 2.

g. "Other" includes 2 people who both had a combination of Master's degree and formal training as medical technologists and cytotechnologists.

h. The maximum number of people for each category is as follows:

With degree: C.T.(ASCP)	9 for Total and Pass groups
	4 for Fail group
With degree: Non-ASCP	5 for Total, Pass and Fail groups
Without degree: C.T.(ASCP)	8 for Total, Pass and Fail groups
Other technical assistants	10 for Total and Pass groups
	3 for Fail group
Other employees	7 for Total and Pass groups
	5 for Fail groups

i. The maximum number of hours spent in training is as follows:

Total	2,400 for Total, Pass and Fail groups
Didactic training	1,040 for Total, Pass and Fail groups
Practical training	2,200 for Total, Pass and Fail groups

The minimum number of hours spent in training is as follows:

Total	840 for Total, Pass and Fail groups
Didactic training	10 for Total, Pass and Fail groups
Practical training	30 for Total, Pass and Fail groups

j. "Other" indicates a reply of "40 hours per week".

k. The maximum number of students is as follows:

Accredited capacity	20 for Total, Pass and Fail groups
Enrolled	18 for Total, Pass and Fail groups
Graduating	18 for Total, Pass and Fail groups

The minimum number of students for each of the three categories and groups is one.

Footnotes for Table 8
(continued)

l. The range of the number of cases per program is as follows:

Female Genital	Total group	500 - 97,900
	Pass group	500 - 97,900
	Fail group	3,100 - 55,900
Respiratory tract	Total group	34 - 7,000
	Pass group	34 - 7,000
	Fail group	50 - 4,000
Gastrointestinal tract	Total group	2 - 1,200
	Pass group	2 - 1,200
	Fail group	5 - 1,200
Effusions	Total group	20 - 745
	Pass group	20 - 745
	Fail group	25 - 745
Urinary tract	Total group	1 - 577
	Pass group	1 - 577
	Fail group	9 - 348
Breast	Total group	2 - 160
	Pass group	2 - 160
	Fail group	2 - 160
Total cases	Total group	3,800 -104,000
	Pass group	3,800 -104,000
	Fail group	3,800 - 65,300

It is possible that many of the figures apply to slides rather than cases even though the annual report form requested cases.

m. X = Less than 1%.

n. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. $X^2 = 13.70$; df = 1, $X^2 = 3.84$

D. PERFORMANCE IN CERTIFICATION EXAMINATION

Raw scores and other information related to the 1965 certification examination were obtained from the office of the Registry of Medical Technologists (ASCP). The examination consisted of two sections: (1) 40 multiple choice and 12 matching questions worth 100 points relating to cell morphology, pertinent basic science, epidemiology, and techniques ("written" section); (2) 25 micro slides worth 100 points for cytologic interpretation ("practical" section).

The entire examination is prepared by a committee of pathologists who also arrange the practical section schedule throughout the country. Candidates are required to provide their own microscopes and lamps for the practical examination. Both sections are scored in the Registry office using answer keys provided by the committee.

The cytotechnology consultants to the study staff reviewed the content of the questions in the written section. They agreed that 48 points related to cell morphology, 40 to pertinent basic science, 3 to epidemiology, and 9 to techniques. Since the practical section (100 points) requires a knowledge of morphology for cytologic interpretation, it is estimated that the total 200 points for the examination are distributed as follows: 74% cell morphology, 20% pertinent basic science, 1.5% epidemiology, and 4.5% techniques.

The raw score analysis reflects the performance required for passing the examination and thus becoming certified. Each candidate must receive a passing score in both sections of the examination, written and practical, in order to be certified. Of the 51 people who failed the 1965 examination, 20 passed the written and failed the practical, 25 failed the written and passed the practical, and 6 failed both sections.

The analysis of examination scores is given in Table 9. The minimum raw score for passing the written section is 56 points. The mean raw score is 71.7 points with a range of 25 through 94 points. The mean raw score for those who passed this section is 74.2 points with a range of 56 through 94 points. For those who failed, the mean raw score is 56.6 points with a range of 25 through 77 points.

The minimum raw score for passing the practical section is 70 points. The mean raw score is 80.2 points with a range of 43 through 97 points. The mean raw score for those who passed this section is 81.9 points with a range of 70 through 97 points. For those who failed this section, the mean raw score is 69.9 points with a range of 43 through 89 points.

Table 10 contains information about the candidates for the 1965 certification examination. Eighty-seven percent (311) of the 358 candidates took the written section for the first time and the remainder for the second, third and fifth times. Significantly more of those attempting this for the second time failed the 1965 certification examination. Almost all (97%) of the candidates took the practical section for the first time. The discrepancy occurs because prior to 1965 the candidates were required to pass the written section of the examination before attempting the practical. The policy changed in 1965 and required that all candidates take both sections in the same examination period regardless of their performance on separate sections.

Almost half (48%) of the candidates started their clinical study in 1963 and about one-third (29%) between 1958 and 1962. Significantly more of those who began their clinical study between 1958 and 1961 failed the 1964 certification examination.

Women comprised 85% (304) of the applicants and men 15% (54). Significantly more of the men (13) failed the examination. It is noteworthy that these same men are included in the fail group of 19 people who started their clinical study between 1958 and 1961.

One-fourth of the candidates indicated that they had teaching duties in cytotechnology at the time they applied for the 1965 certification examination.

TABLE 9

1965 CERTIFICATION EXAMINATION PERFORMANCE

Item	Total in Study	Passed Exam[a]	Failed Exam[a]
Number of Cytotechnologists	358	307	51
Written section raw score			
Range	25 - 94	56 - 94	25 - 77
Mean	71.7	74.2	56.6
Median	73	74	54
Mode	74	74	55
Maximum points possible	100		
Minimum points needed to pass the section	56		
Practical section raw score			
Range	43 - 97	70 - 97	43 - 89
Mean	80.2	81.9	69.9
Median	81	82	68
Mode	84	84	71
Maximum points possible	100		
Minimum points needed to pass the section	70		

a. Each candidate must receive a passing score in both sections, written and practical, in order to be certified.

TABLE 10

INFORMATION FROM
1965 CERTIFICATION EXAMINATION APPLICATION FORMS

Item	Total in Study		Passed Exam[a]	Failed Exam[a]
	N[b]	%[b]	%[c]	%[c]
Number and percent of cytotechnologists.....	358	100	86	14
1. Attempts to take certification examination				
a. Written section				
First attempt.....	311	87	87	13
Second attempt	40	11	70	30[d]
Third and fifth attempts	7	2	100	0
b. Practical section				
First attempt.....	346	97	86	14
Second attempt	12	3	67	33
2. Year clinical study started				
1926 through 1957.....	27	8	93	7
1958 through 1961.....	56	16	66	34[e]
1962	45	13	87	13
1963	173	48	90	10
1964	57	16	90	10
3. Sex of applicants				
a. Female	304	85	88	12
Single	175	49	86	14
Married.....	129	36	90	10
b. Male	54	15	76	24[f]
4. Teaching cytotechnology at time of application for 1965 examination				
Yes.....	85	24	87	13
No	112	31	88	12
No reply	161	45	84	16

a. The terms "Passed Exam" and "Failed Exam" refer to passing and failing the 1965 certification examination for cytotechnologists given by the Registry of Medical Technologists (ASCP).

b. The summations of N (number) and % (percent) for the Total in the Study follow the vertical dimension of the table. All percents are based on 358 people.

c. The summations of % (percent) for the Passed Exam and Failed Exam groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column. For example: 311 people were making the first attempt on the written section of whom 87% passed and 13% failed it.

d. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level.
$X^2 = 8.71$; df = 1, $X^2 = 3.84$

e. Calculation of chi square test for distribution. 0.05 probability level.
$X^2 = 19.55$; df = 1, $X^2 = 3.84$

f. Calculation of chi square test for distribution. 0.05 probability level.
$X^2 = 5.03$; df = 1, $X^2 = 3.84$

E. CHARACTERISTICS OF CYTOTECHNOLOGISTS

The 358 cytotechnologists selected for this study constitute the entire group that took the certification examination for cytotechnologists given by the Board of Registry of Medical Technologists (ASCP) in 1965. This is the largest group for a single examination since the first was given in 1957. Questionnaires were sent in July 1967 to all of these cytotechnologists by the National Council on Medical Technology Education.1/ They were returned by 70% (249) of the cytotechnologists of whom 89% (222) had passed and 11% (27) had failed the certification examination. Information from these questionnaires is compiled in the following tables: Table 11 contains the working environment characteristics, Table 12 the educational background, Tables 13 through 17 the education and job experiences in quality control measures, and Table 18 the education and job experiences in technical procedures.

Working Environment

LOCATION

The 249 cytotechnologists worked in 42 states, the District of Columbia, Puerto Rico and Canada. The largest groups worked in California (12%) and New York (8%). In Missouri, North Carolina, Pennsylvania, Tennessee and Virginia there were more who failed the certification examination than the norm for the entire group.2/ Two-thirds of all of the cytotechnologists were working in the state in which they received their training.

EXPERIENCE

The total working experience for two-thirds of the cytotechnologists was four years or longer. Significantly more of those with five years or more total working experience failed the certification examination. Employment turnover is indicated by the tenure of the cytotechnologists' appointments. Nineteen percent of them worked at their present places of employment for one year or less, 14% for two years, 27% for three years, 18% for four years, and 14% for five years or longer. One-fourth had held their current positions for one year or less, 16% for two years, 22% for three years, 14% for four years, and 12% for five years or longer. Although more of those staying at the same place of employment and in the same position for five years or longer failed the 1965 certification examination, the distribution is not statistically significant.3/

TYPE OF LABORATORY

Eighty-eight percent (220) of the cytotechnologists were employed full time. Most of them worked day hours only (no weekend or night schedule) in hospital laboratories and spent all of their time in cytology departments. Some of the cytotechnologists also worked in other laboratory departments such as hematology, chemistry, microbiology and blood bank, however less than 10% worked in any one of them.

Sixteen percent (41) of the 249 cytotechnologists indicated part time employment. Of this group, 12 people stated that they had both full and part time positions. About half of those working part time did so during the day and half had schedules including day, night and/or weekend hours. The same portion worked in hospitals and independent laboratories. Somewhat more than half of this group spent all of their time in cytology departments.

1/ A copy of the questionnaire is in the Appendix.

2/ The chi square test for distribution could not be applied in all instances because the N in several of the fail groups is less than 5. The distribution of 89% of the group passing and 11% failing the 1965 certification constitutes the norm (normal) for this population.

3/ $X_2^2 = 3.95$; df = 4, $X_2^2 = 9.49$ (Place of employment) (0.05 probability level)
$X^2 = 5.78$; df = 4, $X^2 = 9.49$ (Position) (0.05 probability level)

The mean bed capacity of the hospitals in which 140 of the 165 cytotechnologists worked is 537. The mean bassinet capacity for 123 of these hospitals is 51.1/

Most (87%) of the 249 cytotechnologists had laboratory directors who were pathologists, almost all of whom had full time positions. Almost all of the directors who were on a part time or consultant basis were in the cities where their cytotechnologists worked.

Slightly more than half (52%) of the cytotechnologists said that their laboratory directors and immediate supervisors were available at all times for consultation about laboratory problems. About half (53%) reported that they consulted their immediate supervisors daily about laboratory problems.

DUTIES AND RESPONSIBILITIES

The types of positions held by the 249 cytotechnologists are almost equally divided between supervisory (29%), non-supervisory (31%) and sole cytotechnologist (22%). Approximately one-third (35%) stated that they were teaching cytotechnology but most were assisting rather than supervising in programs.

Half of the 249 cytotechnologists stated that they made decisions about the purchase of all equipment, reagents, etc. in the laboratory. Complete responsibility for such purchases was indicated by 29% of all of the cytotechnologists. Approximately one-third (35%) indicated that they have this responsibility for some of the equipment, reagents, etc. Somewhat more of those with complete responsibility of this nature failed the 1965 certification examination than passed, but the difference is not statistically significant.

Eighty-two percent (204) of the cytotechnologists reported that their immediate supervisors had defined their duties and responsibilities for them. Almost all (92%) said they felt that they had been given the responsibility to use independent judgment in the performance of their duties. All of the negative replies to both of these questions were given by people who passed the 1965 certification examination.

Approximately three-fourths (72%) of the cytotechnologists reported that they discussed problems pertaining to laboratory tests with physicians and others ordering them.

About three-fourths (73%) of the cytotechnologists said that staff pathologists or physicians in their institutions instructed clinicians in methods of specimen procurement to assure proper sampling and cell distribution on micro slides. Only three of the 249 cytotechnologists stated that they did so when a physician was not available.

QUALITY CONTROL MEASURES

The following activities in the practice of cytotechnology were identified by the study consultants as quality control measures:

(1) the review of cytotechnologists' morphologic interpretations by laboratory directors;
(2) information used for correlating clinical and cytologic diagnoses;
(3) identification and verification of specimens throughout preparatory and screening processes;
(4) preparation, maintenance and evaluation of staining solutions.

Physicians reviewed all of the micro slides screened by 16% of the cytotechnologists. Only those showing positive and inconclusive morphology were reviewed by physicians for almost two-thirds (61%) of the cytotechnologists. About one-third of the people giving this reply said that physicians also examined other slides including those for all non-genital cases, certain classifications of abnormal morphology, and material for cytogenetic interpretation. Of those for whom only inconclusive morphology was reviewed by physicians more than the norm for the entire group failed the certification examination than passed it. About half (56%) of the cytotechnologists said that conferences were held in their laboratory departments to review slides and/or cases involving exfoliative cytology. In almost all instances these conferences included pathologists and cytotechnologists.

1/ Hospitals, Journal of the American Hospital Association, Guide Issue Part 2; 41: 453 (August 1) 1967 (Table 1)

The cytotechnologists used several sources of information for correlating clinical and cytologic diagnoses including surgery schedules, medical records, pathology surgical and autopsy reports, and notations from patients' physicians. No particular pattern is evident in these responses.

Table 13 shows the responses of 229 of the cytotechnologists who indicated their present job experiences in identification and verification of specimens, and preparation and use of staining solutions.

Half of the cytotechnologists reported that they record the appearance of specimens on requisition forms when they are received in the laboratory. Included in this group are 33% who said they record all specimens and 17% only non-genital specimens. About one-fourth (27%) reported that someone else in the laboratory does this.

Two-thirds of the 229 cytotechnologists stated that they use serial accession numbers for verifying patients' and case numbers. This was done by someone else in the laboratory for almost all of the remaining group.

More than half (59%) indicated that they labeled equipment used to process non-genital cases by using case or accession numbers. About one-fourth (27%) said that someone else did this in the laboratory.

About two-thirds (69%) of the 229 cytotechnologists routinely verify patients' names and/or accession numbers on micro slides and requisition forms before processing material. About one-fourth (27%) reported that someone else did this.

Almost half (48%) stated that they routinely record the number of slides and filtration units made from a case at the beginning of processing and slightly more than half (55%) said they used this record to verify the number of slides per case. About one-fourth (28%) said that someone else recorded this information and 19% said that someone else verifies it. This information was not recorded by 19% of the cytotechnologists and not verified by 17%.

Somewhat more than half (59%) of the cytotechnologists regularly check the shelf life of reagents and discard those that have expired. Almost one-third (30%) stated that someone else in the laboratory did this. Seventeen percent said that they make stains and reagents used in the laboratory. The remainder either purchase some or all of them, or had someone else in the laboratory do this.

Almost three-fourths (72%) of the 229 cytotechnologists reported that they examined the slides for quality of staining either each time a batch is processed or at least once a day. This was done weekly or when the stain is changed by 15% of the group and by someone else for 10% of the group.

Stains were filtered each time slides were processed or several times a day by 12% of the cytotechnologists and daily or less frequently by 54% of them. One-third had someone else take care of this duty.

Alcohols for the staining procedure were filtered each time slides were stained or several times a day by 5% of the cytotechnologists and daily or less frequently by one-third of them. Someone else did this for almost one-third (29%) of the group. Approximately one-third (30%) did not filter alcohols.

Three percent of the cytotechnologists changed stains daily and almost two-thirds (64%) weekly or less frequently. Almost all of the remainder said that someone else in the laboratory did this for them.

Alcohol solutions were changed daily by 12% of the cytotechnologists and twice a week or less frequently by about half (52%) of them. One-third reported that someone else in the laboratory did this.

Body cavity fluids (hypercellular specimens) were stained separately by approximately one-third (35%) of the cytotechnologists. About one-fourth (29%) said that they did not stain them separately and the same portion said that someone else did this for them.

TABLE II

CHARACTERISTICS OF CYTOTECHNOLOGISTS

PERTAINING TO WORKING ENVIRONMENT

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
Number and percent of cytotechnologists.....	249	100	89	11
1. Total working experience				
1 year or less	1	X[u]	0	100
2 years.....	14	6	93	7
3 years.....	71	29	93	7
4 years.....	88	35	94	6
5 years or more[c]	74	30	81[t]	19[t]
No reply	1	X[u]	0	100
2. Employed in				
Arizona.....	3	1	67	33
California	29	12	90	10
District of Columbia	3	1	0	100
Illinois	11	4	91	9
Kentucky	4	2	75	25
Missouri	5	2	80	20
Montana.....	1	X[u]	0	100
New Jersey	5	2	80	20
New York	19	8	90	10
North Carolina	10	4	80	20
Pennsylvania	13	5	69	31
Tennessee.....	5	2	60	40
Texas.....	12	5	92	8
Virginia	9	4	78	22
Other[d]	111	45	100	0
No reply	9	4	78	22
3. Director of Laboratory				
a. M.D., Pathologist	216	87	88	12
Full Time.....	199	80	88	12
Part Time.....	11	5	91	9
Consultant	6	2	100	0
b. M.D., Not Pathologist.....	13	5	92	8
Full Time.....	8	3	100	0
Part Time.....	5	2	80	20
Consultant	0	0	0	0
c. Not M.D.: Full Time	4	2	100	0
d. No reply	16	6	94	6
e. Location of part time or consultant director				
Same city, same state.....	15	6	87	13
Different city, same state	2	X[u]	100	0
No reply	232	93	89	11

TABLE II
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
4. Length of time at place of present employment				
1 year or less	47	19	87	13
2 years	35	14	89	11
3 years	66	27	92	8
4 years	45	18	93	7
5 years or more[e]	35	14	80	20
No reply	21	8	90	10
5. Full time employment	220	88	89	11
a. Schedule				
Days only	184	74	90	10
Days and weekends	21	8	81	19
Other[f]	15	6	87	13
b. Type of laboratory				
Hospital	147	59	88	12
Independent	55	22	87	13
Other[g]	18	7	94	6
c. Time spent in cytology				
100%	156	63	90	10
99% through 60%	35	14	80	20
59% through 40%	9	4	100	0
39% or less	7	3	86	14
No reply	13	5	85	15
d. Time spent in pathology (histology)				
100%	12	5	75	25
99% through 60%	3	1	100	0
59% through 40%	6	2	100	0
39% or less	19	8	68	32
No reply	180	72	91	9
e. Time also spent in[h]				
Hematology	23	9	87	13
Chemistry	14	6	86	14
Microbiology	9	4	89	11
Blood Bank	7	3	86	14
Other laboratory departments	16	6	88	12
6. Part time employment[i]	41	16	90	10
a. Schedule				
Days only	18	7	94	6
Days and weekends	3	1	100	0
Other[i]	20	8	85	15
b. Type of laboratory				
Hospital	18	7	89	11
Independent	19	8	95	5
Other[j]	4	1	50	50

TABLE 11
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
6. Part time employment (continued)				
c. Time spent in cytology				
100%	25	10	84	16
Less than 100%	7	3	86	14
No reply	9	4	100	0
d. Time spent in pathology (histology)				
100%	4	2	100	0
Less than 100%	0	0	0	0
No reply	37	14	89	11
e. Time also spent in[h]				
Hematology	2	X[u]	100	0
Chemistry	2	X[u]	100	0
Microbiology	4	2	100	0
Blood Bank	2	X[u]	100	0
Other laboratory departments	3	1	100	0
7. Type of position held				
a. Supervisory	73	29	89	11
Chief Cytotechnologist	65	26	89	11
Section Chief	6	2	83	17
Chief of Research	2	X[u]	100	0
b. Non-supervisory	78	31	91	9
Cytopreparation	1	X[u]	100	0
Cytoscreening	28	11	86	14
Cytopreparation and cytoscreening	46	18	93	7
Research	1	X[u]	100	0
Other[k]	2	X[u]	100	0
c. Solo cytotechnologist	68	22	87	13
d. No reply	30	12	90	10
e. Teaching duties				
Yes	86	35	92	8
Teaching supervisor	9	4	100	0
Assist with teaching	77	31	91	9
No reply	163	65	88	12
8. Time in present position				
1 year or less	62	25	89	11
2 years	40	16	90	10
3 years	56	22	95	5
4 years	34	14	94	6
5 years or more[l]	29	12	79	21
No reply	28	11	82	18

TABLE 11
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
9. Consultation with				
a. Laboratory Director				
Available at all times	129	52	85	15
Available often	67	27	97	3
Available when needed	38	15	92	8
Other[m]	5	2	80	20
No reply	10	4	80	20
b. Immediate supervisor				
Available at all times	129	52	88	12
Available often	22	9	96	4
Available when needed	19	8	84	16
Other[m]	3	1	67	33
No reply	76	31	91	9
c. Frequency of consulting immediate supervisor				
Daily	132	53	90	10
Weekly	29	12	93	7
Less than weekly	21	8	86	14
When necessary	21	8	81	19
Other[n]	8	3	100	0
No reply	38	15	87	13
10. Make decisions about purchase of				
a. all equipment, etc.				
Yes, help others	54	22	91	9
Yes, have complete responsibility	73	29	85	15
No, do not do this	60	24	92	8
No reply	62	25	90	10
b. some equipment, etc.				
Yes, help others	56	23	95	5
Yes, have complete responsibility	30	12	87	13
No, do not do this	40	16	88	12
No reply	123	49	88	12
11. Duties and responsibilities defined by supervisor				
Yes	204	82	88	12
No	27	11	100	0
No reply	18	7	89	11
12. Given responsibility to use independent judgment in performance of duties				
Yes	230	92	89	11
No	10	4	100	0
No reply	9	4	78	22
13. Discuss problems with laboratory tests with those who request them				
Yes	180	72	90	10
No	56	23	89	11
No reply	13	5	77	23

TABLE 11
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
14. Review of screened slides by physician				
All slides reviewed	41	16	93	7
Positive slides only	1	X[u]	100	0
Inconclusive slides only	9	4	78	22
Positive and inconclusive slides	151	61	87	13
Positive, inconclusive and sample of negative	29	12	97	3
Other[o]	7	3	100	0
None of slides reviewed	1	X[u]	100	0
No reply	10	4	80	20
15. Slide &/or case reviews by department staff				
a. Schedule				
Daily	64	26	89	11
Weekly	26	10	92	8
Other[p]	50	20	86	14
No reviews	89	36	91	9
No reply	20	8	85	15
b. Participants				
All staff including pathologist & cytotechnologists	74	30	89	11
Laboratory Director, Chief & cytotechnologists	32	13	91	9
Chief & cytotechnologists only	19	8	84	16
Pathologists &/or other physicians only	8	3	88	12
Other[q]	5	2	80	20
No reply	111	45	90	10
16. Sources of information for correlating clinical and cytologic diagnoses				
Surgery schedule	1	X[u]	0	100
Medical records	13	5	69	31
Pathology surgical report	46	19	89	11
Pathology autopsy report	2	X[u]	100	0
Combination of above sources	122	49	90	10
All sources	31	12	97	3
Other[r]	15	6	93	7
None	3	1	67	33
No reply	16	6	88	12
17. Specimen procurement instruction given by				
Staff pathologist or physician	183	73	87	13
Staff members other than pathologist or physician	29	12	100	0
Cytotechnologist when physician not present	3	1	100	0
Other[s]	8	3	88	12
No instruction given	9	4	89	11
No reply	17	7	88	12

Footnotes for Table 11

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension of the table. All percents are based on 249 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: 14 people had two years of college of whom 93% passed the 1965 certification examination and 7% failed. The examination is that given by the Board of Registry of Medical Technologists (ASCP) in 1965 for certification of cytotechnologists.

c. The maximum number of years of total working experience for the Total and Passed Exam groups is 15, for the Failed Exam group is 13.

d. "Other" includes 29 states, Canada and Puerto Rico in the Total and Passed Exam groups of which each have less than 5% of the people in the Total group, all of whom passed the 1965 certification examination.

e. The maximum number of years worked at the present place of employment for the Total and Passed Exam groups is 14, and for the Failed Exam group is 10.

f. "Other" includes 4 people who work day and night schedules,
6 people who work day, weekend and night schedules,
4 people who work at home, and
1 person who works at night only.

g. "Other" includes 8 people who work in public health laboratories,
1 person who works in a research laboratory,
2 people who work independently at home, and
7 people who combine work in hospital laboratories with research and independent laboratories.

h. These percents should not total 100% for the Total group. Each section should be considered separately, i.e. the portion of cytotechnologists working in laboratory departments other than cytology and histology.

i. "Other" includes 1 person who works day and night schedules,
2 people who work day, weekend and night schedules,
5 people who work nights only,
6 people who work night and weekend schedules,
1 person who works only a weekend schedule, and
5 people who work occasionally as relief staff.
Twelve people indicated both full and part time employment. Of these, ten passed the 1965 certification examination and 2 failed it.

j. "Other" includes 2 people who work in research laboratories,
1 person who works at home, and
1 person who combines hospital and independent laboratories.

k. "Other" includes 1 person screening at home, and
1 person combining cytoscreening with general emergency call in laboratory.

l. The maximum number of years worked in the present position for the Total and Passed Exam groups is 13, for the Failed Exam group is 9.

m. "Other" includes replies of "Available by phone or mail only" and "Not always available when needed.".

n. "Other" includes 8 replies which do not indicate clearly that there is consultation with the immediate supervisor, of which two are from people who work alone.

Footnotes for Table 11
(continued)

o. "Other" includes replies specifying the cell classification submitted for review, most being "Class II" and above.

p. "Other" includes review times varying from "every other day" to "isolated occasions" to specification of cases reviewed to "cases of interest".

q. "Other" includes replies to the effect that "it depends on the situation", "students", "discussion of research together".

r. "Other" includes references to use of information on requisition forms, information from doctors, tumor registry.

s. "Other" includes replies to the effect that cytotechnologist does this when necessary (in absence of physician). One person did not know who was responsible for this instruction.

t. Calculation of the chi square test for distribution shows that these figures are statistically significant in that the frequency of replies exceeds the 0.0% probability level.
$X^2 = 9.08$; df = 3, $X^2 = 7.81$

u. X = Less than 1 .

Education Background

The education background reported by the cytotechnologists includes the length of time they attended college, certain aspects of their cytotechnology training, and their involvement in continuing education. Table 12 summarizes this information.

COLLEGE

Almost all (95%) of the 249 cytotechnologists reported that they attended college for two years or longer. About one-third (35%) attended for four years, almost all of whom earned Bachelor's degrees. Approximately half (47%) of them were in college for two or three years, but the major portion did not obtain degrees. Significantly more of those attending for four years or longer earned Bachelor's or higher degrees, whereas fewer of those who attended for two or three years earned degrees. Significantly more of those who attended college for one year or less failed the 1965 certification examination.

CLINICAL STUDY PROGRAMS

The cytotechnologists' clinical study 1/ programs varied in length because some received their instruction prior to the time the A.M.A. Council on Medical Education accredited schools of cytotechnology. For purposes of this study, the time cytotechnologists spent in their clinical study programs is classified as "12 months" and "Other". The latter refers to those programs which the study participants said varied in length from three months through 12 years. The replies are further divided into accredited and non-accredited programs according to the A.M.A. Council on Medical Education.

Eighty-three percent (206) of the 249 cytotechnologists indicated that their clinical study programs were 12 months in length. About half of these were divided so that the first six months, consisting primarily of didactic work, was spent in one laboratory and the second six months (primarily practical work) elsewhere. The other half of this group stayed in one laboratory for the entire period. Significantly more of the cytotechnologists in the latter group had their 12 months of clinical study in a laboratory that was not accredited as a school of cytotechnology than did those who divided their 12 months of study. There is no significant difference , however, in the certification examination performance of the people in accredited and non-accredited programs in the two groups.2/

A comparison of the people attending accredited and non-accredited programs, regardless of their length, shows that significantly more of those who attended accredited programs passed the 1965 certification examination and more of those who attended non-accredited programs failed it. Eighty-four percent of the cytotechnologists reported that they attended accredited programs.

1/ The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 209 of the 249 people who returned questionnaires. The remaining 40 people were trained prior to 1960 under the direction of pathologists or other physicians recognized in the field of cytology.

2/ $X^2 = 2.78$; df = 1, $X^2 = 3.84$ (0.05 probability level)

The clinical study programs were located in 33 states, the District of Columbia and Puerto Rico with the largest number of people attending in California (10%), New York (10%), and Pennsylvania (8%). A larger than normal percent of people who attended programs in the District of Columbia, Pennsylvania and Tennessee failed the 1965 examination.1/ Seventy percent of the cytotechnologists indicated that they completed their clinical study (second six months period) in 35 states, Canada and a foreign country. The states in which the largest number of people completed this portion of their programs are California (9%) and New York (7%).

As noted earlier in this report, two-thirds of the 249 cytotechnologists were working in the state in which they received their training. This group includes 19% who said they worked in the laboratory in which they did their clinical study, 23% worked in the same city but a different laboratory, and 24% worked in the same state but a different city.

The cytotechnologists were asked to indicate the number of lectures in basic sciences, cytology and cytopreparatory techniques they received during their clinical study program. About half (48%) said they attended lectures in the basic sciences with most receiving more than ten. Cytology lectures were attended by three-fourths of the cytotechnologists of whom most indicated more than 30. Two-thirds of them attended lectures in cytopreparatory techniques. The number of lectures in this subject seems to vary more than the other two because almost as many people attended 31 or more lectures as 11 through 30 and one through ten lectures.

Replies about the presentation of lectures pertaining to cytotechnology during the second half of the 12 month program were given by three-fourths of the cytotechnologists. This includes 43% who said lectures were given and 32% who said they were not.

Almost all (91%) of the cytotechnologists said they had quizzes and/or examinations during their clinical study with the majority (55%) having approximately one per week.

Two through four hours per day were spent in microscopic study by about half (55%) of the cytotechnologists during the first half of their clinical program. This was done for a longer period each day, five or six hours, by about one-third (35%) during the first half of the program. Most (84%) of the cytotechnologists spent five or more hours per day in microscopic study during the second half of their clinical study.

CLINICAL STUDY PROGRAMS: QUALITY CONTROL MEASURES

Education Experiences

Table 13 presents the responses of 215 cytotechnologists who indicated their education experiences in schools of cytotechnology with the quality control measures pertaining to identification and verification of specimens, and staining procedures. The following paragraphs summarize the finding for these school experiences.

About half (46%) of the cytotechnologists said they recorded the appearance of all specimens on requisition forms as soon as they were received in the laboratory. About one-fourth (29%) said they recorded the appearance of non-genital specimens only.

Almost all (91%) reported that they used serial accession numbers for verifying patients' and case numbers. Eighty-one percent stated that they recorded the case number on equipment used to process non-genital cases. Slightly more (83%) said they routinely checked patients' names and/or accession numbers on micro slides with those on requisition forms.

More than two-thirds (69%) indicated that they routinely recorded the number of micro slides and filtration units made from a specimen when processing is started and, further, used this number to verify the number of slides per case.

1/ The chi square test for distribution could not be applied in all instances because the N in several of the fail groups is less than 5. The distribution of 89% of the group passing and 11% failing the 1965 certification examination constitutes the norm (normal) for this population.

About half (54%) of the cytotechnologists said they regularly checked the shelf life of reagents for staining specimens and discarded those that have expired. Almost one-third (30%) said that someone else in the laboratory did this. The stains and reagents used in the laboratory were prepared by 40% of the cytotechnologists.

Two-thirds of the cytotechnologists said they examined micro slides for staining quality each time a batch was stained or at least daily.

One-fourth of them said they filtered stains after each batch of slides was processed or at least several times a day and almost two-thirds (63%) said they did so daily or less frequently. Alcohols were filtered each time slides were stained or several times a day by 14% of the cytotechnologists and almost half (46%) said they did so daily or less frequently. One-fourth reported that they did not do this.

Twelve percent of the cytotechnologists said they changed stains in staining dishes each day. Almost three-fourths said they did this weekly or less frequently. About one-fourth (27%) of the group changed alcohol solutions used for staining each day and 59% said they did so twice a week or less frequently.

Body cavity (hypercellular) fluids were stained separately by two-thirds of the cytotechnologists.

There is no outstanding deviation from the norm in the performance related to these school experiences in the comparison of those who passed with those who failed the 1965 certification examination.

Education Applied to Job Experiences

The extent to which the cytotechnologists were prepared in the education programs (schools of cytotechnology) for using quality control measures in their present jobs is shown in Table 14. This depicts the transfer of learning experiences. From about half (56%) to two-thirds (68%) of the 215 cytotechnologists identified and verified specimens on their jobs in the same way they did in the clinical study programs.

In most instances the remaining replies show that cytotechnologists did not deviate from the type of performance learned in the education program but indicated that someome else in the laboratory was responsible for fulfilling the duty. This is also true of the preparation and purchase of reagents. Eighty percent of the cytotechnologists who learned to examine micro slides for staining quality after each batch is stained or daily are doing the same thing on their present jobs. About half (46%) to two-thirds of the cytotechnologists who learned that stains and alcohol solutions should be changed each time slides are stained or several times daily are doing this less frequently on their jobs.

Less than half (43%) of the cytotechnologists who stained body cavity (hypercellular) fluids separately when in the school of cytotechnology are doing so in their jobs. It is noted, however, that about one-fourth (27%) of those who learned to stain them separately said that someone else in the laboratory did this.

Table 15 shows the reverse situation: the extent to which cytotechnologists' job experiences are the same as their education experiences. More than three-fourths (73% - 84%) of the cytotechnologists identified and verified specimens on their jobs as they were instructed in the school of cytotechnology. The major portion of those who have someone else doing this on the job actually did it in the education program. This same pattern prevails in the performance of procedures for staining specimens. It is noteworthy that three-fourths of those who are staining body cavity (hypercellular) fluids separately on their jobs did so in the education program.

Apprentice Experience

The replies of 109 cytotechnologists who indicated their quality control experiences in laboratories that were not schools of cytotechnology ("Apprentice") were distributed approximately the same as those given above for school experiences with the exception of staining hypercellular fluids. Fewer (46% versus 66%) of these cytotechnologists stained body cavity (hypercellular) fluids separately. (Table 13)

Apprentice Applied to Job Experiences

The transfer of apprentice experiences to job experiences are similar to those given above for school of cytotechnology and job experiences with the exception of filtering and changing stains and alcohol solutions. These types of procedures were done on the job in a different way than in the apprentice laboratory. (Tables 16 and 17)

CLINICAL STUDY PROGRAMS: TECHNICAL PROCEDURES

Table 18 presents the cytotechnologists' education, apprentice, and job experiences related to the technical procedures in obtaining specimens, cytopreparation, staining, and microscopic morphology.

Education Experiences

The following paragraphs summarize the responses of 218 cytotechnologists who indicated the technical procedures they performed in the school of cytotechnology (education experiences).

Less than one-fourth of the 218 cytotechnologists reported that they obtained female genital specimens during their education program. About half (52%) or less obtained non-genital specimens of which gastric and oral samples were done most commonly.

In cytopreparatory techniques, almost all (90%) of the cytotechnologists used centrifuging and three-fourths used cell filtration units. Irrigation technique was performed by the least number of people, about one-third (35%).

Essentially all (98%) of the 218 cytotechnologists said they used the Papanicolaou method of staining (or a modification) in their education program. About one-third (32% and 29%) indicated that they used hormonal and cytogenetic staining methods.

Microscopic cytomorphology was done on the following material by 85% or more of the 218 cytotechnologists indicating education experiences:

Female genital including cervical, vaginal, endocervical, and endometrial;
Sputum and bronchial washings;
Esophageal and gastric;
Pleural and ascitic fluids;
Urine;
Breast;
Oral;
Hormonal; and
Radiation or chemotherapy.

About three-fourths (74% and 78%) of them observed the cytomorphology of material from the colon and pericardial fluid. Microscopic evaluations were done by less than half of them on female genital irrigation specimens (49%), viral material (43%) and cytogenetics (37%). About one-fourth (28%) performed the acridine orange fluorescence technique. Eight percent used the electron microscope.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done this failed the certification examination.

Apprentice Experiences

The replies of 113 cytotechnologists who noted the technical procedures they performed in the clinical study programs in laboratories that were not accredited schools of cytotechnology are given in Table 18 and summarized in the following paragraphs.

Twelve percent or less of the 113 cytotechnologists reporting apprentice experiences obtained female genital specimens. Gastric wash and oral specimens were obtained by about one-third (35/ and 39%).

Centrifuging is the only cytopreparatory technique done by most (88%) of the 113 cytotechnologists. Half of them used cell filtration units and 9% irrigation techniques.

Almost all (94%) used the Papanicolaou method of staining (or modification) one-third performed cytogenetic staining methods and about one-fourth (27%) the hormonal methods.

Microscopic cytomorphology was done on the following material by 83% or more of the 113 cytotechnologists indicating their apprentice experiences:

Female genital including cervical, vaginal, endocervical, and endometrial;
Sputum and bronchial washings;
Gastric;
Pleural and ascitic fluids;
Urine;
Breast;
Oral; and
Hormonal.

About three-fourths (73% and 77%) of them observed the cytomorphology of material from the colon and radiation or chemotherapy. Microscopic evaluations were done by about half of them on female genital irrigation specimens (42%), colon material (56%) and pericardial fluid (58%). Other microscopic evaluations performed were on viral materials (39%) and cytogenetics (31%). Ten percent of these cytotechnologists performed the acridine orange fluorescence technique and 3% used the electron miscroscope.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done the latter failed the examination.

Education and/or Apprentice Experiences Applied to Job Experiences

The coincidence of clinical study and job performance of techniques is also shown in Table 18. These responses were given by 221 people who indicated the techniques they performed in either the school of cytotechnology or apprentice laboratories or both as well as on their present jobs. Less than 10% of the 221 cytotechnologists stated that they obtained female genital specimens in both clinical study and on the job. About one-fourth (27% and 25%) obtained gastric wash and oral specimens.

The cytopreparatory technique of centrifuging was done by 72%, ceil filtration by 38% and irrigation by 8% of the cytotechnologists in both situations.

Hormonal and cytogenetic staining methods were used by relatively few of the cytotechnologists in clinical study and on the job (19%) in comparison with the use of the Papanicolaou method (or modification) (81%).

Microscopic cytomorphology was done on the following material by 81% or more of the 221 cytotechnologists in their education and job experiences:

Female genital including cervical, vaginal, endocervical and endometrial;
Sputum and bronchial washings;
Pleural and ascitic fluids;
Urine;
Breast; and
Hormonal.

About three-fourths of them observed the cytomorphology of gastric (76%), oral (72%) and radiation or chemotherapy (78%) material. Sixty percent of them did cytomorphology on pericardial fluid, 50% on colon material, 41% on viral material and 25% on cytogenetics. Almost none of them used the electron microscope and acridine orange fluorescence techniques both in clinical study and on the job.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done the latter in both situations failed the examination.

ATTITUDE ABOUT EDUCATIONAL PREPARATION

Essentially all (96%) of the cytotechnologists said they think their education prepared them to perform the duties assigned to them in their work. (Table 12) Comments about the needs for additional education were made by 27 of the cytotechnologists of whom 21 said they were adequately prepared for their jobs and 6 said they were not.

The need for better preparation in specific science courses was mentioned by one-third of the people commenting. A course in endocrinology was specified by five people, histology by two people and chemistry by one person. The need for courses in supervision and management was stated by one person.

Increased emphasis on instruction in processing and screening non-gynital specimens was desired by three people. The inclusion of more instruction in cytoscreening in the second six months of the clinical study program was mentioned by three people.

Non-specific comments made by the remainder of the group refer to the desirability of continuing and refresher education, and regular use of textbooks as well as the general comment that "additional education is always necessary". Two people said they are doing work that is not pertinent to cytotechnology.

Two people who said their education was not adequate commented as follows: "We had to do entirely too much routine staining and filing from which we learned nothing."; "...in training were given little help from supervisory staff.".

CONTINUING EDUCATION

Attendance at continuing education programs was indicated by three-fourths of the 249 cytotechnologists. (Table 12) Thirty percent earned academic credit hours for courses of which most were toward a Bachelor's degree. About half (53%) participated in workshops or seminars of which the regionally sponsored sessions were most popular. Professional organization meetings were attended by about half (53%) of the cytotechnologists. The American Society of Cytology meetings were attended by the largest number of people.

TABLE 12

CHARACTERISTICS OF CYTOTECHNOLOGISTS
PERTAINING TO EDUCATION BACKGROUND

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
Number and percent of Cytotechnologists.....	249	100	89	11
1. College Education				
0 years.....	3	1	100	0
1 year or less	9	4	44[q]	56[q]
2 years.....	68	27	90	10
No degree.....	44[q]	17	93	7
Degree[c].....	24[q]	10	83	17
3 years.....	49	20	92	8
No degree.....	37[q]	15	95	5
Degree[c].....	12[q]	5	83	17
4 years.....	87	35	91	9
No degree.....	6[q]	2	100	0
Degree[c].....	81[q]	33	90	10
5 or more years[d]	28	11	89	11
No degree.....	1[q]	X[p]	100	0
Degree[c].....	27[q]	11	89	11
Other[e]	5	2	100	0
2. Time spent in training				
a. 12 months.....	206	83	89	11
1) Divided: 6 mo. in each of two institutions	109	44	94	6
1st 6 mo. in accredited program.....	105[r]	42	93[s]	7
1st 6 mo. in non-accredited program..	4	2	100	0
2) Not divided: 12 mo. in 1 institution	97	39	84	16
Accredited program	70	28	86[s]	14
Non-accredited program	27[r]	11	78	22[s]
b. Other[f]	43	17	93	7
Accredited program	34	14	97[s]	3
Non-accredited program	9	3	78	22[s]
3. Location of clinical study				
California.....	26	10	92	8
District of Columbia.....	5	2	40	60
Illinois.....	15	6	100	0
Maryland.....	10	4	90	10
Michigan.....	5	2	80	20
Missouri.....	4	2	75	25
New York.....	25	10	92	8
North Carolina.....	16	6	81	19
Ohio.....	12	5	83	17
Oklahoma.....	6	2	83	17
Pennsylvania.....	19	8	79	21
Tennessee	11	4	73	27
Texas	14	6	93	7
Virginia.....	11	4	91	9
Wisconsin	7	3	86	14
Puerto Rico	6	2	83	17
Other[g].....	57	23	100	0

TABLE 12
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
4. Location of second 6 months study				
Arizona	4	2	75	25
California	23	9	87	13
Illinois	11	4	91	9
Kentucky	3	1	67	33
New York	17	7	94	6
North Carolina	4	2	75	25
Ohio	10	4	90	10
Pennsylvania	12	5	83	17
Tennessee	5	2	60	40
Virginia	6	2	83	17
Wisconsin	3	1	67	33
Other[h]	76	31	100	0
No reply	75	30	84	16
5. Working where school or on the job training attended				
Yes, same laboratory	46	19	91	9
Yes, same city, different laboratory	56	23	86	14
Yes, same state, different city	59	24	93	7
No, out of state	76	30	91	9
No reply	12	5	67	33
6. Lectures given during training program				
a. Given at second training center				
Yes	108	43	89	11
No	80	32	93	7
Other[i]	1	X[p]	100	0
No reply	60	24	85	15
b. Given as part of training program				
1) Basic Sciences				
1 through 10 lectures	31	12	90	10
11 through 30 lectures	46	18	91	9
31 lectures or more[j]	44	18	82	18
No reply	128	51	91	9
2) Cytology				
1 through 30 lectures	46	18	83	17
31 through 100 lectures	88	35	91	8
101 lectures or more[j]	51	21	88	12
No reply	64	26	92	8
3) Cytopreparatory techniques				
1 through 10 lectures	61	25	89	11
11 through 30 lectures	48	19	92	8
31 lectures or more[j]	52	21	85	15
No reply	88	35	91	9

TABLE 12
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
7. Quizzes &/or examinations given during training program				
Approximately one per day	20	8	90	10
Approximately one per week	137	55	91	9
Approximately one per month	45	18	82	18
Less than one per month	25	10	92	8
Other[k]	3	1	67	33
No reply	19	8	95	5
8. Hours per day spent screening slides during				
a. First half of training program				
2 through 4 hours	136	55	86	14
5 through 6 hours	88	35	93	7
7 through 8 hours	11	4	91	9
Other[l]	3	1	100	0
No reply	11	4	91	9
b. Second half of training program				
2 through 4 hours	27	11	93	7
5 through 6 hours	107	43	92	8
7 through 8 hours	101	41	87	13
No reply	14	6	79	21
9. Continuing education				
a. Academic credit				
1) Type				
Bachelor's degree	52	21	85	15
Master's or doctorate[m]	14	6	79	21
Other[m]	8	3	88	12
None	10	4	90	10
No reply	165	66	92	8
2) Number of programs attended				
None	2	X[p]	100	0
1 program	70	28	86	15
No reply	177	71	90	10
b. Non-credit earning (workshops/seminars)				
1) Type				
A.S.C.P. Commission on Continuing Edu.	5	2	100	0
American Society of Cytology	25	10	88	12
Regionally sponsored programs	46	19	93	7
Combination of 2 of above 3	36	14	94	6
All 3	8	3	75	25
Other[n]	13	5	85	15
None	12	5	100	0
No reply	104	42	86	14

TABLE 12
(continued)

Item	Total in Study		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
9. Continuing education (continued)				
b. 2) Number of programs attended				
0 programs	3	1	100	0
1 program	79	32	90	10
2 programs	32	13	94	6
3 programs	18	7	89	11
4 programs	3	1	100	0
5 programs	1	X[p]	100	0
No reply	113	45	87	13
c. Organizational meetings				
1) Type				
American Society of Clinical Pathologists	4	2	50	50
American Society of Cytology	45	18	96	4
American Society of Medical Technologists	13	5	92	8
Combination of 2 of above 3	16	6	88	12
All 3	3	1	67	33
Other[o]	53	21	91	9
None	14	6	100	0
No reply	101	41	86	14
2) Number of programs attended				
0 programs	3	1	100	0
1 program	89	36	91	9
2 programs	32	13	88	12
3 programs	13	5	92	8
4 programs	1	X[p]	100	0
5 programs	1	X[p]	100	0
No reply	110	44	87	13
10. Attitude about education				
a. Preparation adequate				
Yes	238	96	89	11
No	6	2	100	0
No reply	5	2	80	20
b. Comments about needs				
Stated needs	27	11	96	4
No comment	217	87	88	12
No reply	5	2	80	20

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension of the table. All percents are based on 249 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: In the Total group 9 people had 1 year or less of college education of whom 44% passed the 1965 certification examination and 56% failed. The examination is that given by the Board of Registry of Medical Technologists (ASCP) in 1965 for certification of cytotechnologists.

Footnotes for Table 12
(continued)

c. The following summarizes the degrees earned:

2 years of college:		
Associate (24 or 10%)	20 (83%) Passed Exam	4 (17%) Failed Exam
3 years of college:		
Associate (9 or 4%)	7 (78%) Passed Exam	2 (22%) Failed Exam
Bachelor's(3 or 1%)	3 (100%) Passed Exam	0 (0%) Failed Exam
4 years of college:		
Associate (1 or less than 1%)	1 (100%) Passed Exam	0 (0%) Failed Exam
Bachelor's(80 or 32%)	72 (90%) Passed Exam	8 (10%) Failed Exam
5 years of college:		
Bachelor's(19 or 8%)	16 (84%) Passed Exam	3 (16%) Failed Exam
Master's (5 or 2%)	5 (100%) Passed Exam	0 (0%) Failed Exam
Doctorate (3 or 1%)	3 (100%) Passed Exam	0 (0%) Failed Exam

d. The maximum number of years of college education for the Total and Passed Exam groups is 8, for the Failed Exam group is 6.

e. "Other" includes 4 people who have from two through four years of college education but did not give the degree they earned: and 1 person with 4 years of college education who gave the degree of "PHG" which could not be interpreted.

f. "Other" includes 43 people who indicated length of training varying from 3 months through 12 years, "No formal time", and "more than 6 months".

g. "Other" includes 19 states of which each have less than 5% of the people, all of whom passed the 1965 certification examination.

h. "Other" includes 24 states, Canada and another foreign country of which each have less than 5% of the people, all of whom passed the 1965 certification examination.

i. "Other" includes a variety of replies which indicate that the people had conferences and discussions with pathologists but not formal lectures.

j. Maximum number of lectures in basic sciences for the Total and Passed Exam groups is 336, for the Failed Exam group is 130.
Maximum number of lectures in cytology for the Total and Passed Exam groups is 336, for the Failed Exam groups is 192.
Maximum number of lectures in cytopreparation for the Total and Passed Exam groups is 260, for the Failed Exam group is 176.

k. "Other" includes "Can't recall", "varied since training was done in 3 places", and "personal conference daily".
Additional information about types of practical, mid-term, and final examinations was attached to 14 replies.

l. "Other" includes "4 hours on lab duty, 6 hours on study sets", "only the last month 7 hours per day", and "6 hours per day 1st 4 months, 8 hours per day last 2 months".

m. The 14 people include 12 with Master's and 2 with Doctorates.
"Other" includes those who have taken additional college credits but not specifically for a degree.

n. "Other" includes a variety of sessions that were locally sponsored as well as 2 that were in foreign conferences and 1 that noted "visiting lecturers".

o. "Other" includes a variety of international, regional, state and local organizations.

p. X = Less than 1%.

Footnotes for Table 12
(continued)

q. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
College education: $X^2 = 12.60$; df = 4, $X^2 = 9.49$

r. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
Comparison of Accredited/Non-accredited and divided/non-divided/other
$X^2 = 23.14$; df = 2, $X^2 = 5.99$

s. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
Comparison of Pass/Fail and all accredited/non-accredited
$X^2 = 4.64$; df = 1, $X^2 = 3.84$

TABLE 13

EDUCATION, APPRENTICE AND JOB EXPERIENCES IN QUALITY CONTROL FOR CYTOTECHNOLOGISTS ACCORDING TO THE 1965 CERTIFICATION EXAMINATION[a] PERFORMANCE

Experiences	Education[b]				Apprentice[c]				Present Job			
	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]
	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]
Number and percent of Cytotechnologists	215	100	92	8	109	100	94	6	229	100	90	10
1. Identification & verification of specimens												
a. Record appearance of all specimens on request/report forms immediately upon receipt in lab.												
Yes[g]	98	46	88	12	49	45	98	2	75	33	87	13
Yes, other (non-genital only)	62	29	94	6	19	17	84	16	38	17	92	8
No, not done	26	12	100	0	20	18	100	0	34	15	100	0
Someone else does this	17	8	94	6	12	11	100	0	61	27	90	10
Other reply	6	3	100	0	4	4	100	0	9	4	100	0
No reply	6	3	83	17	5	5	60	40	12	5	67	33
b. Use of serial accession numbers for verifying patients' and case numbers												
Yes[g]	196	91	91	9	96	88	92	8	150	66	85	15
No, not done	1	X[f]	100	0	2	2	50	50	2	X[f]	100	0
Someone else does this	17	8	100	0	10	9	100	0	66	29	95	5
Other reply	0	0	0	0	1	X[f]	100	0	4	2	100	0
No reply	1	X[f]	100	0	0	0	100	0	7	3	71	29
c. Record case number on equipment used to process non-genital cases												
Yes[g]	175	81	91	9	79	72	96	4	135	59	90	10
No, not done	17	8	100	0	11	10	91	9	19	8	89	11
Someone else does this	13	6	92	8	12	11	100	0	62	27	92	8
Other reply	3	1	100	0	1	X[f]	100	0	2	X[f]	100	0
No reply	7	3	100	0	6	6	67	33	11	5	82	8

TABLE 13
(continued)

Experiences	Education[b]				Apprentice[c]				Present Job			
	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]
	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]
d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing												
Yes[g]	190	83	91	9	88	81	95	5	158	69	88	12
No, not done	6	3	100	0	4	4	100	0	6	3	100	0
Someone else does this	16	7	100	0	16	15	94	6	61	27	97	3
No reply	3	1	67	33	1	X[f]	0	100	4	2	50	50
e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing												
Yes[g]	148	69	91	9	70	64	96	4	111	48	87	13
No, not done	39	18	92	8	16	15	100	0	43	19	93	7
Someone else does this	22	10	95	5	15	14	93	7	63	28	95	5
Other reply	1	X[f]	100	0	3	3	100	0	4	2	100	0
No reply	5	2	100	0	5	5	60	40	8	3	63	37
Use this record to verify number of slides per case												
Yes[g]	149	69	92	8	70	64	96	4	126	55	88	12
No, not done	30	14	90	10	15	14	93	7	38	17	92	8
Someone else does this	16	7	100	0	13	12	92	8	44	19	98	2
No reply	20	9	85	15	11	10	91	9	21	9	81	19
2. Staining specimens												
a. Regularly check shelf life of reagents & discard those that have expired												
Yes[g]	117	54	90	10	71	65	97	3	136	59	89	11
No, not done	20	9	90	10	11	10	100	0	19	8	89	11
Someone else does this	65	30	95	5	21	19	90	10	69	30	94	6
Other reply	2	X[f]	100	0	1	X[f]	100	0	1	X[f]	100	0
No reply	11	5	91	9	5	5	60	40	4	2	50	50

TABLE 13
(continued)

Experiences	Education[b]				Apprentice[c]				Present Job			
	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]
	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]
2. Staining specimens (continued)												
b. Make stains and reagents used in the laboratory												
Yes[g]	85	40	91	9	28	26	96	4	39	17	87	13
Yes[g], other (purchase some/make some; purchase all; centrally prepared in institution)	95	44	91	9	71	65	97	3	129	56	90	10
Someone else does this	30	14	97	3	8	7	88	12	56	24	95	5
Other reply	1	X[f]	100	0	0	0	0	0	5	2	80	20
No reply	4	2	100	0	2	2	0	100	0	0	0	0
c. Regularly examines slides for quality of staining, such as definition of intra-nuclear structure & intensity of nuclear stain, etc.												
Yes[g] (each staining batch or daily)	140	65	91	9	84	77	98	2	165	72	92	8
Yes[g], other (weekly, change of stain, other)	32	15	88	12	16	15	94	6	35	15	77	23
No, not done	0	0	0	0	0	0	0	0	0	0	0	0
Someone else does this	29	13	93	7	4	4	75	25	22	10	91	9
Other reply	4	2	100	0	3	3	100	0	7	3	100	0
No reply	10	5	100	0	2	2	0	100	0	0	0	0
d. Filter stains prior to use												
Yes (each time slides stained, several times per day)	54	25	94	6	22	19	77	23	27	12	93	7
Yes[g], other (daily, weekly, other)	135	63	89	11	72	66	99	1	123	54	87	13
No, not done	1	X[f]	100	0	1	X[f]	100	0	1	X[f]	100	0
Someone else does this	17	8	100	0	11	10	100	0	73	32	95	5
Other reply	3	1	100	0	3	3	100	0	4	2	100	0
No reply	5	2	100	0	0	0	0	0	1	X[f]	0	100

TABLE 13
(continued)

Experiences	Education[b]				Apprentice[c]				Present Job			
	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]	Total in Study		Pass Exam[a]	Fail Exam[a]
	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]	N[d]	%[d]	%[e]	%[e]
2. e. Filter alcohols for staining prior to use												
Yes (each time slides stained, several times per day).....	30	14	93	7	9	8	78	22	12	5	83	17
Yes[g], other (daily, weekly, other).....	99	46	90	10	43	39	98	2	74	32	86	14
No, not done.....	52	24	94	6	37	34	100	0	68	30	96	4
Someone else does this.....	20	9	90	10	12	11	92	8	66	29	91	9
Other reply.....	3	1	100	0	5	5	100	0	7	3	100	0
No reply.....	11	5	91	9	3	3	33	67	2	X[f]	0	100
f. Frequency of changing stains in staining dishes												
Yes, (daily).....	26	12	77	23	6	6	83	17	6	3	50	50
Yes[g], other (weekly, monthly, as needed).....	153	71	94	6	87	80	97	3	146	64	90	10
Someone else does this.....	27	13	89	11	14	13	100	0	71	31	94	6
No reply.....	9	4	100	0	2	2	0	100	6	3	83	17
g. Frequency of changing alcohols solutions used in staining												
Yes[g](daily).....	59	27	92	8	22	20	95	5	28	12	89	11
Yes[g], other (weekly, bi-weekly, monthly, as needed).....	127	59	91	9	74	68	96	4	120	52	89	11
Someone else does this.....	20	9	95	5	13	12	85	15	75	33	93	7
No reply.....	9	4	89	11	0	0	0	0	6	3	67	33
h. Separate staining of body cavity fluids (hypercellular specimens)												
Yes[g]	141	66	90	10	50	46	94	6	81	35	84	16
No, not done.....	42	20	95	5	39	36	97	3	67	29	93	7
Someone else does this.....	19	9	95	5	14	13	100	0	65	28	95	5
Other reply.....	0	0	0	0	2	2	100	0	3	1	100	0
No reply.....	13	6	92	8	4	4	50	50	13	6	85	15

Footnotes for Table 13

a. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. "Pass Exam" and "Fail Exam" refer to cytotechnologists who passed and failed the 1965 certification examination.

b. "Education" refers to the experiences in the school of cytotechnology.

c. "Apprentice" refers to the experiences in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some of them spent the second half of their 12 month training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology.

d. The summations of N (number) and % (percent) for each of the sections (Education, Apprentice and Present Job) follow the vertical dimension of the table. The percents are based respectively on 215 cytotechnologists (Education), 109 cytotechnologists (Apprentice) and 229 cytotechnologists (Present Job).

e. The summations of % (percent) for each of the three sections (Education, Apprentice, and Present Job) follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel columns for each section. For example: 98 people said that they record the appearance of all specimens upon receipt in the laboratory and of these 88% passed the 1965 certification examination and 12% failed.

f. X = Less than 1%.

g. Calculation of chi square test for distribution of those who passed and failed the 1965 certification examination in each section shows that these figures are not statistically significant. Range of $X^2 = 0.02$ through 1.95; df = 2, $X^2 = 5.99$ (0.05 probability level)

TABLE 14

EDUCATION EXPERIENCES TRANSFERRED
TO
JOB EXPERIENCES IN QUALITY CONTROL MEASURES

Experiences	Education[a]		Present Job[a]					
	Replies		Yes	Yes, Other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
Cytotechnologists with the following educational experiences and related job experiences.....	215	100						
1. Identification & verification of specimens								
a. Record appearance of all specimens on request/report forms immediately upon receipt in lab.								
Yes.....	98	46	(56)	3	1	24	1	15
Yes, other (non-genital only).....	62	29	5	(44)	19	23	2	8
No, not done.....	26	12	4	8	(81)	8	0	0
Someone else does this.....	17	8	24	12	0	(47)	0	18
Other reply.....	6	3	0	0	0	0	(83)	17
No reply.....	6	3	17	17	0	0	0	(67)
b. Use of serial accession numbers for verifying patients' and case numbers								
Yes.....	196	91	(64)		1	23	2	11
No, not done.....	1	X[d]	0		(100)	0	0	0
Someone else does this.....	17	8	35		0	(53)	0	12
Other reply.....	0	0	0		0	0	0	0
No reply.....	1	X[d]	0		0	(100)	0	0
c. Record case number on equipment to process non-genital cases								
Yes.....	175	81	(65)		2	24	X[d]	9
No, not done.....	17	8	6		(77)	6	0	12
Someone else does this.....	13	6	8		0	(62)	0	31
Other reply.....	3	1	33		0	0	(33)	33
No reply.....	7	3	29		0	14	0	(57)

TABLE 14
(continued)

Experiences	Education[a]		Present Job[a]					
	Replies		Yes	Yes Other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing								
Yes	190	88	(68)		1	22		10
No, not done	6	3	50		(50)	0		0
Someone else does this	16	7	31		0	(56)		13
No reply	3	1	33		0	33		(33)
e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing								
Yes	148	69	(57)		8	24	X[d]	10
No, not done	39	18	23		(69)	3	3	3
Someone else does this	22	10	18		5	(50)	0	27
Other reply	1	X[d]	0		0	0	(100)	0
No reply	5	2	(60)		0	20	0	20
Use this record to verify number of slides per case								
Yes	149	69	(66)		8	17		9
No, not done	30	14	23		(73)	0		3
Someone else does this	16	7	19		6	(50)		25
No reply	20	9	10		0	5		(85)
2. Staining specimens								
a. Regularly check shelf life of reagents & discard those that have expires								
Yes	117	54	(66)		0	25	0	9
No, not done	20	9	25		(65)	5	0	5
Someone else does this	65	30	42		5	(42)	0	12
Other reply	2	X[d]	0		50	0	(50)	0
No reply	11	5	(55)		9	18	0	18

TABLE 14
(continued)

Experiences	Education[a]		Present Job[a]					
	Replies		Yes	Yes, Other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. b. Makes stains & reagents used in the lab.								
Yes	85	40	28	(39)		20	2	11
Yes, other (purchase some/make some; purchase all; centrally prepared in institution)	95	44	3	(68)		20	2	6
Someone else does this	30	14	23	33		(33)	0	10
Other reply	1	X[d]	0	0		0	0	(100)
No reply	4	2	0	(75)		25	0	0
c. Regularly examines slides for quality of staining; such as definition of intra-nuclear structure & intensity of nuclear stain, etc.								
Yes, (each staining batch or daily)	140	65	(80)	7	0	5	0	8
Yes, other (weekly, change of stain, other)	32	15	22	(47)	0	16	3	12
No, not done	0	0	0	0	0	0	0	0
Someone else does this	29	13	(55)	17	0	21	0	7
Other reply	4	2	0	0	0	0	(100)	0
No reply	10	5	(70)	10	0	10	0	10
d. Filter stains prior to use								
Yes (each time slides are stained, several times per day)	54	25	30	19	2	(35)	2	13
Yes, other (daily, weekly, other)	134	62	2	(66)	0	23	X[d]	7
No, not done	1	X[d]	0	(100)	0	0	0	0
Someone else does this	17	8	0	41	0	(53)	0	6
Other reply	3	1	0	0	0	33	(67)	0
No reply	6	3	33	(50)	0	0	0	17
e. Filter alcohols for staining prior to use								
Yes (each time slides are stained, several times per day)	30	14	30	13	3	30	3	20
Yes, other (daily, weekly, other)	98	46	1	(53)	6	28	4	8
No, not done	52	24	0	0	(92)	6	0	2
Someone else does this	20	9	0	20	15	(50)	0	15
Other reply	3	1	0	0	0	(67)	33	0
No reply	12	6	8	(42)	8	17	8	17

TABLE 14
(continued)

Experiences	Education[a]		Present Job[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. f. Frequency of changing stains in staining dishes								
Yes, (daily)	26	12	15	(46)		27		12
Yes, other (weekly, bi-weekly, monthly, as needed)	153	71	1	(65)		25		8
Someone else does this	27	13	0	33		(52)		15
No reply	9	4	0	(66)		0		33
g. Frequency of changing alcohol solutions used in staining								
Yes, (daily)	59	27	(36)	24		29		12
Yes, Other (weekly, bi-weekly, monthly, as needed)	127	59	3	(65)		24		9
Someone else does this	20	9	5	(80)		0		15
No reply	9	4	11	(56)		11		22
h. Separate staining of body cavity fluids (hypercellular specimens)								
Yes	141	66	(43)		18	27	1	11
No, not done	42	20	5		(74)	12	2	7
Someone else does this	19	9	16		11	(58)	0	16
Other reply	0	0	0		0	0	0	0
No reply	13	6	23		15	8	0	(54)

a. "Education" refers to the experiences (performance of duties) in the school of cytotechnology. "Present Job" refers to the experiences (performance of duties) on the jobs the cytotechnologists presently hold. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in the school of cytotechnology and either are repeating them on their jobs or, if not, what other experiences they indicated.
For example: Of the 98 cytotechnologists who recorded appearance of all specimens during their education;
56% said they do so on their jobs,
3% said they record only non-genital specimens,
1% said it is not done at all on their jobs,
24% said someone else does this,
1% gave a reply not included in the tabulating code,
15% did not reply.
The largest percent for each response on the job is placed in parentheses to facilitate location of trends in education and job experiences.

Footnotes for Table 14
(continued)

b. The summations of N (number) and % (percent) for Education follow the vertical dimension of the table. All percents are based on 215 people who indicated school experiences. The remaining 34 of the 249 cytotechnologists did not indicate experiences for the school of cytotechnology.

c. The summations of % (percent) for Present Job follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Education). For example see footnote a.

d. X = Less than 1%.

TABLE 15

JOB EXPERIENCES LEARNED AS EDUCATION EXPERIENCES
in
QUALITY CONTROL MEASURES

Experiences	Present Job[a]		Education[a]					
	Replies		Yes	Yes, Other	No, not done	Someone else does	Other reply	No Reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
Cytotechnologists with the following job experiences and related educational experiences.....	229	100						
1. Identification & verification of specimens								
a. Record appearance of all specimens on request/report forms immediately upon receipt in lab.								
Yes.....	75	33	(73)	4	1	5	0	16
Yes, other (non-genital only).....	38	17	8	(71)	5	5	0	11
No, not done.....	34	15	3	35	(62)	0	0	0
Someone else does this.....	61	27	(38)	23	3	13	0	23
Other reply.....	9	4	11	11	0	0	(56)	22
No reply.....	12	5	42	17	0	0	0	(42)
b. Use of serial accession numbers for verifying patients' and case numbers								
Yes.....	150	66	(83)		X[d]	3	X[d]	12
No, not done.....	2	X[d]	0		(100)	0	0	0
Someone else does this.....	66	29	(68)		0	14	0	18
Other reply.....	4	2	(75)		0	0	0	25
No reply.....	7	3	(71)		0	0	0	29
c. Record case number on equipment used to process non-genital cases								
Yes.....	135	59	(84)		X[d]	X[d]	X[d]	14
No, not done.....	19	8	21		(68)	0	0	11
Someone else does this.....	62	27	(68)		2	13	0	18
Other reply.....	2	X[d]	50		0	0	(50)	0
No reply.....	11	5	27		0	0	9	(64)

TABLE 15
(continued)

Experiences	Present Job[a]		Education[a]					
	Replies		Yes	Yes, Other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing								
Yes	158	69	(82)		2	3		13
No, not done	6	3	33		(50)	0		17
Someone else does this	61	27	(67)		0	15		18
No reply	4	2	50		0	0		(50)
e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing								
Yes	111	48	(76)		8	4	0	13
No, not done	43	19	28		(63)	2	0	7
Someone else does this	63	28	(57)		2	18	0	24
Other reply	4	2	25		25	0	25	25
No reply	8	3	25		0	25	0	(50)
Use this record to verify number of slides per case								
Yes	126	55	(78)		6	2		14
No, not done	38	17	32		(58)	3		8
Someone else does this	44	19	(57)		0	18		25
No reply	21	9	10		0	5		(86)
2. Staining specimens								
a. Regularly check shelf life of reagents & discard those that have expired								
Yes	136	59	(57)		4	20	0	20
No, not done	19	8	0		(68)	16	5	11
Someone else does this	69	30	(42)		1	39	0	17
Other reply	1	X[d]	0		0	0	(100)	0
No reply	4	2	25		0	25	0	(50)

TABLE 15
(continued)

Experiences	Present Job[a]		Education[a]					
	Replies		Yes	Yes, Other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. b. Make stains & reagents used in the lab.								
Yes	39	17	(62)	8		18	3	10
Yes, other (purchase some/make some; purchase all; centrally prepared in institution)	129	56	26	(50)		8	0	16
Someone else does this	56	24	30	(34)		18	0	18
Other reply	5	2	40	(40)		0	0	20
c. Regularly examines slides for quality of staining; such as definition of intranuclear structure & intensity of nuclear stain, etc.								
Yes (each staining batch or daily)	165	72	(68)	5	0	10	0	18
Yes, other (weekly, change of stain, other)	34	15	29	(44)	0	15	0	12
No, not done	0	0	0	0	0	0	0	0
Someone else does this	21	9	(33)	24	0	24	0	19
Other reply	7	3	0	14	0	0	(57)	29
No reply	2	X[d]	50	0	0	50	0	0
d. Filter stains prior to use								
Yes, (each time slides stained, several times per day)	27	12	(59)	11	0[d]	0	0	30
Yes, other (daily, weekly, other)	123	54[d]	8	(72)	X[d]	6	0	13
No, not done	1	X[d]	100	0	0	0	0	0
Someone else does this	73	32	26	(44)	0	12	1	16
Other reply	4	2	25	25	0	0	(50)	0
No reply	1	X	0	(100)	0	0	0	0

TABLE 15
(continued)

Experiences	Present Job[a]		Education[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. e. Filter alcohols for staining prior to use								
Yes, (each time slides stained, several times per day)	12	5	(75)	8	0	0	0	17
Yes, other (daily, weekly, other)	74	32	5	(70)	0	5	0	19
No, not done	68	30	2	9	(71)	4	0	15
Someone else does this	66	29	14	(42)	5	15	3	21
Other reply	7	3	14	(57)	0	0	14	14
No reply	2	X[d]	0	100	0	0	0	0
f. Frequency of changing stains in staining dishes								
Yes, (daily)	6	3	(67)	33		0		0
Yes, other (weekly, bi-weekly, monthly, as needed)	146	64	8	(68)		6		17
Someone else does this	71	31	10	(55)		20		16
No reply	6	3	0.	33		0		(67)
g. Frequency of changing alcohol solutions used in staining								
Yes, (daily)	28	12	(75)	14		4		7
Yes, other (weekly, bi-weekly, monthly, as needed)	120	52	12	(68)		3		17
Someone else does this	75	33	23	(40)		16		21
No reply	6	3	17	33		17		33
h. Separate staining of body cavity fluids (hypercellular specimens)								
Yes	81	35	(74)		3	4	0	20
No, not done	67	29	37		(46)	3	0	13
Someone else does this	65	28	(59)		8	17	0	17
Other reply	3	1	(67)		33	0	0	0
No reply	13	6	23		8	8	0	(62)

Footnotes for Table 15

a. "Present Job" refers to the experience (performance of duties) on the jobs the cytotechnologists presently hold. "Education" refers to the experiences (performance of duties) in the school of cytotechnology. This table shows the N (number) and % (percent) of cytotechnolcgists who had the listeu experiences in the school of cytotechnology and either are repeating them on their jobs or, if not, what other experiences they indicated.
For example: Of the 75 cytotechnologists who record appearance of all specimens on their jobs,
73% also did so in their training programs,
4% did only non-genitals in their training programs,
1% did not do this in their training programs,
5% were in programs where someone else did this,
16% did not reply for education (training) program experience.
The largest percent for each response in the education (training) program is placed in parentheses to facilitate location of trends in job and education experiences.

b. The summations of N (number) and % (percent) for Present Job follow the vertical dimension of the table. Al[1] percents are based on 229 people who indicated job experiences. The remaining 20 of the 249 cytotechnologists did not indicate job experiences.

c. The summations of % (percent) for Education follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Present Job). For example see footnote a.

d. X = Less than 1%.

TABLE 16

APPRENTICE AND JOB EXPERIENCES IN QUALITY CONTROL MEASURES

Experiences	Apprentice[a]		Present Job[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
Cytotechnologists with the following apprentice experiences and related job experiences.....	109	100						
1. Identification & verification of specimens								
a. Record appearance of all specimens on request/report forms immediately upon receipt in laboratory								
Yes.....	49	45	(55)	0	0	37	2	6
Yes, other (non-genital).....	19	17	0	(53)	11	16	5	16
No, not done.....	20	18	0	0	(90)	5	0	5
Someone else does this.....	12	11	42	0	0	(58)	0	0
Other reply.....	4	4	0	25	0	0	(75)	0
No reply.....	5	5	0	20	0	20	0	(60)
b. Use of serial accession numbers for verifying patients' and case numbers								
Yes.....	95	87	(65)		2	26	1	5
No, not done.....	2	2	50		0	0	0	50
Someone else does this.....	10	9	30		0	(70)	0	0
Other reply.....	1	X[d]	0		0	0	(100)	0
No reply	1	X[d]	0		0	0	0	(100)
c. Record case number on equipment used to process non-genital cases								
Yes.....	78	72	(65)		3	30	0	3
No, not done.....	11	10	0		(73)	0	0	27
Someone else does this.....	12	11	42		0	(58)	0	0
Other reply.....	1	X[d]	0		0	0	(100)	0
No reply.....	7	6	14		0	14	0	(71)

TABLE 16
(continued)

Experiences	Apprentice[a]		Present Job[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing								
Yes	87	80	(72)		0	23	0	5
No, not done	4	4	0		(100)	0	0	0
Someone else does this	16	15	31		0	(63)	0	6
Other reply	0	0	0		0	0	0	0
No reply	2	2	50		0	0	0	50
e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing								
Yes	70	64	(56)		7	30	0	7
No, not done	16	15	13		(81)	6	0	0
Someone else does this	15	14	33		0	(53)	0	13
Other reply	3	3	0		0	0	(100)	0
No reply	5	5	20		0	0	20	(60)
Use this record to verify number of slides per case								
Yes	70	64	(70)		6	19	0	6
No, not done	15	14	7		(80)	7	0	7
Someone else does this	13	12	23		0	(69)	0	8
No reply	11	10	9		0	0	0	(91)
2. Staining specimens								
a. Regularly check shelf life of reagents & discard those that have expired								
Yes	71	65	(70)		0	25	0	4
No, not done	11	10	18		(64)	18	0	0
Someone else does this	21	19	(48)		0	43	0	10
Other reply	1	X[d]	0		0	0	(100)	0
No reply	5	5	40		0	20	0	40

TABLE 16
(continued)

Experiences	Apprentice[a]		Present Job[a]					
	Replies		Yes	Yes other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. b. Make stains & reagents used in the lab.								
Yes	28	26	(50)	21		25	0	4
Yes, other (purchase some/make some; purchase all; centrally prepared in institution)	71	65	6	(65)		21	4	4
Someone else does this	8	7	13	25		(50)	0	13
Other reply	0	0	0	0		0	0	0
No reply	2	2	0	50		0	0	(50)
c. Regularly examines slides for quality of staining, such as definition of intranuclear structure & intensity of nuclear stain, etc.								
Yes, (each staining batch or daily)	83	76	(86)	2	0	6	0	6
Yes, other (weekly, change of stain, other)	16	15	25	(44)	0	13	6	13
No, not done	0	0	0	0	0	0	0	0
Someone else does this	4	4	(100)	0	0	0	0	0
Other reply	3	3	33	0	0	0	(67)	0
No reply	3	3	(67)	0	0	0	33	0
d. Filter stains prior to use								
Yes, (each time slides stained, several times per day)	21	19	(48)	10	0	24	0	19
Yes, other (daily, weekly, other)	72	66[d]	3	(64)	1	29	0	3
No, not done	1	X[d]	0	(100)	0	0	0	0
Someone else does this	11	10	9	27	0	(64)	0	0
Other reply	3	3[d]	0	0	0	33	(67)	0
No reply	1	X[d]	0	0	0	(100)	0	0

TABLE 16
(continued)

Experiences	Apprentice[a]		Present Job[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. e. Filter alcohols for staining prior to use								
Yes, (each time slides stained, several times per day)	9	8	22	11	0	(33)	0	33
Yes, other (daily, weekly, other)	43	39	0	(51)	7	37	0	5
Someone else does this	12	11	0	17	17	(67)	0	0
Other reply	5	5	0	0	0	40	(60)	0
No reply	3	3	0	(67)	0	33	0	0
No, not done	37	34	0	5	(81)	11	0	3
f. Frequency of changing stains in staining dishes								
Yes, (daily)	6	6	17	33		(50)		0
Yes, other (weekly, bi-weekly, monthly, as needed)	86	79	0	(64)		29		7
Someone else does this	14	13	0	(57)		43		0
No reply	3	3	33	0		33		33
g. Frequency of changing alcohol solutions used in staining								
Yes, (daily)	22	20	32	9		(50)		9
Yes, other (weekly, bi-weekly, monthly, as needed)	73	67	1	(66)		29		5
Someone else does this	13	12	0	46		(54)		0
No reply	1	X[d]	0	0		0		(100)
h. Separate staining of body cavity fluids (hypercellular specimens)								
Yes	50	46	(48)		6	36	0	10
No, not done	39	36	5		(72)	15	0	8
Someone else does this	13	12	46		8	46	0	0
Other reply	2	2	0		0	0	(100)	0
No reply	5	5	20		0	(60)	20	0

Footnotes for Table 16

a. "Apprentice" refers to the experiences (performance of duties) in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some spent the second half of their 12 months training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology. "Present Job" refers to the experiences (performance of duties) on the jobs which the cytotechnologists presently hold. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in the apprentice laboratories and either are repeating them on their jobs or, if not, what other experiences they indicated.

For example: Of the 49 cytotechnologists who recorded appearance of all specimens during their apprentice

55% said they did so on their jobs,
37% said someone else did this,
2% gave a reply not included in the tabulating code,
6% did not reply for their job experience.

The largest percent for each duty (experience) response is placed in parentheses to facilitate location of trends in apprentice and job experience.

b. The summations of N (number) and % (percent) for Apprentice follow the vertical dimension of the table. All percents are based on 109 people who indicated apprentice experiences for their education programs. The remaining 140 of the 249 cytotechnologists did not indicate apprentice experience.

c. The summations of % (percent) for Present Job follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Apprentice). For example see footnote a.

d. X = Less than 1%.

TABLE 17

JOB AND APPRENTICE EXPERIENCES IN QUALITY CONTROL MEASURES

Experiences	Present Job[a]		Apprentice[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
Cytotechnologists with the following job experiences and related apprentice experiences.....	229	100						
1. Identification & verification of specimens								
a. Record appearance of all specimens on request/report forms immediately upon receipt in laboratory								
Yes.....	75	33	(36)	0	0	7	0	57
Yes, other (non-genital).....	38	17	0	(26)	0	0	3	71
No, not done.....	34	15	0	6	(53)	0	0	41
Someone else does this.....	61	27	(30)	5	2	12	0	52
Other reply.....	9	4	11	11	0	0	(33)	44
No reply.....	12	5	(17)	8	0	0	0	75
b. Use of serial accession numbers for verifying patients' and case numbers								
Yes.....	150	66	(41)		X[d]	2	0	56
No, not done.....	2	X[d]	(100)		0	0	0	0
Someone else does this.....	66	29	(38)		0	11	0	52
Other reply.....	4	2	25		0	0	25	50
No reply.....	7	3	(29)		0	0	0	71
c. Record case number on equipment used to process non-genital cases								
Yes.....	135	59	(39)		0	4	0	58
No, not done.....	19	8	11		(42)	0	0	47
Someone else does this.....	62	27	(37)		11	0	0	52
Other reply.....	2	X[d]	0		0	0	(50)	50
No reply.....	11	5	(9)		0	0	0	91

TABLE 17
(continued)

	Present Job[a]		Apprentice[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing								
Yes	158	69	(41)		0	3		56
No, not done	6	3	0		(67)	0		33
Someone else does this	61	27	(33)		0	16		51
No reply	4	2	0		0	0		100
e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing								
Yes	111	48	(35)		2	5	0	59
No, not done	43	19	12		(30)	0	0	58
Someone else does this	63	28	(33)		2	13	0	52
Other reply	4	2	0		0	0	(75)	25
No reply	8	3	(25)		0	0	0	75
Use this record to verify number of slides per case								
Yes	126	55	(39)		X[d]	2		58
No, not done	38	17	11		(32)	0		58
Someone else does this	44	19	(30)		2	21		48
No reply	21	9	9		0	0		91
2. Staining specimens								
a. Regularly check shelf life of reagents & discard those that have expired								
Yes	136	59	(37)		2	7	0	54
No, not done	19	8	0		(37)	0	0	63
Someone else does this	69	30	(26)		3	13	0	58
Other reply	1	X[d]	0		0	0	(100)	0
No reply	4	2	0		0	0	0	100

TABLE 17
(continued)

Experiences	Present Job[a]		Apprentice[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. b. Make stain & reagents used in the lab.								
Yes	39	17	(36)	10		3	0	51
Yes; other (purchase some/make some; purchase all; centrally prepared in institution)	129	56	5	(36)		2	0	58
Someone else does this	56	24	13	(27)		7	0	54
Other reply	5	2	0	(60)		0	0	40
c. Regularly examines slides for quality of staining, such as definition of intranuclear structure & intensity of nuclear stain, etc.								
Yes, (each staining batch or daily)	165	72	(43)	2	0	2	X[d]	52
Yes, other (weekly, change of stain, other)	34	15	6	(21)	0	0	0	74
No , not done	0	0	0	0	0	0	0	0
Someone else does this	21	9	(24)	10	0	0	0	67
Other reply	7	3	0	14	0	0	(29)	57
No reply	2	X[d]	0	50	0	0	0	50
d. Filter stains prior to use								
Yes, (each time slides stained, several times per day)	27	12	(37)	7	0	4	0	52
Yes, other (daily, weekly, other)	123	54	2	(37)	X[d]	2	0	58
No, not done	1	X[d]	0	100	0	0	0	0
Someone else does this	73	32	7	(29)	0	10	1	53
Other reply	4	2	0	0	0	0	(50)	50
No reply	1	X[d]	0	0	0	0	0	100
e. Filter alcohols for staining prior to use								
Yes, (each time slides stained, several times per day)	12	5	(17)	0	0	0	0	83
Yes, other (daily, weekly, other)	74	32	1	(30)	3	3	0	64
No, not done	68	30	0	4	(44)	3	0	49
Someone else does this	66	29	5	(24)	6	12	3	50
Other reply	7	3	0	0	0	0	(43)	57
No reply	2	X[d]	0	0	0	0	0	100

TABLE 17
(continued)

Experiences	Present Job[a]		Apprentice[a]					
	Replies		Yes	Yes, other	No, not done	Someone else does	Other reply	No reply
	N[b]	%[b]	%[c]	%[c]	%[c]	%[c]	%[c]	%[c]
2. f. Frequency of changing stains in staining dishes								
Yes, (daily)	6	3	(17)	0		0		83
Yes, other (weekly, bi-weekly, monthly, as needed)	146	64	1	(38)		5		55
Someone else does this	71	31	4	(35)		9		52
No reply	6	3	0	0		0		100
g. Frequency of changing alcohol solutions used in staining								
Yes, (daily)	28	12	(25)	4		0		71
Yes, other (weekly, bi-weekly, monthly, as needed)	120	52	2	(40)		5		53
Someone else does this	75	33	15	(28)		9		48
No reply	6	3	0	0		0		100
h. Separate staining of body cavity fluids (hypercellular specimens)								
Yes	81	35	(30)		3	7	0	61
No, not done	67	29	5		(42)	2	0	52
Someone else does this	65	28	(28)		9	9	0	54
Other reply	3	1	0		0	0	(67)	33
No reply	13	6	8		8	8	0	77

a. "Present Job" refers to the experiences (performance of duties) on the jobs which the cytotechnologists presently hold. "Apprentice" refers to the experiences (performance of duties) in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some spent the second half of their 12 months training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in apprentice laboratories and either are repeating them on their jobs or, if not, what other experiences they indicated. The column for "No reply" under Apprentice contains a large percent in all instances because there were more people who indicated job experiences than apprentice experiences (299 versus 109).

Footnotes for Table 17
(continued)

a. (continued)
For example: Of the 75 people who recorded appearance of all specimens on their jobs,
36% said they did as apprentices,
7% said someone else did this at the apprentice laboratory,
57% did not reply for their apprentice experience.
The largest percent (except "no reply") for each duty (experience) response is placed in parentheses to facilitate location of trends in job and apprentice experiences.

b. The summations of N (number) and % (percent) for Present Job follow the vertical dimension of the table. All percents are based on 229 people who indicated job experiences. The remaining 20 people did not indicate job experiences.

c. The summations of % (percent) for Apprentice follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Present Job). For example see Footnote a.

d. X = Less than 1%.

TABLE 18

TECHNICAL PROCEDURES PERFORMED IN EDUCATION, APPRENTICE AND JOB ACCORDING TO 1965 CERTIFICATION EXAMINATION PERFORMANCE

Technical Procedures	Education[a]				Apprentice[b]				Education &/or Apprentice and Job[c]			
	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]
	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]
Technical procedures learned & performed by cytotechnologists as students & on the job.....	218	100	91	9	113	100	96	4	221	100	94	6
1. Obtaining specimens												
a. Female Genital												
Vaginal aspiration.....	53	24	79	21	13	12	92	8	20	9	65	35
Vaginal irrigation.....	18	8	67	33	4	4	75	25	5	2	20	80
Pipette.....	28	13	79	21	8	7	88	12	13	6	62	38
Cotton swab.....	38	17	82	18	12	11	92	8	12	5	67	33
Cervical spatula.....	50	23	82	18	12	11	92	8	19	9	63	37
b. Non-genital												
Gastric washes.....	114	52	89	11	39	35	95	5	55	25	87	13
Oral.....	95	44	93	7	44	39	93	7	60	27	92	8
Aerosol induced respiratory....	47	22	89	11	19	17	95	5	22	10	86	14
2. Special cytopreparatory techniques												
Centrifuging.....	196	90	91	9	100	88	96	4	160	72	92	8
Cell filtration.....	160	73	91	9	58	51	95	5	84	38	92	8
Irrigation.....	35	33	91	9	10	9	80	20	17	8	82	18
3. Staining												
Papanicolaou (or modification).....	213	98	90	10	106	94	96	4	180	81	91	9
Hormonal.....	70	32	91	9	31	27	90	10	42	19	90	10
Cytogenetic.....	63	29	94	6	37	33	92	8	43	19	93	7

TABLE 18
(continued)

Technical Procedures	Education[a]				Apprentice[b]				Education &/or Apprentice and Job[c]			
	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]
	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]
4. Microscopic cytomorphology												
a. Female Genital												
Cervical Spatula.....	190	87	91	9	101	89	96	4	191	86	92	8
Vaginal.....	203	93	91	9	106	94	96	4	201	91	92	8
Endocervical.....	196	90	90	10	102	90	96	4	194	88	91	9
Endometrial.....	187	86	90	10	97	86	96	4	179	81	91	9
Irrigation.....	106	49	91	9	48	42	94	6	83	38	90	10
b. Respiratory												
Sputum.....	209	96	90	10	102	90	96	4	192	87	91	9
Bronchial washings.....	204	94	91	9	97	86	96	4	181	82	92	8
c. Gastrointestinal tract												
Esophageal.....	195	89	90	10	83	73	95	5	151	68	92	8
Gastric.....	203	93	91	9	94	83	96	4	167	76	91	9
Colon.....	161	74	92	8	63	56	94	6	110	50	92	8
d. Serous Fluids												
Pleural.....	209	96	90	10	96	85	97	3	183	83	91	9
Ascitic.....	206	94	91	9	92	81	96	4	178	81	91	9
Pericardial.....	171	78	91	9	66	58	94	6	133	60	90	10
e. Urine.....	206	94	91	9	96	85	96	4	181	82	91	9
f. Breast.....	206	94	91	9	103	91	96	4	194	88	92	8
g. Oral.....	186	85	91	9	91	81	96	4	159	72	93	7

TABLE 18
(continued)

Technical Procedures	Education[a]				Apprentice[b]				Education &/or Apprentice and Job[c]			
	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]	Total in Study		Pass Exam[d]	Fail Exam[d]
	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]	N[e]	%[e]	%[f]	%[f]
5. Other microscopic evaluation												
Hormonal	186	85	92	8	98	87	96	4	190	86	92	8
Radiation or chemotherapy	187	86	93	7	87	77	95	5	172	78	92	8
Viral	93	43	95	5	44	39	93	7	91	41	97	3
Cytogenetics	80	37	93	7	35	31	89	11	55	25	91	9
Electron microscopy or other special microscopic techniques	17	8	88	12	3	3	67	33	3	1	100	0
Acridine Orange Fluorescence	62	28	92	8	11	10	82	18	7	3	100	0

a. "Education" refers to performance of technical procedures in the school of cytotechnology.

b. "Apprentice" refers to the performance of technical procedures in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some of them spent the second half of their 12 month training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology.

c. This refers to the technical procedures performed both in the training program (school of cytotechnology and/or apprentice) and on the job presently held by the cytotechnologists.

d. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. "Pass Exam" and "Fail Exam" refer to cytotechnologists who passed and failed the 1965 certification examination.

e. The summations of N (number) and % (percent) for each of the sections (Education, Apprentice, Education &/or Apprentice and Job) follow the vertical dimension of the table. The percents are based respectively on 218 cytotechnologists (Education), 113 cytotechnologists (Apprentice) and 221 cytotechnologists (Education &/or Apprentice and Job) who replied in this section.

f. The summations of % (percent) for each of the three sections (Education, Apprentice, Education &/or Apprentice and Job) follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column for each section. For example: 53 people said they obtained specimens by vaginal aspiration and of these
79% passed the 1965 certification examination and
21% failed.

F. CHARACTERISTICS OF LABORATORY SUPERVISORS

Each cytotechnologost was asked to state the name and address of his immediate supervisor. Two quesionnaires 1/ were sent to the identified supervisors by the National Council on Medical Technology Education during July and August 1967. One requested information about the supervisor, himself, and the other was a form for evaluating the cytotechnologists' job performance. Although 158 job evaluation forms were returned, the supervisors' questionnaire was returned by 126 people. Eight people returned only the job evaluation forms. The information forms returned by 22 supervisors were incomplete or incorrectly completed. Nine supervisors each returned supervisor forms for themselves and job evaluation forms for two cytotechnologists. (Table 19 summarizes the replies)

Two-thirds of the 126 laboratory supervisors were physicians and almost all of the remaining were ASCP-certified cytotechnologists, some of whom had other types of certification.

Three-fourths of the laboratory supervisors were 36 years of age or older and two-thirds had more than five years of total experience. About three-fourths (71%) held two or fewer positions prior to their present one. Previous positions were supervisory in nature for about one-third (36%) of them and an additional one-fourth said they had held a variety of types of positions (non-supervisory, supervisory and research).

The positions currently held by almost three-fourths (71%) of them were in hospitals and by about one-fourth (22%) in independent laboratories. These positions were held in 37 states, the District of Columbia, Puerto Rico, and Canada. The position title for more than half (58%) of the supervisors was Laboratory Director and for one-third was Supervisor. About half (55%) of them indicated the department they supervised. These included 25% in Cytology, 8% in Pathology and 17% in all laboratory departments. The groups are equally divided in the length of time they have held their present positions; 43% for five years or less and 43% for six years or longer. Seventeen percent said that their present positions include teaching responsibilities.

The supervisors were asked for the number of personnel under their direction. Most of the supervisors indicated that they have ASCP-certified cytotechnologists and clerical personnel with the majority having one or two people of each category. Those indicating other categories gave the following in descending order of frequency: non-ASCP laboratory assistants and technologists, ASCP-certified medical technologists, maintenance personnel, "other" technical personnel, ASCP-certified histologic technicians, and laboratory assistants.

More than three-fourths (79%) of the laboratory supervisors attended college for four or more years and two-thirds had earned doctorate degrees in medicine. Formal education in cytotechnology was indicated by three-fourths of them including 46% who said they received it in a pathology residency and 28% in a school of cytotechnology.

Eighty-seven percent of the laboratory supervisors participated in continuing education. Academic credit was earned by 4%. Two-thirds attended non-credit earning workshops or seminars. Professional organization meetings were attended by 82% of them. Almost all (95%) of them belonged to professional organizations.

Between 78% and 80% used four or more professional journals and textbooks in their work.

According to the supervisors' estimates of work done in their laboratories, about two-thirds reported a maximum of 20,000 slides of female genital material (62%) and a maximum of 2,000 slides on non-genital material (67%).

It is difficult to identify any of these supervisor characteristics specifically with cytotechnologists who passed and failed the 1965 certification examination because the number (10) of respondents supervising failing cytotechnologists is too small to make such a comparison.

1/ Both questionnaires are reproduced in the Appendix.

TABLE 19

CHARACTERISTICS OF LABORATORY SUPERVISORS

Item	Total Group		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
Number and Percent of Laboratory Supervisors	126	100	92	8
1. Certified as				
M.D.	83	66	88	12
C.T.(ASCP)	23	18	100	0
Other[c]	16	13	100	0
None	3	2	100	0
No reply	1	X[t]	100	0
2. Age				
24 through 35 years	23	18	96	4
36 through 45 years	54	43	91	9
46 through 55 years	26	21	96	4
56 years or more[d]	15	12	93	7
No reply	8	6	75	25
3. Total length of experience				
1 through 5 years	21	17	81	19
6 through 10 years	40	32	100	0
11 years or more[e]	45	36	89	11
No reply	20	16	95	5
4. Positions held prior to present position				
a. Number				
0 positions	24	19	92	8
1 position	39	31	92	8
2 positions	27	21	93	7
3 positions or more[f]	25	20	88	12
No reply	11	9	100	0
b. Type				
Non-supervisory	13	10	100	0
Supervisory	45	36	82	18
Research	4	3	100	0
More than one type	30	24	100	0
None	2	2	100	0
No reply	32	25	94	6
5. Present position				
a. Type of laboratory				
Hospital	89	71	92	8
Independent	28	22	93	7
Other[g]	8	6	88	12
No reply	1	X[t]	100	0

TABLE 19
(continued)

Item	Total Group		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
5. b. Location				
Arizona	2	2	50	50
California	15	12	93	7
District of Columbia	1	X[t]	0	100
Illinois	7	6	86	14
Louisiana	6	5	100	0
Maryland	6	5	100	0
New Jersey	5	4	80	20
North Carolina	6	5	100	0
Pennsylvania	4	3	75	25
South Carolina	4	3	75	25
Texas	5	4	80	20
Virginia	5	4	80	20
Wisconsin	1	X[t]	0	0
Other[h]	59	47	100	0
c. Title				
Director of laboratory	73	58	88	12
Supervisor	40	32	100	0
Other[i]	11	9	100	0
No reply	2	2	50	50
d. Department in which supervising				
Pathology	10	8	80	20
Cytology	31	25	97	3
All laboratory departments	21	17	100	0
Other[j]	7	6	100	0
No reply	57	45	88	12
e. Length of time in present position				
Less than 1 year through 5 years	54	43	91	9
6 through 10 years	32	25	94	6
11 years or more[k]	23	18	91	9
No reply	17	13	100	0
f. Teaching duties				
Yes	22	17	100	0
No	104	83	90	10
6. Number of personnel supervised				
a. C.T.(ASCP)				
0 people	16	13	88	12
1 person	34	27	91	9
2 people	36	29	89	11
3 people	14	11	100	0
4 people or more[l]	26	21	96	4
b. M.T.(ASCP)				
0 people	70	56	96	4
1 person	7	6	57	43
2 people	3	2	100	0
3 people	3	2	100	0
4 people or more[l]	43	34	91	9

TABLE 19
(continued)

Item	Total in Group		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
6. c. H.T. (ASCP)				
0 people	100	79	94	6
1 person	14	11	79	21
2 people	7	6	86	14
3 people	3	2	100	0
4 people or more[1]	2	2	100	0
d. C.L.A. (ASCP)				
0 people	110	87	92	8
1 person	6	5	83	17
2 people	3	2	100	0
3 people	2	2	100	0
4 people or more[1]	5	4	100	0
e. Other technologists				
0 people	59	47	97	3
1 person	19	15	95	5
2 people	8	6	75	25
3 people	6	5	83	17
4 people or more[1]	34	27	88	12
f. Other laboratory assistants				
0 people	55	44	93	7
1 person	19	15	90	10
2 people	24	19	96	4
3 people	5	4	80	20
4 people or more[1]	23	18	91	9
g. Other technical personnel				
0 people	92	73	91	9
1 person	2	2	100	0
2 people	8	6	88	12
3 people	2	2	100	0
4 people or more[1]	22	17	96	4
h. Clerical personnel				
0 people	28	22	93	7
1 person	25	20	88	12
2 people	19	15	95	5
3 people	16	13	94	6
4 people or more[1]	38	30	92	8
i. Maintenance personnel				
0 people	73	58	96	4
1 person	32	25	84	16
2 people	11	9	91	9
3 people	7	6	86	14
4 people or more[1]	3	2	100	0

TABLE 19
(continued)

Item	Total in Group		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
7. Education Background				
a. Attended college				
0 years	5	4	100	0
1 year	3	2	100	0
2 years	8	6	100	0
3 years	7	6	100	0
4 years	28	22	96	4
5 years or more[m]	72	57	88	12
No reply	3	2	100	0
b. College degree				
None	9	7	100	0
Associate	5	4	100	0
Bachelor's	16	13	94	6
Master's	4	3	100	0
Doctorate	82	65	90	10
Other[n]	4	3	75	25
No reply	6	5	100	0
c. Major field of study				
Medicine	83	66	90	10
Biological sciences	24	19	100	0
Other[o]	9	7	100	0
No reply	10	8	80	20
d. Formal education in cytotechnology				
Yes, school of cytotechnology	35	28	97	3
Yes, pathology residency	58	46	86	14
Yes, other[p]	4	3	100	0
No	24	19	96	4
No reply	5	4	100	0
e. Attendance at school of cytotechnology				
6 months	16	13	100	0
12 months	8	6	100	0
Other[q]	44	35	86	14
Did not attend	12	10	100	0
No reply	46	37	91	9
8. Continuing education				
a. Academic credit	5	4	100	0
Bachelor's degree	3	2	100	0
Master's degree	1	X[t]	100	0
Doctorate	1	X[t]	100	0
No reply	121	96	92	8

TABLE 19
(continued)

Item	Total in Group		Passed Exam	Failed Exam
	N[a]	%[a]	%[b]	%[b]
8. b. Non-credit earning (workshops/ seminars)	84	67	95	5
Attended 1	51	41	92	8
2	21	17	91	9
3 or more[r]	12	2	100	0
No reply	42	33	91	9
c. Organizational meetings	103	82	91	9
Attended 1	45	36	93	7
2	37	29	92	8
3 or more[r]	21	17	86	14
No reply	23	18	96	4
d. Other types				
Stated	23	18	96	4
No reply	103	82	91	9
9. Membership in organizations				
1 organization	20	16	90	10
2 organizations	39	31	95	5
3 organizations	30	24	93	7
4 organizations or more[r]	31	25	87	13
No reply	6	5	100	0
10. Number of professional journals read				
1 through 3 named	24	19	92	8
4 through 6 named	45	36	91	9
7 or more named[r]	55	44	93	7
No reply	2	2	100	0
11. Number of textbooks read				
1 through 3 named	17	13	94	6
4 through 6 named	31	25	94	6
7 or more named[r]	67	53	100	0
No reply	11	9	36	64
12. Number of cases and slides examined in laboratory in 1966				
a. Female genital				
1) Cases: 10,000 or less	67	53	90	10
10,001 through 20,000	30	24	93	7
20,001 or more[s]	29	23	97	3
2) Slides: 10,000 or less	50	40	88	12
10,001 through 20,000	28	22	93	7
20,001 or more[s]	48	38	96	4
b. Non-genital				
1) Cases: 1,000 or less	88	70	90	10
1,001 through 2,000	20	16	100	0
2,001 or more[s]	18	14	94	6
2) Slides: 1,000 or less	57	45	88	12
1,001 through 2,000	28	22	96	4
2,001 or more[s]	41	33	95	5

Footnotes for Table 19

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension ot the table. All percents are based on 126 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: In the Total group, 83 people are M.D.'s of whom 88% supervised people who passed the 1965 certification examination and 12% supervised people who failed.

c. "Other" includes supervisors who were certified as MT(ASCP), CT; HT(ASCP), CT; RN and CT; MT and MD; RT (Canada); MT(AMT); CT and advanced registered technologist in cytology (Canada).

d. The maximum age for Total and Passed Exam groups is 80 years, for Failed Exam group is 62 years.

e. The maximum total experience for Total and Passed Exam groups is 22 years, for Failed Exam group is 20 years.

f. The maximum number of previous positions for Total and Passed Exam groups is 10, for Failed Exam group is 7.

g. "Other" includes public health, clinic, combination of hospital and independent laboratories.

h. For Total group, "other" includes 25 states, Puerto Rico, and Canada. For Passed Exam group, "other" includes 23 states, Puerto Rico, and Canada. Each of these has less than 5% of the people.

i. "Other" includes titles of Professor, Instructor, Commanding Officer, Assistant Professor of Pathology.

j. "Other" includes Tissue Culture Laboratory and Obstetrics-Gynocology, Cytopathology, School of Cytotechnology, Cytology and Hematology, Oral Cytology, and Oral Pathology.

k. The maximum years of experience in present positions for Total and Passed Exam groups is 36, for Failed Exam group is 20 years.

l. The largest number of

CT(ASCP)	14	Total and Passed Exam groups
	4	Failed Exam group
MT(ASCP)	27	Total and Passed Exam groups
	24	Failed Exam group
HT(ASCP)	9	Total and Passed Exam groups
	2	Failed Exam group
CLA(ASCP)	28	Total and Passed Exam groups
	1	Failed Exam group
Other technologists	27	Total and Passed Exam group
	9	Failed Exam group
Other Lab. Ass'ts	66	Total and Failed Exam groups
	13	Passed Exam group
Other Tech. Personnel	36	Total and Failed Exam groups (one reply gave 126 enlisted men)
	33	Passed Exam group
Clerical	15	Total and Failed Exam groups
	10	Passed Exam group
Maintenance	10	Total and Passed Exam groups
	3	Failed Exam group

m. The maximum number of years of college attendance for the Total and Passed Exam groups is 13, for the Failed Exam group is 6.

n. "Other" includes certificate programs indicated by replies of "School of Medical Technology", "Science", and "Nursing Education".

Footnotes for Table 19
(continued)

o. "Other" includes replies of "Arts", "Humanities", "Law", "Teaching", "Home Economics".

p. "Other" includes replies indicating study at Papanicoloau School of Cytotechnology for less than 6 months, Ruth Graham at Roswell Park (New York), and study under pathologist.

q. "Other" includes the following replies:
"Have assisted running a cytotechnology school"
"University of Tennessee before approval and Boston under Ruth Graham"
"36 months"
"Special courses for pathologists"

r. Maximum number not tallied.

s. The maximum estimated number of cases and slides is as follows:

Female Genital cases	59,000	Total and Passed Exam groups
	31,000	Failed Exam group
Female Genital slides	110,000	Total and Passed Exam groups
	40,000	Failed Exam group
Non-genital cases	11,000	Total, Passed Exam and Failed Exam groups
Non-genital slides	40,000	Total and Passed Exam groups
	32,000	Failed Exam group

The minimum estimated number of cases and slides is as follows:

Female Genital cases	2,000	Total and Failed Exam groups
	300	Passed Exam group
Female Genital slides	3,000	Total and Failed Exam groups
	500	Passed Exam group
Non-genital cases	10	Total and Passed Exam groups
	50	Failed Exam group
Non-genital slides	300	Total and Failed Exam groups
	50	Passed Exam group

t. X = Less than 1%.

G. JOB PERFORMANCE RATINGS

The second questionnaire returned by 158 laboratory supervisors contained 60 items describing aspects of cytotechnologists' job performance. These items were divided into five categories: Skills, Dependability, Reliability, Initiative and Personal Relations. The supervisors were asked to rate the particular cytotechnologist in this study population who was in their employ using the subjective scale of "excellent", "good", "average", "less than average", "unsatisfactory", and "does not apply". The last was to be used for items which may not apply to the duties performed by the cytotechnologist. Table 20 contains the distribution of ratings for 158 cytotechnologists, Table 21 for 141 who passed the 1965 certification examination, and Table 22 for 17 cytotechnologists who failed this examination.

The arithmetic mean of the number of people rated in each scale in all categories is as follows: 55% (87) of the 158 cytotechnologists were rated "excellent", 26% (41) rated "good", 10% (15) rated "average", 2% (2) rated "less than average", less than 1% (0.06) rated "unsatisfactory", and 6% (10) rated "does not apply".

There is a statistically significant difference in the distribution of ratings of the 158 cytotechnologists in seven of the job performance items. Significantly fewer of the cytotechnologists were rated "excellent" in the following items:

Judgment
Skills n. "Can logically relate cytomorphologic findings to patient history or provisional clinical diagnosis. (0.02 probability level)

Continuing Education
Initiative e. "Reads publications pertaining to work. (Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.)" (0.001 probability level)
Initiative g. "Shows desire to continue education by attending local, regional and/or national educational meetings within the past 18 months." (0.10 probability level)
Initiative i. "Reports, formally or informally, on attendance at educational meetings for the benefit of other members of the staff". (0.05 probability level)

Personal Relations
Initiative j. "Constructively suggests modifications of administrative policies if occasion arises." (0.01 probability level)

Significantly more of the cytotechnologists were rated "excellent" in

Techniques
Reliability i. "Legibly labels all equipment and slides used in processing a case." (0.10 probability level)

Work Accomplishment
Initiative c. "Voluntarily does and reports additional laboratory work to prove or enhance findings when circumstances warrant. (Such as special processing, staining, etc.)" (0.10 probability level)

There is a statistically significant difference in the distributions when comparing the arithmetic mean of the number of people rated in each scale in each category with individual items within that category. Significantly fewer of the 158 cytotechnologists were rated "excellent" in the comparison of the mean for

Skills with Skills item n. "Can logically relate cytomorphologic findings to patient history or provisional diagnosis." (Judgment) (0.05 probability level)

Reliability with Reliability item c. "Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations." (Judgment) (0.05 probability level)

Initiative with Initiative item e. "Reads publications pertaining to work. Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.)" (Continuing Education) (0.05 probability level)

There is no statistically significant difference in job performance rating between those who passed and those who failed the 1965 certification examination when comparing the arithmetic mean of the numbers of people rated in each scale in all categories of the pass group with the fail group.

There is, however, a statistically significant difference in the distribution of ratings of those who passed and failed the certification examinatin in seven job performance items. Significantly more of those who passed were rated "excellent" in the following items:

Attendance
Dependability item c. "Amount of sick leave taken has been minimal and/or justified." (0.05 probability level)

Dependability item d. "Requests for annual leave (vacation) have been reasonable (within established policy) and considerate of the total staff." (0.10 probability level)

Consults supervisor
Dependability item j. "Consults supervisor about unusual problems and/or situations (technical and/or administrative) when necessary." (0.05 probability level)

Quality Control
Reliability item l. "Takes appropriate precautions to maintain high quality of staining solutions (such as regularly filtering and changing stain,alcohol solutions and water)." (0.10 probability level)

Judgment
Reliability item c. "Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations." (0.10 probability level)

Appearance
Personal Relations item e. "Personal appearance is exemplary: clean uniform and shoes, personally neat, etc." (0.10 probability level)

Temperament
Personal Relations item f. "Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology." (0.05 probability level)

TABLE 20

JOB PERFORMANCE RATINGS FOR 158 CYTOTECHNOLOGISTS
WHO TOOK 1965 CERTIFICATION EXAMINATION

Item	Total of 158 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for 60 Items.....	% 100	% 55	% 26	% 10	% 2	% X[e]	% 6	% 1
Skills: 15 Items.....	100	55	30	8	X[e]	X[e]	5	6
Each item[b] of								
a. Techniques.....	100	56	23	5	0	0	16	X[e]
b. Techniques.....	100	40	18	11	1	0	27	2
d. Techniques.....	100	65	27	2	X[e]	0	6	0
e. Techniques.....	100	63	27	9	0	X[e]	X[e]	0
g. Techniques.....	100	58	32	6	0	0	3	1
h. Techniques.....	100	67	29	4	0	0	0	0
i. Techniques.....	100	61	31	7	X[e]	0	X[e]	0
c. Instrumentation....	100	51	25	8	X[e]	0	15	0
f. Instrumentation....	100	55	33	11	X[e]	0	0	X[e]
j. Judgment.....	100	63	28	7	1	0	X[e]	0
k. Judgment.....	100	51	35	12	X[e]	0	X[e]	0
l. Judgment.....	100	51	36	11	X[e]	X[e]	X[e]	0
m. Judgment.....	100	48[c,d]	36	10	3	X[e]	3	X[e]
n. Judgment.....	100	42[c,d]	39	13	2	0[e]	4	X[e]
o. Efficiency.....	100	58	30	9	1	X[e]	0	1
Dependability: 11 Items.....	100	64	23	8	1	X[e]	1	3
Each item[b] of								
a. Utilization of time	100	61	26	9	3	0	1	X[e]
h. Utilization of time	100	69	25	4	0	0	1	X[e]
i. Utilization of time	100	68	23	5	3	X[e]	0	0
k. Utilization of time	100	61	27	10	X[e]	0	0	1
b. Attendance.....	100	53	21	12	3	X[e]	10	1
c. Attendance.....	100	65	20	13	1	0	X[e]	X[e]
d. Attendance.....	100	67	20	9	3	0	1	1
e. Attendance.....	100	57	32	6	3	0	1	1
f. Attendance.....	100	69	22	7	2	0	X[e]	0
g. Attendance.....	100	67	23	8	1	0	X[e]	X[e]
j. Consults Supervisor	100	70	22	7	X[e]	X[e]	0	X[e]

TABLE 20
(continued)

Item	Total of 158 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for each category (continued)	%	%	%	%	%	%	%	%
Reliability: 12 Items.....	100	56	23	7	X[e]	X[e]	10	13
Each item[b] of								
a. Techniques.....	100	70	25	3	X[e]	0	2	0
b. Techniques.....	100	67	22	7	2	X[e]	0	1
g. Techniques.....	100	41	21	14	1	0	22	1
h. Techniques.....	100	51	17	5	0	0	26	X[e]
i. Techniques.....	100	59[c]	14	6	0	0	21	X[e]
j. Techniques.....	100	62	19	5	0	0	12	2
c. Judgment.....	100	48[d]	38	10	3	0	1	X[e]
d. Judgment.....	100	69	25	6	X[e]	0	0	0
e. Judgment.....	100	59	23	10	3	0	4	1
f. Judgment.....	100	48	24	11	3	0	13	X[e]
k. Quality Control....	100	53	32	8	1	0	5	X[e]
l. Quality Control....	100	49	25	6	1	0	17	1
Initiative: 16 Items.....	100	46	26	12	3	X[e]	10	13
Each item[b] of								
a. Work Accomplishment	100	51	27	15	4	1	3	X[e]
c. Work Accomplishment	100	41[c]	29	16	3	X[e]	10	1
d. Work Accomplishment	100	56	29	11	X[e]	0	3	X[e]
f. Work Accomplishment	100	53	30	12	2	1	0	1
l. Work Accomplishment	100	41	18	6	0	0	32	3
m. Work Accomplishment	100	50	25	13	X[e]	X[e]	10	X[e]
n. Work Accomplishment	100	51	29	13	2	0	4	2
o. Work Accomplishment	100	49	30	9	4	X[e]	8	X[e]
b. Personal Relations	100	54[c]	29	8	3	X[e]	5	X[e]
j. Personal Relations	100	36[c,d]	34	14	4	X[e]	10	2
e. Continuing Education	100	37[c,d]	34	21	6	1	X[e]	X[e]
g. Continuing Education	100	48[c]	22[c]	18	3	3	4	3
h. Continuing Education	100	42	17	13	3	2	20	3
i. Continuing Education	100	33[c]	25	14	3	1	22	3
k. Teaching.....	100	39	17	4	2	0	35	3
p. Judgment.....	100	54	29	14	2	X[e]	0	X[e]

TABLE 20
(continued)

Item	Total of 158 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfac-tory	Does not Apply	No Reply
PERCENT[a] rated for each category (continued)	%	%	%	%	%	%	%	%
Personal Relations: 6 Items....	100	59	25	9	3	X[e]	1	4
Each item[b] of								
a. Peers.....	100	56	29	11	3	X[e]	0	X[e]
b. Peers.....	100	60	27	8	4	0	0	1
c. Supervision.....	100	56	29	10	4	1	X[e]	X[e]
d. Lab. Assistant.....	100	54	23	10	3	X[e]	7	1
e. Appearance.....	100	72	17	10	X[e]	0	0	X[e]
f. Temperament.....	100	63	27	6	2	X[e]	0	2

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 98 through 101% because all are adjusted to the nearest whole number.

b. Letters preceding titles identify items in the rating form completed by the Supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 158 cytotechnologists with means for all items for 158 cytotechnologists. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Skills n: $X^2 = 7.93$; df = 2, $X^2 = 7.82$ (0.02 probability level)
2) Reliability i: $X^2 = 5.87$; df = 2, $X^2 = 4.61$ (0.10 probability level)
3) Initiative c: $X^2 = 5.89$; df = 2, $X^2 = 4.61$ (0.10 probability level)
4) Initiative e: $X^2 = 14.87$; df = 2, $X^2 = 13.82$ (0.001 probability level)
5) Initiative g: $X^2 = 5.67$; df = 2, $X^2 = 4.61$ (0.10 probability level)
6) Initiative i: $X^2 = 7.37$; df = 2, $X^2 = 5.99$ (0.05 probability level)
7) Initiative j: $X^2 = 10.32$; df = 2, $X^2 = 9.22$ (0.01 probability level)

d. Comparison of item rating distribution for 158 cytotechnologists with means for items in each section for 158 cytotechnologists. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Skills n: $X^2 = 6.79$; df = 2, $X^2 = 5.99$ (0.05 probability level)
2) Reliability c: $X^2 = 7.30$; df = 2, $X^2 = 5.99$ (0.05 probability level)
3) Initiative e: $X^2 = 6.33$; df = 2, $X^2 = 5.99$ (0.05 probability level)

e. X = Less than 1%.

TABLE 21

JOB PERFORMANCE RATINGS FOR 141 CYTOTECHNOLOGISTS
WHO PASSED THE 1965 CERTIFICATION EXAMINATION

Item	Total of 141 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for 60 Items.....	% 100	% 57	% 25	% 9	% 1	% X[d]	% 6	% 2
Skills: 15 Items.....	100	57	29	8	X[d]	X[d]	6	X[d]
Each item[b] of								
a. Techniques.....	100	56	23	4	0	0	16	X[d]
b. Techniques.....	100	39	18	12	X[d]	0	28	2
d. Techniques.....	100	67	23	2	X[d]	0	7	0
e. Techniques.....	100	65	25	9	0	X[d]	X[d]	0
g. Techniques.....	100	60	31	5	0	0	4	1
h. Techniques.....	100	69	27	4	0	0	0	0
i. Techniques.....	100	62	31	6	X[d]	0	X[d]	0
c. Instrumentation....	100	53	23	8	X[d]	0	16	0
f. Instrumentation....	100	56	33	10	X[d]	0	0	X[d]
j. Judgment.....	100	66	26	6	1	0	0	0
k. Judgment.....	100	53	36	10	X[d]	0	X[d]	0
l. Judgment.....	100	53	36	9	X[d]	X[d]	X[d]	0
m. Judgment.....	100	49	36	9	1	X[d]	3	X[d]
n. Judgment.....	100	43	39	11	1	0	4	X[d]
o. Efficiency.....	100	60	29	7	1	X[d]	0	1
Dependability: 11[b] Items.....	100	67	21	8	1	X[d]	1	X[d]
Each item[b] of.....								
a. Utilization of time	100	62	25	9	3	0	1	X[d]
h. Utilization of time	100	71	23	4	0	0	1	X[d]
i. Utilization of time	100	70	21	6	2	X[d]	1	0
k. Utilization of time	100	62	28	9	X[d]	0	0	X[d]
b. Attendance.....	100	56	21	11	3	X[d]	6	1
c. Attendance.....	100	69[c]	16	12	1	0	X[d]	X[d]
d. Attendance.....	100	70[c]	16	9	2	0	1	1
e. Attendance.....	100	59	30	6	3	0	1	1
f. Attendance.....	100	72	18	7	2	0	X[d]	0
g. Attendance.....	100	69	21	8	1	0	X[d]	X[d]
j. Consults Supervisor	100	73[c]	18	7	X[d]	X[d]	0	X[d]

TABLE 21
(continued)

Item	Total of 141 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for each category (continued)	%	%	%	%	%	%	%	%
Reliability: 12 Items.....	100	58	23	7	X[d]	X[d]	11	X[d]
Each item[b] of								
a. Techniques.....	100	71	23	4	0	0	2	0
b. Techniques.....	100	69	21	6	2	X[d]	0	1
g. Techniques.....	100	41	20	14	X[d]	0	23	1
h. Techniques.....	100	52	16	6	0	0	26	X[d]
i. Techniques.....	100	60	11	6	0	0	22	X[d]
j. Techniques.....	100	63	17	5	0	0	13	2
c. Judgment.....	100	50[c]	36	9	3	0	1	X[d]
d. Judgment.....	100	71	24	4	X[d]	0	0	0
e. Judgment.....	100	60	23	9	1	0	5	1
f. Judgment.....	100	50	23	9	2	0	14	X[d]
k. Quality Control....	100	54	33	7	X[d]	0	5	X[d]
l. Quality Control....	100	52[c]	24	4	X[d]	0	18	1
Initiative: 16 Items.....	100	48	26	12	3	X[d]	11	1
Each item[b] of								
a. Work Accomplishment	100	51	27	14	4	1	3	X[d]
c. Work Accomplishment	100	42	28	15	3	X[d]	11	1
d. Work Accomplishment	100	57	28	11	X[d]	0	3	X[d]
f. Work Accomplishment	100	55	30	11	2	1	0	X[d]
l. Work Accomplishment	100	43	18	7	0	0	31	2
m. Work Accomplishment	100	52	25	11	0	X[d]	11	X[d]
n. Work Accomplishment	100	53	27	13	2	0	4	2
o. Work Accomplishment	100	50	29	8	4	X[d]	7	X[d]
b. Personal Relations.	100	57	28	7	4	X[d]	4	X[d]
j. Personal Relations.	100	37	33	15	2	X[d]	11	2
e. Continuing Education	100	38	33	19	6	1	X[d]	X[d]
g. Continuing Education	100	49	21	16	3	4	4	4
h. Continuing Education	100	43	15	14	3	2	21	3
i. Continuing Education	100	36	22	14	3	1	21	3
k. Teaching.....	100	40	17	4	2	0	36	1
p. Judgment.....	100	55	30	11	2	X[d]	0	X[d]

TABLE 21
(continued)

Item	Total of 141 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfac-tory	Does not Apply	No Reply
PERCENT[a] rated for each category (continued)	%	%	%	%	%	%	%	%
Personal Relations: 6 Items....	100	62	23	10	3	X[d]	X[d]	1
Each item[b] of								
a. Peers.....	100	57	28	12	2	X[d]	0	X[d]
b. Peers.....	100	62	26	8	4	0	0	1
c. Supervision.....	100	58	25	11	4	1	X[d]	X[d]
d. Laboratory Assistant	100	57	21	10	4	X[d]	6	1
e. Appearance.....	100	75[c]	14	11	X[d]	0	0	X[d]
f. Temperament.....	100	66[c]	23	6	1	X[d]	0	2

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 98 through 101% because all are adjusted to the nearest whole number.

b. The letters preceding titles identify items in the rating form completed by the supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 141 cytotechnologists who passed and 17 cytotechnologists who failed the 1965 certification examination. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Dependability c: $X^2 = 7.21$; df = 2, $X^2 = 5.99$ (0.05 probability level)
More of Passed Exam group rated excellent
2) Dependability d: $X^2 = 5.57$; df = 2, $X^2 = 4.61$ (0.10 probability level)
More of Passed Exam group rated excellent
3) Dependability j: $X^2 = 6.36$; df = 2, $X^2 = 5.99$ (0.05 probability level)
More of Passed Exam group rated excellent
4) Reliability c: $X^2 = 4.72$; df = 2, $X^2 = 4.61$ (0.10 probability level)
More of Passed Exam group rated excellent
5) Reliability l: $X^2 = 5.00$; df = 2, $X^2 = 4.61$ (0.10 probability level)
More of Passed Exam group rated excellent
6) Personal Relations e: $X^2 = 4.73$; df = 2, $X^2 = 4.61$ (0.10 probability level)
More of Passed Exam group rated excellent
7) Personal Relations f: $X^2 = 6.24$; df = 2, $X^2 = 5.99$ (0.05 probability level)
More of Passed Exam group rated excellent

d. X = Less than 1%.

TABLE 22

JOB PERFORMANCE RATINGS FOR 17 CYTOTECHNOLOGISTS
WHO FAILED THE 1965 CERTIFICATION EXAMINATION

Item	Total of 17 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for 60 Items.....	% 100	% 41	% 37	% 14	% 2	% 0	% 6	% X[d]
Skills: 15 Items.....	100	43	36	16	2	0	3	0
Each item[b] of								
a. Techniques.....	100	53	24	12	0	0	12	0
b. Techniques.....	100	47	24	6	6	0	18	0
d. Techniques.....	100	47	53	0	0	0	0	0
e. Techniques.....	100	47	41	12	0	0	0	0
g. Techniques.....	100	41	47	12	0	0	0	0
h. Techniques.....	100	47	47	6	0	0	0	0
i. Techniques.....	100	53	29	18	0	0	0	0
c. Instrumentation....	100	41	41	12	0	0	6	0
f. Instrumentation....	100	47	35	18	0	0	0	0
j. Judgment.....	100	41	41	12	0	0	6	0
k. Judgment.....	100	41	24	29	6	0	0	0
l. Judgment.....	100	35	35	29	0	0	0	0
m. Judgment.....	100	35	35	18	12	0	0	0
n. Judgment.....	100	29	35	29	6	0	0	0
o. Efficiency.....	100	41	35	24	0	0	0	0
Dependability: 11[b] Items.....	100	45	40	11	1	0	3	X[d]
Each item[b] of								
a. Utilization of time	100	53	35	12	0	0	0	0
h. Utilization of time	100	53	41	6	0	0	0	0
i. Utilization of time	100	53	41	0	6	0	0	0
k. Utilization of time	100	53	18	24	0	0	0	6
b. Attendance.....	100	29	18	18	0	0	35	0
c. Attendance.....	100	35[c]	47	18	0	0	0	0
d. Attendance.....	100	41[c]	47	6	6	0	0	0
e. Attendance.....	100	41	47	12	0	0	0	0
f. Attendance.....	100	47	47	6	0	0	0	0
g. Attendance.....	100	47	41	12	0	0	0	0
j. Consults Supervisor.	100	41[c]	53	6	0	0	0	0

TABLE 22
(continued)

Item	Total of 17 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfactory	Does not Apply	No Reply
PERCENT[a] rated for (continued)	%	%	%	%	%	%	%	%
Reliability: 12 Items.....	100	43	34	13	3	0	6	0
Each item[b] of								
a. Techniques.....	100	59	41	0	0	0	0	0
b. Techniques.....	100	53	35	12	0	0	0	0
g. Techniques.....	100	35	29	18	6	0	12	0
h. Techniques.....	100	47	29	0	0	0	24	0
i. Techniques.....	100	47	35	6	0	0	12	0
j. Techniques.....	100	53	35	6	0	0	6	0
c. Judgment.....	100	24[c]	53	24	0	0	0	0
d. Judgment.....	100	53	29	18	0	0	0	0
e. Judgment.....	100	47	29	12	12	0	0	0
f. Judgment.....	100	29	29	29	6	0	6	0
k. Quality Control.....	100	41	29	18	6	0	6	0
l. Quality Control.....	100	29[c]	35	18	6	0	12	0
Initiative: 16 Items.....	100	35	33	18	3	0	11	1
Each item[b] of								
a. Work Accomplishment.....	100	47	24	24	6	0	0	0
c. Work Accomplishment.....	100	29	41	24	0	0	6	0
d. Work Accomplishment.....	100	47	41	12	0	0	0	0
f. Work Accomplishment.....	100	41	35	18	0	0	0	6
l. Work Accomplishment.....	100	29	18	0	0	0	47	6
m. Work Accomplishment.....	100	35	29	24	6	0	6	0
n. Work Accomplishment.....	100	35	41	18	0	0	6	0
o. Work Accomplishment.....	100	35	35	18	0	0	12	0
b. Personal Relations.....	100	35	35	12	0	0	18	0
j. Personal Relations.....	100	29	41	6	18	0	6	0
e. Continuing Education.....	100	29	35	35	0	0	0	0
g. Continuing Education.....	100	41	29	29	0	0	0	0
h. Continuing Education.....	100	41	35	6	6	0	12	0
i. Continuing Education.....	100	12	47	12	6	0	24	0
k. Teaching.....	100	24	18	12	0	0	35	12
p. Judgment.....	100	41	24	35	0	0	0	0

TABLE 22
(continued)

Item	Total of 17 C.T.	Job Performance Rating						
		Excellent	Good	Average	Less than Average	Unsatisfac-tory	Does not Apply	No Reply
PERCENT[a] rated for (continued)	%	%	%	%	%	%	%	%
Personal Relations: 6 items....	100	41	46	7	4	0	2	0
Each item[b] of								
a. Peers.....	100	53	35	6	6	0	0	0
b. Peers.....	100	41	41	12	6	0	0	0
c. Supervision.....	100	35	59	0	6	0	0	0
d. Laboratory Assistant....	100	35	41	12	0	0	12	0
e. Appearance.....	100	47[c]	47	6	0	0	0	0
f. Temperament.....	100	35[c]	53	6	6	0	0	0

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 99 through 101% because all are adjusted to the nearest whole number.

b. The letters preceding titles identify items in the rating form completed by the supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 141 cytotechnologists who passed and 17 cytotechnologists who failed the 1965 certification examination. Calculation of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Dependability c: $X^2 = 7.21$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent
2) Dependability d: $X^2 = 5.57$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
3) Dependability j: $X^2 = 6.36$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent
4) Reliability c: $X^2 = 4.72$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
5) Reliability l: $X^2 = 5.00$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
6) Personal Relations e: $X^2 = 4.73$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
7) Personal Relations f: $X^2 = 6.24$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent

d. X = Less than 1%.

CONTENTS OF APPENDICES

APPENDIX A
Methodology

This report culminates the cytotechnologist study which was designed to acquire information about relationships among educational achievement, certification examination scores and job performance of cytotechnologists. This section of the report presents the method of obtaining and analyzing the data obtained from files of the offices of the Boards of Registry of Medical Technologists and Schools of Medical Technology (ASCP) as well as questionnaires received from cytotechnologists and their laboratory supervisors.

The cytotechnologists selected for this study were the candidates for the 1965 certification examination in exfoliative cytology administered by the Board of Registry of Medical Technologists (ASCP). This group was selected because it was the largest taking the examination with sufficient working experience to enable completion of the cytotechnologist questionnaire and for laboratory supervisors to evaluate individuals' job performance. This group consists of 358 people of whom 307 passed and 51 failed the 1965 certification examination.

The office of the Registry of Medical Technologists (ASCP) maintains a file for each applicant for the examination in exfoliative cytology containing a transcript of college credit hours earned (or, in lieu of the transcript, a form summarizing credit hours accepted toward fulfillment of prerequisites) and a performance evaluation from the school of cytotechnology or other clinical program attended. Information about college credit hours was available from this file for 306 of the cytotechnologists. The credit hours were transferred to a keypunch code sheet according to those recorded on transcripts and those recorded on forms substituting for transcripts. The record of transcript credit hours was divided to show the number of credit hours earned in A, B, and C grades ("satisfactory performance") and the credit hours earned in D and F grades ("unsatisfactory performance"). The number of total credit hours earned was recorded separately from the number earned in science courses without indication of grades.

Performance evaluations of clinical study were recorded as confirmed by directors of programs on forms provided by the Registry office. Information was transferred to keypunch code sheets in numbers one through four representing the ratings of "excellent", "good", "fair", and "poor". Only one rating was given for the entire period of training. In some instances, however, the cytotechnologists received their clinical study in two institutions in which case the evaluations by both institutions were recorded in appropriately designated columns in the keypunch code sheet.

The Registry office provided identification numbers for each school of cytotechnology within each state attended by the cytotechnologists surveyed. The institutions attended which were not A.M.A. accredited schools of cytotechnology were identified by the state code number and additional numbers designated by the study staff.

The raw scores from the 1965 certification examination were also provided by the Registry office. These included scores for the written and practical sections of the examination.

The Board of Schools of Medical Technology (ASCP) permitted the use of annual reports filed with its office for the 82 schools of cytotechnology accredited in 1964 and 1965. These reports provided descriptive data regarding qualifications of school directors, qualifications and size of technical staffs, laboratory workloads, and related information which were transferred to keypunch code sheets.

During July 1967, questionnaires were sent from the National Council on Medical Technology Education to each of the 358 cytotechnologists in the study population requesting information concerning their location, type and length of employment; and various matters relating to their education programs and work. Each of the cytotechnologists was requested to submit the name of his immediate laboratory supervisor. This questionnaire is reproduced in Appendix C. Completed questionnaires were returned by 249 (70%) of the 358 cytotechnologists of whom 222 passed and 27 failed the 1965 certification examination.

Each of the laboratory supervisors named by the reporting cytotechnologists were then sent questionnaires by the National Council on Medical Technology Education during August and September, 1967. On questionnaire A each supervisor was asked to evaluate the job performance of the cytotechnologist indicated according to 60 items relating to skills, dependability, reliability, initiative, and personal relations. The ratings were recorded by six indices, "excellent", "good", "average", "less than average", "unsatisfactory", and "does not apply". On questionnaire B each supervisor was asked to provide information about his own education and work experience. These questionnaires are reproduced in Appendix D. Of the 249 supervisors surveyed, 158 returned job evaluation forms (Questionnaire A) and 126 returned information about themselves (Questionnaire B).

The Cytotechnologist Questionnaire and Supervisors Questionnaires (A and B) were prepared with the assistance of the consultants to NCMTE. They were pre-tested by appropriate people in two laboratories in Memphis, Tennessee and one laboratory in Baltimore, Maryland. Revisions were made according to the reactions of the people involved in the pre-test program.

Each of the cytotechnologists was assigned a study number, consecutively, according to the "Pass" and "Fail" groups. This system facilitated distinction of the "Pass" and "Fail" groups as well as identification of cytotechnologists who did not have certification numbers because they did not pass the examination in 1965 or subsequently. Study numbers were assigned to the laboratory supervisors as their completed forms were received in the NCMTE office.

All data were organized and assigned to the following decks of IBM cards:

Deck 1: Cytotechnologists' certification examination scores for the 1965 certification examination in exfoliative cytology and performance rating in clinical study. (Obtained from files in the office of the Registry of Medical Technologists (ASCP)) N = 358

Deck 2: Academic credit hours taken by the cytotechnologists. (College transcript and Registry form for credit hours from files in the office of the Registry of Medical Technologists (ASCP)) N = 358

Deck 3: Information from the 1964 and 1965 annual reports of the schools of cytotechnology. (From the files of the office of the Board of Schools of Medical Technology (ASCP)) N = 82

Modified deck combining cards from Deck 3 and Deck 1 to identify cytotechnologists with schools of cytotechnology. N = 313

Deck 4: Rating of cytotechnologists' job performance. (Supervisors Form A) N = 158

Deck 5: Information about education and working experience of laboratory supervisors. (Supervisors Form B) N = 126

Deck 6: Information about location and type of work for cytotechnologists. (Cytotechnologists Questionnaire) N = 249

Deck 7: Information about quality control measures used by cytotechnologists in their education programs and work. (Cytotechnologists Questionnaire) N = 249

Deck 8: Information about procedures and techniques performed by cytotechnologists in their education programs and work. (Cytotechnologists Questionnaire) N = 249

Each card in each deck was commonly identified by the cytotechnologists' and laboratory supervisors' Registry certification number (where applicable) and respective study numbers.

All data were processed on an IBM 1620 computer at the Yalem Scientific Computer Center at St. Louis University (St. Louis, Missouri) under the direction of Mr. Robert Sullivan and Miss Marguerite Inglis. The relationships attempted and reported were derived by members, staff and consultants of the National Council on Medical Technology Education with advice from the computer center staff. Findings were derived from single and double column item analysis of data on all decks of cards, arithmetic means of job performance ratings, and chi square test for distribution (where possible). The programs used for all analyses were obtained from the Yalem Scientific Computer Center. Statistically significant relationships were determined through use of the chi square and Kolmogorov-Smirnov formulae for distribution.

APPENDIX B
History

The National Council on Medical Technology Education grew out of a concerted effort over an eight-year period to appraise the educational preparation of medical laboratory personnel.

In October 1956 the Medical Technology Study Committee (an ad hoc joint committee of the American Society of Clinical Pathologists and American Society of Medical Technologists) met with research consultants and representatives of medical, paramedical and hospital organizations to assess various professional and legislative facets of medical technology. This deliberation culminated in the recommendation that the National Committee for Careers in Medical Technology 1/ endeavor to obtain financial support for a national study of the education and utilization of medical laboratory personnel. Several attempts to do so were unsuccessful.

The Alabama Project

Three years later, in 1959, the National Committee for Careers in Medical Technology did obtain funds to conduct a pilot study on medical technology education in Alabama. This "Alabama Pilot Study" (subsequently known as the Alabama Project) developed from requests by the Alabama State Society of Medical Technologists and American Society of Medical Technologists and was financed through the Cancer Control Program of the United States Public Health Service. Its objectives were

1. to find ways and means of increasing and improving the quality of medical technology instruction in Alabama;
2. to find ways of increasing cancer cytolcgic training of medical technologists; and
3. to provide specialized cytologic training.2/

The Alabama Project was supervised by Joseph A. Cunningham, M.D. (Project Director), Mrs. Sara Crowson, M.T.(ASCP) and Mrs. Frances Wideman, M.T.(ASCP) (Field Coordinators). It was conducted in three phases.

During Phase I, the staff assembled information on current programs in schools of medical technology through surveys designed to explore the following areas of need:

"1. Encouraging formalization of the schools of medical technology,
2. Faculty development,
3. Developing resource material,
4. Assisting teaching supervisors in improving their skills,
5. Strengthening the interest of Alabama colleges in the teaching programs of the AMA-Approved schools,
6. Cooperation with recruitment efforts of the Alabama State Society of Medical Technologists."

1/ The National Committee for Careers in Medical Technology is an incorporated organization consisting of representatives of the American Society of Clinical Pathologists, American Society of Medical Technologists and College of American Pathologists.

2/ The Alabama Pilot Study. Final report of a three-year project (1959-1962) for the improvement of medical technology education. Sponsored by the National Committee for Careers in Medical Technology through the United States Public Health Service Contract #73071.

These surveys were evaluated at a meeting of school directors and teaching supervisors where priorities were assigned in the following order:

1. Budgetary considerations,
2. Space requirements,
3. Strengthening college affiliations,
4. Improving communications among schools of medical technology,
5. Providing teaching aids, and
6. Developing teaching skills of instructors.

These suggestions were implemented in Phase II through a conference of directors of six schools of medical technology and ten Alabama colleges. They recommended that

1. representatives of the programs concerned meet every third year to review their respective programs and the success of their graduates in the certification examination administered by the Registry of Medical Technologists (ASCP); and
2. respective facilities of closely affiliated colleges and schools of medical technology meet annually to discuss student deficiencies.

Communications between schools of medical technology were facilitated through publication of a newsletter, "The Alabama Pilot". Methods for developing teaching skills were introduced to instructors through

1. seminars on student evaluation and difficulties with teaching methods in medical technology;
2. a course on problem situations in supervision; and
3. workshops in the preparation and use of teaching aids, laboratory instrumentation and fluorescence microscopy.

In addition, the preparation and use of teaching aids were emphasized by publishing and distributing lists of pertinent films, film strips and slide collections; and acquiring films and slides in blood banking, coagulation, blood cell morphology, cytology and histologic technique.

The objectives relating to cytotechnology were implemented through a survey of Alabama pathologists to determine needs for instruction and recruitment in medical technology. The project activities included

1. acquisition of scholarship funds for student support,
2. development of instructional material,
3. publication of a newsletter for the exchange of information among schools of cytotechnology,
4. intensive recruitment of students, and
5. a workshop in endometrial carcinoma.

Phase III comprised the evaluation of all project activities which indicated progress in all areas and emphasized needs for and interest in their continuation.

The National Council on Medical Technology Education

In October 1962 a group of 24 representatives of agencies concerned with education in medical technology and cytotechnology met to study the findings and recommendations of the Alabama Project. They recommended unanimously "...that a pilot study be set up to test whether a central education office could do for all Approved Schools of Medical Technology the many things accomplished by the Alabama Project for the Alabama Schools as well as fulfilling other needs."2/

As a direct consequence, the National Council on Medical Technology Education was formed in July 1964, under the sponsorship of the National Committee for Careers in Medical Technology and through the support of the Cancer Control Branch of the Division of Chronic Diseases, United States Public Health Service.3/ The N.C.C.M.T. chairman, Robert Horn, Jr., M.D., appointed as members of the Council

Merlin L. Trumbull, M.D. (Chairman and Project Director)
Nellie May Bering, B.S.,M.T.(ASCP)
Joseph A. Cunningham, M.D.
Mary Frances James, M.S.,M.T.(ASCP)
John B. Miale, M.D.

3/ Community Cancer Demonstration Project Grant Number 5514-A-65

He appointed as staff and consultants
Ruth I. Heinemann, B.S.,M.T.(ASCP) (Program Coordinator)
W. I. Christopher, M.H.A. (Consultant)
Robert Richart, Ph.D. (Consultant)
Subsequent appointments include
Arch Lugenbeel, M.Ed. (Education Associate)
Frances Kaplan, M.A., (Consultant)
Arline Howdon, B.A.,C.T.(ASCP) (Consultant)
Irma Rube, M.S.,C.T.(ASCP) (Consultant)
Drs. Trumbull and Miale resigned in 1966 and were replaced by Rex Couch, M.D. and Tyra T. Hutchens, M.D.

In their first meeting in October 1964 the members of the Council concurred in a need for further baseline information about medical technology education prior to implementation of the Alabama Project recommendations. This conviction derived from the realization that various boards and committees involved in the education and certification of medical technologists were then considering the basic question of whether or not current and future demands in this rapidly developing profession were being met through established programs of education in medical technology. Accordingly, they took action to confine their initial projects to studies in depth of the academic, technical, graduate and continuing education programs for medical technologists, cytotechnologists and certified laboratory assistants in order to determine directions of future service in the development of these programs.

The projects initiated by the Council to date are

1. Medical Technologist Study, Certified Laboratory Assistant Study, and Cytotechnologist Study. These surveys are intended to examine the relationships between educational preparation and job performance of laboratory personnel.
2. Back-to-Work Project. This project consists of the location of medical technologists not currently active in their profession and the organization of retraining programs for those who wish to resume such activity.
3. Continuing Education. Following development of a training grants program for experienced medical technologists, the Council intends to survey existing graduate degree programs and to assist in the establishment of new programs.
4. Community College. A joint committee of the National Council on Medical Technology Education and the American Association of Junior Colleges has been formed to consider guidelines for curricula appropriate for two-year colleges in medical laboratory personnel education.

The Medical Technologist Study was published in August 1967 under the title of National Correlations in Medical Technology Education. The report of the Cytotechnologist Study was completed in May 1968 under the title of Report of a National Study of Cytotechnologists: Education and Performance Relationships. The report of an informal survey, Graduate Study Interests of Medical Technologists, was published in the American Journal of Medical Technology, Volume 33, No. 6-November-December 1967.

APPENDIX C

Questionnaire to Cytotechnologists and Introductory Letters

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

CYTOTECHNOLOGIST STUDY

Questionnaire to Cytotechnologists

Please give or select the answer most descriptive of you, your job or your impressions.

1. Name: _____
(Last) (First) (Middle) (Maiden)

2. Certification: C.T.(ASCP) # _____
M.T.(ASCP) # _____
Other (Please specify type and number) _____

3. What is the total length of time that you have worked as a cytotechnologist?
_____ 6 months or less
_____ 7 through 12 months
_____ 13 through 24 months
_____ 25 through 30 months
_____ 31 through 36 months
_____ 37 through 42 months
_____ 43 through 48 months
_____ 49 months or more
Please specify number _____

4. Education
a. How much college education have you had?
_____ None
_____ Less than 1 year
_____ 1 year
_____ 2 years
_____ 3 years
_____ 4 years
_____ More than 4 years (Please specify number) _____

b. What college degree do you have?
_____ None
_____ Associate
_____ Bachelor's
_____ Master's
_____ Doctorate

c. What A.M.A. accredited school of cytotechnology did you attend?
(Note: If the laboratory where you had your training was not an accredited school of cytotechnology, please give the name of the laboratory (or institution) and indicate that it was not an accredited school.)

Name of Institution: _____

Address: _____
(Street)

_____
(City) (State) (Zip Code)

d. How long did you attend the school of cytotechnology?
(Note: If the laboratory where you had your training was not an accredited school of cytotechnology, please give the total length of time you spent in the training program you attended.)

_____ 6 months
_____ 12 months
_____ Other (Please specify number of months) _____

4. Education (continued)

e. If you attended the school of cytotechnology for less than 12 months, where did you have the full time experience necessary to complete the 12 month requirements for taking the certification examination?

Name of Institution: _____

Address: _____
(Street)

_____
(City) (State) (Zip Code)

1) How many months did you spend at this institution to complete your clinical study (training)?

_____ 6 months
_____ 5 months
_____ 4 months
_____ 3 months
_____ Other (Please specify number of months) _____

2) Did you have regularly scheduled lectures and/or conferences with your instructors (supervisors) as a part of the clinical study (training) program at this institution?

_____ Yes
_____ No
_____ Other (Please specify) _____

5. Place of full time employment

a. Where do you work?
Name of Institution: _____

Address: _____
(Street)

_____
(City) (State) (Zip Code)

b. Who is the director of the cytology laboratory where you are working?
Name: _____

_____ M.D. Pathologist	_____ M.D.: Not Pathologist	_____ Not M.D.
_____ Full Time[1]	_____ Full Time[1]	_____ Full Time[1]
_____ Part Time[2]	_____ Part Time[2]	_____ Part Time[2]
_____ Consultant[3]	_____ Consultant[3]	_____ Consultant[3]

Address: (Complete only if director is part time or consultant)

_____
(Street)

_____
(City) (State) (Zip Code)

---

1. Full Time: "In residence" in the institution in which you are employed and available to medical and laboratory staffs for consultation at all times.
2. Part Time: Not "In residence" in the institution in which you are employed. Visits your laboratory frequently (4 hours or less per day and 2 days or more per week.)
3. Consultants: Not "In residence" in the institution in which you are employed. Visits your laboratory infrequently (less than 2 days per week.)

5. Place of full time employment (continued)

c. How long have you worked at this institution as a cytotechnologist?

_____	6 months or less	_____	31 - 36 months
_____	7 - 12 months	_____	37 - 42 months
_____	13 - 18 months	_____	43 - 48 months
_____	19 - 24 months	_____	49 months or more
_____	25 - 30 months	_____	Please specify number

d. What are your working hours and in what type of laboratory are you working?
(Note: If you have both full time and part time positions, please complete all pertinent sections.)

1) Full Time (35 or more hours per week)

a) Time:
_____ Day
_____ Day and weekend
_____ Day and night
_____ Day, weekend and night
_____ Other (Please specify) _____

b) Location: (Please check all of the departments where you work and give the approximate percent of time you spend in cytology and/or pathology.)

_____ Hospital (Include private, federal, state, county, city, university, etc. institutions which have bed patients.)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Hematology
_____ Chemistry
_____ Microbiology
_____ Blood Bank
_____ Other (Please specify) _____

_____ Independent (Including clinic or doctors' office)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Hematology
_____ Chemistry
_____ Microbiology
_____ Blood Bank
_____ Other (Please specify) _____

_____ Public Health (Only non-hospital: federal, state, county, city)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Microbiology
_____ Other (Please specify) _____

2) Part Time (Less than 35 hours per week)

a) Time:
_____ Day
_____ Day and weekend
_____ Day and night
_____ Day, weekend and night
_____ Other (Please specify) _____

5. d. (continued)
2) b) Location: (Please check all of the departments where you work and give the approximate percent of time you spend in cytology and/or pathology.)

_____ Hospital (Include private, federal, state, county, city, university, etc. institutions which have bed patients.)
- _____ Cytology _____ % of time
- _____ Pathology (Including cytology) _____ % of time
- _____ Hematology
- _____ Chemistry
- _____ Microbiology
- _____ Blood Bank
- _____ Other (Please specify) _____

_____ Independent (Including clinic or doctors' office)
- _____ Cytology _____ % of time
- _____ Pathology (Including cytology) _____ % of time
- _____ Hematology
- _____ Chemistry
- _____ Microbiology
- _____ Blood Bank
- _____ Other (Please specify) _____

_____ Public Health (Only non-hospital: federal, state, county, city)
- _____ Cytology _____ % of time
- _____ Pathology (Including cytology) _____ % of time
- _____ Microbiology
- _____ Other (Please specify) _____

e. What type of position do you have now?
(Note: If you have both full and part time positions, please indicate the type for both and whether they are full or part time.)

_____ Supervisory
- _____ Chief Cytotechnologist, _____ Full Time _____ Part Time
- _____ Section Chief: Cytopreparation, _____ Full Time _____ Part Time
- _____ Section Chief: Cytoscreening, _____ Full Time _____ Part Time
- _____ Chief of Research Laboratory, _____ Full Time _____ Part Time
- _____ Teaching Supervisor (School of Cytotechnology) _____ Full Time _____ Part Time
- _____ Assist with teaching, _____ Full Time _____ Part Time
  - _____ by lecturing (basic sciences, cytology)
  - _____ by giving practical instruction in the laboratory
  - _____ by giving practical examinations
  - _____ other (Please specify) _____

_____ Non-supervisory ("Staff")
- _____ Chief Cytotechnologist, _____ Full Time _____ Part Time
- _____ Section Chief: Cytopreparation, _____ Full Time _____ Part Time
- _____ Section Chief: Cytoscreening, _____ Full Time _____ Part Time
- _____ Chief of Research Laboratory, _____ Full Time _____ Part Time
- _____ Teaching Supervisor (School of Cytotechnology _____ Full Time _____ Part Time
- _____ Assist with teaching, _____ Full Time _____ Part Time
  - _____ by lecturing (basic sciences, cytology)
  - _____ by giving practical instruction in the laboratory
  - _____ by giving practical examinations
  - _____ other (Please specify) _____

_____ Sole Cytotechnologist (Only person in department doing all preparation and screening)
- _____ Full Time _____ Part Time

5. f. How long have you held your present position?

_____ 6 months or less	_____ 31 - 36 months
_____ 7 - 12 months	_____ 37 - 42 months
_____ 13 - 18 months	_____ 43 - 48 months
_____ 19 - 24 months	_____ 49 months or more
_____ 25 - 30 months	Please spedify number _____

g. Are you working in the same geographic area where you attended the school of cytotechnology (or had your training)?

_____ Yes, same laboratory
_____ Yes, same city but not same laboratory
_____ Yes, same state but not same city
_____ No, out of the state where training obtained

6. Consultation

a. To what extent is the laboratory director available for cytologic consultation?

_____ In the laboratory at all times
_____ Often (In the laboratory at least once a day)
_____ Available when needed but not in the laboratory ever day
_____ Available by telephone or mail only
_____ Not always available when needed
_____ Never
_____ Other (Please specify) _____

b. To what extent is your immediate supervisor (chief cytotechnologist or the like) available for consultation?

_____ In the laboratory al all times
_____ Often (In the laboratory at least once a day)
_____ Available when needed but not in the laboratory every day
_____ Available by telephone or mail only
_____ Not always available when needed
_____ Never
_____ Other (Please specify) _____

c. How often do you consult your immediate supervisor?

_____ Daily
_____ Weekly
_____ Monthly
_____ Seldom
_____ Never
_____ Other (Please specify) _____

7. Do you make decisions about the selection of equipment, reagents, etc, that are purchased for your laboratory?

On all items

_____ Yes, help others
_____ Yes, have complete responsibility
_____ No, do not have this responsibility

On some items

_____ Yes, help others
_____ Yes, have complete responsibility
_____ No, do not have this responsibility

8. Have your duties and responsibilities for your job been clearly defined for you by your immediate supervisor?

_____ Yes _____ No

9. Do you think that you have the responsibility to use independent judgment in the performance of your duties?

_____ Yes _____ No

10. Do you freely discuss problems about specimen quality or confer about patients' clinical history with physicians or others requesting work in your laboratory?

_____ Yes _____ No

11. Does a physician review all of the slides you have screened?

_____ Yes _____ No

If "No", which of the following does he (she) review? (Use more than one choice if appropriate.)

_____ Positive slides
_____ Inconclusive slides (doubtful or suspicious)
_____ Sample of negative slides
_____ Other (Please specify) _____
_____ None

12. Does your department staff have the opportunity to review together the cases and/or slides that have been screened previously as a part of the daily work load?

_____ Yes
- _____ Daily
- _____ Weekly
- _____ Bi-monthly
- _____ Monthly
- _____ Other (Please specify) _____

_____ No, the department staff does not have slide review sessions.

If "Yes", who participates in these sessions?

_____ Entire staff including all pathologists and cytotechnologists
_____ Laboratory director, only, with chief and staff cytotechnologists
_____ Chief and cytotechnologists only
_____ Pathologists and/or other physicians only
_____ Other (Please specify) _____

13. What information sources do you use to correlate clinical and cytologic diagnoses (whenever this correlation is necessary)?

_____ Surgery schedule
_____ Medical records
_____ Surgical report from pathology department
_____ Autopsy report from pathology department
_____ Other (Please specify) _____
_____ None

14. Does a pathologist or another physician on your staff instruct clinicians in proper methods of specimen procurement to assure proper sampling and cell distribution on the slide?

_____ Yes
_____ No, but other staff members do
_____ No, this is never done
_____ Other (Please specify) _____

instructions for questions 15, 16, and 17

There are three columns to the right of each set of responses for these statements. The first column (left to right) is for indicating your experience* as a student in the AMA accredited school of cytotechnology. If you completed your clinical study (training) in a laboratory outside of a school of cytotechnology, please use the second column to indicate your experience there. The third column is for indicating your experience on your present job. If you did your clinical study (training) in a laboratory that was not and A.M.A. accredited school of cytotechnology, please use the columns under "Student" to indicate what you learned in that laboratory as a student.

Please indicate your replies by placing a check mark in the appropriate columns below.

	Student		Present
	School of C.T.	Other Lab.	Job
15. Identification and verification of specimens.			
a. Record the appearance of all specimens on their request/report forms immediately after they are received in the laboratory.			
Yes	____	____	____
No, only non-genital specimens	____	____	____
No, none	____	____	____
No, someone else in the laboratory does this	____	____	____
Other (Please specify) _____	____	____	____
b. Use serial accession numbers for verification of patients and case numbers.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
Other (Please specify) _____	____	____	____
c. Record the case number on equipment used in processing a non-genital case to avoid confusion of specimens.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
d. Check, routinely, the patients' names and/or accession numbers on the micro slides with those on the request/report forms before processing the slides.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
e. Routinely record the number of slides and filtration units made from a specimen or case at the beginning of processing.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
Use this record to verify the number of slides per case.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____

* Experience (student and job) is defined as performing the listed function more than once.

	Student School of C.T.	Student Other Lab.	Present Job
16. Staining specimens			
a. Regularly check shelf life of reagents and discard those that have expired.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
b. Make stains and reagents used in the laboratory.			
Yes	____	____	____
No, purchase some and make some	____	____	____
No, purchase all from supply company	____	____	____
No, centrally prepared in institution	____	____	____
No, someone else in the laboratory does this	____	____	____
No, other (Please specify) _____	____	____	____
c. Regularly examine slides for quality of staining such as definition of intra-nuclear structure, intensity of nuclear stain, etc.			
Yes,each staining batch (slides)	____	____	____
Yes, daily	____	____	____
Yes, weekly	____	____	____
Yes, change of staining solution (batch of stain)	____	____	____
Yes, other (Please specify) _____	____	____	____
No, someone else in the laboratory does this	____	____	____
No, it is never done	____	____	____
No, other (Please specify) _____	____	____	____
d. Filter stains prior to using them.			
Yes, each time slides are stained	____	____	____
Yes, several times a day	____	____	____
Yes, once a day	____	____	____
Yes, once a week	____	____	____
Yes, other (Please specify) _____	____	____	____
No, someone else in laboratory does this	____	____	____
No, it is never done	____	____	____
e. Filter alcohols for staining procedure prior to using them.			
Yes, each time slides are stained	____	____	____
Yes, several times a day	____	____	____
Yes, once a day	____	____	____
Yes, once a week	____	____	____
Yes, other (Please specify) _____	____	____	____
No, someone else in laboratory does this	____	____	____
No, it is never done	____	____	____
f. Frequency of changing stains in staining dishes			
Daily	____	____	____
Weekly	____	____	____
Monthly	____	____	____
Other (Please specify) _____	____	____	____
No, someone else in the laboratory does this	____	____	____

	Student		Present
	School of C.T.	Other Lab.	Job
16. g. Frequency of changing alcohol solutions used in staining.			
Daily	____	____	____
Weekly	____	____	____
Monthly	____	____	____
Other (Please specify) _____	____	____	____
No, someone else in the laboratory does this	____	____	____
h. Separate staining of body cavity fluids (hypercellular specimens) to prevent cell and debris contamination.			
Yes	____	____	____
No	____	____	____
No, someone else in the laboratory does this	____	____	____
17. Indicate those of the following procedures you learned and performed as a student and those you are doing on your present job.			
a. Obtaining specimens			
Female genital			
Vaginal aspiration	____	____	____
Vaginal irrigation	____	____	____
Pipette	____	____	____
Cotton swab	____	____	____
Cervical spatula	____	____	____
Other (Please specify) _____	____	____	____
Non-genital			
Gastric washes	____	____	____
Oral	____	____	____
Aerosol-induced respiratory specimens	____	____	____
b. Special cyto-preparatory techniques			
Centrifuging	____	____	____
Cell filtration (e.g., Gelman, Millipore, Nucleopore, etc.)	____	____	____
Irrigation	____	____	____
c. Staining			
Papanicolaou (or modification)	____	____	____
Hormonal (e.g., Shorr, cresyl-echt-violet)	____	____	____
Cytogenetic (e.g., Fuelgen, Guard, etc.)	____	____	____
d. Microscopic cytomorphology			
Female Genital			
Cervical spatula	____	____	____
Vaginal	____	____	____
Endocervical	____	____	____
Endometrial	____	____	____
Irrigation	____	____	____
Respiratory			
Sputum	____	____	____
Bronchial washings	____	____	____
Gastrointestinal tract			
Esophageal	____	____	____
Gastric	____	____	____
Colon	____	____	____

	Student		Present
	School of C.T.	Other Lab.	Job
17. d. Microscopic cytomorphology (continued)			
Serous fluids			
Pleural	____	____	____
Ascitic	____	____	____
Pericardial	____	____	____
Urine	____	____	____
Breast	____	____	____
Oral	____	____	____
e. Other microscopic evaluation			
Hormonal	____	____	____
Radiation or chemotherapy	____	____	____
Viral	____	____	____
Cytogenetics	____	____	____
Electron microscopy or other special microscopic techniques	____	____	____
(Please specify) _____			
Acridine Orange fluorescence technique	____	____	____

18. How many lectures did you have during the 12 months of clinical study?
(Give numbers in spaces provided)

Basic Science ____ lectures per week for ____ weeks.
Cytology ____ lectures per week for ____ weeks.
Cytopreparatory techniques ____ lectures per week for ____ weeks.

19. How many quizzes and/or examinations did you have during the 12 months of clinical study?

____ Approximately one a day
____ Approximately one a week
____ Approximately one a month
____ Less than one a month
____ Other (Please specify) _____

20. Approximately how many hours per day did you devote to screening slides

a. during the first 6 months of your clinical study (training)

____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 hours per day
____ 6 hours per day
____ 7 hours per day
____ 8 hours per day

b. during the second 6 months of your clinical study (training)

____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 hours per day
____ 6 hours per day
____ 7 hours per day
____ 8 hours per day

21. Do you think that your education has prepared you to perform the duties assigned to you in your work?

____ Yes ____ No

If "No", what additional education do you need?

_____

_____

22. What kind of continuing education have you had since you completed your cytotechnology program?

a. Academic credit for

_____	Bachelor's degree	_____	Completed	_____ Not completed
_____	Master's degree	_____	Completed	_____ Not completed
_____	Doctorate	_____	Completed	_____ Not completed

b. Non-credit earning

_____ Workshops by A.S.C.P. Commission on Continuing Education
_____ Workshops by American Society of Cytology
_____ Regional workshops or seminars pertaining to cytology (e.g., Johns Hopkins, University of Kentucky, etc.)
_____ Other (Please specify) _____

c. Organizational meetings

_____ American Society of Clinical Pathologists
_____ American Society of Cytology
_____ American Society of Medical Technologists
_____ Other (Please specify) _____

_____

23. We would like to contact the person who is directly responsible for supervising your work (your immediate supervisor) to obtain information about conditions of work in your laboratory. We will appreciate your giving us permission to contact him (her).

Name: _____

Address: _____
(Street)

_____
(City) (State) (Zip Code)

Thank you for your assistance.

Note: This questionnaire contains an error in question 5.e. in the listing of non-supervisory positions. Those for the supervisory level were inadvertently repeated for the non-supervisory level. The cytotechnologists replying apparently detected this as an error and responded in a manner which enabled sufficient definition of non-supervisory positions.

July 1967

NATIONAL COUNCIL ON

Medical Technology Education

1025 E. H. Crump Boulevard, Memphis, Tenn. 38104

area 901 *phone 526-6581*

research associate: RUTH I. HEINEMANN, MT (ASCP) *education associate:* ARCH LUGENBEEL

council members: REX D. COUCH, M.D., CHAIRMAN; NELLIE MAY BERING, MT (ASCP); JOSEPH A. CUNNINGHAM, M.D., MARY FRANCES JAMES, MT (ASCP); TYRA T. HUTCHENS, M.D.; AND ROBERT W. COON, M.D., EX OFFICIO

In October 1964, the National Council on Medical Technology Education was established by the National Committee for Careers in Medical Technology through funds provided by the Cancer Control Program of the U.S. Public Health Service. General Information about the Council is enclosed. You will note that the American Society of Medical Technologists and the American Society of Clinical Pathologists have demonstrated interest in the Council's study of various aspects of medical technology education.

One of the purposes of our project is to study how education relates to the work done by medical laboratory personnel. In order to uncover the pertinent relationships between education and work for cytotechnologists we have prepared questions for which we need the answers. We selected for our study group the people who took the ASCP Registry examination in cytotechnology in 1965. You are one of the people in this group. The enclosed questionnaire is designed to obtain information about you and your work. Most questions can be answered easily by checking an appropriate reply. Please complete and return it in the enclosed self-addressed envelope as soon as possible. Your replies will be kept in confidence.

The establishment of the N.C.M.T.E. provides an opportunity to clarify issues in the development of education programs for medical laboratory personnel. By completing and returning the questionnaire promptly, you will contribute to the efforts of the Council in the furtherance of our education programs.

Thank you for your interest in participating in this study.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

NATIONAL COUNCIL ON

Medical Technology Education

1025 E. H. Crump Boulevard, Memphis, Tenn. 38104

area 901 *phone 526-6581*

research associate: RUTH I. HEINEMANN, MT (ASCP) *education associate:* ARCH SUTTENFIELD

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Several weeks ago you should have received a letter and form from the office of the National Council on Medical Technology Education asking you to participate in the Cytotechnologist Study. You are one of 358 people selected for this study. To date we have received replies from 152 people. If possible, we would like to hear from everyone to know whether or not each is employed and, if so, to have the replies to the items in the form.

Since we have not heard from you, this is to remind you to return the form with an appropriate reply. If, for some reason, you have not received the letter and form, please let us know immediately so that we may send them to you.

We will appreciate hearing from you within the next two weeks.

Sincerely,

(Miss) Ruth I. Heinemann, M.T. (ASCP)
Research Associate

RIH/nr

APPENDIX D

Questionnaire to Laboratory Supervisors, Job Performance Evaluation Form, and Introductory Letters

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

CYTOTECHNOLOGIST STUDY

Supervisor's Form A

On the attached sheets there are eight major items to be considered in evaluating personnel. The first five are categories of performance. Under each there are statements describing personnel activities and attitudes to be considered by supervisors in determining level of job performance. Please read each statement carefully and rank the cytotechnologist under consideration according to the following scale:

1 = Excellent performance
2 = Good performance
3 = Average performance
4 = Less than average performance
5 = Unsatisfactory performance
6 = Does not apply

Write the appropriate number in the space provided ("Rating") at the left of each statement. There is a possibility that a few statements may not be applicable to your laboratory situation. If a statement does not apply to your situation, you may rank it as "6".

Items 6, 7, and 8 are self-explanatory.

Since this is a study, this form is not designed for general use as an evaluation tool. It should not be used as such until its worth has been demonstrated.

Thank you for your assistance.

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

CYTOTECHNOLOGIST STUDY

Supervisor's Form A

Supervisor of Cytotechnologist #_____ Supervisor # _____

Reting

1. Skills

_____ a. Consistently uses good technique in the preparation and staining of cytologic specimens.
_____ b. Accurately records and reports the gross appearance of non-genital specimens.
_____ c. Takes all necessary precautions to keep cytopreparatory equipment and work areas clean.
_____ d. Understands basic principles of the Papanicolaou staining procedure and can prepare solutions as required.
_____ e. Keeps lens and mechanism of microscope clean and instrument covered when not in use.
_____ f. Understands practical aspects of microscopic technique and can apply this knowledge to obtain optimum illumination.
_____ g. Maintains good posture at the microscope.
_____ h. Has good manual dexterity demonstrated in handling specimens, equipment, and the microscope (in routine screening).
_____ i. Uses marking apparatus skillfully. (That is, markings are neat and of consistent size, etc.)
_____ j. Uses discrimination in selection of cells or fields to be marked.
_____ k. Understands significance of background patterns and non-epithelial findings (blood elements, viral inclusions, organisms, etc.) in the total interpretation of the specimen.
_____ l. Recognizes degree of atypia and its relationship to severity of lesion.
_____ m. Understands physiology of menstruation and utilizes this knowledge in making reliable hormonal evaluations.
_____ n. Can logically relate cytomorphologic findings to patient history or provisional clinical diagnosis.
_____ o. Organizes work efficiently so that necessary quantity of work is completed with desirable quality of performance.

2. Dependability

_____ a. Arrives at laboratory on time and begins work promptly.
(Note: Consider not only arrival but also return from lunch and coffee breaks.)
_____ b. Volunteers a reasonable number of times for changes in schedule or extra duty as required by circumstances. (That is, shares this proportionately with other members of the staff.)
_____ c. Amount of sick leave taken has been minimal and/or justified.
_____ d. Requests for annual leave (vacation) have been reasonable (within established policy) and considerate of the total staff.
_____ e. Special requests of unplanned short absences have been minimal or non-existent. (Doctor's, dentist's or other special appointments.)
_____ f. Gives notice of absence sufficiently in advance so that laboratory work schedule can be satisfactorily adjusted.
_____ g. Remains on duty until all work assigned to him (her) is completed.
_____ h. Does not habitually ask others to complete or assist with completion of work assignments.
_____ i. Will accept duties and instructions given by supervisor and will complete them without further reminder. (That is, requires a minimum amount of supervision.)
_____ j. Consults supervisor about unusual problems and/or situations (technical and/or administrative) when necessary.
_____ k. Plans work to meet all ordinary and most unusual situations.

Rating 3. Reliability

_____ a. Follows technical procedures as outlined in the laboratory using instructions as guides.
_____ b. Abides by established personnel and other administrative policies.
_____ c. Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations.
_____ d. Possesses both the deep sense of responsibility and the conscientiousness that are necessary in making decisions that involve the well-being of a patient.
_____ e. Voluntarily reviews cytology slides for which the diagnosis has not been confirmed by subsequent pathology report.
_____ f. When necessary, determines the source of technical problems by checking reagents and introducing variations of procedure ("trouble shooting").
_____ g. Regularly records essential facts about specimens (physical appearance, general condition, unusual aspects, etc.) on report form immediately upon their receipt in the laboratory.
_____ h. Numbers all cases and specimens immediately upon their receipt in the laboratory (serial accession).
_____ i. Legibly labels all equipment and slides used in processing a case.
_____ j. Routinely checks the patients' names and accession numbers on micro slides before and during preparation, staining, screening, and reporting.
_____ k. Regularly examines stained material for quality of staining such as definition of intra-nuclear structure, intensity of nuclear stain, etc.
_____ l. Takes appropriate precautions to maintain high quality of staining solutions (such as regularly filtering and changing stain, alcohol solutions and water).

4. Initiative

_____ a. Looks for things to do and does them without being asked. (This includes technical work and duties necessary to maintain a clean, orderly work area, etc.).
_____ b. Voluntarily assists co-workers with work.
_____ c. Voluntarily does and reports additional laboratory work to prove or enhance findings when circumstances warrant. (Such as special processing, staining, etc.).
_____ d. Readily undertakes any procedure requested in his area of responsibility with little or no instruction from supervisor.
_____ e. Reads publications pertaining to work. (Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.).
_____ f. Readily supports and puts into practice changes made in procedures (technical and/or administrative) in the interest of accuracy, precision, efficiency, etc.
_____ g. Shows desire to continue education by attending local, regional and/or national educational meetings within the past 18 months.
_____ h. Attends educational programs offered within the institution as work schedule and opportunity allow. (Such as in-service training sessions; Pathology Conference; Medical, Surgical and Grand Rounds; guest lecturers; etc.).
_____ i. Reports, formally or informally, on attendance at educational meetings for the benefit of other members of the staff.
_____ j. Constructively suggests modifications of administrative policies if occasion arises.
_____ k. Willingly accepts responsibility to participate in teaching students. (If there is a teaching program.)
_____ l. Attends department slide review or other conferences regularly.
_____ m. Readily learns to use new equipment.
_____ n. Readily accepts and puts into practice changes in technical procedures that are recommended by supervisor.
_____ o. Participates in trying and proving new methods and procedures.
_____ p. Regularly and critically reviews the results of his own work to avoid reporting errors.

Rating 5. Personal Relations

_____ a. Well liked by co-workers.
_____ b. Respected by co-workers for good use of professional ability and judgment, exemplary personal conduct, etc.
_____ c. Readily accepts instruction and constructive criticism from supervisors.
_____ d. Shows interest in and respect for laboratory assistants and readily helps them with technical problems.
_____ e. Personal appearance is exemplary: clean uniform and shoes, personally neat, etc.
_____ f. Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology.

6. Would you promote this person to a higher position if you had the opportunity?

_____ Yes _____ No

If your answer is "No", does this mean that you think this person is displaying his maximum capability and has reached his maximum work potential?

_____ Yes _____ No

If your answer is still "No", what are your reasons for not wanting to promote this person?

7. If there are other factors you consider in your evaluation of personnel, please list them below and comment.

8. Work Load

a. What was the total number of cases studies in your laboratory in 1966?
   1) Female genital _____
   2) Non-genital _____

b. What was the total number of slides studied in your laboratory in 1966?
   1) Female genital _____
   2) Non-genital _____

July 1967

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

CYTOTECHNOLOGIST STUDY

Supervisor's Form B

Supervisor of Cytotechnologist #_____ Supervisor #_____

Please select or give the replies best describing you and your position.

1. Name: _____
(Last) (First) (Middle)

2. Certification Number: C.T.(ASCP) _____
M.T.(ASCP) _____
H.T.(ASCP) _____
Other: (Please specify type and number) _____
None: _____

3. Age: _____

4. Total length of your experience in cytotechnology (cytology):
_____ 6 months or less
_____ 7 through 12 months
_____ 13 through 18 months
_____ 19 through 24 months
_____ 25 through 30 months
_____ 31 through 36 months
_____ 37 through 42 months
_____ 43 through 48 months
_____ 49 months or more
Please specify number _____

a. Number of positions you have had prior to your present position
_____ None
_____ One
_____ Two
_____ Three
_____ Four
_____ Five
_____ Six
_____ Seven
_____ More than seven
_____ Please specify number

b. Type of positions you have had prior to your present position.
_____ Non-supervisory ("Staff") (Other than research)
_____ Supervisory (Other than research)
_____ Sole Cytotechnologist (Other than research)
_____ Research: Non-supervisory ("Staff")
_____ Research: Supervisory
_____ Research: Sole Cytotechnologist

5. Present place of employment:
Name of Institution: _____

Address: _____
(Street)

_____
(City) (State) (Zip Code)

6. Title of your present position: _____

If supervisor of a laboratory department (section), please specify the department:

_____

7. Number of years in present position

_____ 6 months	_____ 31 through 36 months
_____ 7 through 12 months	_____ 37 through 42 months
_____ 13 through 18 months	_____ 43 through 48 months
_____ 19 through 24 months	_____ 49 months or more
_____ 25 through 30 months	Please specify number _____

8. Number of people you supervise in your laboratory:

Technical: C.T.(ASCP) _____
M.T.(ASCP) _____
H.T.(ASCP) _____
C.L.A.(ASCP) _____
Other technologists: _____
Other laboratory assistants: _____
Other technical (Please specify) _____

_____

Clerical: _____

Maintenance: _____

9. Education

a. How many years did you attend college (university)?

_____ None	_____ 4 years
_____ Less than 1 year	_____ 5 years
_____ 1 year	_____ 6 years
_____ 2 years	_____ More than 6 years
_____ 3 years	

b. In what major field did you study and what degree did you receive?

_____No degree but took courses in (major field) _____

_____Bachelor's degree in _____

_____Master's degree in _____

_____Doctorate in _____

_____Other (Please specify) _____

c. Have you had <u>formal</u> education and/or training in cytotechnology and/or cytology?

_____ Yes: AMA accredited school of cytotechnology
_____ Yes: Pathology Residency
_____ No

d. How long did you attend an AMA accredited school of cytotechnology?

_____ Did not attend
_____ 6 months
_____ 12 months
_____ Other (Please specify) _____

9. Education (continued)
   e. What continuing education programs have you attended in the past 18 months?
      1) Academic credit for
         _____ Bachelor's degree: Completed_____ Not completed_____
         _____ Master's degree: Completed_____ Not completed_____
         _____ Doctorate: Completed_____ Not completed_____

      2) Non-credit earning:
         _____ ASCP Commission on Continuing Education Workshops, Tutorials, etc.
         _____ Workshops of American Society of Cytology
         _____ Regional workshops or seminars pertaining to cytology (e.g., Johns Hopkins, University of Kentucky, etc.)
         _____ Other (Please specify) _____

      3) Organizational meetings (convention, etc.)
         _____ American Society of Clinical Pathologists
         _____ American Society of Cytology
         _____ American Society of Medical Technologists
         _____ College of American Pathologists
         _____ Other (Please specify) _____

      4) Other types of continuing education not mentioned above:
         (Please specify)
         _____

         _____

10. To what professional organizations do you belong?
    _____ American Association for the Advancement of Science
    _____ American Association of Bioanalysts
    _____ American Association of Clinical Chemists
    _____ American Society of Clinical Pathology
    _____ American Society of Cytology
    _____ American Society of Medical Technologists
    _____ American Society of Microbiologists
    _____ College of American Pathologists
    _____ Other: (Please specify) _____

    _____

11. Of the following scientific journals and periodicals which have you read in the past 6 months? If there are others not listed, please specify them under "Other" if you read them regularly.
    _____ American Journal of Clinical Pathology
    _____ American Journal of Obstetrics and Gynecology
    _____ The American Journal of Pathology
    _____ Acta Cytologica
    _____ CA
    _____ Cancer
    _____ Cancer Research
    _____ Laboratory Investigation
    _____ Stain Technology
    _____ Yearbook of (Cancer, Internal Medicine, Obstetrics and Gynecology, Pathology, Clinical Pathology)
    _____ Other: _____

    _____

12. How many textbooks related to your work have you used frequently in the past 6 months?

_____ None
_____ 1 textbook
_____ 2 textbooks
_____ 3 textbooks
_____ 4 textbooks
_____ 5 textbooks
_____ 6 textbooks
_____ 7 textbooks
_____ More than 7 textbooks:
Please specify number _____

Thank you for your assistance

July 1967

NATIONAL COUNCIL ON

Medical Technology Education

1025 E. H. Crump Boulevard, Memphis, Tenn. 38104

area 901 *phone 526-6581*

research associate: RUTH I. HEINEMANN, MT (ASCP) *education associate:* ARCH LUGENBEEL

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The first phase of study is devoted to determining whether or not there is a relationship between an individual's education and his job performance. We selected the people who took the 1965 ASCP certification examination for cytotechnologists for our study in this specialty. To each person selected, we have sent a questionnaire seeking information about his place of employment and the kind of work he is doing. Each is asked to give permission to obtain information from his supervisor. To each supervisor named, we are sending a request for information about the person selected.

gave your name as her immediate supervisor. We will appreciate your giving your time to complete the enclosed forms from your experience as her supervisor. Your replies will be kept in confidence.

The establishment of the National Council on Medical Technology Education provides an opportunity to clarify issues in the development of education programs for medical laboratory personnel. By completing and returning the questionnaire promptly, you will contribute to the efforts of the Council in the furtherance of our education programs.

Thank you for your interest in participating in this study.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

NATIONAL COUNCIL ON

Medical Technology Education

1025 E. H. Crump Boulevard, Memphis, Tenn. 38104

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A few weeks ago you should have received a letter and forms from the office of the National Council on Medical Technology Education asking you to assist in a study.

Your name was given as supervisor of one of the 358 people from the group taking the 1965 Registry examination for cytotechnologists which has been selected for the study. To date we have received replies from 237 of these examinees and sent forms to their supervisors where indicated. The information from the supervisors is necessary in order that we can complete the study.

Since we have not heard from you, this is to remind you to return the forms with appropriate replies. If, for some reason, you have not received the letter and forms, please let us know immediately so that we may send them to you.

We will appreciate hearing from you within the next two weeks.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

APPENDIX E

Essentials for Acceptable Schools of Cytotechnology
Requirements for Certification in Exfoliative Cytology

Essentials of an Acceptable School of Cytotechnology

Revised to December 1, 1962

Prepared by the Council on Medical Education and Hospitals of the American Medical Association with the cooperation of the American Society of Clinical Pathologists, and presented to the House of Delegates of the American Medical Association for approval.

Two organizations are primarily concerned with the training of cytotechnologists: the Council on Medical Education and Hospitals of the American Medical Association, and the American Society of Clinical Pathologists through its Committee on Cytotechnology and Board of Schools of Medical Technology. The Board of Schools is primarily concerned with the evaluation and survey of schools of cytotechnology, acting in an advisory capacity to the Council. It also assists the Council in the maintenance of high standards of education and in the development of new schools of cytotechnology. The Board of Registry of Medical Technologists investigates and certifies the competency of the cytotechnologists who are graduates of approved schools.

The cooperating groups have established the following standards for this type of training for the information of schools, physicians, hospitals, prospective students, and others, and for the protection of the public.

Cytotechnologists are being trained in these schools to work under the direction of qualified physicians and not as independent practitioners.

I. Administration

1. Acceptable schools for training in exfoliative cytology may be conducted by approved medical schools, hospitals, or other acceptable laboratories suitably organized in accordance with present educational standards.

2. All training of cytotechnologists shall be under competent medical supervision.

3. The resources for continued operation of a school should be insured through regular budgets, gifts, or endowments, but not entirely through students' fees. Such a training school for exfoliative cytology should not be operated for profit, and students should not be exploited for service. Schools should adhere to proper and suitable ethical and educational standards recognized by the Board of Schools of Medical Technology, the American Society of Clinical Pathologists, and the American Medical Association.

II. Faculty and Personnel

4. The director must be a pathologist certified by the American Board of Pathology or be eligible for certification by this Board and recognized as having special interest and competence in cytology with special training and experience in exfoliative cytology. The director should be actively engaged in cytology. The director, or an associate with equivalent acceptable qualifications, shall be in attendance for sufficient period throughout the training course to take an active part in and properly supervise the laboratory work and teaching.

5. The teaching staff should include qualified instructors adequate for both group and individual instruction. It should include at least one instructor, in addition to the director, who is a registered cytotechnologist or eligible for registration, and who is actively engaged in cytology.

6. Enrollment in a school should not exceed 2 students to each member of the teaching staff.

7. A minimum of 2 students is recommended for enrollment in each class.

III. Organization

8. Adequate space, light, and modern equipment should be provided within the department for the teaching of cytotechnology. A library containing texts and up-to-date reference material pertaining to cytology and cytotechnology should be maintained, or be readily accessible to the institution.

9. Approved schools for training in exfoliative cytology should be associated with an acceptable institution which:

a. Maintains a current cytology test volume of at least 5,000 specimens per year to furnish adequate material for training and test screening experience for students. The distribution of specimen material should preferably include an adequate quantity of at least 3 of the following: female genital tract, respiratory system, gastrointestinal system, and effusions. The availability of supplementary and essential teaching material for adequate cytology study sets may be considered in lieu of the specified diagnostic serv-

ice volume for the diversification of type and source of cytologic material. The quality of the material available for teaching is more important than the actual volume.

b. Maintains an adequate system of filing, recording, and indexing of results in the associated laboratory for proper cytologic correlation and evaluation. There should be close liaison with clinical services or physicians supplying cytologic material.

IV. Prerequisites for Admission

10. The applicant must complete 2 years (60 semester hours or 90 quarter hours) of work in an accredited college or university before being accepted by an approved school of cytotechnology. This preparatory work must include a minimum of 12 semester hours or 18 quarter hours of biology (which may include courses in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, and zoology). It is strongly recommended that the balance of the required total of 60 semester hours include courses in English, chemistry, general mathematics, and physics.

The holder of a registered medical technologist certificate (ASCP) will also be eligible for admission.

V. Curriculum

11. Length of course:

a. A minimum of 6 calendar months shall be provided in the training course, of which not less than 4 shall be consecutive.

b. A second 6 months of work experience acceptable to the director of the student's training program shall be completed before the student can be declared eligible by the director for examination by the Registry of Medical Technologists. This second 6 months of experience need not necessarily be in an approved school of cytotechnology, but certification and approval of this second phase of the training program must be made to the Registry by the director of the student's program.

12. A detailed curriculum should be provided, a copy of which is to be submitted with the application for approval. The curriculum should include the historical background of cytology, the application of cytology in clinical medicine, and the use and limitations of cytology in screening and diagnosis of both malignant and benign diseases. Lectures and demonstrations in anatomy, histology, embryology, cytochemistry, cytophysiology, endocrine alterations or abnormalities, and inflammatory diseases should be presented. The preparation of materials for examination, record keeping, indexing, and methods of correlating cytology with the pathological diagnoses should be taught.

13. Regular textbook assignments, lectures, and demonstrations should be planned. Assigned time for practice in the screening of specimens should be part of the planned curriculum and testing procedure. A complete record of practical and written examinations should be maintained and continually evaluated. Although emphasis should rightfully be placed on cytology of the female genital tract, instruction in the cytology of the gastrointestinal tract, urinary tract, body cavities, lung, and other organs should be given appropriate attention.

VI. Ethics

14. Excessive student fees and commercial advertising should be considered unethical. Schools conducted primarily for the purpose of substituting students for paid technologists will not be considered for approval.

VII. Health

15. Applicants for admission to an approved school shall be required to submit evidence of good health and successful vaccinations, and a report of a medical examination should be a part of the student's records. This examination shall include a roentgen examination of the chest. Provisions should be made for medical care and reasonable hospitalization.

VIII. Admission to the Approved List

16. Application for approval of a school for the training of cytotechnologists should be made to the Council on Medical Education and Hospitals of the American Medical Association, 535 N. Dearborn, Chicago 10. Forms will be supplied for this purpose on request and should be completed by the director of the school requesting this approval. Inquiries regarding the registration of qualified cytotechnologists should be addressed to the Board of Registry of Medical Technologists, Post Office Box 44, Muncie, Ind.

17. Approval may be withdrawn whenever in the opinion of the Council a school does not maintain an educational program at least in accordance with the above minimum standards. Whenever a training program has not been in operation for a period of 2 consecutive years, approval may also be withdrawn.

18. Approved schools should notify the Council on Medical Education and Hospitals of the American Medical Association whenever a change occurs in the directorship of a school.

Essentials of an Acceptable School of Cytotechnology

December 1, 1967

Prepared by the Council on Medical Education of the American Medical Association with the cooperation of the American Society of Clinical Pathologists, and presented to the House of Delegates of the American Medical Association for approval.

Two organizations are primarily concerned with the training of cytotechnologists: the Council on Medical Education of the American Medical Association, and the American Society of Clinical Pathologists through its Committee on Cytotechnology and Board of Schools of Medical Technology. The Board of Schools is primarily concerned with the evaluation and survey of schools of cytotechnology, acting in an advisory capacity to the Council. It also assists the Council in the maintenance of high standards of education and in the development of new schools of cytotechnology. The Board of Registry of Medical Technologists investigates and certifies the competency of the cytotechnologists who are graduates of approved schools.

The cooperating groups have established the following standards for this type of training for the information of schools, physicians, hospitals, prospective students, and others, and for the protection of the public.

Cytotechnologists are being trained in these schools to work under the direction of qualified physicians and not as independent practitioners.

I. ADMINISTRATION

1. Acceptable schools for training in exfoliative cytology may be conducted by approved medical schools, hospitals, or other acceptable laboratories suitably organized in accordance with present educational standards.

2. All training of cytotechnologists shall be under competent medical supervision.

3. The resources for continued operation of a school should be insured through regular budgets, gifts, or endowments, but not entirely through students' fees. Such a training school for exfoliative cytology should not be operated for profit, and students should not be exploited for service. Schools should adhere to proper and suitable ethical and educational standards recognized by the Board of Schools of Medical Technology, the American Society of Clinical Pathologists, and the American Medical Association.

II. FACULTY AND PERSONNEL

4. The director must be a pathologist certified by the American Board of Pathology or be eligible for certification by this Board and recognized as having special interest and competence in cytology with special training and experience in exfoliative cytology. The director should be actively engaged in cytology. The director, or an associate with equivalent acceptable qualifications, shall be in attendance for sufficient period throughout the training course to take an active part in and properly supervise the laboratory work and teaching.

5. The teaching staff should include qualified instructors adequate for both group and individual instruction. It should include at least one instructor, in addition to the director, who is a registered cytotechnologist or eligible for registration, and who is actively engaged in cytology.

6. Enrollment in a school should not exceed 2 students to each member of the teaching staff.

7. A minimum of 2 students is recommended for enrollment in each class.

III. ORGANIZATION

8. Adequate space, light, and modern equipment should be provided within the department for the teaching of cytotechnology. A library containing texts and up-to-date reference material pertaining to cytology and cytotechnology should be maintained, or be readily accessible to the institution.

9. Approved schools for training in exfoliative cytology should be associated with an acceptable institution which:

a. Maintains a current cytology test volume of at least 5,000 specimens per year to furnish adequate material for

training and test screening experience for students. The distribution of specimen material should preferably include an adequate quantity of at least 3 of the following: female genital tract, respiratory system, gastrointestinal system, and effusions. The availability of supplementary and essential teaching material for adequate cytology study sets may be considered in lieu of the specified diagnostic service volume for the diversification of type and source of cytologic material. The quality of the material available for teaching is more important than the actual volume.

b. Maintains an adequate system of filing, recording, and indexing of results in the associated laboratory for proper cytologic correlation and evaluation. There should be close liaison with clinical services or physicians supplying cytologic material.

IV. PREREQUISITES FOR ADMISSION

10. The applicant must complete 2 years (60 semester hours, or 90 quarter hours) of work in an accredited college or university before being accepted by an approved school of cytotechnology. This preparatory work must include a minimum of 12 semester hours or 18 quarter hours of science. It is preferable that all 12 semester hours of science be in the biological sciences (which may include courses in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, and zoology). However, 8 semester hours (12 quarter hours) of biology and 4 semester hours (6 quarter hours) of another science is acceptable.

The following are eligible for admission irrespective of the science credits possessed:

a. The holder of a registered medical technologist certificate (ASCP).

b. The holder of a baccalaureate degree from an accredited college or university.

V. CURRICULUM

11. Length of course:

Training shall be for a minimum of one year (12 months). However, at the discretion of the school director, the second half of the year (6 months) may be taken in a laboratory selected by the director of the approved school. Only laboratories having adequate clinical material and at least one ASCP registered cytotechnologist may be selected for the last 6 months of training.

12. A detailed curriculum should be provided, a copy of which is to be submitted with the application for approval. The curriculum should include the historical background of cytology, the application of cytology in clinical medicine, the use and limitations of cytology in screening and diagnosis of both malignant and benign diseases. Lectures and demonstrations in anatomy, histology, embryology, cytochemistry, cytophysiology, endocrine alterations or abnormalities, and inflammatory diseases should be presented. The preparation of materials for examination, record keeping, indexing, and methods of correlating cytology with the pathological diagnoses should be taught.

13. Regular textbook assignments, lectures, and demonstrations should be planned. Assigned time for practice in the screening of specimens should be part of the planned curriculum and testing procedure. A complete record of practical and written examinations should be maintained and continually evaluated. Although emphasis should rightfully be placed on cytology of the female genital tract, instruction in the cytology of the gastrointestinal tract, urinary tract, body cavities, lung, and other organs should be given appropriate attention.

VI. ETHICS

14. Excessive student fees and commercial advertising should be considered unethical. Schools conducted primarily for the purpose of substituting students for paid technologists will not be considered for approval.

VII. HEALTH

15. Applicants for admission to an approved school shall be required to submit evidence of good health and successful vaccinations, and a report of a medical examination should be a part of the student's records. This examination shall include a roentgen examination of the chest. Provisions should be made for medical care and reasonable hospitalization.

VIII. ADMISSION TO THE APPROVED LIST

16. Application for approval of a school for the training of cytotechnologists should be made to the Council on Medical Education of the American Medical Association, 535 North Dearborn Street, Chicago, Illinois 60610. Forms will be supplied for this purpose on request and should be completed by the director of the school requesting this approval. Inquiries regarding the registration of qualified cytotechnologists should be addressed to the Board of Registry of Medical Technologists, Post Office Box 44, Muncie, Indiana.

17. Approval may be withdrawn whenever in the opinion of the Council a school does not maintain an educational program at least in accordance with the above minimum standards. Whenever a training program has not been in operation for a period of 2 consecutive years, approval may also be withdrawn.

18. Approved schools should notify the Council on Medical Education of the American Medical Association whenever a change occurs in the directorship of a school.

REQUIREMENTS FOR CERTIFICATION IN EXFOLIATIVE CYTOLOGY

The Registry of Medical Technologists of the American Society of Clinical Pathologists. 41st Ed. Page 10. December 1964.

"7. Certification in Exfoliative Cytology

High school graduates who completed (italicized) six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology.

Candidates with two years of college, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology, may be considered if they have the training mentioned above, plus six months of full time experience in cytology.

Candidates whose training began on or after January 1, 1960, must have:

a. 2 years of college credits from a college or university approved by a recognized regional accrediting agency, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology.
b. 6 months of training in a laboratory approved by the Council on Medical Education and Hospitals of the American Medical Association.
c. 6 months of full time experience in cytology in an acceptable laboratory.

Both a practical and a written examination will be given. Only those who pass the written examination will be eligible to take the practical examination. Candidates must pass both sections of the examination, and in case of failure must repeat both sections."

The Registry of Medical Technologists of The American Society of Clinical Pathologists. 46th Ed. Second Printing. Page 9. October 1967

"7. Certification in Exfoliative Cytology

High school graduates who completed (italicized) six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology.

Candidates with two years of college, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology, may be considered if they have the training mentioned above, plus six months of full time experience in cytology.

MT(ASCP) registrants are eligible to enter Approved Schools of Cyto-technology.

Candidates whose training began on or after January 1, 1960, must have:

a. 2 years of college credits from a college or university approved by a recognized reional accrediting agency, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology.

b. 6 months of training in a School of Cytotechnology approved by the Council on Medical Education of the American Medical Association.

c. 6 months of full-time experience in cytotechnology in a laboratory acceptable to the pathologist who directed the formal six months of training.

Both a practical and a written examination will be given. In case of failure candidates must repeat both sections."

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