

Medical Technologist Core Job Tasks Still Reign

Studies of changes in job task mix among allied health professionals are scarce, particularly for medical laboratory personnel. An exhaustive literature search revealed few¹⁻³ retrospective or cross-sectional studies and no prospective studies.

In 1989, however, the American Society for Clinical Laboratory Science (formerly the American Society for Medical Technology) conducted a retrospective cross-sectional study⁴ of the changes in job-related tasks as perceived by randomly selected managers of hospital laboratories. Respondents managed either independent or non-independent laboratories within hospitals. All hospitals were listed in the *American Hospital Association Guide* for 1988. Independent laboratories were identified by the Health Care Financing Administration, and hospitals were sorted by geographic distribution and bed size.

Survey participants were asked to compare the job responsibilities of newly certified (by both the ASCP and the NCA [Lenexa, KS]) clinical laboratory scientists (medical technologists [MTs]) and clinical laboratory technicians (medical laboratory technicians [MLTs]) in 1989 with the job responsibilities of MTs and MLTs certified in 1983. The managers evaluated changes in 14 job-related tasks for each level of practitioner. The results showed that MTs in 1989 did more complex technical tasks, did fewer repetitive tasks, and gained more managerial tasks than they had in 1983. The types of tasks varied by the size of the facility. The MTs in smaller hospitals did a broader range of tasks than MTs in large hospitals. This perception-based study, however, did not document the changes in responsibilities of the same MTs and MLTs over time, and, as a cross-sectional study, it provided only a snapshot rather than a time-related trend of career patterns.

In 1993, the Research and Development Committee of the ASCP Board of Registry (BOR) conducted a 10-year retrospective study to determine

ABSTRACT *In 1993, the ASCP Board of Registry began a 10-year prospective study of the career patterns of 412 newly MT(ASCP)-certified persons. The Board examined the changes in core, advanced technical, and management job tasks of these MTs during their first 5 years of work. In the first year, the MTs did core tasks more frequently than advanced technical or management tasks. Five years later, they still did core tasks frequently and had acquired additional advanced technical and management tasks. The entry-level task mix of MTs was the same regardless of gender, ethnicity, job title, facility location, or degree.*

the progress of MTs after they became ASCP-certified in 1983.⁵ Later in 1993, the ASCP BOR began a prospective study to follow the careers of MTs for the next 10 years. During the first year of the prospective study, researchers gathered and reported data on the job preparedness of the entry-level MTs.⁶ The results showed that the educational programs of the National Accrediting Agency for the Clinical Laboratory Sciences (NAACLS) prepared students for the tasks they do when entering the profession. The data further validated that the tasks delineated in the ASCP BOR scope-of-practice document are consistent with actual entry-level tasks.⁷

In this report, our aim is to describe the self-reported changes in job responsibilities of the same group of MTs certified by the ASCP BOR in 1993. Our objectives were the following:

1. To map the frequency of various job tasks over time
2. To determine if the frequencies of core, managerial, and advanced technical tasks varied significantly as MT careers progressed from the year of entry (1993) to 2 years (1995) and 5 years (1997) later
3. To determine if job responsibilities between genders and among ethnic groups, facility locations (urban, suburban, or rural), and job titles (staff MT, supervisor, or manager) changed significantly during the 5-year period

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Methods

Sample

During the first year, the BOR mailed 2,002 surveys to a random stratified sample of persons qualified to take the MT certification examination in 1993 (time 1).⁸ Later that year, 1,096 persons (55%) returned usable surveys. The BOR changed the cohort to include only these respondents. The BOR mailed the survey again in 1995 (time 2) and in 1997 (time 3). Of the 587 who returned the survey every year, 412 answered all the questions. The responses of the 412-member cohort were considered in the final analysis for this report; the rest were excluded.

The demographic breakdown of the 412-member sample shows the following: median age in 1993, 25 years (range, 21-55); Caucasian, 84%; minorities, 16%; staff MTs, 91%; and section supervisors, managers, or education coordinators, 9%. Gender percentages, highest degree, location, marital status, and first job data are shown graphically in Figure 1.

The largest percentage (89%) was eligible for MT certification under route 1 (graduation from an NAACLS-accredited program). Under route 2, 3, or 4, 11% were eligible. Routes 2, 3, or 4 allowed persons to qualify by combining a baccalaureate degree, previous certification, and 3 to 5 years of work experience.

Instrument

The survey instrument consisted of a laboratory responsibility scale developed by the BOR Research and Development Committee. The experts divided

29 items into core, advanced technical, and management or administration task categories (Table 1). The experts reviewed the survey instrument for appropriateness and face validity. To rate how frequently they did each of the 29 tasks, respondents chose 1 of the following 4 responses: frequently, sometimes, rarely, and never. A recent report shows that scores obtained by this scale are valid.⁹

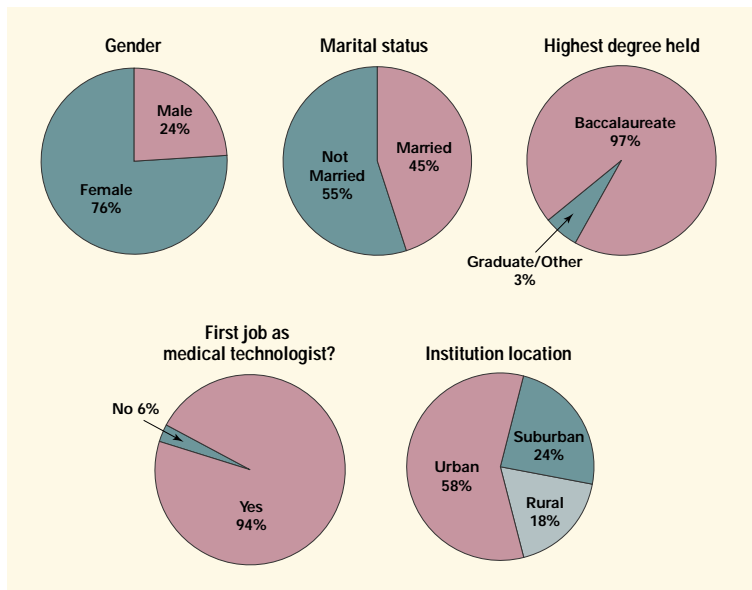
Measurement Model

We analyzed respondent data with the Rasch model. We used the FACETS computer program written by John Michael Linacre of the MESA Psychometric Laboratory at the University of Chicago. Developed by George Rasch in 1953, the Rasch approach produces results different from those of traditional statistical analyses. With this model, researchers can separate the elements under investigation and focus on each element one at a time. In our study, we separated items (tasks) from people and reported all results in common units of measure as determined on a "ruler" (which we discuss in the "Results" section). We converted our raw scores into standardized units. These units were then aligned on the ruler that measured task frequency.

In the Rasch model, all tasks are not created equal. In our study, some tasks were done with much less frequency yet represent a higher level of responsibility than others. In contrast, traditional statistical analysis treats all tasks as having equal value and describes data in terms of averages, percentages, and probabilities. Raw scores must first be converted into measures before statistics can be applied. Statistics describes only one-time events and is the language of ambiguity. Without this conversion, it is like comparing "apples with oranges."

Objective (Rasch) measurement, on the other hand, offers clarity, precision, and definition. It allows precise visual comparison and placement of the items measured and enables researchers to make decisions based on fact rather than fuzzy description. Results are produced in common units called logits (for log-odds unit). Each element has its measure along the same line, as an inch has its measure along a ruler. This aspect is crucial because it allows direct comparison across individuals, groups, or time. Because Rasch results are linear, independent, objective, and general, we can make inferences from them. Objective measurement refines and clarifies results in a way that statistics alone cannot. (To learn more about

Fig 1. Demographic data—gender, marital status, highest degree held, first job data, and present job location—of the 412-person sample that participated in the survey.



Rasch analysis see Tatum DS. Rasch analysis: an introduction to objective measurement. *Lab Med.* 2000;31:272-274 or the Web site: www.rasch.org/memo1.htm)

Statistical Analysis

When we converted the raw scores to objective measures, we did a statistical analysis. We compared the dependent variables—core tasks, advanced technical tasks, and managerial tasks—with the independent variables—gender, ethnicity, facility location, job title, and certification route—for 1993, 1995, and 1997. We used the F statistic to detect differences between tasks at each time and made paired comparisons (*t* test) to detect significant differences between groups.

Results

All numbers in our analysis are directly comparable to one other because we expressed the results for each person, group, or task in the same units of measure. This allowed us to make comparisons between years. As an analogy, we count money in common units such as dollars, and we know that 100 pennies equals 1 dollar. A dollar does not vary (much) from year to year, so we have a common frame of reference. The measurement scale for our results is similar. The logit is a common unit of measure, and each logit has 100 points. A ruler graduated in these units gives us the measures and benchmarks we can use to compare performances in different years.

We calibrated the measurement scale so the origin, or balance point, is 10.00. A person with an “average” job responsibility or a task with an “average” frequency has a measure of 10.00. A task calibrated at 10.00 has a 50% chance of being done by a person with a 10.00 measure job responsibility. A measure lower than 10.00 indicates a lower frequency; a measure higher than 10.00 indicates a higher frequency.

The results of significance tests for the 6 independent variables are shown in Table 2. In 1993, the only variable that influenced all 3 task categories was eligibility route. For persons becoming eligible for certification through route 1, the mean values for core tasks were 10.66, 10.92, and 10.96. By comparison, the means for other eligibility routes were 11.23, 11.20, and 11.21; these were for the years 1993, 1995, and 1997, respectively. For the route 1 group, the mean indexes for the advanced

Table 1. Tasks of Medical Technologist

Core	
	Collect and prepare specimens
	Do routine laboratory tests
	Do specialized laboratory tests
	Recognize a problem in quality control results
	Evaluate computer data problems
	Troubleshoot laboratory instruments
	Do preventive maintenance
	Communicate technical information to medical and lay persons
	Train laboratory personnel
	Prepare and present lectures
	Participate in continuing education
	Recognize normal and abnormal values
	Correlate abnormal values with disease status
Advanced Technical	
	Do quality assurance activities
	Implement new test procedures
	Evaluate new instruments
	Select new instruments
	Participate in research activities
	Recommend test selection
	Develop laboratory manuals, reports, and other documents
	Establish technical procedures
	Implement safety and waste management procedures
Management	
	Purchase reagents
	Do utilization studies
	Work with legislative activities
	Supervise laboratory personnel
	Supervise laboratory projects
	Participate in committee activities

technical tasks were 8.56, 9.14, and 9.28 vs 9.58, 9.59, and 9.75 for the other routes of eligibility in 1993, 1995, and 1997, respectively. By 1997, the eligibility route did not influence the task frequencies. For core and advanced technical tasks, we found significant differences between urban and rural locations for 1995. We found no significant differences between urban and rural locations for management tasks.

The mean task frequency indexes for 1993, 1995, and 1997 are shown in Table 3. At entry level (1993), MTs did core responsibilities more frequently than both advanced technical and management tasks. They did advanced technical tasks more frequently than management tasks from 1993 to 1997. The increase in frequency over the years was significant for advanced technical tasks and management tasks. The MTs did core tasks

more frequently than advanced technical and management tasks for up to 5 years after entry. The frequency of core tasks done in 1995 was significantly higher than in 1993. A map of the changing frequencies in all tasks done by survey MTs is shown in Figure 2.

Discussion

Our results indicate that entry-level MTs had the same task mix regardless of gender, ethnicity, job title, facility location, and degree obtained. Route of certification eligibility made a difference at the entry-level position. The MTs entering through routes 2, 3, or 4 did more advanced technical and management tasks. The differences subsided, however, after 5 years. When we looked at tasks done by technologists in entry-level positions, we found that route 1 entrants did different tasks than those who entered by other routes. The dif-

ference may be due to the 3 to 5 years' laboratory experience of the other-route entrants.

Facility location was also a factor in task mix during 1995. Although urban technologists did fewer core tasks than rural technologists, rural technologists did advanced technical tasks more frequently than their urban counterparts. Management task frequency was the same in both urban and rural locations. Because the differences occurred only in 1995, they are difficult to explain. They may have arisen from data aberrations. Although the frequencies of advanced technical and management tasks increased after 5 years, core task responsibilities did not concurrently decline.

Conclusion

Medical technology is an egalitarian profession. Gender and ethnicity do not influence task responsibilities at entry level or over time. Career

Table 2. Significance ($P < .05$) Test Results for Independent Variables vs Task Category

Variable	Core			Advanced Technical			Management		
	1993	1995	1997	1993	1995	1997	1993	1995	1997
Gender	NS	NS	NS	NS	NS	NS	NS	NS	NS
Ethnicity	NS	NS	NS	NS	NS	NS	NS	NS	NS
Job title	NS	NS	NS	NS	NS	NS	NS	NS	NS
Facility location	NS	.01* NS† NS‡	NS	NS	.03* NS† NS‡	NS	NS	NS	NS
Degree	NS	NS	NS	NS	NS	NS	NS	NS	NS
Eligibility route	.001	.05	NS	.005	.04	NS	.003	.04	NS

NS indicates not significant ($P > .05$); gender, female vs male; ethnicity, Caucasian vs minorities; job title, staff technologist vs supervisor or laboratory manager; facility location, urban vs rural, urban vs suburban, suburban vs rural; degree, baccalaureate vs graduate; eligibility route, route 1 vs other routes.

*Urban vs rural.

†Urban vs suburban.

‡Suburban vs rural.

Table 3. Mean (\pm SE) Task Frequency Indexes

Task Category	1993	1995	1997
Core	10.72 (0.04)	10.95 (0.04)*	10.99 (0.04)†
Advanced technical	8.67 (0.07)	9.19 (0.06)‡	9.33 (0.07)§,
Management	7.84 (0.07)	8.55 (0.07)¶	8.66 (0.07)#

Significant differences ($P < .05$)

* 1993 vs 1995 ($P < .01$) || 1995 vs 1997 ($P < .01$)

† 1993 vs 1997 ($P < .01$) ¶ 1993 vs 1995 ($P < .01$) 1995 vs 1997

‡ 1993 vs 1995 ($P < .01$) # 1993 vs 1997 ($P < .01$)

§ 1993 vs 1997 ($P < .01$)

Nonsignificant differences ($P > .05$)

Measurement	Items 1993			Items 1995		Items 1997	
	Items 1993			Items 1995		Items 1997	
Frequency: Almost always 14	recog values			More Frequent			
Very frequent 13	routine test			recog values		recog values	
				routine test		routine test	
Frequent 12	Correlate QC QA	preventive		preventive QC correlate QA		QC	preventive
Often 11	com info	special test	troubleshoot	troubleshoot special test		QA correlate	troubleshoot
	contin ed	specimens		com info	contin ed	com info contin ed	special test
Usually 10	eval computer train			eval computer	new test	eval computer	new test
Sometimes 9	new test safety committee manuals research	eval new inst	test selection	eval new inst manuals	supervise people test selection	new test manuals eval new inst supervise people	test selection supervise project
	select new inst estab procedures supervise project eval ed purchase lecture	supervise people	utilization	committee safety research estab procedures purchase utilization	supervise project select new inst	committee estab procedures purchase select new inst utilization	test selection safety research supervise project
Rarely 8	legislative			lecture eval ed		lecture eval ed	
				legislative		legislative	

Black text = core tasks
 Red text = advanced technical
 Blue text = management
 Bold text = a significant change, 1993 to 1995, or 1995 to 1997

counselors and educators trying to attract people to medical technology will welcome this finding.

Another important finding is that core responsibilities are done more frequently than advanced technical and management tasks for up to 5 years after entering the profession as an MT. This is consistent with responsibilities judged by educators (in 1995) to be outside the scope of practice for entry-level practitioners. The BOR prospective study clearly shows that educators must continue to emphasize technical skills. The facts of measurement confirm the intuitions of educators.

More studies are needed to determine if on-the-job training has more influence than professional educational programs when technologists learn advanced technical and management skills. Our results show that the frequency with which MTs do advanced technical and management tasks increases with each 2-year period (up to 5 years) that MTs practice their profession.

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Fig 2. Map of medical technologist responsibilities, 1993-1997. See Table 1 for expansion of abbreviations of tasks listed here.