An Assessment of the Workforce and Training Needs of Rural Kansas Medical Laboratories

ALEXANDRA CORNS, LETYCIA NUÑEZ-ARGOTE, ROBERT MOSER

ABSTRACT

INTRODUCTION: Medical laboratory scientists (MLSs) and medical laboratory technicians (MLTs) are in the top 10 highest demand specialties in Kansas hospitals. To date, no research has assessed the workforce of rural laboratories; this study aimed to provide a snapshot of the laboratory workforce characteristics, availability, and capacity in critical access hospitals (CAHs) in rural Kansas.

METHODS: This was a cross-sectional study conducted between May and July of 2023 via an electronic survey completed by the laboratory leadership from all 82 Kansas CAHs.

RESULTS: The CAH laboratories employed an average of 4.6 full-time employees, with 37% employing 3 or fewer full-time laboratory staff. In laboratories with 3 or fewer full-time employees, only 27% performed high-complexity laboratory testing. Among CAHs, 38% had open positions for MLT- or MLS-trained individuals. Of MLT and MLS personnel, 40% trained at either local rural community colleges or at a program in the Philippines.

CONCLUSIONS: Maintaining high-complexity testing in rural laboratories requires proficient staff. More than 50% of CAH laboratories employed at least 1 MLT or MLS trained at a rural community college, underscoring the importance of increasing enrollment to rural laboratory education programs, supporting MLT programs with training ladders toward MLS, and extending to laboratory professionals existing incentives, such as loan forgiveness options for those working with underserved communities, that may improve full-time staff availability.

ABBREVIATIONS: ASCP - American Society for Clinical Pathology, CAH - critical access hospital, HCT - high-complexity testing, KHA - Kansas Hospital Association, MLS - medical laboratory scientist, MLT - medical laboratory technician, NAACLS - National Accrediting Agency for Clinical Laboratory Sciences.

INDEX TERMS: health workforce, medical laboratory personnel, rural health.

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***Alexandra Corns**, The University of Kansas School of Medicine*

***Letycia Nuñez-Argote**, North Carolina A&T State University*

***Robert Moser**, The Kansas Center for Rural Health*

***Address for Correspondence: Alexandra Corns**, The University of Kansas School of Medicine, acorns@kumc.edu*

INTRODUCTION

The Kansas Hospital Association (KHA) conducts a workforce survey annually that assesses the staffing in hospitals across Kansas. Prior to the COVID-19 pandemic, the KHA workforce survey showed a vacancy rate of 7% for laboratory personnel, which increased to 22% in the 2023 edition.[1,2] Laboratory personnel including medical laboratory technologists (MLTs) and medical laboratory scientists (MLSs) were identified within the top 10 specialties with the most vacancies and highest demand within Kansas hospitals.[2] The vacancy report concluded that, by 2028, there would be 2442 unfilled open positions for MLT and MLS staff in hospitals across the state.[1]

These data reflect an impending critical laboratory workforce shortage of laboratory personnel and warrant further investigation. Previous literature details challenges that affect laboratories but does not offer an assessment of the workforce, and understanding this problem requires information on those who facilitate testing in rural communities, including the portion and characteristics of laboratory staff able to perform high-complexity testing (HCT). This study aimed to provide a novel assessment of the employee characteristics in Kansas' critical access hospital (CAH) laboratories, document vacancy rates, and discern the training and education background of staff in these sites.

METHODS

Data from the Flex Monitoring website, accessed in April 2023, were used to identify all existing CAHs in Kansas.[3] The KHA membership directory was then used to identify laboratory leaders at each facility who received an email containing an electronic survey link and a printable version of the questionnaire, which could be completed and returned to study personnel.[4] Up to 3 reminder emails and a follow-up phone call were sent to encourage participation.

Study data were collected and managed using Research Electronic Data Capture (REDCap)[5,6] between May and July of 2023. There were no incentives provided to respondents.

The survey included questions about the total number of staff working within the laboratory, with subcategories by full-time employment, MLT or MLS education, employee education and certification through the American Society for Clinical Pathology (ASCP), and whether staff with other health care roles (eg, nurse, radiology technician, etc) were cross-trained to perform laboratory testing. The sufficiency of staff was assessed by asking how many open positions were available for MLT or MLS or other HCT personnel. The survey also included questions on the capacity of the laboratory to perform HCT.

Responses were summarized with basic descriptive statistics using STATA software.[7] Some items required recoding before analysis because of questions allowing for the selection of multiple options or because of open-ended entry by respondents. This project was classified as a quality improvement study, and review was waived by the institutional review board of the University of Kansas Medical Center.

RESULTS

Respondent and Facility Leadership Demographics

The survey achieved a 100% response rate ($n = 82$), with 85% of responses submitted electronically and 15% obtained via telephone follow-up. Most respondents self-identified as laboratory manager or administrator (57%, $n = 47$; Table 1).

Regarding laboratory directors working in CAHs, 46% ($n = 36$) worked as contractors, and 45% ($n = 37$) had their highest education attainment at the associate (including MLT) or bachelor's (including MLS) level, with 29% ($n = 24$) of laboratory directors having a graduate degree. Similarly, at 28% ($n = 23$) of CAHs, the laboratory director and medical director were identified as the same person. The medical director's specialty was pathology at 64.6% ($n = 53$) of facilities. When asked whether the laboratory's medical director worked local or remote 50.0% ($n = 41$) of respondents indicated that their medical director worked remotely (Table 1).

Table 1. Demographic information of Kansas critical access hospitals' leadership

Measures	Personnel ($N = 82$) % (n)
Survey respondents' job title	
Manager/administrator	57 (47)
Director	18 (15)
Supervisor	9 (7)
Testing personnel	1 (1)
Missing/not indicated	15 (12)
Laboratory directors' employment	
Contracted	46 (38)
Employed by facility	32 (26)
Missing/not indicated	22 (18)
Laboratory directors' education	
MLT/associate only	7 (6)
MLS/bachelor only	24 (20)
MLS and MLT	4 (3)
MLS and other bachelor	1 (1)
MLS and other graduate	4 (3)
Bachelor other	9 (7)
Graduate MD	12 (10)
Graduate other	13 (11)
Missing/not indicated	26 (21)
Laboratory medical directors' specialty	
Pathology	65 (53)
Family medicine	9 (7)
Missing/not indicated	27 (22)
Laboratory medical directors' employment	
Local	22 (18)
Remote	50 (41)
Missing/not indicated	28 (23)

Percentages may not add to total because of rounding. Abbreviations: MD, Doctor of Medicine; MLS, medical laboratory scientist; MLT, medical laboratory technician.

Laboratory Capacity and Testing Personnel Composition

Overall, 70% ($n = 57$) of CAH laboratories reported the capacity to perform HCT. On average, 5.5 ($n = 57$; minimum [min.] = 1; maximum [max.] = 14) full-time employees capable of performing moderate or HCT worked in CAHs where HCT was performed (Table 2). CAH laboratories where HCT was not available (15%, $n = 12$) had fewer full-time employees who could do HCT—3.8 on average ($n = 11$; min. = 1; max. = 9).

The overall average number of full-time employees for CAH laboratories was 4.6 ($n = 81$; min. = 1; max. = 14), which was lower than the 5.2 average for all staff capable of performing moderate and HCT and suggests laboratories employed some part-time personnel to maintain HCT services. More than one-third (37%, $n = 30$) of CAH laboratories reported having 3 or fewer full-time employees, and 29% ($n = 19$) of laboratories said they had 3 or fewer personnel able to perform HCT. Responses indicated that 38% ($n = 32$) of laboratories were hiring for MLS or MLT (Table 2).

Regarding training and certification, while more than 90% of reporting CAH laboratories had at least 1 full-time worker who was ASCP certified, 45% ($n = 37$) said they had 3 or fewer full-time certified employees, and 6%

Table 2. Laboratory testing personnel availability and needs

Measures	Personnel ($N = 82$) % (n)
Number of full-time laboratory employees	
≤3	37 (30)
4–5	33 (27)
≥6	29 (24)
Missing/not indicated	1 (1)
Number of moderate and high-complexity testing employees	
≤3	23 (19)
4–5	33 (27)
≥6	28 (23)
Missing/not indicated	16 (13)
Full-time employees holding ASCP certification	
None	6 (5)
<3	45 (37)
4 or 5	27 (22)
≥6	20 (16)
Missing/not indicated	2 (2)
Cross-trained staff	
0	77 (63)
1 or 2	11 (9)
≥3	10 (8)
Missing/not indicated	2 (2)
Open positions for MLS or MLT	
None	60 (49)
1	18 (15)
2	13 (11)
3–5	7 (6)
Missing/not indicated	1 (1)
Open positions for other moderate and high complexity testing staff	
None	67 (55)
1	9 (7)
2–4	7 (6)
Missing/not indicated	17 (14)

Percentages may not add to total due to rounding. Abbreviations: ASCP, American Society for Clinical Pathology; MLS, medical laboratory scientist; MLT, medical laboratory technician.

($n = 5$) reported none. The majority (77%, $n = 63$) of CAHs did not use cross-trained staff to support laboratory functions (Table 2).

Testing Personnel Education Background

A total of 58 responses listed 171 different institutions where laboratory personnel received their education. Three respondents said their staff received on-the-job training or other vocational education and held no formal degrees. There were 43 separate US-based higher education institutions reported, with an additional 14 schools located in the Philippines. Of the education institutions reported, 70% of programs were accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) as of 2023, and 63% of CAHs employed at least 1 individual who trained at an NAACLS-accredited MLS or MLT program. Figure 1 shows the most frequently mentioned training institutions for testing personnel within Kansas CAHs.

$N = 82$ CAHs in the study population, 58 responses to the questions, and 171 total institutions noted. Percentages may not add to total because of rounding and multiple answers per respondent. Students who matriculate at Washburn University complete their MLS training through UNMC. Similarly, students who matriculate in WATC complete their MLS training through Wichita State University. Abbreviations: MLS, medical laboratory scientist; MLT, medical laboratory technologist; UNMC, University of Nebraska Medical Center; WATC, Wichita Area Technical College.

DISCUSSION

CAHs are required to provide basic laboratory services to allow for diagnosis of acute conditions, which necessitates the presence of capable, trained staff to undertake the work.[8] In 2022, a management report indicated that a 25-bed CAH laboratory required 300 labor hours, which is approximately 7.5 full-time equivalents.[9] Based on this estimate, CAHs in Kansas are understaffed, with an average of 4.6 full-time employees. This shortage was endorsed by more than one-third of CAHs reporting that inadequate staffing was a problem in their laboratory and that 38% of laboratories were hiring for at least 1 MLS or MLT staff member.

Beyond testing personnel, this staffing deficiency also appeared to affect the leadership level of laboratories, as only 32% of laboratory directors were employed locally by the CAHs. This example corroborates other research in support of promoting local employees to leadership roles.[10] With the majority of laboratory directors having associate or bachelor's level training, it is important to promote education opportunities to pursue further education into graduate laboratory management programs.

One key finding was that the most common training institution for rural laboratory professionals was Barton Community College, followed by personnel trained in foreign schools. This shows the potential for investing in local resources that can support health care pipelines for laboratory staffing. Talamantes et al examined the association between attending community college and the intention to serve in underserved communities and found that students who first matriculated at a community college had

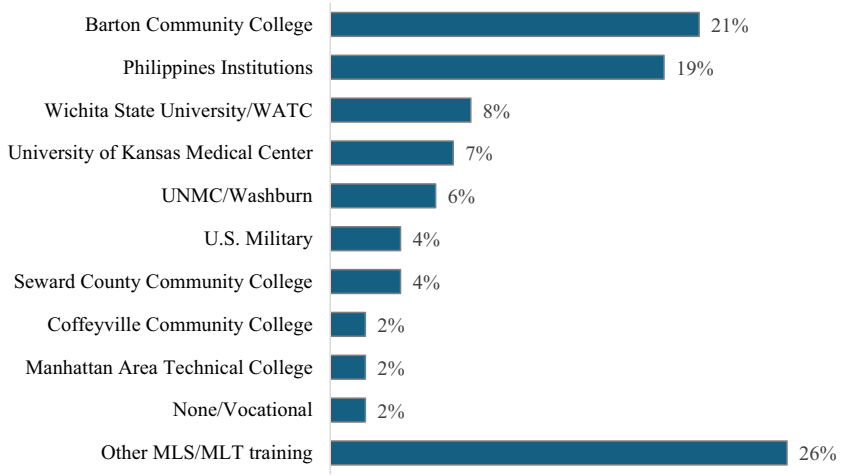

Figure 1. Programs where Kansas CAH laboratory personnel received training ($n = 171$).

higher odds of reporting their intention to serve in an underserved community.[10] Increasing support for rural training of laboratory professions could increase their employment in rural laboratories and fix the gap currently filled by foreign-trained staff.

While training new professionals is needed, rural communities should also support the implementation of loan forgiveness programs for laboratory professionals who work in a rural area. A study of Kansas loan forgiveness programs for physicians found that 62.6% of providers stayed at their original site at least 1 year after completion of loan forgiveness, and of those who left their original site, 33.3% were still practicing in a rural area.[11] These findings support the success of this model to place practitioners in rural areas. Thus, a similar model could be beneficial to increase the number of laboratory professionals working in rural areas.

Limitations

This study may not be generalizable to all CAHs or laboratories serving in them. This study relied on self-reported data from individuals working in these facilities, which may introduce cognitive and recall bias. Several responses were also incomplete, leading to partial assessment of these facilities. Additionally, these data reflect the Kansas CAHs as of July of 2023, and, since that time, 2 facilities have closed, and 2 new hospitals were identified as CAHs that were not included in this data set. Further evaluation would be beneficial to understand factors contributing to the laboratory workforce shortage.

CONCLUSION

Laboratories that maintain access to essential health care within rural Kansas are facing alarming staffing concerns. Potential solutions to address this shortage include promoting rural laboratory education programs and including laboratory professionals in existing or new educational loan forgiveness options for underserved communities.

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CONFLICTS OF INTEREST

The authors report no potential conflicts that exist in relation to this project.

DISCLOSURES

The findings and conclusions are those of the authors and do not necessarily represent the official policies and positions of the University of Kansas Medical Center or the University of Kansas Health System.

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