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ORIGINAL RESEARCH

A survey of the working environment of medical technologists in South Africa

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Background: Advancing medical laboratory and genomic testing is reliant on a workforce equipped with the skills required to perform and interpret the complexity of new generation assays. In certain areas, challenges in recruiting and retaining qualified laboratory staff have led to shortages of experienced professionals which may negatively influence diagnostic services. Local research in this field is limited, and this study aimed to evaluate how medical technologists and technicians perceived and related to their working environment.

Methods: A mixed methods study was conducted to evaluate respondents' perceptions of factors influencing workplace experience such as interpersonal relationships, compliance to continuing professional development (CPD), work ethic and scope of practice within the medical laboratory. A link to a web-based survey was distributed to an expert group attending the 2015 congress of the Society of Medical Laboratory Technology of South Africa (SMLTSA), Port Elizabeth.

Results: Survey results indicated that 27.5% of respondents were not happy with their career choice, notably the younger generation and public sector participants, where the latter reported significantly lower salaries than those in other sectors ($p < 0.05$). Only 54.2% reported being active members of the SMLTSA. Difficulties in attending professional development activities were described and deviation from scope of practice noted. Some respondents felt undervalued, reporting work ethic as satisfactory. Interpersonal tension was perceived between certain groups and the level of education was least likely to be related to salary scale. Most of the respondents (98.6%) were registered with the Health Professions Council of South Africa (HPCSA).

Conclusion: The majority of participants reported to be satisfied with their career choice. This study was conducted prior to the introduction of the professional degree in medical laboratory science and may not be reflective of the current views of this sector of laboratory staff. However the study serves as a basis for further research using a representative sample of different laboratory professionals to assess job satisfaction and factors affecting retention of staff in medical diagnostic laboratories.

Keywords: HPCSA, SMLTSA, medical technologist, medical technician, scope of practice, CPD

Introduction

Medical diagnostic services in South Africa are provided by the National Health Laboratory Service (NHLS) as well as private pathology laboratories including a number of medical technologist run laboratories. South Africa has a parallel healthcare system where approximately 80% of the population rely on services provided by the Department of Health. This department in turn utilises the NHLS network of laboratories to provide a diagnostic service,[1] while members of medical funding schemes have access to the private healthcare system and network of pathology laboratories.

The NHLS and blood transfusion services are major employers of medical technologists and medical technicians in South Africa. To ensure delivery of high-quality medical diagnostics, laboratories require suitably qualified staff who are registered with the HPCSA and are working in their areas of specialisation. Additionally, laboratories can conform to the criteria of the South African National Accreditation System (SANAS) which is the only national body responsible for conducting conformity assessments. The laboratory is evaluated in terms of compliance to set standards (ISO15189). This standard evaluates quality control and assurance, training, qualification of staff and standard operating procedures.[2]

The migration of healthcare practitioners from sub-Saharan Africa to more lucrative positions in developed countries has the potential to create workforce imbalances in the health sector of the source country.[3] The studies focused on medical doctors and nurses with minimal information on how this migration affects medical technologists and their contribution to diagnostic services in South Africa. Although the use of automation and point of care testing is becoming increasingly common, the operation of these instruments is dependent on medical laboratory professionals skilled to troubleshoot problems thereby ensuring reliable results generated by the testing platforms. Countries, such as the USA, Canada and the UK, have documented a shortage of medical technologists and cited that the numbers leaving exceeded the number of newly qualified personnel, where those leaving were not taking up positions in other laboratories.[4] Phipps reported the lack of adequate staffing in hospitals impacted negatively in the efficient operation of clinical laboratories and that staff retention was hampered by

the increased workplace demands.[5] Approximately 85.7% of surveyed laboratory directors highlighted the need for more laboratory personnel as workplace demands have increased, due to competitiveness among laboratories.[6] Although similar competitive situations exist in South Africa, the effect of medical technologists leaving the country or the profession, as well as other factors such as remuneration, staff shortages and increased workload experienced by medical technologists and technicians is largely unknown.

This study aimed to survey the perceptions of medical technologists and technicians regarding the profession and work environment. It also identified areas of concern among professionals with regards to career choices, interpersonal relationships, scope of practice, compliance of CPD and membership to the SMLTSA.

Materials and methods

Ethical approval for this study was granted by the Health and Wellness Science Research Ethics committee (HWS-REC) of the Cape Peninsula University of Technology (CPUT/HW-REC 2018/18). Permission was granted by the SMLTSA to contact participants who attended the Medical Laboratory Professionals Congress held in 2015 in Port Elizabeth. A cross-sectional survey compiled by the researcher was conducted using an online questionnaire and a letter of invitation to participate and the survey link was emailed to each of the attendees. An explanation of the purpose of the study was given and confidentiality was assured.

Data collection was conducted over a one-year period (June 2015/2016). To increase data collection, the snowball recruitment process was implemented where some participants provided email addresses of colleagues in the industry who indicated interest in participating in the survey.

Descriptive and inferential analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS). Responses obtained by using Survey Monkey were downloaded and imported into the SPSS software, the data was cleaned, coded and analysed. To make sample groups more robust, employer groups were classified into five categories: Public Sector (NHLS), Private Sector (private pathology laboratories), Blood Transfusion Services (SANBS and WPBTS) and Independent Practice (medical technologists who were self-employed and registered with Board of Health Care funders). Descriptive statistics were used to provide an overview of the respondents' demographics and their responses. Results of each item in the questionnaire were reported in percentage and absolute frequencies. The chi-square test was used to test the significance of association between numeric and nominal variables and a p-value of < 0.05 was considered significant.

Results

From the 475 invitations sent via email, 144 respondents completed the survey. The response rate of the survey was 30.3% where 20.8% of the respondents were male and 78.5% were female. As seen in Table I, a small proportion of respondents (11/140, 7.9%) indicated that they were board-registered medical technicians, while medical technologists had the majority representation (129/144, 92.1%).

Forty-eight (34%) respondents reported being employed in the private sector, with forty-two (29.8%) employed in the public sector and eight (5.7%) respondents were self-employed in medical technology practices registered with the Board of Health Care Funders (BHF). Twenty-nine (20.1%) respondents were professionals working for a medical laboratory not listed in the survey. Of the 144 respondents sampled, 98.6% (140/142) indicated to be HPCSA-registered while 54.2% (77/142) reported being active members of the SMLTSA.

The response by medical technologists and technicians to the question "Are you currently happy with your career choice?' indicated those > 35 years of age were more positive about their career choice (63/120, 52.5%) than the 18–34 years age group (24/120, 20%). From the total responses received 72.5% of individuals were content with their career choice. Most of the respondents pleased with their career choice were employed in private laboratories (31/73, 42.5%), whereas public sector respondents displayed the highest proportion of unhappiness in their career choice (14/73, 19.2%).

At the time of this survey, 52.5% of the respondents indicated that they earned more than R20 000 per month (period 2015/2016). Public laboratory employees reported earning significantly lower salaries than those in the private and "other" sector ($p = 0.03$ and $p < 0.001$ respectively) as well as the blood banks ($p = 0.007$), but were not significantly lower than those earned in independent practices ($p > 0.05$).

Majority of medical technologists employed by the NHLS reported earning less than R15 000 per month (57.1%), while the largest proportion of these technologists were in the 25–34 age group (70.6%). Medical technicians employed in the public sector reported this salary range at the 35–44 years group. In the private sector the largest portion of medical technologists (28.2%) indicated earning between R15 001–R20 000, primarily in the 25–34 age group. There were five medical technologists in the 45–54 age group, of which two (40%) reported earnings in the salary range of R25 001–R30 000 per month. In contrast, 66.6% of medical technologists employed in blood transfusion services, reported earning salaries of R25 000 and above per month. An interesting observation is that one of two technologists in the 35–44 year age group, reported earning between R20 001–R25 000 which was the same salary scale reported by a medical technician in the same age group.

The challenges expressed by respondents in attaining CPD compliance were identified and examples of thematic analysis of qualitative responses are shown in Table II.

In an attempt to evaluate the respondent's perceived interpersonal relationships with fellow colleagues, a means rating was performed, where the lower rating for relationships indicated a more negative perception of the relationship. A higher score (M = 3.41) demonstrated the relationship between

Table I: Demographics of the surveyed respondents

		Frequency	Per cent	Valid per cent	Cumulative per cent
Gender	Male	30	20.8	21.0	21.0
	Female	113	78.5	79.0	100.0
	Total	143	99.3	100.0	
Missing	System	1	0.7		
Total		144	100.0		
Age	18–24	10	6.9	7.0	7.0
	25–34	56	38.9	39.2	46.2
	35–44	28	19.4	19.6	65.7
	45–54	25	17.4	17.5	83.2
	55–64	21	14.6	14.7	97.9
	65–74	3	2.1	2.1	100.0
	Total	143	99.3	100.0	
Missing	System	1	0.7		
Total		144	100.0		
Salary bracket	< R15 000	30	20.8	25.0	25.0
	R15 001–R20 000	27	18.8	22.5	47.5
	R20 001–R25 000	22	15.3	18.3	65.8
	R25 001–R30 000	17	11.8	14.2	80.0
	R30 001–R35 000	11	7.6	9.2	89.2
	R35 001 or more	13	9.0	10.8	100.0
	Total	120	83.3	100.0	
Missing	System	24	16.7		
Total		144	100.0		
Registration	Medical technologists	129	89.6	92.1	92.1
	Medical technicians	11	7.6	7.9	100.0
	Total	140	97.2	100.0	
Missing	System	4	2.8		
Total		144	100.0		
Employer	Public lab [NHLS]	42	29.2	29.8	29.8
	Private lab 1 [LANCET]	24	16.7	17.0	46.8
	Private lab 2 [AMPATH]	4	2.8	2.8	49.6
	Private lab 3 [PATHCARE]	20	13.9	14.2	63.8
	Blood transfusion lab 1 [SANBS]	11	7.6	7.8	71.6
	Blood transfusion lab 2 [WPBTS]	3	2.1	2.1	73.8
	Independent practice [Self-employed]	8	5.6	5.7	79.4
	Other **	29	20.1	20.6	100.0
	Total	141	97.9	100.0	
Missing	System	3	2.1		
Total		144	100.0		
Membership	HPCSA	140	97.2	98.6	
	SMLTSA	77	53.5	54.2	
	Total	142	98.6	100.0	
Missing	System	2	1.4		
Total		144	100.0		

** Those who indicated 'none of the above' in the employer category

Table II: Qualitative analysis of expressed reasons for non-attendance of CPD activities

Reason	Example verbatim
Unable to attend due to work responsibilities	"Night shift"
Employer does not allow me to attend	"Employer does not give me special leave and does not pay for me"
Family responsibilities	"Family responsibilities (small children – not always possible to get someone to look after them)" "It sometimes clashed with my responsibility as a single mom"
Not a suitable time	"Prior arrangements made or out of town" "Hours not suitable"
Far away/Travel difficulties	"Can't drive at night" "There is no SMLTSA branch in my city so no activities are local and the expense is too great to travel" "Venues too far"
Other	"I didn't know about them" "I am not a member of the society" "I do not need to participate, I have enough CEUs"

the medical scientists towards the pathologists whereas a lower overall score (M = 2.53) was calculated for the relationship between pathologists towards medical technologists. Some medical technologists (44.2%) and technicians (34.4%) reported feeling disrespect from pathologists in their working environment. Additionally, fewer medical technologists (18.6%) than technicians (31.3%) perceived that their roles were regarded as of a lesser value and that their knowledge, training and attained qualifications were not fully recognised by the pathologists, as summarised in Table III.

Analysis of the respondents' opinion regarding adherence to the scope of practice for each laboratory profession confirmed that it was the perception of medical technologists and technicians that pathologists were least likely to work outside of their scope of practice (19/115, 16.5%). However, the majority of respondents (65/113, 57.5%) felt that medical technicians worked outside of their scope of practice and further analysis revealed that perceptions regarding adherence or non-adherence to scope of practice was independent of where the respondents were employed.

Discussion

The perception that medical technologists are unhappy in their profession appears to be anecdotal as the majority of respondents (71.9%) in this survey reported to be satisfied with their career. However, respondents (< 35 years of age) reported a lower level of happiness with their career choice than their older colleagues (35 years and older). A contributing factor may have been that at the time of this study (2015/2016) medical technologists in the public sector reported earning less than R15 000 per month consisted primarily of respondents in the 25–34-year category. This is a time when family responsibilities increase which adds pressure on the younger professionals, who may have felt that their expectations or needs were not being met. Additionally, counterparts in the private sector earned between R15 000–R20 000. Alternatively, studies relating to work wellbeing suggested that individuals committed to their careers derived more meaning from their work and were therefore more likely to experience job satisfaction. It is possible that the older age group in this study were happier within the profession because of a higher sense of commitment or felt that they are living a 'calling'.[7] This is supported by the U-curve theory which postulates that happiness is to a certain extent, age-related. Research supporting this acknowledges that reasons for happiness and unhappiness are multifactorial, including environmental contexts, but on average happiness increases after middle age.[8]

Overall, employees in the public sector earned significantly lower salaries than those in the private sector ($p < 0.01$). These findings support those reported in a previous South African study confirming higher remuneration of medical technologists employed in private laboratories.[9] It must be noted that there has been an increase in the remuneration packages for medical technologists employed in the public sector hence differences between private and public employers may not be reflective in the current salary scales (2018/2020). This study found a positive relationship between age/years of experience and salary. As expected, an employee's salary will increase with years of experience or service as a result of yearly increments, however, there was a weaker relationship between salary and educational qualifications. This reflects that a higher qualification in medical technology is not proportionate to a higher salary scale. In contrast, the US salary survey from medical laboratory observer (MLO)(2013 to 2018), showed that the higher the qualification, the higher the salary. This also eliminates the possibility of, as reported in our current study, a technician earning an equivalent salary to a medical technologist who has a recognised higher qualification.[9-12] The results from this survey conducted are in contrast to research in a previous South African study which indicated that medical technicians reach a plateau in their earnings in South Africa.[13] A possible reason for this anomaly is that medical technicians have fewer job opportunities due

Table III: Summary of reasons for providing a low relationship rating given by respondents

Pathologists' relationship towards medical technologists	Frequency	Per cent	Valid per cent	Cumulative per cent
Not enough interaction/communication	7	4.9	16.3	16.3
Lack of respect from pathologists towards medical technologists	19	13.2	44.2	60.5
Recognition of qualification	8	5.6	18.6	79.1
Pathologists' relationship towards medical technicians	**Frequency**	**Per cent**	**Valid per cent**	**Cumulative per cent**
Not enough interaction/communication	7	4.9	21.9	21.9
Lack of respect from pathologists towards medical technologists	11	7.6	34.4	56.3
Recognition of qualification	10	6.9	31.3	87.5

to their training which is limited to the workplace where they perform minimal theoretical learning and tend to remain with the same employer and benefit from the yearly increases in basic remuneration. The medical technician programme is approved by the HPCSA but is not a formal qualification registered with the South African Qualifications Authority (SAQA). During the period of data collection for this study, medical technicians in the public sector reported earning less than R15 000 per month and were in an older age group (35–54 years old), possibly due to choosing this career option and writing the technicians board examinations later in life.

However, the practice of equal remuneration has the potential to create discontent among these two professional groups in the laboratory and it is hoped that with the introduction of the Bachelor of Health Science degree in Medical Laboratory Science, the value added by these graduates will be recognised and remunerated accordingly. This degree provides graduates with a NQF level 8 qualification and has an excellent theoretical base with a focus on application of knowledge, complex problem solving and critical thinking skills. A concern is that if these graduate's educational expertise is not recognised and remunerated accordingly then those entering the profession may become disillusioned and leave for more rewarding career paths, raising concerns regarding the ability of the remaining workforce to meet the increasing number and demand of tests.

As with previous research conducted among medical technologists in South Africa, the majority of respondents were female.[13] This finding of female predominance in the profession is echoed in a study done by the US of laboratory science workers[6] but differs from that done in West Africa where healthcare professionals across all disciplines (including laboratory workers) were collectively male orientated.[14] The response rate to our online survey was higher than expected, as previous experience by Brand et al. a survey response rate of 16.6% was achieved among medical technologists and medical technicians using the local postal services.[15] One of the possible reasons for the higher response rate from the private sector (34%) was that more medical technologists from these laboratories attended the 2015 SMLTSA Congress in Port Elizabeth, than those from the public sector (29.85% of the responses). This differentiation in numbers of technologists employed in the two sectors is similar to a previous report from sub-Saharan Africa, where 29% of respondents were employed in the public sector.[14]

High CPD compliance was evident among the respondents of this study (94.2%) which is explained by the fact that, in order to practice, one has to retain HPCSA registration that is dependent on being deemed CPD compliant in the event of an audit. The majority of the responding medical technologists and technicians (140/144, 98.6%) confirmed their HPCSA registration, while 54.2% (77/142) reported being active members of the SMLTSA. Despite a database being provided by the SMLTSA to contact congress attendees, the high compliance was not achieved through all of the activities arranged by the SMLTSA, since 40% (38.9%) of respondents were not aware that the SMLTSA arranged such CPD activities, and less than half of those with knowledge of this programme (45.5%), indicated that they attended these arranged events. Another important consideration is that approximately 10% of the HPCSA-registered medical technologists and medical technicians in South Africa are recorded as active members of the SMLTSA (2017). The primary reasons cited by the respondents for non-attendance of these activities was work responsibilities (54.8%), followed by transport challenges (13.7%) or that the cost involved in attending was too high (12.3%). Respondents in a 2007 survey, offered similar logistical reasons for non-attendance of CPD activities arranged by the SMLTSA, sighting financial constraints as the main obstacle.[16] Currently, the SMLTSA has branches in the Western and Eastern Cape, KwaZulu-Natal, Gauteng (limited to a branch on the East Rand of Johannesburg) and the Free State. As the majority of respondents to this survey were from Gauteng it may partly explain our findings, while another reason for low membership could be due to the lack of branches in some provinces as those previously situated in the Boland, Mthatha, North West and Mpumalanga have been closed, ironically due to the lack of membership. Furthermore, the SMLTSA is a member of the International Federation of Biomedical Laboratory Science (IFBLS), which allows the local profession to gain an international perspective by collaborating and connecting with medical technologists or laboratory scientists and technicians from around the world, and should be well supported by membership from this fraternity.

Medical technologists and medical technician's attitudes towards their work environment reflect their perceptions about the organisation and the performance of other professions within the medical diagnostic laboratory, which may in turn influence their own behaviour in practice. Some respondents stated a perceived measure of disrespect from pathologists with comments stating a lack of communication and teamwork among medical technologists, technicians and pathologists in some laboratories. Respondents did however feel that pathologists were most likely to work within their scope of practice while the same was not true for medical technicians.

No readily available literature reporting on the scope of practice of medical technologists/scientists and medical technicians within the medical diagnostic laboratory setting was consulted, however some studies were performed among nursing professionals where respondents disclosed they often had to work outside their scope of practice in order to fulfil the needs of critically ill patients, infringing on the scope of practice pertaining to critical care nurses.[15] Similarly, medical technicians may in time, and with increasing experience, become competent in performing tasks originally considered outside their scope of practice, and continue to do so routinely. It is well known that when new technology in laboratory equipment becomes available, manufacturers train and certify competency of the medical technologist or technician chosen by the employer, irrespective of their HPCSA-registered qualification. This is an area which could lead to the overlap of responsibilities among these two laboratory workers. With advanced complexity of these instruments and as the data generated by them increases,

it may be understandable for certain medical technicians to perform work initially expected of medical technologists. The South African government provides a framework for practising medical technologists in the Scope of Practice of Medical Technology (Government Gazette No 8218).[17] The regulations defining this scope have not been updated nor amended since the last publication. Similarly, there have been no updates regarding this from the HPCSA in over a decade. As there is a lack of formal documentation gazetted that clearly defines the scope of practice for the different laboratory personnel in South Africa, guidelines were published by the Professional Board for Medical Technology (PBMT) and SANAS. In 2014/2015, the PBMT released a bulletin advising that medical technicians could sign out automated work if it was verified by a medical technologist.[18] In addition, SANAS in 2015 released a bulletin stating the following, "Technicians may enter test results on the IT system provided the verification of the results is done by a medical technologist. Medical technicians must not verify/authorise results".[19] Since these documents are only guidelines they cannot be enforced.

Conclusion

Diagnostic medical laboratories offer an integral contribution to health care and the workforce responsible for a service of quality includes many role players with different levels of training and education. Medical technologists and the newly graduated medical laboratory scientists (BHSc) are an important group within the limited resource setting of the public health system in South Africa. This service faces many challenges in the current economic climate with an increasing disease burden experienced by many other developing countries.

The research findings do provide a better understanding of the diagnostic laboratory working environment, although further research is required to explore the roles and working relationships between key professionals. A challenging area of concern is the lack of clearly defined roles within the scope of practice of medical technologists and that of the technician which may further be complicated by the introduction of the graduate medical laboratory scientist. A comprehensive strategy may be sought to address workforce needs in order to meet the increasing demand for higher level diagnostic testing which relies on strong team work in order to create a unified diagnostic service.

Limitations of the study

A number of factors limit the extrapolation of results to the broader laboratory community in South Africa or elsewhere. The sample was skewed by a convenience sampling method, and the distribution of respondents was centred in one province. Importantly, the opinion and perceptions of other laboratory personnel was not elicited. The largest proportion of respondents were not from the public sector and the delayed period of data collection should be taken into account when interpreting data. The public sector salary review process was concluded during the data collection period for this publication and may have influenced opinions. In addition, remuneration rates reported in this study are unlikely to reflect those currently offered by the employers.

Respondents who were likely to complete the survey may have a greater desire to provide their own insights based on their personal experiences within the laboratory, which does create further selection bias. The accuracy of salaries could vary depending on the respondents' truthfulness or trust in sharing these details. Respondents with an email account and access to the internet could participate, while this may not have been the case for a proportion of medical technologists and medical technicians and therefore their opinions were not included in this analysis.

This study has offered a unique insight and is an attempt to scientifically evaluate the attitudes and perceptions of the working environment experienced by medical technologists and medical technicians in the South African context.

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