Liikanen, E. (2019) Cytotechnologists’ education and work in Finland. Cytopathology. 2019:30, s. 281– 284.

DOI: https://doi.org/10.1111/cyt.12680

Title: Cytotechnologists' education and work in Finland

Running title: Survey of cytotechnologists in Finland reveals useful data on training, work experience and everyday duties

Corresponding Author: Eeva Liikanen, Biomedical Laboratory Science, Tampere University of Applied Sciences, Tampere, Finland.

Abstract

Objective

The aim of this study was to survey the work that cytotechnologists carry out in Finland.

Methods

An electronic questionnaire was planned with the Board of the Finnish Association of Cytotechnologists and an email containing the link was sent to all 107 of its members in January 2018. It included 17 questions on their age and work experience, education and work. There was also space for them to add others comments.

Results

Just under half (45%) replied. Their average age was 51 (range 28-64), 41% had a Bachelor degree, 59% had college-level training and they had spent an average of 15 years screening cytology specimens. After basic professional education they had completed their cytology education in many ways and the most common routes were internship training (71%) and one-year cytology specialisation (38%). Most of the cytotechnologists (85%) had duties other than screening and they mostly included a combination of histechnology and cytotechnology (37.5%) or just cytotechnology (17%) or histechnology (9%). The other 15% only screened cytology specimens. All cytotechnologists screened Pap smears, 94% screened urinary and respiratory specimens, 82% screened effusions and 39% screened fine-needle aspirations.

Conclusions

We found that internship training provided essential training for Finnish cytotechnologists after they complete their basic professional studies. They reported many other duties in addition to microscopy screening.

Key words: cytology, cytotechnologist, education, screening

Introduction

The way that cytotechnologists are educated varies internationally, even throughout Europe, [1-3] and training programmes can be provided as separate courses, a combination of separate courses or in-house education.[2] The basic standard educational requirements for cytotechnology training are either being a medical or laboratory technologist or being a biomedical scientist with a Bachelors degree.[2] Some countries provide postgraduate training and education programme for cytotechnologists and these include Croatia, where courses have been organised by the country's Ministry of Health and Social Welfare since 2000. [4] In Finland, biomedical scientists study at universities that offer applied science courses lasting 3.5 years and receive a Bachelors degree if they achieve 210 European Credit Transfer and Accumulation System credits. Once they have acquired their degree, they are able work in all kinds of clinical laboratories, such as those covering clinical chemistry, histology, haematology and physiology. However, they need another one to two years of in-house training and theoretical education before they have the competencies needed to practise as cytotechnologists. The one-year cytology education programme for biomedical scientists finished about 25 years ago in Finland and since then only a few organisations have continued to provide in cytology. Some cytotechnologists complete their education by attending courses organised by The International Academy of Cytology.

The Finnish curriculum in cytology includes sampling and techniques, basic gynaecological screening for normal cells, micro-organisms and obviously malignant cells and basic non-gynaecological screening for normal bronchial and urine cells and obviously malignant cells. Students also study the Bethesda and Papanicolaou (Pap) classification systems, the cytological criteria of malignancy and safety and quality management. Finnish cytotechnologists take the view that newly graduated biomedical laboratory scientists have the basic competencies they need to develop the required skills and knowledge in cytology[5].

In Finland, the recommended career route for a cytotechnologist is graduate entry followed by preliminary training in general laboratory technology. Subsequent training should take into account the probability, and reality, of primary cervical cancer screening changing from cytology to human papillomavirus testing and the need to perform tests for the virus and take part in rapid on-site evaluation for fine needle aspirations. Any training should also be provided in line with the support training and practice guidelines developed by the European Federation of Cytology Societies.[1]

Worldwide of educations for cytotechnologist varies considerably. In the United States, education programmes for cytotechnologists are based on the Standards and Guidelines for the Accreditation of Educational Programs in Cytotechnology. [6] These require the following entry-level competencies: screening and interpretation, basic laboratory techniques, laboratory operations, application of companion technologies, evidenced-based medicine and professional development. Screening and interpretation involves gynaecological and non-gynaecological cytology and fine needle aspiration cytology. Meanwhile, in Europe, the European Advisory Committee of Cytotechnology provides guidelines for minimum requirements for practising cytotechnology in Europe and national cytology and cytotechnology societies organise workshops, slide seminars, tutorials and conferences to train cytotechnologists.[2,7] However, many of the cytotechnology programmes across the world tend to be small and many have closed down in the United States,[8] while Australia has developed self-appraisal for postgraduate training and education programme.[9] There could be several explanations for this including the fact that cytotechnology is not a well-known profession and cytotechnologists do have not had the opportunity to continue their studies in cytotechnology at Masters and Doctorate levels.[8]

In general cytotechnologists screen many kind of specimens, including Pap smears, respiratory and urinary specimens and fine-needle aspirations. The work carried out by cytotechnologists varies across Europe. [1] For example cytotechnologists working in Croatia screen blood smears in cytology laboratories, but these are performed in haematology laboratories in Finland. The work carried out by cytotechnologists has also undergone a number of changes over the last few years. Pap tests have decreased, screening frequency recommendations have changed, efficiencies have increased as a consequence of computer-assisted screening technology and human papillomavirus testing has expanded.[7] The same kind of situation is assumed to exist also in the developed countries.

Most cytotechnologists have an intermediate level of responsibility, which includes signing off negative and inadequate gynaecological samples, and the minority operate at an advanced level, where their responsibilities can include bringing abnormal gynaecological samples to the attention of clinicians.[2] Cytotechnologists tend to be an underused resource in cytology[10] and their roles can include preparing pre-screen non-gynaecological cytology slides and assessing whether fine needle aspirations are adequate when immediate diagnosis is not required[11]. Finnish cytotechnologists have basic to intermediate responsibilities[7].

There is a need to establish formal training and education in cytology across Europe and to establish criteria for minimum standards in cytology for cytotechnologists and cytopathologists.[3] That is why a three-year Cytological Training at European Standard through Telepathology project was established by Cy-TEST group in 2014 and why the Eurocytology programme received funding from ERASMUS + Programme of the European Commission to assess, maintain and increase cytomorphological knowledge.[3]

The aim of this study was to describe the education and work of cytotechnologists in Finland by using responses to a survey created with the help of the national organization.

Methods

The questionnaire was planned with the Board of the Finnish Association of Cytotechnologists in autumn 2017 and the data were collected by an electronic Microsoft Forms questionnaire (Microsoft Corp, Redmond, WA, USA) in January 2018. The link for the questionnaire was sent by email to all 107 members of the Finnish Association of Cytotechnologists and 48 cytotechnologists (45%) responded by the March 2018 deadline. The questionnaire consisted of 17 questions, including questions about their age and work experience and education. The latter comprised two multiple-choice questions and two open-ended questions. There were also three multiple-choice questions and one open-ended question about their work. We also provided space for them to provide any additional comments they felt were relevant. The questionnaire also asked them questions about their salary, but this study primarily focused on their education and work and those responses are not included in this paper. The means were calculated using Microsoft Forms.

Results

The average age of the cytotechnologists was 51 years and they ranged from 28 to 64 years. They had spent an average of 15 years screening cytology specimens. When it came to their basic professional education, 29 (60%) had college-level training and 19 (40%) had a Bachelors degree.

After their professional education they had completed their cytology education in a number of ways (Table 1) and the most common educational routes were internship training (n=34, 71%) and one-year cytology specialization (n=18, 38%). A quarter (n=12, 25%) fell in the other category, with nine (19%) saying they had undergone postgraduate training and education programme at a University of Applied Sciences, two (4%) reporting different short courses and one (2%) citing postgraduate training and education programme at college level. None of the respondents had the Quality Assurance, Training and Examinations committee qualification.

The majority (n=42, 82.5%) of the cytotechnologists reported duties other than screening. The remaining six (12.5%) only screened cytology specimens. In Table 2 is presented any duties carried out by cytotechnologists in addition to screening. The most common general duties were a combination of histechnology and cytotechnology (n=18, 37.5%), just cytotechnology (n=8, 17%) and histotechnology (n=4, 9%). All cytotechnologists screened Pap smears, 46 (94%) screened urinary and respiratory specimens, 39 (82%) screened effusions and 19 (39%) screened fine-needle aspirations. Less than half (n=22, 47%) of respondents did not sign out normal and inadequate Pap smears.

There were 21 responses in the free comments sections and 17 of the respondents felt that their salary was too low for their level of responsibility. Three cytotechnologists described their work. One reported that they felt the research we were undertaking in this study was important and one stated that they still found their work interesting.

Discussion

According to this questionnaire-based study, cytology laboratories play an essential role in training cytotechnologists in Finland, as nearly three-quarters (n=34, 71%) of those who responded had undergone internship training. In addition, a significant number had undergone a one-year cytology specialization (n=18, 37.5%), which had finished about quarter of a century ago. Many of those will be due to retire in the foreseeable future, as the average age for respondents was 51 years, the oldest respondent was 64 and the retirement age when citizens can receive a pension in Finland is currently 65. In reality, the average age of Finnish cutotechnologists is probably higher, because the response to this survey was 45% and it is likely that younger cytotechnologists responded more actively than older ones, as this was a web-based survey. This response rate can be consider good, because it was higher than other similar web-based surveys, where response rates ranged from 20.7% to 31.5%.[12] The respondents followed various training routes to acquire their education in cytology. There is no longer any form of structured cytology or cytotechnology education for graduated biomedical scientists in Finland that enables them to develop the competencies they need to work as cytotechnologists. Some plans for postgraduate training and education programme in cytology has been already done and they have to be implemented in the near future. They are significant to carry out together with university of applies sciences and cytology laboratories. Otherwise, cytopahtologists and cytotechnologists have a big challenge to train biomedical laboratory technologists to professional cytotechnologists.

In addition to Pap smears the cytotechnologists in our study mainly screened urinary and respiratory specimens (n=45, 94%) and effusions (n=39, 82%). Less than half (n=19, 39%) screened fine-needle aspirations. The majory of the cytotechnologists (n=41, 85 %) also had other duties than screening and only seven (15%) focused solely on screening cytology specimens. Thus Finnish cytotechnologists have intermediate level responsibility for screening.[2] More than half (n=26, 54.5%) had duties that included histotechnology and (n=22, 46.5%) had duties that included cytotechnology. In addition, many had other different duties. One of the reasons that cytotechnologists have versatile job descriptions is that some cytology laboratories are quite small and their staff perform different duties on a rotational basis.

Cytology education faces a number of challenges due to changing medical practices. For example, organized human papillomavirus test for cervical cancer screening is only used in the Tampere region of Finland at the moment and has not been rolled out to the rest of the country.[13] If this screening does expand in Finland, Pap smear screening will decrease substantially. It is also likely that the use of molecular biology methods will increase in cytology and there is a possibility that these competencies will partly replace traditional microscopy screening. Any education needs to reflect changes in the demands for different competencies and the healthcare profiles and priorities of the countries where cytotechnologists work. Cytotechonology is a relatively rare profession in Europe and it is important that those performing these roles receive the same training as common European education could enable this specialism to share training resources and enable skilled staff to work in other countries. For example the Eurocytology project also offers excellent cytology courses (https://www.eurocytology.eu/en/home).

Developing countries face challenges when it comes to training cytotechnologists - and cytopathologists[14-15] - due to a lack of access to supervised reporting cases, slide case teaching material, access to the Internet, new text books, up-to-date journals, multidisciplinary meetings, tutorials and conferences. There is also a particular issues with the lack of experienced cytotechnologists and cytopathologists who can supervise novice ones in cytology laboratories. If they have access to the Internet, then E-learning is one way that people can learn the skills they need to be cytotechnologists in developing countries. In fact, virtual microscopy is already a key tool that is being used to train cytotechnologists[16], both in basic and postgraduate training and education programme. However, E-learning on its own is not an option for cytopathologists, as other study methods are needed, such as blended learning, which combined E-learning and teaching. Basic professional and continuing education is a reasonable way to carry out by blended learning for both cytopathologists[17] and cytochnologists.[18]

This study showed that cytotechnologists perform and range of duties. However, Finnish cytotechnologist do not perform rapid on-site evaluation (ROSE). In fact these fine needle aspirations provide adequate specimens and providing preliminary diagnoses.[7-8,19] Cytotechnologists can also perform small biopsy processing, frozen sections, fluorescent *in situ* hybridisation, *in situ* hybridisation, telepathology, digital imaging and pre-screening of histology specimens.[8] Naturally these duties need further education. Unfortunately there have not been any studies about the job orientation of cytotechnologists after 1992 and this study fills in a gap in that knowledge by providing much more recent data. A study of cytotechnologists in the United States, published that year, ranked responsibility as very low motivational factor, but salary as a very high factor. [20] Whereas a study of cytotechnology students working in Colombia and published in 2017 cited responsibility as a motivational factor.[21] Studying the job orientation of cytotechnologists could reveal their views about what kind of duties they expect to perform in the future.

Conclusions

This study of Finnish cytotechnologists showed that they had achieved their current roles by following a number of different training routes and that their duties varied considerably in addition to microscopy screening. It highlighted the lack of formal training programmes and underlined that internship training is an essential way of training cytotechnologists after they complete their basic professional studies in Finland. We also concluded that European-wide training programmes could provide extra support to this fairly rare healthcare specialism.

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