

Great interest in a Swedish nationally regulated specialist education among biomedical laboratory scientists and biomedical laboratory scientist students

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Biomedical laboratory scientists (BLS) work in many different disciplines but one common denominator for all the fields within the profession is the rapid development in biomedicine and the corresponding increase of advanced technology. A nationally regulated specialist training for BLS is a way for the profession to gain advanced skills and to create career opportunities. From a larger study set, the aims of this sub-study were to investigate BLS student's and professional's view on education, choice of workplace, career development, advanced studies and a potential nationally regulated specialist training program. Two surveys were designed using webbenkater.com. The surveys were sent to BLS student members (n=483) and professional members (n=2083) of The Swedish Institute of Biomedical Laboratory Science (IBL), the professional organization of BLS's in Sweden. Response rate was 57% (276/483) for the student sub-survey and 44% (n=923/2083) for the professional sub-survey. Students from all semesters (1-6, n=272) were represented, with a majority from semester 2, 4 and 6. Top reasons for choosing the BLS education were; easy to get a job (65%), stimulating work tasks (59%) and a good education for further studies (39%). A majority of the students planned for further advanced academic studies (64%) and 54% percent were interested in a potential nationally regulated specialist training. Among professionals, 21% stated there were explicit career paths at their workplace. The individual interest for a potential nationally regulated specialist training was 53% and most responders (93%) stated a need for such an education in Sweden. Among IBL members, there is great interest in a nationally regulated specialized training among both future and present professionals in Sweden. In relation to a future shortage, we also show that in order to attract students to BLS training, we need to be able to offer advanced training as well.

Key words: Medical Laboratory Personnel, Medical Laboratory Science, Education.

Introduction

The biomedical laboratory scientist (BLS) is a young profession compared to several of the other health professions.¹ The BLS education and practical training make the profession unique compared to other professions in the medical laboratory, in terms of knowledge within quality assurance, evaluation of pre-analytical conditions, and assessment and validation of medical laboratory analysis.² The current curriculum in Sweden is three years of academic studies resulting in a professional exam as biomedical laboratory scientist and a Bachelor of Science degree. Within this program, curriculum in all courses are based on learning outcomes regulated at a national level and related to

knowledge and understanding, skills and abilities as well as judgement and attitude/approach.³ Biomedical laboratory scientists today work in many different disciplines and BLS in Sweden can either work in laboratory medicine or in the field of clinical physiology. While BLS in laboratory medicine are educated and work within molecular biology, immunology, transfusion medicine, pathology, microbiology, hematology, chemistry etc. BLS in clinical physiology are more directly patient oriented, and educated in clinical physiology, clinical neurophysiology, ultrasound and nuclear medicine. The two educations in Sweden are separate, although some initial basic courses are common. One common denominator for all the fields within the profession is

the rapid development in biomedicine and the corresponding changes in methodology and increase of advanced technology. Here, the BLS's knowledge throughout the analytical chain has contributed to the desired efficiency improvement that takes place.⁴ In order to keep up with changes in methodology and high technology, professionals are expected to have a continuous professional development (CPD) throughout their entire working life.⁵

Today there is a shortage of BLS in Sweden, with large expected retirements within the next few years. According to a recent national report⁶, 17 out of 21 county councils reported that there is a shortage of BLS. In addition, the largest age group of BLS, according to the same report, are within the age range of 60-64 years. At the same time, not enough of BLS students are examined to make up for the retirees. The number of required training places within the education has increased, but unfortunately, many students do not carry out the full training. Only 51% of all students who started a BLS education in the 2012/2013 academic year in Sweden graduated as of academic year 2017/2018, according to a report from the University Chancellor's Office. Among those, 71% graduated within the normal time span (3 academic years). Apart from recruiting newly examined students, it is of outmost importance to also maintain the existing workforce in Swedish health care.⁷

The national organization for biomedical laboratory scientists in Sweden, the Swedish Institute of Biomedical Laboratory Science (IBL), has for decades been working for the development of the profession e.g. educating BLS in different fields and working towards a nationally regulated specialist training to create career opportunities in order to make the profession more attractive. The existence of a nationally regulated specialist training program ahead could also motivate students for applying to the BLS programs in the future. A specialist training program can specialize BLS skills and abilities within specific areas since the BLS scientist degree/bachelor degree in Sweden today provides the student with general skills in all disciplines within each field.

Today, guidelines for career development (qualification ladder) for BLS in Sweden is present at some regional levels. With continuous professional development and experience, the BLS should be able to gradually increase his/her knowledge and responsibility in the laboratories. Besides the clinical profile, education and research are other areas or career paths for the BLS.

In order to plan for the future work within the organization of IBL it is important to get both BLS students and professional BLS opinions on current topics of interest. Also, from a wider perspective, it is important to get input from future and present professionals on professionally related issues that impact this workforce in Sweden today.

From a larger study set, the aims of this sub-study were to;

- Investigate BLS students view on BLS education, choice of future workplace, advanced studies and a potential nationally regulated specialist training program.
- Investigate BLS professionals view on choice of workplace, career development, advanced studies and about a nationally regulated specialization program.

Materials and Methods

General study overview

Names and e-mail contact details of all the BLS professionals and BLS students in Sweden registered at the Swedish Institute of Biomedical Laboratory Science were collected. We designed two surveys using (webbenkater.com), one to use among the students at the BLS programs in any of the ten universities in Sweden and one to use among professional members of the IBL. We sent an email invitation to complete the survey to all the individuals for whom we had email addresses. Registration of e-mail address is voluntary in the IBL directory. We issued several re-invitations to maximize response rates.

The student survey was sent to 483 e-mail addresses (at the time there were 544 student members in the register) in February 2018. We also encouraged the student members to spread the survey to their student colleagues that were non-members. There are

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currently 10 universities in Sweden with a BLS program. Six of them offers both orientations; laboratory medicine and clinical physiology, and four laboratory medicine only.

The invitation for the survey for professional members was sent to 2083 e-mail addresses (2541 professional members in the register) in September 2018. We also provided a link on the IBL homepage (<https://ibl-inst.se/>) to use for answering the survey.

In both surveys, participants could choose what questions to answer; hence, everyone who responded did not answer all questions. Only one question, year of graduation, in the professional study was compulsory. In total, the student survey consisted of 18 questions and the professional survey consisted of 41 questions.

From this larger study set-up, questions related to the study aim, were analyzed as of sub-study set up.

Sub-study set-up

Thirteen (of 18) questions from the student survey were selected in this sub-study. We selected questions related to BLS education, choice of future workplace, advanced studies and a potential nationally regulated specialist training program. None of the selected questions were compulsory to answer.

Twelve (of 41) questions from the survey to the professional members were selected in this sub-study. We selected questions related to choice of workplace, career development, advanced studies and about a nationally regulated specialization program. None of the selected questions were compulsory to answer.

Results

The student sub-study

Below, we report results from 13 questions answered by the students, relevant to the scope of this report. For the 13 questions, 3265 answers were collected. Two hundred and seventy-six students responded to one or more questions in the sub-study, response rate 57% (276/483). Most responders were women (80%, n=221/276) and between 19-24 years of age (59%, n=162/276). Students from all semesters (1-6, n=272) were represented, with a majority from semester 2 (28%, n=77/272), 4 (32%, n=87/272) and

6 (36%, n=99/272). Most students were enrolled in the laboratory medicine orientation (62%, n=166/269), 24% (n=66/269) listed their program as containing both laboratory medicine and clinical physiology and 14 % studied clinical physiology (n=37/269).

The majority of the students had BLS as a first choice when applying to higher education (84%, n=227/271). There was a significant difference between student groups regarding BLS as a first choice. Students enrolled in clinical physiology more often had another first choice when applying to higher education, compared to students enrolled in laboratory medicine orientation (Pearson's Chi-square: p=0.021). There were no differences between students in terms of age (Pearson's Chi-square: p=0.59) or sex (Pearson's Chi-square: p=0.84) regarding BLS as first choice. Students that listed BLS as a second choice, listed medical doctor and other educations within health care and biomedicine as firsthand choices. Most of the students found the education to correspond to their expectations in terms of academic level (62 %, n=165/267).

Top reasons (multiple choices possible) for choosing the BLS education were; easy to get a job (65%, n=173/267), stimulating work tasks (59%, n=157/267) and a good education for further studies (39%, n=105/267).

A majority of students already had plans for further advanced academic studies (64%, n=170/265), 11% (n=28/265) immediately after bachelor graduation (figure 1). Despite no significant difference between the groups (Pearson's Chi-square: p=0.18), more women (66%) compared to men (55%) had plans for further academic studies (yes results combined). Students enrolled in clinical physiology answered more often that they had plans for further advanced academic studies (81%) compared to students enrolled in laboratory medicine orientation (59%, Pearson's Chi-square: p=0.013). Students in the age groups of 30-34 and 35-39 had the lowest interest for further academic studies, (48% and 33% respectively), while interest was higher in age groups 19-24 (71%), 25-29 (62%) and above age 40 (58%). The interest for advanced academic studies was significantly different between students at different semesters. Among semester 2 students, 19% (n=14/75) intended to continue with advanced academic studies directly after graduation while only 1% (n=1/91) of students from

semester 6 answered the same (Pearson's Chi-square: $p=0.000085$). Fifty-eight term 2 students (77%) were interested in advanced studies either directly after graduation or later after graduation

(Yes-answers combined) while 49 of the term 6 students answered the same (54%, Pearson's Chi-square: $p=0.0017$) (figure 1).

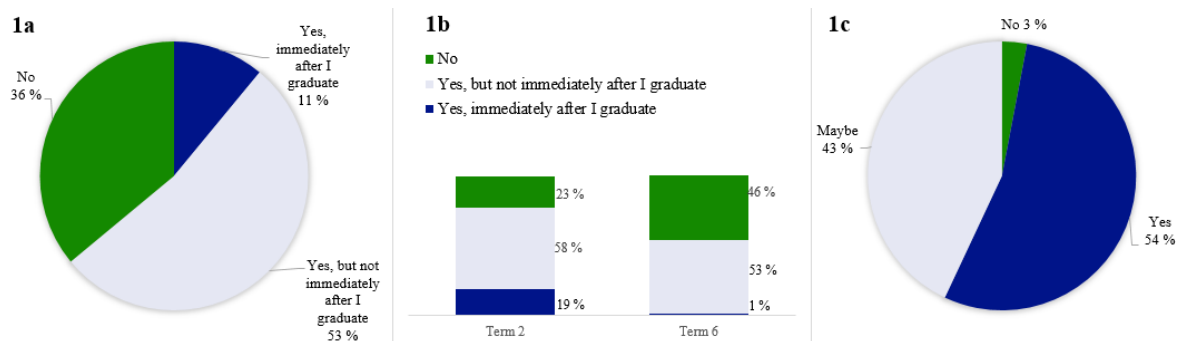


Figure 1: BLS student view on advanced studies and a nationally regulated specialist training program. From the student sub-study conducted by the Swedish Institute of Biomedical Laboratory Science (IBL), most students were interested in further advanced studies (1a). There were however differences between students at different semesters (1b). Term 6 students were less interested in further advanced studies compared to term 2 students both in terms of immediately after graduation (1% compared to 19%; Pearson's Chi-square: $p=0.000085$) or combined with later after graduation (54% compared to 77%; Pearson's Chi-square 0.0017). A majority of the students also showed interest in a potential nationally regulated specialist training program (1c).

Fifty-four percent (142/264) were interested in a potential nationally regulated specialist training and 43% stated that they might be interested, thus only 3% stated they were totally uninterested (figure 1). There was no difference in interest for a specialist education (yes/no) in terms of sex (Pearson's Chi-square: $p=0.68$) or orientation of studies (Pearson's Chi-square: $p=0.88$). Students in the age groups of over 40 had the lowest interest for a potential nationally regulated specialist training (yes/no, 82%), while interest was higher in all other age groups 19-24 (95%), 25-29 (96%), 30-34 (89%) and 35-39 (100%). The interest for a potential nationally regulated specialist training was not significantly different between students at semester 2 (84%) or semester 6 (92%, Pearson's Chi-square: $p=0.85$).

Good colleagues and a nice working community were top reasons for choosing a future workplace (69%, $n=184/266$ multiple choices possible). Interesting working tasks were second (46%, $n=122/266$) followed by a high salary (44%, $n=116/266$) and possibilities for career development (41%, $n=108/266$). The choice of sector was irrelevant for most students (62%, $n=165/265$), 12% ($n=32/265$) answered the public health care, and 23% ($n=60/265$) the private sector. Most students saw themselves working in health care (49%, $n=129/264$), followed by in research (17%, $n=45/264$), pharmaceutical industry (10% $n=26/264$), and veterinary medicine (10%, $n=25/264$).

The professional sub-study

Below, we report results from 12 questions answered by the professionals, relevant to the scope of this report. For the 12 questions, 10 874 answers were collected.

Nine hundred and twenty-three professionals responded to one or more questions in the sub-study, response rate 44% ($n=923/2083$). Again, most participants were women (94%, $n=870/922$). Responders were from all age groups (19-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-65, >65), with the lowest participation in age groups 19-24 (2%, $n=22/923$) and >65 (2%, $n=16/923$). The highest participation rate was seen in age groups 55-59 (17%, $n=191/923$) and 60-65 (18%, $n=171/923$). Professionals were from all parts of Sweden, with a majority from the county of Stockholm (13%, $n=117/922$), Västra Götaland (18%, $n=167/922$) and Skåne (10%, $n=96/922$). Participation from the other counties varied between 1 and 7%.

Most professionals were from laboratory medicine (90%, $n=816/910$) while 10% ($n=94/910$) worked in clinical physiology. In addition, most responders were from the public health care sector (86%, $n=789/921$), less were working in private care (8%, $n=74/921$), at universities (5%, $n=43/921$) and other. Employees were in majority (92%, $n=839/914$), 6% ($n=52/914$) stated themselves as managers.

Good colleagues and interesting working tasks were top reasons for choosing a future workplace among the professionals (62% n=576/923 and 55% n=506/923 respectively, multiple choices possible). Alternate working tasks were third (38%, n=350/923) followed by career development (CPD) (34%, n=316/923). A high salary and good management were stated as important among 25% and 26% (n=233/923, 237/923) of the responders.

Twenty-one per cent (n=193/918) in total stated that there were explicit career paths at their workplace while 68% (n=622/918) stated the lack thereof. Eleven per cent (n=103/918) were unsecure in regards of career paths. Professionals working in clinical physiology, compared to professionals working in laboratory medicine, more frequently answered that there were explicit career paths at their working place (43% compared to 23%, yes/no answers only). Professionals at universities and other governmental institutes more often answered that there were career paths (56%), compared to professionals working in public health care (23%), private sector (26%), municipality (7%) and other

(11%) (Pearson's Chi-square: p= 0.000031, yes/no answer only).

Eighty-two per cent (n=729/884) answered that they've had continuous professional development at the workplace and there was no significant difference between professionals from clinical physiology (89%) or from laboratory medicine (81%, Pearson's Chi-Square: p=0.057) nor between different sectors (private 78%, public health care 83%, universities and other governmental institutes 82% and municipality 81%, Pearson's Chi-Square: p=0.77).

Seventeen per cent (n=148/885) of the professionals planned for advanced academic studies in general. Among professionals, more men (52%) compared to women (25%) had plans for further academic studies (yes results combined and compared to no-results, Pearson's Chi-square: p= 0.0015). Also, professionals from clinical physiology more often stated their interest for advanced academic studies compared to professionals working in laboratory medicine (35% and 19% respectively, Pearson's Chi-square: p= 0.034).

Is there a need for a regulated specialist education?

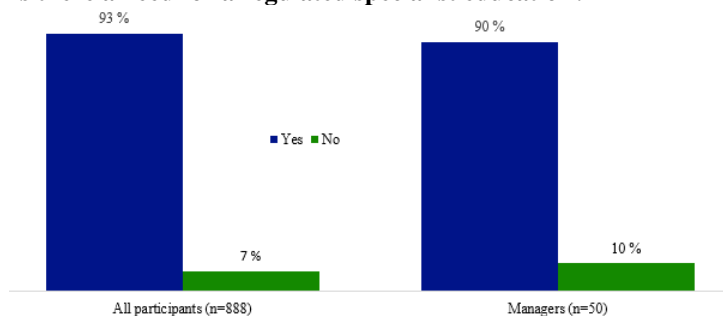


Figure 2: BLS professional view on a nationally regulated specialist program in Sweden. From the professional sub-study conducted by the Swedish Institute of Biomedical Laboratory Science (IBL), professional employees and managers both agreed on the need for a nationally regulated specialist program in Sweden. There was no significant difference regarding managers and non-managers opinions on the need for a nationally regulated specialist training (Pearson's Chi-square: p= 0.38).

The individual interest for a potential nationally regulated specialist training was 53% (n=470/884) while 26% stated that they might be interested and most responders also stated a need for such an education in Sweden, 93% (n=809/868). There were no significant differences between men or women in regards of interest for a nationally regulated specialist training (71% and 80% respectively, yes results combined and compared to no-results (Pearson's Chi-Square: p=0.24) nor between professionals from clinical physiology or laboratory medicine (71% and 80% respectively, yes results combined and compared to no-results, Pearson's

Chi-Square: p=0.14). Of participants who answered that they work as managers, 90% (n = 45/50) consider that a regulated specialist training is needed (figure 2). There was no significant difference regarding their managers and non-managers opinions on the need for a nationally regulated specialist training (Pearson's Chi-square: p= 0.38).

Discussion

The biomedical laboratory scientists is in the crossroads between the health disciplines and has a deep understanding of technology for diagnostic purposes. The high rate of technical development in combination

with new evidence in both the diagnostic and treatment field requires a continuous and deep knowledge to meet the future challenges in health care.⁴

Here, we present data from BLS students and professionals on their view on the education, choice of workplace, career development, advanced studies and a potential nationally regulated specialist training program. Response rates for the two surveys were 57% (student sub-study) and 44% (professional sub-study). Two hundred and seventy-six students gave their important opinions and although we had hoped to include more participants, we are grateful for their interest. IBL as a professional organization has for many years offered free membership for students to include future professionals and make sure they have impact on the development of the organization. In Sweden 2018, 294 students graduated (personal communication C Hesse, University of Gothenburg) with a professional and a bachelor's degree from the ten universities. IBL, as many other organizations in Sweden, struggle to keep former students as members once the free period has ended. At the time of the survey, 544 student members were registered in IBL. There are an estimated 1257 number of students enrolled in the BLS education throughout Sweden.⁸

For the professionals, at the time of the survey, we had 2541 members and e-mail addresses to 2083 of them. Nine hundred and twenty-three contributed, a substantial number but unfortunately approx. only 1/10 of all BLSs in Sweden.⁹ Despite declining numbers due to retirees and perhaps a general lack of interest in organizational work, IBL works hard to change this development. We want to be the obvious choice of organization for all Swedish BLSs, no matter their specialization, discipline or working platform. Since this was a survey aimed mostly for member students or member professionals, response rates can only be seen within the frames of the organization. No register is present to reach all BLS in Sweden, hence this is an attempt to provide observational data from this group of professionals.

Despite moderate response rates, we were able to draw some general conclusions from the participants that took part in the study. Most responders in both groups were women. This is in accordance with the distribution in the general working BLS population. Also, most participants were from laboratory

medicine. There are fewer BLS in clinical physiology nationally, and this is reflected in both the number of educational places and clinics at the hospitals. Among the 466 educational slots in Sweden 2018, 112 were in clinical physiology (personal communication C Hesse, University of Gothenburg). Most professional responders were in the age-groups 55-59 and 60-65. This is also in line with national data.⁹

The student survey indicates that the shortage of BLS in the field was the main reason for applying to the program. Other top reasons were stimulating working tasks and the possibility to continue with advanced studies. Despite a promising job market, we know that many students do not carry out the full training potentially due to several reasons. The current survey did not include questions on this topic, and we have no follow-up data on student flow-through for this group. We acknowledge that their opinions would have been of high value to understand the reasons for leaving the programs. One speculation from the results is that although the majority of the students had BLS as a first choice when applying, some that listed BLS as a second choice mentioned medical doctor and other educations within health care and biomedicine as first hand choices. It is possible that they later gained admission to their firsthand choices. Others may have chosen the program without prior knowledge on the education and/or profession, and if not in agreement with their own expectations, they've exited before graduation. Interestingly, students enrolled in clinical physiology more often had another first choice besides the BLS program, compared to students enrolled in laboratory medicine orientation.

When it comes to choosing working place, students and professionals here agree on the importance of good colleagues and interesting working tasks. High salary was more important for students (44%) compared to professionals (25%). This may reflect a wish from the students on future working conditions. However, among professionals, experience could have pointed to other factors as more important. A good career development was listed high in both groups. It is interesting that students also recognize this, already during training. It is alarming that 68% of the professionals listed a lack of career paths at their own working place. There were however differences between workplaces and between laboratory disciplines; professionals of clinical physiology and professionals in universities and other governmental

sectors more often reported that were career paths present at the workplace. The lack of clear career opportunities in health care can also be one reason for BLS to quit employments and apply for other jobs in e.g. the diagnostic industry for example, thereby adding to the shortage.

Many professional BLS in this study had however been offered some continuous professional development. A good career development that includes CPD could be a tool to attract and to keep employees at the laboratories, in times of shortage of working force. One of IBLs major objects is to offer CPD in different areas and hence educate BLSs in different fields. Also, IBL has provided a competence document including examples of competence levels as example to be used at the working places.⁵

Many of the students responded that they already planned for advanced studies (64%) once they have graduated from the bachelor program. Students that planned for advanced studies were more often women and in clinical physiology orientation. There was a very high interest in the lower semesters while semester 6 students seemed to be more interested in maybe trying on the working life before continuing with advanced studies. It would be of great interest to do a follow-up study aiming to better understand their thoughts on this and why this is different between the semesters. Compared to the students, more men than women among professionals planned for further advanced studies, and numbers were also substantially lower (17%). In agreement, professionals and BLS students in clinical physiology more often planned for advanced studies compared to professionals and students in laboratory medicine.

Most students and professionals who responded to the study were interested in a potential nationally regulated specialist training. The interest was highest among the students (97% were interested or maybe interested) compared to the professionals (79% were interested or maybe interested). Among the professionals, 93% of all responders stated a need for such an education in Sweden, the numbers among managers was 90%. There is no regulated specialist education in Sweden today, despite long-term efforts from IBL and others for many years. There are master programs available, some in specific specializations, open for BLS. However, without a regulated national program recognized in society and health care,

students must argue the importance and value in the workplace themselves and will not benefit from agreements open for nurses for example. Without a national consensus, positions for specialized BLS can be rare and different between regions and hospitals. IBL has for several years been inviting managers and educators to work on a plan for a core curriculum for specialized training competences and to design an education that benefit the needs in healthcare but also to investigate how an experienced and specialized BLS can get specific positions. One good example area is pathology. Here, the experienced and well-educated BLS can perform gross cutting of selected specimens for example, in order to save pathology consultant time. Thereby, pathology consultants can be empowered to cope with increasing workloads and/or be able to contribute and participate more to the always increasing number of services, quality and development within the pathology field.¹⁰ Other areas in Sweden where a specialist program for BLS is of relevance is for example within molecular diagnostics, diagnostic cytology and point-of care testing. Also in clinical physiology/ neurophysiology there is a need for future specialists, i.a. ultrasound and intraoperative neurophysiology monitoring since there is a lack of physicians.

There are some limitations with the two sub-studies. If response rate would have been higher, results and conclusions would of course have been more powerful. There is also a possibility of bias if only BLS in favor of advanced studies and a national regulated specialist program answered the surveys.

In conclusion, we show that among the participating students and professionals, there is great interest in a nationally regulated specialized training. Students were also highly interested in further studies on an advanced level. In relation to a future shortage, since the possibilities of further studies was important already for students, we also show that in order to attract students to basic BLS training, we need to be able to offer advanced training as well.

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