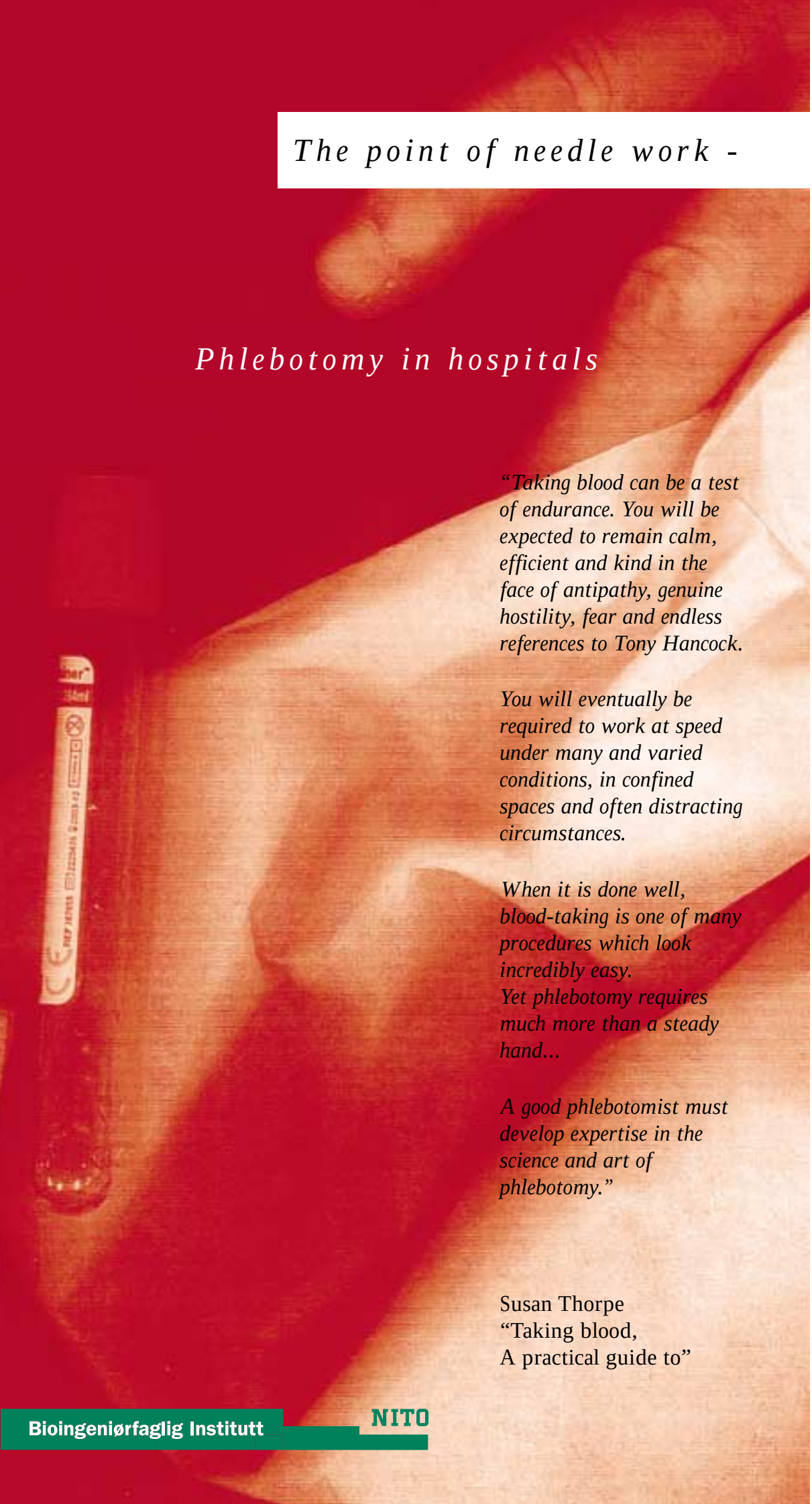
The point of needle work -

Phlebotomy in hospitals



"Taking blood can be a test of endurance. You will be expected to remain calm, efficient and kind in the face of antipathy, genuine hostility, fear and endless references to Tony Hancock.

You will eventually be required to work at speed under many and varied conditions, in confined spaces and often distracting circumstances.

When it is done well, blood-taking is one of many procedures which look incredibly easy.
Yet phlebotomy requires much more than a steady hand...

A good phlebotomist must develop expertise in the science and art of phlebotomy."

Susan Thorpe
"Taking blood,
A practical guide to"

Bioingeniørfaglig Institutt
NITO

Introduction

With this document, NITO BFI (The Norwegian Institute of Biomedical Science) aims at drawing attention to the current situation for phlebotomy, the art of taking blood samples, in hospitals. Sample taking is of decisive importance for ensuring that specimens, which arrive for analysis at the medical laboratories, are of satisfactory quality. Patients have the right to have blood samples taken correctly and by personnel with sufficient professional competence to be able to carry out the task. Therefore, BFI believes that it is a matter of concern if taking blood samples becomes a low priority task in Norwegian hospitals. Preanalytical conditions, accreditation and the organisation of phlebotomy are the central topics of this document.

In Norwegian hospitals, phlebotomy has traditionally been taken care of by medical laboratory technologists (MLT´s), and then to a large extent by MLT´s employed in the clinical chemistry laboratory or its equivalent.

MLT´s are responsible for taking blood samples and analysing biological materials, testing and evaluation of new analyses and methods, and guidance of users and other medical personnel. This includes responsibility for procedures from the time a laboratory analysis is requisitioned until the results of the analysis have been obtained.

Demands for greater efficiency in Norwegian hospitals have led to more intensive treatment of patients. The consequences for laboratory management include the following:

- Increased sample drawing, including stat assistance
- Larger volume of analyses
- Broader repertoire of analyses to be carried out
- Demands for reduced reporting time for laboratory analyses

Taking blood samples is an important task requiring significant resources in hospitals. There are many open MLT positions, and as a result, many MLT´s change jobs more frequently. The consequence for the laboratories is a higher turnover in MLT positions than in the past.

In recent years we have seen an increasing demand for blood samples, a greater volume of analyses and a shortage of MLT´s. As a result, many hospitals are now evaluating new methods of organising phlebotomy. Some hospitals have adopted alternative solutions for organising phlebotomy.

BFI hopes that this document will make a useful contribution to the effort of evaluating new methods of rationalising and increasing the efficiency of phlebotomy in Norwegian hospitals.

Why are blood samples taken?

The purpose of taking a blood sample is to identify and quantify chemical, biochemical or biological markers for diseases. The results of the laboratory analyses are used in the diagnosis, treatment and follow-up of the illness.

The quality of the results of a particular analysis depends on the extent to which the entire analysis process is quality assured.

This process can be divided into three main areas:

- Preanalytical conditions
- Analytical conditions
- Postanalytical conditions

Since the focus of this document is phlebotomy, the document deals only with the pre-analytical conditions.

Preanalytical conditions

Preanalytical conditions are the sum of all of those conditions in effect from the time when the requisitioner has ordered an analysis to the time when the specimen is ready to be analysed.

Obtaining accurate results from an analysis depends on having blood samples taken in the proper way. Since doctors in diagnosing, treating and following-up a particular condition use the results of the laboratory analyses, incorrect blood collection procedures will, in many cases, have direct consequences for patient care. Procedures for taking blood samples are the most important source of error for many types of analyses, and are therefore a central factor in the evaluation of preanalytical conditions.

It is very important that the patient feels confident that blood samples are taken under approved conditions and by medical personnel with the appropriate knowledge and skills. Whoever carries out this task must have acquired the appropriate theoretical knowledge of the factors involved in taking blood samples, and which of them will have significance for the requisitioned analysis. Phlebotomy is a craft. Expert guidance and practice over time are therefore essential for acquiring the knowledge and skills required to become a skilled phlebotomist.

To ensure that the preanalytical conditions are up to standard, knowledge and quality assurance of various areas are required. Of these, the most important are:

- Ordering procedures
- Biological variation, including biorhythmic variation and the significance of the patient's physical and psychological situation (fasting, body position, physical exertion, stress etc.)
- Patient identification
- Type of blood sample (venous, capillary, arterial)
- Equipment for drawing blood samples (needles, sample drawing tubes, additives, etc.)
- Interference with analytical methods as a result of haemolysis, stasis, lipaemia, or other chemical interference
- Marking, registration and identification of the specimen
- The significance of centrifuging, storage, temperature and transport

When taking blood samples, every individual phlebotomist is responsible for knowing and following the right procedures. If an error is made when the sample is taken, the resulting error will be transferred to the results of the analysis. In such a case laboratory analysis, that is itself of high quality and correctly carried out, is of little help. When taking blood samples it is important to be aware that deviations from the necessary procedures cannot always be detected by the laboratory's ordinary quality control procedures.

Unsatisfactory blood samples can result in analysis results that deviate from the correct values. In many cases the doctor who requisitioned the test will have little or no opportunity to discover the error, and the consequence will be a risk of incorrect treatment of the patient.

It is therefore very important that all those who take blood samples receive proper training, so that they understand the significance of following the procedures, and not least the importance of reporting deviations.

Uncertainty concerning preanalytical conditions will always place a question mark by the final results of the analysis. A study presented in international fora shows that the causes of errors in reported test results are distributed as follows: analytical errors 13%, postanalytical errors 19% and preanalytical errors 67%.[1]

Example of taking a poor blood sample and its consequences

The requisitioner has ordered a coagulation analysis, for example PT-INR. Taking the sample proves difficult, prolonged stasis is used, the flow of blood comes slowly and the tube is not completely filled.

As a result, the coagulation analysis returns an incorrect result. This analysis is usually used to decide the medicine dosage for patients being treated with anticoagulants. Dosages which are too low result in the medicines not having the effects they should, and the patient risks having a stroke or infarct. Dosages of these medicines that are too high result in increased risk of bleeding.

In Norway approximately 50 patients die every year as a result of treatment with anticoagulants. Medicine dosages that are based on incorrect analytical results may therefore endanger life and health.[2]

The accreditation of blood sampling

Norwegian Accreditation (NA) is responsible for accreditation of testing and calibration laboratories. NA accredits sampling, testing and professional opinions and interpretations in accordance with NS-EN ISO/IEC 17025, "General requirements for the competence of testing and calibration laboratories". It is possible to accredit blood sampling as an independent activity.

In the introduction to NA Document no. 30, "Accreditation of sampling and site sampling and testing", it is stated: "Sampling is an important part of the testing process. If a mistake is made during the sampling, this mistake will be transferred to the test results. In such cases correct performance of the analysis will not solve the problem. Quality assurance of sampling is therefore important, preferably also accreditation. When sampling is to be accredited, all processes related to sampling have to be documented."[3]

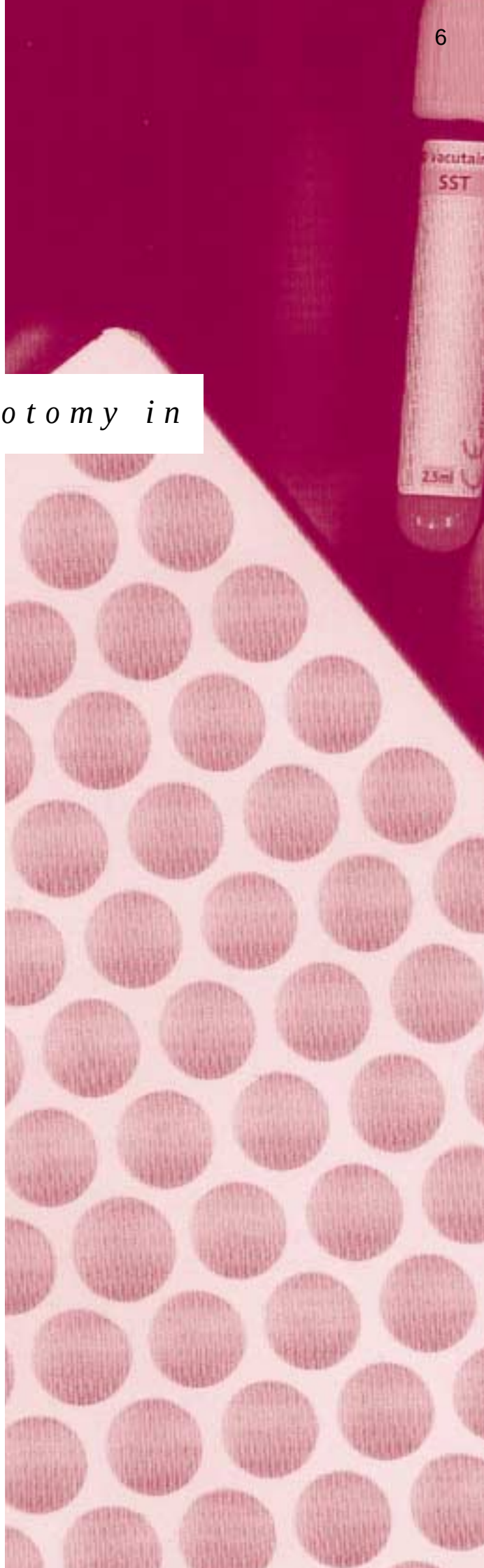
In the accreditation of sample taking, strong emphasis is placed on the requirement that those who carry out sample taking, and training and approval of personnel, be properly qualified. In addition, documentation is required on those who are approved to carry out the task at any given time.

BFI believes that accreditation of sample drawing can be a means of ensuring that the quality of blood sampling in Norwegian hospitals matches the significance of the task. Accreditation does not necessarily lead to better quality, but it ensures that the necessary procedures are developed and used.

Quality assurance of phlebotomy outside the hospital

Quality assurance of phlebotomy outside the hospital is handled by the Norwegian Quality Improvement of Laboratory Services in Primary Care (NOKLUS) which was established in 1992. NOKLUS has developed information folders which are distributed to all doctors' surgeries and nursing homes affiliated with the arrangement (99 percent of doctors' surgeries in Norway are affiliated.[4]) The folders contain a broad spectrum of information on laboratory activities, including information on phlebotomy.

NOKLUS has advisory medical laboratory technologists in every county in Norway who are responsible for promoting quality assurance of all laboratory services in primary health care. This includes that the quality of blood samples being taken is satisfactory.



The organisation of phlebotomy in Norwegian hospitals

Centralised responsibility for sample taking

Since the first MLT education programmes began in the 1950`s, it has been the established practice that MLT´s employed in the clinical chemistry laboratory or central laboratory are in charge of all blood sampling in Norwegian hospitals.

MLT´s have phlebotomy as an important part of their education. In their education they acquire knowledge of preanalytical sources of error. This means that through their education, MLT´s acquire theoretical knowledge of the significance which preanalytical sources of error have for the results of various laboratory analyses. In addition it is important to be aware of the fact that taking blood samples is a craft which accordingly requires practice in order to be carried out in a considerate, correct and efficient way. It cannot be repeated too many times that if an error is made when the sample is drawn which is of significance for the analytical method to be used, the resulting error will without exception be transferred to the result of the nalysis. This type of error will seldom or never be detected with the help of the laboratories' ordinary analytical control routines, and will thereby result in an increased risk of patients being incorrectly treated.

Because MLT´s are responsible for the analysis of blood samples and the technical validation of the results of the analysis, they have the competency required to evaluate preanalytical sources of error and their significance. BFI is therefore of the opinion that MLT education and professional experience makes MLT´s the professional group best qualified to handle blood sampling in Norwegian hospitals.

However, a shortage of MLT´s, increased production of laboratory analyses and demands for increased productivity have led to the testing of several models for rationalising the work involved in collecting blood samples.

Use of personnel resources across laboratory departments

At Haukeland University Hospital and Sørlandet Hospital Kristiansand a system has been introduced by which the clinical chemistry laboratory continues to be responsible for all blood samples, while the other laboratories must also contribute personnel resources to assist in taking blood samples. In practice this means that the other laboratories agree to contribute MLT´s who can participate in this work in the periods where the volume of sample taking is greatest, usually in the morning. The advantage of this system is that it makes use of personnel resources and competencies across departmental boundaries. For the hospital it means a more rapid and efficient round of blood sample taking in the morning, and a shorter reporting time for the department which made the requisition. For the clinical chemistry laboratory this means that the rush in the morning is reduced, which facilitates more efficient working conditions during the rest of the day.

Employment of other professional groups in the laboratories

At Ullevål University Hospital and the University Hospital of North Norway (UNN), medical secretaries have been employed to take blood samples due to a shortage of MLT´s. The clinical chemistry laboratory at UNN has approximately 15 years' experience with having medical secretaries carry out aspects of the preanalytical work. UNN's experience shows that if medical personnel other than MLT´s are used to handle blood sampling, it is advantageous/essential that the medical secretaries are employed in the laboratory. The close connection makes it easier to communicate changes in routines and to continually keep the phlebotomists up to date on the necessary routines. Another advantage is that personnel who have phlebotomy as their main task receive significant practice and are skilled in taking blood samples - which makes the situation gentler on the patient and gives high quality specimens. The biggest complaint about this system is that there are many tasks in a laboratory that medical secretaries are not qualified to carry out. Thus, this way of organising the work lacks flexibility as far as the efficient use of employee resources throughout the whole workday is concerned.

Decentralised responsibility for taking blood samples

Trial project with blood sampling decentralised to hospital wards

At Haugesund Hospital a project was carried out where state authorised nurses in an in-patient department took blood samples from the patients. This project was evaluated in March 2001. From the evaluation report it emerged that the nurses felt the task took too much time, and that they caused the patients unnecessary pain due to lack of experience in taking blood samples. The laboratory experienced minimal rationalisation gains because the system created a logistics situation whereby it was difficult to maintain oversight and the result was a decreased quality of blood specimens. The recommendation after this project was that the model tested in the trial could not be recommended.[5]

Decentralised responsibility outside of the laboratories' fixed sample drawing rounds

At St. Olav's Hospital a system has been implemented where state authorised nurses took blood samples outside of the laboratory's fixed rounds. This gives the MLT´s more time for the analytical work between the sample taking rounds, so that the operation of the laboratory becomes more efficient. The system is quite demanding in that it requires keeping a large group of nurses up to date on the applicable blood sample procedures. An advantage here is that the nurses are available when it is desirable to draw the sample, and that there are fewer unfamiliar people around the patient. However, this model requires increased personnel resources in the busy nursing workday, which is already burdened with other task priorities. There is also the problem that taking blood samples is not part of Norwegian nursing education. With relatively few blood collection procedures per nurse, it becomes difficult for nurses to develop routine skill and good practice.[6]

Organisation of phlebotomy in other countries

Denmark and Finland

In both Denmark and Finland phlebotomy is almost exclusively handled by MLT´s. At the same time, it is now being evaluated as to whether it is more efficient to have sample drawing carried out by other professional groups, and whether sample drawing can be accomplished in a more cost-effective way without having negative consequences for the quality of the specimens.

Sweden

In Sweden general nurses are often the ones who take blood samples in hospitals. Within the hospitals there are however phlebotomy units where MLT´s, state authorised nurses and auxiliary nurses work together and take blood samples. In primary health care it is not unusual for MLT´s to take blood samples.[7]

United Kingdom

In the United Kingdom there is an educational track for medical laboratory assistants (MLA). In addition phlebotomists are trained; these are often MLA´s and auxiliary nurses/medical secretaries with additional education. Both groups are usually state educated, and their competency is evaluated through a competency assessment once the course has been completed.[8]

USA

Until the 1980`s phlebotomy in the USA was organised along the lines of the most common Norwegian model, where qualified personnel from hospital laboratories handled most of the volume of blood sampling in the hospitals. A trend towards decentralisation resulted in most hospitals switching to another model, where care personnel in the individual hospital wards took over most of the blood sampling. In the mid 1990`s, increasing demand for quality assurance of specimens and for documentation of personnel competency, and many large compensation-related court cases, led to centralised routines with phlebotomists linked to the laboratory again becoming the most common model for phlebotomy in hospitals in the USA.[9]

Conclusion

NITO BFI has evaluated the various models in connection with the organising of phlebotomy in Norway, and concludes that the following principles must form the basis for phlebotomy in Norwegian hospitals:

1. The patient has the right to have blood samples drawn in a way that is as considerate, correct and efficient as possible.
2. When samples are drawn, respect and consideration for the patient and her/his relatives must be shown.
3. The patient has the right to receive information on which blood tests will be carried out, and the phlebotomist must inform the patient about this in an objective manner.
4. All blood sampling must be quality assured and conducted in accordance with approved procedures, in order to reduce the opportunity for preanalytical errors.
5. The medical laboratories must be principally responsible for organising and quality assuring all blood sampling in the hospitals.
6. The MLT´s must have the professional responsibility for organising and supervising blood sampling in the hospitals and they should carry out most of the volume of sample taking.
7. If phlebotomy is delegated to other professional groups, the MLT´s must be responsible for training and quality assurance of the task.

Recommendations from NITO BFI

1. MLT´s employed in the clinical chemistry laboratory or the central laboratory must carry out most of the volume of blood sample taking.
2. If taking blood samples becomes a bottleneck, hindering efficient patient treatment, or puts the clinical chemistry laboratory or the central laboratory under too much pressure, in the interests of maintaining quality standards, assistance with sample taking should be sought from the hospital's other laboratory departments.

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