This document provides a technique for the collection of diagnostic capillary blood specimens, including recommendations for collection sites and specimen handling and identification. Specifications for disposable devices used to collect, process, and transfer diagnostic capillary blood specimens are also included.

A standard for global application developed through the Clinical and Laboratory Standards Institute consensus process.
The Clinical and Laboratory Standards Institute (CLSI) is a not-for-profit membership organization that brings together the varied perspectives and expertise of the worldwide laboratory community for the advancement of a common cause: to foster excellence in laboratory medicine by developing and implementing clinical laboratory standards and guidelines that help laboratories fulfill their responsibilities with efficiency, effectiveness, and global applicability.

**Consensus Process**

Consensus—the substantial agreement by materially affected, competent, and interested parties—is core to the development of all CLSI documents. It does not always connote unanimous agreement, but does mean that the participants in the development of a consensus document have considered and resolved all relevant objections and accept the resulting agreement.

**Commenting on Documents**

CLSI documents undergo periodic evaluation and modification to keep pace with advancements in technologies, procedures, methods, and protocols affecting the laboratory or health care.

CLSI’s consensus process depends on experts who volunteer to serve as contributing authors and/or as participants in the reviewing and commenting process. At the end of each comment period, the committee that developed the document is obligated to review all comments, respond in writing to all substantive comments, and revise the draft document as appropriate.

Comments on published CLSI documents are equally essential, and may be submitted by anyone, at any time, on any document. All comments are addressed according to the consensus process by a committee of experts.

**Appeals Process**

If it is believed that an objection has not been adequately addressed, the process for appeals is documented in the CLSI Standards Development Policies and Process document.

All comments and responses submitted on draft and published documents are retained on file at CLSI and are available upon request.

**Get Involved—Volunteer!**

Do you use CLSI documents in your workplace? Do you see room for improvement? Would you like to get involved in the revision process? Or maybe you see a need to develop a new document for an emerging technology? CLSI wants to hear from you. We are always looking for volunteers. By donating your time and talents to improve the standards that affect your own work, you will play an active role in improving public health across the globe.

For further information on committee participation or to submit comments, contact CLSI.

Clinical and Laboratory Standards Institute
950 West Valley Road, Suite 2500
Wayne, PA 19087 USA
P: 610.688.0100
F: 610.688.0700
www.clsi.org
standard@clsi.org
Procedures and Devices for the Collection of Diagnostic Capillary Blood Specimens; Approved Standard—Sixth Edition

Volume 28 Number 25

Dennis J. Ernst, MT(ASCP)
Lisa O. Ballance, BSMT(ASCP)
Roger R. Calam, PhD, DABCC
Ruth McCall, MT(ASCP)
Diane I. Szamossi, MA, MT(ASCP), SH
Lorraine Tyndall, MS, MT(ASCP)

Abstract

Clinical and Laboratory Standards Institute document GP42-A6—Procedures and Devices for the Collection of Diagnostic Capillary Blood Specimens; Approved Standard—Sixth Edition provides a technique for the collection of diagnostic capillary blood specimens, including recommendations for collection sites and specimen handling and identification. Specifications for disposable devices used to collect, process, and transfer diagnostic capillary blood specimens are also included.


The Clinical and Laboratory Standards Institute consensus process, which is the mechanism for moving a document through two or more levels of review by the health care community, is an ongoing process. Users should expect revised editions of any given document. Because rapid changes in technology may affect the procedures, methods, and protocols in a standard or guideline, users should replace outdated editions with the current editions of CLSI documents. Current editions are listed in the CLSI catalog and posted on our website at www.clsi.org. If your organization is not a member and would like to become one, and to request a copy of the catalog, contact us at: Telephone: 610.688.0100; Fax: 610.688.0700; E-Mail: customerservice@clsi.org; Website: www.clsi.org.
Copyright ©2008 Clinical and Laboratory Standards Institute. Except as stated below, any reproduction of content from a CLSI copyrighted standard, guideline, companion product, or other material requires express written consent from CLSI. All rights reserved. Interested parties may send permission requests to permissions@clsi.org.

CLSI hereby grants permission to each individual member or purchaser to make a single reproduction of this publication for use in its laboratory procedure manual at a single site. To request permission to use this publication in any other manner, e-mail permissions@clsi.org.

**Suggested Citation**


**Proposed Standard**
July 1977

**Tentative Standard**
February 1979

**Approved Standard**
March 1982

**Approved Standard—Second Edition**
July 1986

**Approved Standard—Third Edition**
July 1991

**Approved Standard—Fourth Edition**
September 1999

**Approved Standard—Fifth Edition**
June 2004

**Approved Standard—Sixth Edition**
September 2008

ISBN 1-56238-677-8
ISSN 0273-3099
## Contents

Abstract .................................................................................................................................................... i

Committee Membership ................................................................................................................................ iii

Foreword .............................................................................................................................................. vii

1 Scope .......................................................................................................................................... 1

2 Introduction ................................................................................................................................ 1

2.1 Pediatric Patients ........................................................................................................... 1

2.2 Adult Patients ................................................................................................................ 2

2.3 Patients for Whom Skin Puncture May Be Inappropriate ............................................. 2

3 Standard Precautions .................................................................................................................. 3

4 Terminology ............................................................................................................................... 3

4.1 Definitions .................................................................................................................... 3

4.2 Abbreviations/Acronyms .............................................................................................. 3

5 Skin Puncture ............................................................................................................................. 3

6 Outline for Skin Puncture Technique ........................................................................................ 4

7 Sites for Collecting Skin Puncture Blood .................................................................................. 5

7.1 Infants ........................................................................................................................... 5

7.2 Older Children and Adults ............................................................................................ 6

8 Approach, Identify, and Position the Patient ............................................................................. 6

8.1 Identify the Patient ........................................................................................................ 7

8.2 Position the Patient ....................................................................................................... 8

9 Procedure for Warming the Skin Site Before Puncture (Arterialization) .................................. 8

9.1 Blood Flow ................................................................................................................... 8

10 Technique for Cleansing the Skin Puncture Site ....................................................................... 9

10.1 Isopropanol ................................................................................................................... 9

10.2 Cleansing the Site ......................................................................................................... 9

11 Skin Puncture Technique ........................................................................................................... 9

11.1 Depth ............................................................................................................................. 9

11.2 Skin Puncture/Incision Devices .................................................................................... 9

11.3 Puncture ........................................................................................................................ 9

12 Skin Puncture Specimen Collection Technique ....................................................................... 10

12.1 First-Drop Elimination ................................................................................................ 11

12.2 Blood Specimen Collection ........................................................................................ 11

12.3 Device Disposal ............................................................................................................. 11

12.4 Order of Collection ........................................................................................................ 11

12.5 Microcollection Device Filling, Closure, and Mixing ................................................ 12

12.6 pH and Blood Gas Determination ................................................................................ 12

12.7 Microhematocrit Collection ........................................................................................ 12
Contents (Continued)

12.8 Blood Films .................................................................................................................. 12
13 Technique for Sealing and Handling Capillary Tubes ..................................................... 12
   13.1 Methods .................................................................................................................... 12
   13.2 Procedure ............................................................................................................... 13
14 Identification and Labeling of Capillary Blood Specimens ............................................. 13
15 Analyte Variations Between Skin Puncture and Venipuncture Specimens ...................... 13
   15.1 Hematological Variations Between Serum and Plasma ........................................ 14
   15.2 Hemolysis ............................................................................................................... 14
16 Devices for Collecting Blood Specimens From Skin Punctures ....................................... 14
   16.1 General Device Considerations .............................................................................. 15
   16.2 General Accessories for Microcollection Devices ........................................... 15
   16.3 Plastic Microcollection Devices ............................................................................ 15
   16.4 Disposable Microcollection and Microhematocrit Tubes .................................... 16
   16.5 Microdilution Systems ........................................................................................... 17
References ............................................................................................................................. 19

Additional References ........................................................................................................ 21

Summary of Consensus Comments and Working Group Responses .................................... 22

Summary of Delegate Comments and Working Group Responses ..................................... 23

The Quality Management System Approach ...................................................................... 24

Related CLSI Reference Materials .................................................................................... 25
Foreword

Since this standard was first proposed in 1977, CLSI has periodically assembled working groups and charged them with the responsibility of updating and maintaining a standardized capillary blood collection procedure for all health care professionals who have capillary blood specimen collection responsibilities. Each working group is composed of members representing industry, government, and the professions.

This latest revision builds on the efforts of past working groups in establishing and maintaining the standardized procedure for skin puncture specimen collection for the health care industry. The Working Group on Capillary Blood Collection functions under the CLSI Area Committee on Quality Systems and Laboratory Practices.

In revising this standard, the working group has reviewed the various comments on the previous standard (H4-A5) received by CLSI, and incorporated changes where appropriate based on new information and studies published since the last revision. This version of the document includes recommendations regarding proper patient identification procedures consistent with other pertinent CLSI documents such as H03$^1$ and was reorganized for clarity.

Key Words

Calcaneus, capillary, first-drop elimination, heelstick, hemolysis, latex allergy, microdilution, microhematocrit, milking, newborn, order of draw, prewarm, scooping, scorers, sealants
Procedures and Devices for the Collection of Diagnostic Capillary Blood Specimens; Approved Standard—Sixth Edition

1 Scope

This standard describes general procedures for collecting diagnostic capillary blood specimens. It is intended for phlebotomists or other health care providers responsible for obtaining specimens from patients, as well as for manufacturers of skin puncture and incision devices and microcollection containers.

In addition, this document describes and recommends several disposable devices for collecting, processing, and transferring diagnostic capillary blood specimens. The recommendations are strictly limited to disposable products, which are used once per specimen or as defined by the manufacturer’s detailed test technique.

This document does not address skin puncture procedure for self-testing or collection procedures for capillary blood gases. (For information on capillary blood gas collection, see CLSI/NCCLS document H11.2)

2 Introduction

2.1 Pediatric Patients

Blood specimens obtained by skin puncture are especially important in pediatrics, because small but adequate amounts of blood for laboratory tests can be obtained with this technique. Obtaining blood by venipuncture from infants may be difficult and potentially hazardous, and obtaining large quantities of blood, especially from premature infants, may result in anemia (see Figure 1). Puncturing deep veins in children may cause:

- cardiac arrest;
- hemorrhage;
- venous thrombosis;
- reflex arteriospasm and gangrene of an extremity;
- damage to surrounding tissues or organs (eg, puncturing the apex of the lung or piercing the trachea);
- infection; and
- injury from restraining the infant or child during the collection procedure.
2.2 Adult Patients

It is also advantageous to obtain skin puncture blood specimens from some adult patients. Skin puncture is especially applicable for:

- severely burned patients;
- extremely obese patients;
- patients with thrombotic tendencies;
- geriatric patients, or other patients in whom superficial veins are being preserved for intravenous (IV) therapy, not accessible, or are very fragile;
- patients performing tests at home (eg, blood glucose);
- apprehensive patients; and
- point-of-care testing.

2.3 Patients for Whom Skin Puncture May Be Inappropriate

If a patient is dehydrated or has poor peripheral circulation from other causes (eg, peripheral edema), it may be impossible to obtain a representative blood specimen, especially by skin puncture.
The Quality Management System Approach

Clinical and Laboratory Standards Institute (CLSI) subscribes to a quality management system approach in the development of standards and guidelines, which facilitates project management; defines a document structure via a template; and provides a process to identify needed documents. The approach is based on the model presented in the most current edition of CLSI/NCCLS document HS1—A Quality Management System Model for Health Care. The quality management system approach applies a core set of “quality system essentials” (QSEs), basic to any organization, to all operations in any health care service’s path of workflow (ie, operational aspects that define how a particular product or service is provided). The QSEs provide the framework for delivery of any type of product or service, serving as a manager’s guide. The QSEs are:

- Documents & Records
- Organization
- Personnel
- Equipment
- Purchasing & Inventory
- Information Management
- Occurrence Management
- Process Improvement
- Customer Service
- Facilities & Safety
- Process Control
- Assessment
- External & Internal
- Information Management
- Occurrence Management
- Process Improvement
- Customer Service
- Facilities & Safety
- Process Control
- Assessment
- External & Internal

GP42-A6 addresses the QSEs indicated by an “X.” For a description of the other documents listed in the grid, please refer to the Related CLSI Reference Materials section on the following page.

Path of Workflow

A path of workflow is the description of the necessary steps to deliver the particular product or service that the organization or entity provides. For example, CLSI/NCCLS document GP26—Application of a Quality Management System Model for Laboratory Services defines a clinical laboratory path of workflow, which consists of three sequential processes: preexamination, examination, and postexamination. All clinical laboratories follow these processes to deliver the laboratory’s services, namely quality laboratory information.

GP42-A6 addresses the clinical laboratory path of workflow steps indicated by an “X.” For a description of the other documents listed in the grid, please refer to the Related CLSI Reference Materials section on the following page.

Adapted from CLSI/NCCLS document HS01—A Quality Management System Model for Health Care.
Related CLSI Reference Materials*

C46-A Procedures and Devices for the Collection of Diagnostic Capillary Blood Specimens; Approved Standard—Sixth Edition
This document provides clear definitions of the quantities in current use, and provides a single source of information on appropriate specimen collection, preanalytical variables, calibration, and quality control for blood pH and gas analysis and related measurements.

This document provides requirements for venous blood collection tubes and additives, including technical descriptions of ethylenediaminetetraacetic acid (EDTA), sodium citrate, and heparin compounds used in blood collection devices.

This document provides procedures for collecting diagnostic specimens by venipuncture, including line draws, blood culture collection, and venipuncture in children. It includes recommendations on order of draw.


This document provides principles for collecting, handling, and transporting arterial blood specimens to assist with reducing collection hazards and ensuring the integrity of the arterial specimen.

This document includes criteria for preparing an optimal serum or plasma sample and for the devices used to process blood specimens.


H21-A5 Collection, Transport, and Processing of Blood Specimens for Testing Plasma-Based Coagulation Assays and Molecular Hemostasis Assays; Approved Guideline—Fifth Edition (2008). This guideline contains procedures for collecting, transporting, and storing blood; processing blood specimens; storing plasma for coagulation testing; and general recommendations for performing the tests.

This document addresses the issues associated with specimen collection, the filter paper collection device, and the application of blood to filter paper, and provides uniform techniques for collecting the best possible specimen for use in newborn screening programs.

Based on US regulations, this document provides guidance on the risk of transmission of infectious agents by aerosols, droplets, blood, and body substances in a laboratory setting; specific precautions for preventing the laboratory transmission of microbial infection from laboratory instruments and materials; and recommendations for the management of exposure to infectious agents.

X03-R Implementing a Needlestick and Sharps Injury Prevention Program in the Clinical Laboratory; A Report (2002).
This document provides guidance for implementing safer medical devices that reduce or eliminate sharps injuries to laboratory personnel.

* Proposed-level documents are being advanced through the Clinical and Laboratory Standards Institute consensus process; therefore, readers should refer to the most current editions.
Explore the Latest Offerings from CLSI!

As we continue to set the global standard for quality in laboratory testing, we’re adding initiatives to bring even more value to our members and customers.

**The Key to Quality**

**Power Forward with this Official Interactive Guide**
Fundamentals for implementing a quality management system in the clinical laboratory.

**Visit the CLSI U Education Center**
Where we provide the convenient and cost-effective education resources that laboratories need to put CLSI standards into practice, including webinars, workshops, and more.

**Find Membership Opportunities**
See the options that make it even easier for your organization to take full advantage of CLSI benefits and our unique membership value.

**Shop Our Online Products**
Including eCLIPSE Ultimate Access™, CLSI’s cloud-based, online portal that makes it easy to access our standards and guidelines—anytime, anywhere.

For more information, visit [www.clsi.org](http://www.clsi.org) today.