

Second Edition

Second Edition

Essentials of Blood Banking and Transfusion Medicine

has been prepared keeping in mind the necessary material, both theory and practical aspects, required for the postgraduate students of pathology, clinical postgraduate students who utilize blood, clinicians, MBBS students, students of AYUSH courses, diploma and laboratory technology students and nursing staff who work with blood transfusion.

An effort has been made to give at a glance the principles and practice of blood banking as it may be difficult for our readers to go through the voluminous books in transfusion medicine.

The book has 23 chapters covering important topics like safe use of blood, blood donation, donor health screening, donor suitability, evaluation, phlebotomy, post-donation care and adverse donor reactions, ABO blood group systems and subgroups, Rh typing and weaker variants, anti-human globulin reagent, Coombs' test, crossmatching, transfusion reactions, transfusion transmitted diseases, preservation of blood, principles in blood and blood components, blood transfusion in clinical practice, autologous blood transfusion, blood substitutes, HLA antigens and other platelet and leucocyte antigens and their role in blood transfusion contents, errors and discrepancies in ABO typing, blood bank organization and its management, motivation, recruitment and retention of blood donors, recent advances in blood banking, quality improvement and quality control in blood transfusion services and convalescent plasma and SARS-CoV-2 (COVID-19) antibodies.

Ganga S Pilli MD, PhD, DTM

is Professor, Department of Pathology, KLE Academy of Higher Education and Research's JN Medical College, Belgaum, Karnataka. She has served as incharge of Blood Bank at KLE Society's Dr Prabhakar Kore Hospital. She has completed her PhD and is actively involved in research, academics and extracurricular activities. Backed with a teaching experience of 34 years, she has also conducted many CMEs on blood banking.



QR code to
access online
CBS Catalogue

ISBN: 978-93-54660-31-3



Essentials of
Blood Banking and Transfusion Medicine

Ganga S Pilli



Second Edition

Essentials of Blood Banking and Transfusion Medicine

For Undergraduate and Postgraduate Students of
Medical Sciences, AYUSH, Laboratory Medicine and
Allied Health Sciences, and Clinicians in Practice



Ganga S Pilli



CBS Dedicated to Education
CBS Publishers & Distributors Pvt Ltd




CBS Publishers & Distributors Pvt Ltd
4819/XI, Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India
E-mail: delhi@cbspd.com, cbspubs@airtelmail.in; Website: www.cbspd.com
New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Lucknow | Mumbai
Hyderabad | Jharkhand | Nagpur | Patna | Pune | Uttarakhand



Second Edition

Essentials of Blood Banking and Transfusion Medicine

*For Undergraduate and Postgraduate Students of
Medical Sciences, AYUSH, Laboratory Medicine and
Allied Health Sciences, and Clinicians in Practice*





Second Edition

Essentials of Blood Banking and Transfusion Medicine

*For Undergraduate and Postgraduate Students of
Medical Sciences, AYUSH, Laboratory Medicine and
Allied Health Sciences, and Clinicians in Practice*

Ganga S Pilli MD, PhD, DTM

Professor

Department of Pathology

JN Medical College

KLE Academy of Higher Education and Research

Belgaum, Karnataka



CBS Publishers & Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Lucknow • Mumbai
Hyderabad • Jharkhand • Nagpur • Patna • Pune • Uttarakhand



ISBN: 978-93-54660-31-3

Copyright © Author and Publisher

Second Edition: 2022

First Edition: 2012

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission, in writing, from the author and the publisher.

Published by **Satish Kumar Jain** and produced by **Varun Jain** for

CBS Publishers & Distributors Pvt Ltd

4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India.

Ph: 011-23289259, 23266861, 23266867

Website: www.cbspd.com

Fax: 011-23243014

e-mail: delhi@cbspd.com;

cbspdpubs@airtelmail.in.

Corporate Office: 204 FIE, Industrial Area, Patparganj, Delhi 110 092

Ph: 011-4934 4934

Fax: 011-4934 4935

e-mail: publishing@cbspd.com; publicity@cbspd.com

Branches

- **Bengaluru:** Seema House 2975, 17th Cross, K.R. Road, Banasankari 2nd Stage, Bengaluru 560 070, Karnataka, India
Ph: +91-80-26771678/79 Fax: +91-80-26771680 e-mail: bangalore@cbspd.com
- **Chennai:** 7, Subbaraya Street, Shenoy Nagar, Chennai 600 030, Tamil Nadu, India
Ph: +91-44-26680620, 26681266 Fax: +91-44-42032115 e-mail: chennai@cbspd.com
- **Kochi:** 42/1325, 1326, Power House Road, Opp KSEB, Ernakulum, Kochi 682 018, Kerala, India
Ph: +91-484-4059061-65,67 Fax: +91-484-4059065 e-mail: kochi@cbspd.com
- **Kolkata:** 147, Hind Ceramics Compound, 1st Floor, Nilgunj Road, Belghoria, Kolkata-700056, India
Ph: +91-9096713055/7798394118, 9836841399 e-mail: kolkata@cbspd.com
- **Lucknow:** Basement, Khushnuma Complex, 7 Meerabai Marg (Behind Jawahar Bhawan), Lucknow-226001, UP, India
Ph: +0522-4000032 e-mail: tiwari.lucknow@cbspd.com
- **Mumbai:** PWD Shed, Gala no 25/26, Ramchandra Bhatt Marg, Next to JJ Hospital Gate no. 2, Opp. Union Bank of India, Noorbaug, Mumbai-400009, Maharashtra, India
Ph: +91-22-66661880/89 e-mail: mumbai@cbspd.com

Representatives

- | | | | | | |
|-------------|--------------|-------------|--------------|---------------|--------------|
| • Hyderabad | 0-9885175004 | • Jharkhand | 0-9811541605 | • Nagpur | 0-9421945513 |
| • Patna | 0-9334159340 | • Pune | 0-9623451994 | • Uttarakhand | 0-9716462459 |

Printed at

Disclaimer

Science and technology are constantly changing fields. New research and experience broaden the scope of information and knowledge. The author has tried her best in giving information available to her while preparing the material for this book. Although, all efforts have been made to ensure optimum accuracy of the material, yet it is quite possible some errors might have been left uncorrected. The publisher, the printer and the author will not be held responsible for any inadvertent errors, omissions or inaccuracies.

to

my parents and family members

and

my dear students who are my inspirers



Foreword

It gives me immense pleasure to write the Foreword to this book *Essentials of Blood Banking and Transfusion Medicine*. There are several elaborate as well as short textbooks on blood banking and blood transfusion, both Indian and foreign, but many of them do not have required up-to-date information. This book has been planned to give details of blood donation, techniques in blood banking, blood transfusion reactions, component therapy, blood transfusion in clinical practice, use of quality control and many other topics with recent advances.

Today, blood transfusion medicine is one of the rapidly expanding fields of medicine. This book is not only useful for students and technologists, but also to the practising physicians and surgeons, more so for the medical professionals working in the blood banks. The main purpose of this book is to provide easy and quick access to the information and guidelines on blood transfusion to the clinicians and all those who work with blood transfusion.

The author has chosen this subject to contribute her efforts with experience in diagnostic services in blood banking. This is the second edition of the book which speaks the popularity and demand of the book with updated information. I am sure it will be useful to all the students, both undergraduate and postgraduate, and clinicians, to achieve the goal of transfusion service to provide safe blood and blood components.

I congratulate the author for the pains she has taken to bring out the second edition of the book and wish her a great success.

VD Patil

Ex-Registrar
KLE University, Belagavi



Preface to the Second Edition

The book *Essentials of Blood Banking and Transfusion Medicine* now has seen the second edition with the help of CBS Publishers and Distributors. I am grateful to publishers for making this book to reach all my students not only locally but also nationally and internationally.

Though in brief, manuscript is prepared keeping in mind the necessary material both the theory and practical aspects required for the postgraduate students of pathology, clinical postgraduate students, clinicians, MBBS students, other medical students of AYUSH, Diploma and BSc (Laboratory Technology) students and nursing staff who work with blood. For the second edition of the book, four new chapters have been added and other chapters are updated.

I am grateful to Dr Shweta Nanjannavar and Dr Sangeeta Pathak for contributing following chapters to this book.

1. Chapter 20: "Motivation, recruitment and retention of blood donors" by Dr Shweta B Nanjannavar
2. Chapter 23: "Convalescent plasma and SARS-CoV-2 (COVID-19) antibodies" by Dr Sangeeta Pathak

I acknowledge all those who are directly or indirectly involved in preparation of the material for this book, especially my postgraduate and laboratory technology students.

I have made effort to give, at a glance, the necessary knowledge on blood banking and transfusion medicine which may be difficult for our readers to go through the voluminous books in transfusion medicine.

I am grateful to Dr Kavita GU, Professor of Pathology and Blood Bank In-charge at SS Institute of Medical Sciences, Davangere, for going through the manuscript of the second edition.

I appreciate the efforts and dedication of Mr SV Virgi for his valuable technical suggestions with his rich experience at blood bank.

I am thankful to Dr (Mrs) AV Dhaded, retired Professor of Pathology, Belgaum Institute of Medical Sciences, and former Professor and Head, Department of Pathology, for the critical appraisal of the book during infantile phase.

I am grateful to my children (Vijay and Veena), their spouses, and my husband Dr SC Pilli for their inspiration in preparation of the manuscript.

I am thankful to Dr Uday V Kokatnur for helping me in drawing the schematic and line diagrams.

More than all this, I thank my parents from whom I learnt the art of writing, especially my father who at the age of 84 is still an active writer in chosen field of his subject, and my mother supporting him in his endeavors.

Finally, I bow to all my superiors and Almighty.

Ganga S Pilli



Preface to the First Edition

This is my second book. I started writing material for this book two years back. I am grateful to all those who are directly or indirectly involved in preparation of the material for this book especially my postgraduate and laboratory technology students.

Though in brief, I have done this manuscript keeping in mind the necessary material both the theory and practical aspects required for the postgraduate students of pathology, clinical postgraduate students who utilize blood, clinicians, MBBS students, other medical students of Alternative System of Medicine, Diploma and B.Sc. (Laboratory Technology) students and nursing staff who work with blood.

I have made this effort to give, at a glance, the principles and practice of blood banking which may be difficult for our readers to go through the voluminous books in transfusion medicine.

I am grateful to Dr Sangeeta Pathak, Sr. Consultant and Head of Transfusion Medicine at Max Healthcare, New Delhi, for going through the material and giving the critical appraisal for the book.

I appreciate the efforts and dedication of Mr. SV Virgi, for his valuable technical suggestions with his rich experience at blood bank.

I am thankful to Dr. (Mrs.) AV Dhaded, Presently Professor, Department of Pathology, Belgaum Institute of Medical Sciences, for going through the material and giving the critical appraisal for the book.

I am grateful to our beloved registrar of KLE University, Dr VD Patil, Dr MV Jali, Medical Director and CE and Dr AS Godhi, Principal, JN Medical College, for giving me an opportunity and encouraging me to make this difficult task, a successful venture.

I fail in my duty if I do not express my gratitude to my children (Vijay and Veena) and husband Dr SC Pilli who tolerated me, when I was busy spending most of my time in preparation of the material at home or away at workplace and library.

More than all this, I thank my parents from whom I learnt the art of writing, especially my father who at the age of 75 is still an active writer in his chosen field of subject, and my mother supporting him in his endeavors.

Finally, I acknowledge the support from Chancellor Dr Prabhakar Kore, Vice-Chancellor Dr CK Kokate, *Ex-Registrar* Dr PF Kotur and bow to Almighty for his blessings.

Ganga S Pilli



<i>Foreword by VD Patil</i>	<i>vii</i>
<i>Preface to the Second Edition</i>	<i>ix</i>
<i>Preface to the First Edition</i>	<i>xi</i>
1. Safe Use of Blood	1
2. Blood Donation	15
3. Donor Health Screening, Donor Suitability Evaluation, Phlebotomy, Post-Donation Care and Adverse Donor Reactions	30
4. ABO Blood Group Systems	38
5. Subgroups of ABO System and Bombay Phenotype	55
6. Rh Typing and Weaker Variants of Rh System	58
7. Preparation and Standardization of Anti-Human Globulin (AHG) Reagent	63
8. Coombs' Test	66
9. Crossmatching	73
10. Transfusion Reactions	78
11. Transfusion Transmitted Diseases (TTDs)	95
12. Preservation of Blood, Principles and its Applications in Blood Banking	104
13. Blood and Blood Components	113
14. Blood Transfusion in Clinical Practice	124
15. Autologous Blood Transfusion	148
16. Blood Substitutes	152
17. HLA Antigens and other Platelet and Leucocyte Antigens and their Role in Blood Transfusion	156

xiv	Essentials of Blood Banking and Transfusion Medicine	
18.	Errors and Discrepancies in ABO Typing	162
19.	Blood Bank Organization and its Management	171
20.	Motivation, Recruitment and Retention of Blood Donors	182
21.	Recent Advances in Blood Banking	188
22.	Quality Improvement and Quality Control in Blood Transfusion Services	193
23.	Convalescent Plasma and SARS-CoV-2 (COVID-19) Antibodies	211
	<i>References</i>	<i>217</i>
	<i>Index</i>	<i>221</i>