WHO Manual for the standardized investigation, diagnosis and management of the infertile male

The treatment of male infertility has been revolutionized by advances in assisted reproductive technology. This concise and structured account, prepared by an authoritative international panel of experts, provides a consensus on the most effective and logical approach to the investigation and management of male infertility. It focuses attention on three key areas: history-taking; clinical assessment of male fertility; and objective criteria for diagnostic categories. This approach complements the areas covered in the companion volume *WHO Laboratory Manual for the Examination of Human Semen and Sperm–Cervical Mucus Interaction* (CUP, 4th edn, 1999) and significantly expands upon the section on male infertility in the previous volume on the infertile couple *WHO Manual for the Standardized Investigation and Diagnosis of the Infertile Couple* (CUP, 1993). This new, practical consensus will be an indispensable guide to good clinical management of all forms of male infertility.
WHO MANUAL

for the standardized investigation, diagnosis and management of the infertile male

Patrick J. Rowe
World Health Organization
Geneva, Switzerland

Frank H. Comhaire
University Hospital
Ghent, Belgium

Timothy B. Hargrave
University of Edinburgh
Edinburgh, Scotland

Ahmed M. A. Mahmoud
University Hospital
Ghent, Belgium

Published on behalf of the
WORLD HEALTH ORGANIZATION
by

CAMBRIDGE UNIVERSITY PRESS
## Contents

1. Preface ix
2. International board of experts x

1 Introduction 1

2 History-taking 5
1.1 The definition of infertility 5
1.1.1 Primary male infertility 6
1.1.2 Impregnation 6
1.1.3 Secondary male infertility 6
1.1.4 The duration of involuntary infertility 7
1.2 Previous investigations and/or treatment for infertility 8
1.3 History of diseases with possible adverse effect on fertility 8
1.3.1 Fever 8
1.3.2 Medical interventions 10
1.3.3 History of surgery 10
1.3.4 Urinary tract infection 12
1.3.5 Sexually transmitted disease 12
1.3.6 Epididymitis 13
1.4 Pathology possibly causing testicular damage 13
1.4.1 Mumps orchitis 13
1.4.2 Testicular injury 13
1.4.3 Testicular torsion 13
1.4.4 History of varicocele 14
1.4.5 Testicular maldescent 14
1.5 Other factors with possible adverse effect on fertility 14
1.5.1 Sexual and ejaculatory function 15

3 Clinical assessment of male fertility 17
3.1 Physical examination 17
3.1.1  General examination  17
3.1.2  Gynecomastia  17
3.1.3  Examination of the penis  18
3.1.4  Examination of the testes  18
3.1.5  Examination of the epididymides  21
3.1.6  Examination of the vasa deferentia  22
3.1.7  Scrotal swelling  22
3.1.8  Varicocele  24
3.1.9  Inguinal examination  24
3.1.10  Examination of the prostate gland and seminal vesicles  24
3.2  Laboratory investigations  25
3.2.1  Semen analysis  25
3.2.2  Other laboratory investigations  26
3.2.2.1  Tests on blood and serum  26
3.2.2.2  Tests on urine  27
3.2.2.3  Prostatic expressed fluid  28
3.2.2.4  Hormone determinations  28
3.2.2.5  Chromosome and genetic analysis  30
3.3  Additional technical investigations  31
3.3.1  Scrotal thermography  31
3.3.2  Doppler investigations  32
3.3.2.1  Doppler ultrasonography  32
3.3.2.2  Duplex Doppler  33
3.3.3  Other imaging techniques  33
3.3.3.1  Ultrasonography (echography)  33
3.3.3.2  Imaging of the hypothalamo-pituitary region  33
3.3.4  Testicular biopsy  33

4  Objective criteria for diagnostic categories in the standardized management of male infertility  37
4.1  Semen classification  37
        Interpretation of the result of semen analysis  37
4.2  Diagnostic categories and management  40
4.2.1  Sexual and/or ejaculatory dysfunction  43
4.2.2  Immunological cause  45
4.2.3  No demonstrable cause  46
4.2.4  Isolated seminal plasma abnormalities  47
4.2.5  Iatrogenic causes  47
4.2.6  Systemic causes  48
4.2.7  Congenital abnormalities  48
4.2.8 Acquired testicular damage 50
4.2.9 Varicocele 51
4.2.10 Male accessory gland infection (MAGI) 52
4.2.11 Endocrine causes 54
4.2.12 Idiopathic oligozoospermia 55
4.2.13 Idiopathic asthenozoospermia 55
4.2.14 Idiopathic teratozoospermia 56
4.2.15 Idiopathic cryptozoospermia 56
4.2.16 Obstructive azoospermia 56
4.2.17 Idiopathic azoospermia 57
4.3 General comments 58
4.3.1 General treatment strategy 58
4.3.2 Notes on assisted reproduction 59

Appendices
I Data collection form and flowchart 61
II Tanner pubertal stage 69
III Reference values for semen variables 73
IV Methods for spermatozoa selection for use in insemination or assisted reproduction 75
References 77
Index 87
Preface

While it is imperative that each case of infertility is considered clinically as a couple, evolution in our management of the male and female partners proceeds asynchronously. Since publication of the first edition of the *WHO Manual for the Standardized Investigation, Diagnosis and Management of the Infertile Couple* in 1993 there have been major developments in our ability to help couples with a significant male factor achieve a pregnancy. Many of these treatment options involve the use of assisted reproductive technology, ranging from intrauterine insemination to in vitro fertilization and even intracytoplasmic sperm injection for the most severe cases. Less dramatic progress has been made in developing more successful treatment options for couples with female factors.

Consequently, while there is a clear need to revise and update that part of the Manual concerning the male partner, the section on the female partner requires little change. Therefore it was decided to divide the Manual into two volumes. This was not an easy decision and must not be taken as any indication of a move away from considering infertility as a problem of a couple, it is purely a pragmatic publishing decision.

The present Manual has been approved by consensus reached among the authors and an international board of experts.
International board of experts

Dr M.S. Bornman, Department of Urology, University of Pretoria, Private Bag X169, Pretoria 0001, South Africa
Dr F.H. Comhaire, Department of Internal Medicine, Section Endocrinology, University Hospital Ghent, De Pintelaan 185, B-9000 Ghent, Belgium
Dr K. Everaert, Department of Urology, University Hospital Ghent, De Pintelaan 185, B-9000 Ghent, Belgium
Dr T.B. Hargreave, Department of Urological Surgery, Western General Hospital, Crewe Road, Edinburgh EH4 2XU, UK
Dr A.M.A. Mahmoud, Department of Internal Medicine, Section Endocrinology, University Hospital Ghent, De Pintelaan 185, B-9000 Ghent, Belgium
Dr D. Mortimer, Genesis Fertility Centre, 550, 555 West 12th Avenue, Vancouver, BC V5Z 3X7, Canada
Dr P.J. Rowe, World Health Organization Special Programme on Research Development and Research Training in Human Reproduction, 1211 Geneva 27, Switzerland
Dr H. Tournaye, Centre for Reproductive Medicine, AZ-Brussels Free University, Laarbeeklaan 101, B-1090 Brussels, Belgium
Dr R.E.A. Weber, Dijkzigt Ziekenhuis, Dr Molewaterplein 40, NL-3015 GD Rotterdam, The Netherlands
Dr C. Yssel, Department of Urology, University of Pretoria, Private Bag X169, Pretoria 0001, South Africa