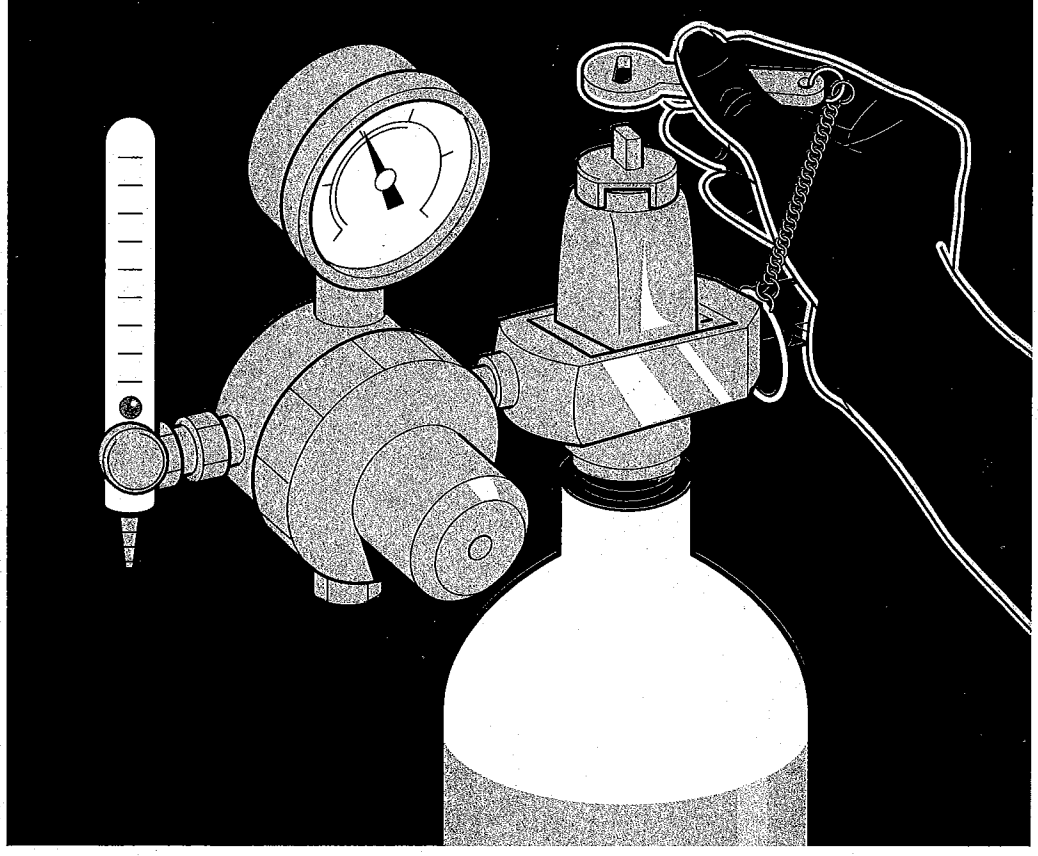
VSO Books

Care and Safe Use of Hospital Equipment

Muriel Skeet and David Fear



VSO 01

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HOSPITAL EQUIPMENT

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The British Safety Council for Figure 6

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FOREWORD

Many developing countries have attempted to establish a comprehensive health care technical service. In most cases this is still at a very early stage of development, and district health facilities which are remote from engineering expertise and technical back-up frequently find their medical and hospital equipment not functioning or unsafe. Inability of health services to make full use of available equipment results in decreased quality of care and high wastage of scarce resources, ultimately hampering progress towards a country's health goals.

However, most technical problems can be avoided by proper management of equipment, planned preventative maintenance and service by locally available technical staff, and correct use by medical personnel. The issues involved in good equipment maintenance and user practice are still not appreciated enough in many places and the major reason for this is lack of information, particularly of clear guidelines and training materials appropriate for developing countries' circumstances.

This volume provides district health facility staff with the required information in a simple, user-friendly manual, based on the extensive experience of many people working in the field.

The point of departure from other available material is that this book addresses primarily non-specialists in clinical/hospital engineering, such as health facility managers, equipment users and multi-skilled craftsmen. The manual has a considerable focus on maintenance management and approaches to user training, and provides practical guidelines on planned preventative maintenance. It will help managers at district level to review and improve their equipment maintenance systems, medical staff to use equipment with care and respect, and craftsmen to implement first-line maintenance and repair procedures and refer more complex problems to a qualified technician/engineer.

The authors, the publishers, and all those who contributed to this publication should be congratulated on this endeavour. It is an important contribution to the international drive towards improving equipment management, and ultimately towards improving safety, quality and cost-effectiveness of health care in developing countries.

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INTRODUCTION

Many of us working in hospitals or health centres have been frustrated at some time or other because a piece of equipment is not in good working order when we most need it. Even worse, our patients may suffer or be put at risk if, for example, oxygen is not available when urgently required or a steriliser is not up to standard when we come to do the ward dressings. Often, at district level, spares are not readily available and engineers, even where they exist, are not present around the clock.

In the majority of hospitals, maintenance services are not seen as being of vital importance to good patient care and good management. There may be a local handyman with a small work place and a few tools to carry out repairs but rarely does he have the encouragement and incentives which will motivate him to do a good and speedy job. Many health care professionals do not see the care and safety of equipment as a priority. In the past it has been easy to ask for a new piece of machinery but donors are in shorter supply today. The world-wide recession has meant that industrialised countries are cutting many programmes including those overseas.

In the meanwhile, health problems have increased alarmingly. Every country is affected by the AIDS pandemic. Malaria has resurged and in 1993 the World Health Organization (WHO) declared the incidence of tuberculosis as a global crisis. Cardiovascular diseases and cancer rates are now reaching similar levels in developed and developing countries while population changes, geographic as well as demographic, have brought new health problems of displaced persons and very old people in almost all countries.

As we approach the turn of the century the world faces the increasing pressures of war, pestilence, famine and death. Although the majority of nations made a positive start in their quest for Health-for-All after the Alma-Ata Conference of 1978, formidable political, economic and social circumstances have meant that in many instances the gap between policy-making and policy implementation remains very wide indeed. Resources are in even shorter supply than they were ten years ago. Health problems have increased while funds to solve them have diminished.

Each of us must be concerned with conserving costs and the care and maintenance of the equipment we use daily must become 'a concept which is part and parcel of our decentralised (district) health care system'[1].

We are all aware of the need for safety at work – not only in relation to ourselves but also regarding those in our care. Machinery and equipment must be safe to use at all times. That is one of our greatest responsibilities and one which those in charge of a hospital or health centre must take very seriously indeed. Of course the best solution for the problem would be to introduce a national maintenance and equipment management scheme as described in the report of a WHO Round Table discussion[2]. Although this idea must remain the ultimate goal, most developing countries cannot afford the rapid implementation of such a programme for their public health service[3].

Most problems with health-care equipment can be traced back to fairly simple causes. According to a Swiss study[4], 60% of accidents with medical equipment are caused by the users. A similar percentage of user-caused defects or malfunctions requiring repair and calibration to rectify them has also been recorded. In developing countries the number of user-caused defects appears to be significantly higher. In general, users in developing countries have not been trained to handle their equipment properly. The problem is often aggravated by low motivation due mainly to lack of management and few, if any, incentives. It was found that equipment belonging to non-government health services was often in better working condition because of clearer definitions and control of responsibilities and thus better motivation for staff. The authors concluded that adequate user training would drastically reduce the incidence of equipment failure. Their cautious estimate was a decrease of 30 to 40%. In summary, good management, clear responsibility for maintenance and effective guidelines are three key issues in the maintenance of hospital equipment.

The aims and audience of this book

This book has been commissioned by VSO to help hospital staff overcome problems in equipment maintenance where there is no hospital engineer at hand. VSO health workers and their local colleagues in health programmes throughout the developing world identified the need for the guidance and information offered in this book. They participated in trials of the guidelines presented in Part II, along with a range of other health professionals worldwide.

This book is addressed to three groups of people – all without relevant technical expertise. First, it is written to help managers of hospitals and health centres who, ultimately, are responsible for the care and safe use of equipment in their hospitals. It is intended to help them review their existing maintenance system and see whether it can be improved. This book will help management to select and train at least one member of staff as a Maintenance Staff Member. It also aims to help management to set up an inventory, to choose new equipment which is appropriate for local circumstances and to withstand offers of machinery which is not. We hope that all members of the hospital management team will have access to a copy of this publication so that they are able to work together to establish safe and reliable routine practices throughout their institution.

The second group for whom this book has been written is the Maintenance Staff Members designated by their management teams to provide a maintenance service in hospitals and health centres where there is no engineer. The vast majority of the text is compiled to provide step-by-step guidelines on how to carry out first-line maintenance in carefully prescribed circumstances and on when to send for a qualified technician. It also includes suggestions on how to teach staff to use equipment with care and respect.

The third group the authors had in mind is those daily users of equipment – doctors, nurses and therapists. Short summaries of good practice – the User Checklists in Part II - are set out for them which, it is envisaged, will be copied onto a poster, translated into a local language and displayed in a prominent position either on or near each piece of equipment.

This book may be used as a teaching aid and the text has been deliberately written in the second person to facilitate its use as a manual for staff training. In other circumstances it may be used as a resource for problem-solving when a fault or breakdown occurs.

The book is divided into two parts. The first part describes the management of maintenance and suggests ways in which preparation for change in maintenance practice may be planned and implemented including the appropriate training of all hospital staff. It includes information on the basic tool kit which should be assembled and gives examples of how to set up a routine system for care and fault identification. It goes into safety aspects, including the ethical and legal responsibilities of hospital managers and it deals with the purchasing and checking of new equipment.

The second part of the book is more specific. It consists of guidelines for the care and maintenance of individual pieces of equipment. These are presented in a logical sequence for training purposes. It is under the last heading of each set of these guidelines that the important check lists for users of the equipment can be found.

Because of the variation in hospital equipment throughout the world, we have concentrated on the most common types in use and the book is well illustrated so that these may be identified and the text adapted as necessary. Some of the simple line drawings may be reproduced either on a chalk board or a flip chart.

It is recognised that there are many other pieces of equipment which could be included in Part II. As the aim was to produce useful material for those situations where there is no engineer, the focus is on items of equipment which most commonly break down, which are most important for patient care or which can be mended relatively simply. The items of equipment were identified through VSO health programmes where VSO volunteers worked with local colleagues in rural situations throughout the developing world. A future publication is planned which deals with electric generators, water supplies and the physical fabric of hospitals.

Much lip service is paid today to self-help as a key factor in human development. But in order to be self-reliant, new knowledge has to be acquired, new skills must be learned and attitudes – even towards the use of machinery and equipment – may have to undergo change. Hospital and health centre managers today find themselves with a major responsibility to inform, explain, guide and advise their staff. It is hoped that this publication will help them in this important task in relation to the care and safe use of hospital equipment.

Muriel Skeet

References

1. Halbwachs, H., *Maintenance and the district health system - Approach and perspectives,* unpublished report on a seminar in Senegal, GTZ, Eschborn, 1993.

2. Bloom, G. et al, 'The right equipment in good working order', round table discussion, *WHO Forum*, Vol.10, 1989.

3. Halbwachs, H. and Werlein, R., *Training health personnel to operate health care equipment - How to plan, prepare and conduct user training,* GTZ, Eschborn, 1993.

4. Von der Mosel, H., 'Der Klinisch-biologische Ingenieur', *Schweizerische Ärztezeitung,* No 51, December 1971.

EVALUATION OF THIS BOOK

In order to ensure that this publication achieves its objectives it will be necessary to update it from time to time. The publishers and authors would welcome comments from both trainers and users, particularly in regard to how useful the book has been; where it has failed; what difficulties have been experienced in using it; what corrections or amendments are required and additional comments on illustrations, drawings, presentation, distribution and so on. It is hoped that it may be assessed for effectiveness very easily. Observations could be made during and after its use and comments collected from persons who have participated in the teaching/learning sessions.

For a more detailed evaluation, a simple questionnaire is supplied at the back of the book. Collated and analysed, it is hoped that these comments and suggestions will result in the improvement of a future edition.

PART I

PREPARING SYSTEMS FOR THE CARE AND SAFE USE OF HOSPITAL EQUIPMENT