

HEPATITIS AND THE TREATMENT OF CHRONIC RENAL FAILURE

**Report of the Advisory Group
1970 - 1972
Chairman : Lord Rosenheim**

Department of Health and Social Security

Scottish Home and Health Department

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FOREWORD

Soon after the introduction of haemodialysis in the treatment of chronic renal failure, outbreaks of jaundice were reported among patients and staff. In most cases the hepatitis was mild and transient, but on rare occasions the disease has been fulminant and fatal.

Anxiety about the infection is understandable, but there are no grounds for a negative or defeatist attitude. The problem is no different in kind from problems of infectious disease which have been met and overcome in the past. The present report reviews relevant current knowledge and produces recommendations for the prevention and containment of hepatitis in regular dialysis and renal transplantation units.

I hope that all concerned will accept the recommendations and modify their practice in accordance with the suggested codes and that such positive action may lead to the prevention of further outbreaks and the alleviation of anxiety.

Acknowledgements to the many people who helped the Advisory Group will be found in Appendix 1, but I must record my very sincere thanks and those of my colleagues in the Group, to our Secretaries, Dr Catherine Dennis and Mr W G Robertson of the Department of Health and Social Security, who have shown great energy and assiduity. Other members of the Health Departments have provided valuable assistance and to all of them we are most grateful.

On behalf of the Group

ROSENHEIM

March 1972

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. Regular dialysis and renal transplantation are established and effective forms of treatment (2.1).
2. The occurrence of hepatitis presents a risk to patients and staff of regular dialysis and renal transplantation units. The form of hepatitis is usually but not invariably, associated with the Australia antigen or its antibody or both (3.3 and 3.6).
3. Control of infection is most likely to be achieved by comprehensive measures based on well recognised principles. A code of practice is recommended (7).
4. Blood transfusion should be minimised for patients with chronic renal failure; only blood screened as negative for the Australia antigen and its antibody should be used (5.2.1). Similar precautions should be taken with patients in progressive renal failure who may ultimately require dialysis (5.2.2).
5. Patients and staff in regular dialysis and renal transplantation units should be regularly screened for evidence of infectivity (5.2.3).
6. Patients with chronic renal failure should be screened prior to admission to regular dialysis units. Those showing evidence of infectivity should not be admitted to the main unit. (5.2.4). Whether they should be accepted for treatment in an isolation unit is a matter for the clinical decision of the director.
7. Movement between units should be controlled; patients from overseas who cannot be fully assessed before admission should not be admitted (5.2.5).
8. Early discharge to home dialysis will minimise the risk of hepatitis (5.2.6).

9. Whenever possible patients in hospital should undertake their own dialysis (5.2.7).
10. The aim should be to give transplants to uninfected patients as early as possible. A greater supply of donor kidneys is essential (5.2.8).
11. Transplantation before dialysis is generally impractical (5.2.8).
12. Transplantation for infective patients may diminish the risk of serum hepatitis but further experience is required (5.2.9).
13. Isolation facilities must be available in regular dialysis and renal transplantation units (6.1). These facilities should be functionally separate but close to the main unit (6.4).
14. When an infective patient with chronic renal failure requires surgery, surgical teams must be fully informed (6.5). Precaution is needed in the dental care of infective patients (6.6).
15. Present dialysis equipment may not be entirely free from the risk of transmitting infection (8.1). Research into the design of equipment is being pursued and should continue (8.2). Disposable dialysers should be used for infective patients (8.3).
16. The workload in regular dialysis and renal transplantation units should not be allowed to reach such a level that full precautions cannot be taken (9.3).
17. All staff coming into contact with patients in chronic renal failure should be briefed at regular intervals of risks and precautions (9.2).
18. Staff should be screened before working in the main unit and not accepted if Australia antigen positive. Staff health should be monitored. Staff with suspicious symptoms should be off duty (9.2).
19. So far as possible staff turnover should be minimised. It is undesirable to employ agency nurses in regular dialysis and renal transplantation units (9.4).

20. The special risks in the treatment of chronic renal failure create special problems for staff. Sympathetic consideration should be given to these problems (9.5).
21. Facilities for the treatment of acute renal failure should be separate from those for chronic renal failure (9.7).
22. Laboratory staff dealing with specimens from regular dialysis and transplantation units must take special precautions and be fully briefed. A code of practice is recommended at Appendix 3.
23. Hospital authorities with regular dialysis or renal transplantation units should review accommodation and facilities of the laboratories serving these units with a view to ensuring safe conditions (10.4).
24. Post-mortem examinations on infective patients should be carried out only by experienced staff in suitable accommodation and with full precautions (10.5).
25. All regular dialysis and renal transplantation units should co-operate with the Public Health Laboratory Service in the study of epidemiology (11.1).
26. Statutory notification of infective jaundice should be reviewed (11.2).
27. Hospital laboratories should report all findings of Australia antigen to the Public Health Laboratory Service (11.3).

1. INTRODUCTION

1.1 Hepatitis is a risk in the treatment of chronic renal failure by regular dialysis or transplantation. Several serious outbreaks in patients and staff have occurred in this country (1) and elsewhere (2). These outbreaks have occurred despite the existence of codes of safe practice from the outset. These codes were strengthened following a 1968 report (3) by the Public Health Laboratory Service on the microbiological aspects of haemodialysis which made recommendations for containing the risk. This report was published before the importance of Australia antigen^Ø was appreciated. It is now known that this antigen is usually implicated. Further outbreaks with several deaths have increased anxiety among patients and staff. It has been realised that there are problems wider than those of microbiology.

We were therefore appointed by the Department of Health and Social Security, the Scottish Home and Health Department, and the Welsh Office in October 1970 with the following terms of reference:

"To review the medical problems arising in the treatment of chronic renal failure by means of intermittent haemodialysis and renal transplantation in the present knowledge of the hazards involved including hepatitis, and to make recommendations".

At the same time the Departments set up a complementary advisory group on testing for the Australia (Hepatitis-Associated) antigen and its antibody. Liaison was maintained through participation by their Chairman, Dr Maycock, as a member of our Group and we were informed of their recommendations.

1.2 We held 13 meetings and took evidence from clinicians and nurses working in regular dialysis and renal transplantation units and from those engaged in microbiological and epidemiological research. Appendix 1). We established that every regular dialysis and renal transplantation unit has a code of practice. We found nothing to criticize in these codes. Our own recommendations (section 7) are largely a consolidation of existing practice.

Ø This term will be used throughout the report, in preference to the alternative "Hepatitis Associated Antigen" (HAA).

1.3 APPROACH

This report is confined to hepatitis since it is the major problem. Present knowledge of hepatitis in the context of renal failure is limited. Special problems of epidemiology and incidence, of aetiology, prophylaxis and prevention, and of clinical management and ethics required discussion. In the present state of knowledge (1972) some of our recommendations are necessarily empirical.

1.4 STRUCTURE OF THE REPORT

The report starts with an account of the position reached in regular dialysis and renal transplantation and of the current working practices and problems of unit management (section 2). This is followed by a summary of present knowledge of hepatitis in general and in the field of renal failure in particular (sections 3 and 4). These passages are intended as background for substantive discussion later in the report.

2. THE PRESENT STATUS OF TREATMENT FOR CHRONIC RENAL FAILURE

2.1 Chronic renal failure is inevitably fatal if untreated. Regular dialysis and renal transplantation can keep suitable patients in reasonable health for a number of years. A forthcoming study of British experience (4) will demonstrate the effectiveness of these forms of treatment. Of patients treated by regular dialysis alone, 64.1% survived for three years or more; patients who had transplants in addition to dialysis show a 58.8% survival over the same period. At the present time more than 1000 patients are being treated by regular dialysis, of whom more than half are at home. Over the last few years about 200 kidney transplants have been carried out each year. This is rapid progress since regular dialysis was accepted as a regular therapeutic measure in 1965 and renal transplantation passed beyond the experimental stage only in 1967.

2.2 REGULAR DIALYSIS

Once stabilised, the patient usually feels well and can lead a reasonably normal life apart from being dependent on dialysis two or three times a week, usually overnight. Regular dialysis is a specialist hospital service provided at regional or sub-regional

level and not by every hospital. Specially trained doctors, nurses and technical staff and purpose-designed units are needed as well as machines and equipment. The case-load must be sufficient to enable staff to acquire and maintain the necessary skills. Pathological and surgical support are also required. Physicians in charge of regular dialysis are consultants with wider interests either in nephrology or in general medicine. The efficiency of any regular dialysis unit depends on effective management. The treatment is complex and requires close teamwork. Patients are under psychological stress and the staff can also be under considerable strain from demanding and sometimes monotonous tasks. Several units have had difficulty in recruiting and retaining sufficient nurses and other staff. Anxiety about the risk of contracting hepatitis is a factor, certainly in units where outbreaks have occurred.

- 2.3 Hospital dialysis has disadvantages. Facilities and staff limit the numbers that can be treated. Rehabilitation is constrained by frequent visits to hospital, by the greater risk of cross-infection and by the development of psychological dependence. The role of hospital dialysis is essentially that of resuscitating severely ill patients and of enabling them later to proceed to home dialysis or transplantation which are the natural goals from the moment the patient is accepted for treatment.

2.4 HOME DIALYSIS

Home dialysis has been developed since 1967. It allows fuller rehabilitation than hospital dialysis and opens the way to acceptance of new patients for treatment. The patient requires some aptitude, suitable home conditions and the aid of a relative. He and his relative must be trained by the unit team. The consultant in charge remains responsible for regular supervision and periodic outpatient assessment; the hospital for supplying the essential drugs and materials. If major difficulties or intercurrent illness arise, the patient telephones the unit for advice or assistance. Re-admission may be necessary and beds must be reserved for such a contingency. Nurses with special experience of dialysis and medical social workers keep in touch with the patient, and technical staff are available to

deal with any mechanical problems beyond the patient's competence. Home dialysis therefore does not involve 'discharge' from hospital in the usual sense.

Before a patient can be established on home dialysis a room must be set aside for dialysis and be adapted to take extra plumbing and electrical services. This is a responsibility of local health authorities. Otherwise home dialysis is a hospital responsibility. Some local authorities have found themselves unable to co-operate quickly, whilst others have given every assistance (5). It is a matter for regret that the co-operation afforded to hospitals has been uneven. While patients are waiting for adaptation of their homes they must still go to hospital for dialysis 2-3 times a week thus limiting the acceptance of further patients. The speed with which local authorities provide facilities determines the number of new patients who can be accepted. The possibility of transplantation does not diminish the urgency for home adaptation since graft rejection could make a return to dialysis necessary. Since we started work, the Department of Health and Social Security (see Appendix 4) has called the attention of local authorities to the need for them to play their part promptly. Local authorities should appreciate the importance of prompt action and that delay not only reduces the opportunity to treat new patients but also leads to greater risk of hepatitis to patients in hospital. The Department has also advised hospitals to inform the local health authority as soon as there is a firm intention to put a patient on home dialysis so that the authority may initiate action at the earliest stage (Appendix 4).

2.5 RENAL TRANSPLANTATION

In 1967 the Medical Research Council advised the Departments that kidney transplantation had passed beyond the experimental phase and was ready for controlled development. The Advisory Committee on Renal Transplantation was set up to give expert advice to the Departments. Insertion of the graft usually presents no special problems to a surgeon with training and experience but if the graft succeeds, the patient still requires regular supervision. A patient in chronic renal failure is usually made and kept reasonably well by

regular dialysis prior to transplantation. Post operative dialysis is often necessary until the grafted kidney functions adequately, and if the graft fails the patient usually returns to regular dialysis.

- 2.6 Cadavers are now the main source of donor kidneys. These must be removed within a short time after death if viability is to be preserved. Immunological tests on potential recipients and donors have to be carried out to establish the degree of compatibility between patient and graft. When kidneys become available, suitable patients have to be summoned to hospital at short notice. The major difficulty in the development of renal transplantation is the present lack of sufficient donor organs although the potential supply has been calculated to be adequate for the need (6). As a result, patients who would benefit from transplantation have to be maintained on dialysis. Although the number of centres undertaking transplantation has increased from 4 in 1967 to 16 in 1970, the number of available kidneys and therefore of grafts has not risen comparably.
- 2.7 A unit offering the full range of service for terminal renal failure thus has a wide variety of tasks.
- (a) Assessment of patients entering end-stage renal failure and their initial dialysis.
 - (b) Training for home dialysis and continuing supervision.
 - (c) Continuing hospital dialysis for patients unsuitable for transplantation or home dialysis.
 - (d) Preparation of patients for transplantation; arranging for immunological tests; obtaining kidneys; post-operative dialysis; continuing supervision, treatment and assessment.
 - (e) Emergency assessment and treatment of patients who have had sudden graft failure or who have had difficulty with home dialysis.
 - (f) Prevention and control of infection within the unit.
 - (g) Research.
 - (h) Training of staff.
 - (i) Communication with the laboratory, with other clinical departments and with local health authorities.

3. THE NATURE OF HEPATITIS

- 3.1 Viral hepatitis is caused by either of two agents - virus A, the aetiological agent of infectious epidemic hepatitis; and virus B the agent of serum hepatitis or homologous serum jaundice (7). In neither type of hepatitis has the causative virus been unequivocally cultured. Both types are known to be caused by filter-passing agents. There are epidemiological and immunological differences between the two types of infection though these cannot always be detected in clinical practice. Infectious hepatitis occurs more frequently in epidemics, is spread most commonly by the faecal-oral route and has a short incubation period of two to six weeks. Serum hepatitis generally occurs sporadically, is usually transmitted parenterally eg by transfusion of blood or blood products, and has a long incubation period of four weeks to six months. However, recent evidence suggests that serum hepatitis may sometimes be transmitted by the faecal-oral and other non parenteral routes at present ill-defined (8). This may explain how cases of sporadic hepatitis come to be positive for Australia antigen (about 30% of all hepatitis in most series). As will be discussed later Australia antigen is thought to be either identifiable with or closely related to the virus of serum hepatitis. The severity of illness in both serum and infectious hepatitis can vary but the former type of illness is generally considered to run a more severe course.

Dr Polakoff's studies (9) for the Public Health Laboratory Service have confirmed a clear and statistically significant difference between healthy people (such as hospital staff) and patients with chronic renal failure in their response to the infective agent: the former present clear clinical evidence of hepatitis whereas in the latter, the infection tends to be a symptomatic or to run a milder course.

Anicteric hepatitis (hepatitis without jaundice) is several times commoner than the icteric form. Systematic liver function tests in closed communities or contacts during outbreaks of hepatitis, have shown that the infection may be acquired without any clinical manifestations. Such sub-clinical cases are unlikely to be detected in the general population since special laboratory investigations would be needed. However, it is possible that sub-clinical cases can transmit the agent to others.

In neither serum nor infectious hepatitis is there a test to demonstrate immunity. Clinical observation suggests that one attack immunises but infection with one form does not protect against a subsequent attack from the other. No effective preventive vaccine is yet available and the evidence of the value of human normal immunoglobulin in preventing or attenuating serum hepatitis is extremely limited and inconclusive. There is some evidence that it is valuable in preventing infectious hepatitis. The treatment of hepatitis when it follows a fulminant course has recently been reviewed by Dr Williams (10). The course was fulminant amongst the staff who died in the Edinburgh and Manchester outbreaks.

3.2 THE AUSTRALIA ANTIGEN AND ITS ANTIBODY

Although the causative agents of these two forms of hepatitis have not been isolated, a serum antigen, termed the Australia antigen, is apparently a specific marker for serum hepatitis. So far as is demonstrable, outbreaks of hepatitis in regular dialysis and renal transplantation units in this country (with one exception) have been associated with the presence of the Australia antigen. Knowledge of the Australia antigen and its antibody is useful in the detection and control of hepatitis. Methods of detection including the immunodiffusion technique, immunoelectroosmophoresis, complement fixation, and electron microscopy are discussed in the report of the Advisory Group on Testing for the Australia (Hepatitis Associated) Antigen and its Antibody (11). The antigen although it may not be the actual infectious virus particle, characteristically may be found in the blood during the late incubation period, persists during the acute phase of illness, and disappears during convalescence. Some people carry the Australia antigen and therefore presumably the virus of serum hepatitis for long periods: the reasons are at present unclear. Studies of healthy blood donor panels in Britain suggest a prevalence of the antigen of 1 to 2 per 1000 (11). As there is no reason to suppose that blood donors are uncharacteristic of the general population, Australia antigen positivity without apparent ill effect must be fairly common in the general population. Equally there is no reason to suppose that patients referred to hospital are in this respect atypical, and hospitals must constantly be treating unknown carriers, with few recognised outbreaks of serum hepatitis.

It would therefore seem that the risk of hepatitis to hospitals in general should not be exaggerated.

The significance of the antibody to Australia antigen is less well established, although, prima facie, it suggests past or present infection. However, there is some evidence that a low titre of antibody is present in a significant proportion of the healthy population.

3.3 HEPATITIS IN PATIENTS WITH CHRONIC RENAL FAILURE

In renal failure, hepatitis may be sub-clinical, mild, severe or fulminant, but most patients who develop hepatitis in renal units have not been severely ill. Some outbreaks have been characterized by low infectivity but high virulence, and others by the opposite features. These differences may be due to different strains of the causal agent or different dosages. Patients with chronic renal failure are more susceptible to infection because of their clinical or immunological status. Since anaemia is a common feature of renal failure blood transfusion may be necessary in spite of its recognised risks. It may be needed, for example, after major surgery such as renal transplantation. Further, the technique of regular dialysis depends on extracorporeal circulation of the blood and contamination of the equipment or environment may occur even with the best possible precautions.

3.4 THE SIGNIFICANCE OF THE AUSTRALIA ANTIGEN AND ANTIBODY IN HEPATITIS ASSOCIATED WITH RENAL FAILURE TREATMENT

Dr Polakoff's studies (9) show that even one Australia antigen positive patient can lead to an outbreak. Although there is no absolute evidence (see 3.2 above) it would seem prudent to regard the presence of the antibody in patients with chronic renal failure as equally significant. Patients may remain Australia antigen positive indefinitely, thus constituting a continuing hazard to fellow patients and to nursing, medical and laboratory personnel.

3.5 ROUTINE CHECKS

The presence of the Australia antigen or antibody must be regarded as the most significant indicator of infectivity. A raised level of serum aspartate aminotransferase or of alanine aminotransferase.

which is not normally found in patients with chronic renal failure, is suggestive of hepatitis in the absence of other possible causes. In the routine checking of patients and staff for possible infection, in addition to looking for Australia antigen, attention must be paid to the patient's history and general state, and in particular to the results of liver function tests (eg serum bilirubin and serum enzyme estimations).

3.6 RISK TO STAFF

A feature of outbreaks has been the transmission of the disease to staff, probably due to contact with infective blood. Understandably there is anxiety on this score. In Britain over the period 1965-1971 some 120 staff associated with this work developed clinical hepatitis, and 6 staff died. Dr Polakoff's survey followed up staff who had left dialysis units but found no cases of hepatitis occurring after service in the units.

3.7 HEPATITIS IN OTHER HOSPITAL CONTEXTS

We have attempted to compare the risks in regular dialysis and renal transplantation units with other situations in which immunosuppressive therapy is given or where the analysis of blood and body fluids is routinely carried out. A survey in progress by an MRC Working Party suggests that the case incidence of hepatitis, both icteric and anicteric, after transfusion of whole blood may be of the order of 4 to 5 per cent in this country. Among those employed in the Regional Transfusion Centres in England and Wales the diagnosis of 'hepatitis' was reported on 37 sick certificates in the period 1952-1970. In the same period the staff establishment increased from about 1,500 to about 2,400 but the actual number of staff employed during these years is not known. During the 2 years that Australia antigen testing has been carried out at the Virus Reference Laboratory of the Public Health Laboratory Service, only 1 case of hepatitis has been diagnosed in their laboratory workers.

The Association of Clinical Pathologists is carrying out a retrospective study into the risk of hepatitis in general laboratories and their figures should be available shortly. We made enquiries about hepatitis in major surgery and in leukaemic and other patients

subject to immunosuppression but nothing comparable to the epidemics in regular dialysis and renal transplantation units has been brought to our notice. On present knowledge, therefore, it would appear that chronic renal failure treatment is a field of exceptional risk from hepatitis.

4. NUMBERS OF CASES

4.1 OUTBREAKS OF HEPATITIS IN RENAL FAILURE UNITS IN ENGLAND, SCOTLAND AND WALES SINCE 1965.

Only a prospective survey with an agreed common definition of hepatitis at the outset can give accurate figures. Most of the information available about hepatitis is retrospective, hepatitis being defined by the reporting source, and may include anicteric as well as icteric cases. Facilities for testing for the presence of the Australia antigen have been available only during the last two years. Subject to these reservations, available evidence suggests that up to September 1971 there have been 12 outbreaks (ie 2 or more cases) of hepatitis in British regular dialysis and renal transplantation units. (Table 1).

Table 1

Outbreak	Date	Cases				Deaths		
		Patients	Contacts	Staff	Total	Patients	Staff	Total
Manchester	1965/66	5	-	11	16	-	3	3
Liverpool	1966/71	15	7	33	55	-	-	-
Charing Cross I	1966/67	15	-	-	15	-	-	-
Charing Cross II	1968/71	64	-	1	65	-	-	-
Birmingham	1967/71	21	4	12	37	-	-	-
Royal Victoria Newcastle	1969/71	4	1	-	5	1	-	1
Royal Free	1969/70	3	-	8	11	-	-	-
Hammersmith I	1969/70	6	-	1	7	3	-	3
Hammersmith II	1971	6	-	2	8	-	-	-
Edinburgh	1969/71	18	2	8	28	8	3	11
Guys	1969/71	33	14	42	89	-	-	-
Cardiff	1969/71	16	1	4	21	-	-	-
		206	29	122	357	12	6	18

It would be misleading to calculate annual averages from these figures since the number of hospital centres, and consequently of patients and staff, has been greatly increased since 1965. Nor can attack rates be

determined from this table since both patients and staff are constantly changing as a result of staff rotation and mortality in patients from causes other than hepatitis.

4.2 CASES IN 1969-1971

Enquiries of our own covered all regular dialysis and renal transplantation units in England, Scotland and Wales and sought retrospective information about new cases occurring in the two successive twelve-month periods between July 1969 - July 1971. The cases involved in outbreaks (ie 2 or more cases) are shown in Table 2.

Table 2

Period	Cases				Deaths			
	Patients	Contacts	Staff	Total	Patients	Contacts	Staff	Total
1 July'69-30 June'70	90	14	41	145	10	-	2	12
1 July'70-30 June'71	70	11	31	112	2	-	1	3
1 July'69-30 June'71	160	25	72	257	12	-	3	15

In addition there were 4 single cases in the first period and 5 in the second.

4.3 ATTACK RATES

The best calculation of attack rates is that compiled by Dr Polakoff and with permission we have below reproduced her tables.

Dr Polakoff defines her terms as follows:

Patient: A patient with irreversible renal failure having maintenance dialysis, usually haemodialysis.

Clinical hepatitis: An illness with jaundice or serum bilirubin above the normal maximum and/or enlarged liver not attributed to any cause other than viral hepatitis.

Sub-clinical

hepatitis: Abnormal results of serum transaminase tests, not attributed to non-infective causes, and/or Australia antigen detected in serum. Symptoms such as anorexia, malaise, abdominal pain, etc. may or may not be present.

Outbreak of

hepatitis: Two or more cases of clinical hepatitis detected within six months of each other among patients and/or staff in one unit.

Sporadic

hepatitis: Other instances of clinical hepatitis, Australia antigen carriage or abnormal liver function.

TABLE 3

THE NUMBER OF DIALYSIS UNITS IN THE SURVEY AND
THE NUMBER REPORTING HEPATITIS

Year	Number of units in the survey	Number of units with hepatitis outbreaks	Number of units with sporadic hepatitis		Total units with any hepatitis
			Clinical	Sub-clinical	
1968		1 (5%)	2	2	5 (25%)
1969	20	3 (15%)	3*	2*	7 (35%)
1970		3* (15%)	1	4	8 (40%)
1969	21 (one unit entered survey in 1969)	4 (19%)	2	2	8 (38%)
1970	28 (seven more units entered survey in 1970)	4 (14%)	1	5	10 (36%)

* one unit had one clinical and seven sub-clinical cases in 1969. This unit came into the outbreak category in 1970 but the outbreak was not associated with Australia antigen.

TABLE 4

INCIDENCE OF HEPATITIS IN PATIENTS AND STAFF
IN THE SURVEY UNITS DURING THE YEARS 1968 AND 1969

Year	Number of units in the survey	Category	Number of persons in unit during* the year	Number of cases of hepatitis			Attack rate (per 100 persons)	Attack rate (per 100 person weeks)
				C	SC	All		
1968	20	Patients	468	4	4	8	1.7	0.06
		All Unit Staff	820	3	1	4	0.5	0.02
1969	20 (Continuing from 1968)	Patients	608	12	20	32	5.3	0.20
		All Unit Staff	903	10	2	12	1.3	0.04
1969	1 (Joined Survey in 1969)	Patients	67	5	6	11	16.4	0.77
		All Unit Staff	55	3	0	3	5.4	0.19
1969	21 (Total in 1969)	Patients	675	17	26	43	6.4	0.24
		All Unit Staff	958	13	2	15	1.6	0.05

C: Clinical SC: Sub-clinical

* Those with at least one week of staff duty or consecutive dialysis.

Attack rates varied widely between units

TABLE 5

INCIDENCE OF HEPATITIS IN PATIENTS AND STAFF
IN THE SURVEY UNITS DURING THE YEAR 1970

Number of units in the survey	Category	Number of persons in unit during year	Number of cases of hepatitis		
			Clinical	Sub-Clinical	Total
20*	Patients	645	8	28	36 (5.6%)
	All Unit Staff	1136	3	1	4 (0.4%)
1**	Patients	37	6	15	21 (56.8%)
	All Unit Staff	60	14	3	17 (28.3%)
7***	Patients	88	1	0	1 (1.1%)
	All Unit Staff	225	0	0	0 (0.0%)
Total 28	Patients	770	15	43	58 (7.5%)
	All Unit Staff	1421	17	4	21 (1.5%)

* entered survey in 1968

** " " " 1969

*** " " " 1970

TABLE 6

INCIDENCE OF HEPATITIS IN STAFF AND PATIENTS IN
1969 IN FOUR HAEMODIALYSIS UNITS WITH OUTBREAKS
AND IN 17 UNITS WITHOUT OUTBREAKS

Units in terms of outbreaks	Category	Number of persons* in unit during 1969	Number of cases of hepatitis		
			Clinical	Sub-Clinical	Total
4 units beginning or continuing outbreaks	Patients	169	14	19	33 (19.5%)
	All Unit Staff	260	12	2	14 (5.4%)
17 units not experiencing outbreaks	Patients	506	3	7	10 (2.0%)
	All Unit Staff	698	1	0	1 (0.1%)

* persons with at least one week of staff duty or consecutive dialysis

5. THE PREVENTION AND CONTROL OF INFECTION

5.1 INTRODUCTION

There are special risks of infection in regular dialysis and renal transplantation units, but the appropriate measures to control them differ in no essential respect from those in general use. These include a code for safe procedures and prevention of contamination; sound planning of facilities and accommodation; avoidance of overcrowding; good organisation, management and communications; staff adequate to the workload with good morale and training; and capability for isolation of suspects.

5.2 PREVENTION OF RISK

5.2.1 BLOOD TRANSFUSION

A major source of possible infection is blood transfusion which should be used as sparingly as possible for patients with chronic renal failure. When blood is given it should be as safe as is possible in the light of present knowledge and techniques. What is technically possible is discussed in the report of the Advisory Group on Testing for the Presence of Australia (Hepatitis Associated) Antigen and its Antibody. All blood donations will eventually be screened for the Australia antigen but until this is possible we recommend that Regional Transfusion Centres should provide regular dialysis and renal transplantation units only with screened blood. We emphasize the importance of accurate records and follow-up so that, in the event of hepatitis occurring, appropriate action may be taken. It has been suggested that only washed thawed previously frozen red cells, suspended in saline or albumin solution should be used for renal failure patients, but at present this procedure is still experimental and not widely practicable.

5.2.2 PREVENTION OF INFECTION PRIOR TO TREATMENT BY REGULAR DIALYSIS

Patients in progressive renal failure are usually under treatment for some time before they are referred to a regular dialysis unit and it is important to avoid unnecessary risk at this stage also. We therefore recommend that clinicians having the care of patients with progressive renal failure should minimize transfusion, always use screened blood, and maintain careful records of any transfusion given.

5.2.3 SCREENING

The object of screening both patients and staff is to detect evidence of past or present hepatitis. It would be unwise to rely solely on the test for the Australia antigen or its antibody, since false negative results are possible. A comprehensive picture of the patient's clinical and pathological state is necessary. We therefore define 'patient screening' by the following criteria:

- (a) the taking of a comprehensive clinical history, including direct questioning for recent or past contact with hepatitis;
- (b) testing for the Australia antigen and its antibody;
- (c) a serum bilirubin level;
- (d) serum enzyme levels i.e. serum aspartate aminotransferase (previously known as SGOT) and alanine aminotransferase (SGPT).

We recommend that all patients should be screened before admission in order that an informed decision can be taken about acceptance. We also recommend that patients continue to be screened routinely during treatment. The scope of screening should cover patients on hospital dialysis, on home dialysis, and those with transplants. American experience suggests that infection can be imported by staff (12). We recommend therefore that staff should be similarly screened, before taking up post and thereafter at regular intervals. Staff judged positive by these criteria should not be employed in the main unit. If fit, they may be the most suitable for treating patients known or thought to be infective. After 3 consecutive monthly negative tests, staff may be considered clear. We also recommend that screening should be intensified during an alert. (See Code of Practice 7.12.4)

5.2.4 SELECTION OF PATIENTS

Whether or not to accept for regular dialysis treatment patients positive for Australia antigen or its antibody is a difficult decision. The admission to a unit of a single such patient can cause an outbreak in the unit. Many clinicians would not at present accept Australia antigen positive patients for dialysis treatment, and this seems to be a reasonable clinical decision in present circumstances.

Some would accept such patients into isolation facilities especially if they were capable of self-treatment under supervision and could be discharged quickly to home dialysis. These are essentially matters for clinical judgement and the directors of units will no doubt weigh all relevant factors including the capacity and existing workload of their units, and the risk to staff as well as patients.

5.2.5 CONTROL OF MOVEMENT

There have been instances of transfer of Australia antigen positive patients between units and of patients from abroad being found to be Australia antigen positive on admission. We consider that movement of patients between units should be controlled. Whilst there is no objection to movement for clinical purposes between units which work in close liaison, we recommend that casual traffic (eg for holidays) should cease. In view of the risk, patients from overseas who cannot be fully assessed before admission should not be accepted for casual dialysis.

5.2.6 HOME DIALYSIS

Experience confirms that the patient on home dialysis is less likely to contract hepatitis and presents less risk to others. Suitable patients should therefore be rapidly transferred from hospital to home dialysis. It has proved possible to prepare patients for home dialysis in about two months from admission, given favourable circumstances. This should be the objective from the outset of treatment. One unit has found it possible to train infective patients in the home. Whilst making no firm recommendation we suggest that doctors should bear this in mind for appropriate infective patients.

5.2.7 SELF-TREATMENT TO CONTROL HEPATITIS

Home dialysis is self-treatment. Risk of infection to staff can be diminished if those patients found to be unsuitable for home dialysis can achieve self-treatment in hospitals. Clearly this is not practicable for seriously ill patients but the patient who is reasonably well should be able to achieve self-treatment in the same way as the patient in training for home dialysis. We recommend that self-treatment in hospital should be encouraged wherever possible.

5.2.8 RENAL TRANSPLANTATION AS A PROPHYLACTIC AGAINST HEPATITIS

Successful transplantation reduces the risk of contracting hepatitis in so far as it eliminates the need for dialysis and diminishes patient contact. The shorter the time on hospital dialysis prior to transplantation the less the risk, but unfortunately most patients have to wait considerable periods for a suitable kidney. A greater supply of suitable donor kidneys is therefore essential not only to the expansion of the service but also to the reduction of the risk of hepatitis for patients and staff. To this end it is necessary for information about suitable prospective donors to be communicated rapidly to transplant teams. Co-operation by clinicians not themselves engaged in caring for patients with renal failure is essential. We recommend that the appropriate professional bodies should study this problem and give a lead.

There are some advantages in admitting patients for transplantation direct from home dialysis. In the event of graft failure, the patient would be trained for self-treatment. Several teams have made it a matter of clinical policy to establish patients on home dialysis before offering transplantation. On the other hand, the opportunity of a good match with a donor kidney should not be missed.

Renal transplantation undertaken before regular dialysis becomes necessary has been suggested as a possible measure for minimising the risk of hepatitis. Its practicability depends not only on a clinical judgement as to the optimum time for transplantation but also on the availability of a suitable kidney at that time. Transplantation before regular dialysis, though feasible, is unlikely to be widely used at present.

5.2.9 TRANSPLANTATION FOR INFECTIVE PATIENTS

The main argument in favour of transplantation for infective patients is that repeated dialysis, with possibilities of contaminating other patients and staff with infective blood is avoided. Against this must be set the possible hazards to staff during major surgery. The patient with chronic renal failure may remain Australia antigen positive indefinitely. Persistence of the antigen may be due to the

use of immunosuppressive drugs following transplantation. Transplantation in such patients has not commended itself to the majority of surgeons.

5.3 IMMUNOGLOBULIN IN PROPHYLAXIS

It has not been shown that human normal immunoglobulin as at present prepared will prevent serum hepatitis and evidence for any attenuating effect is meagre and inconclusive. Investigation of the preventive and therapeutic value of immunoglobulin separated from plasma containing antibody to Australia antigen is at an early stage. Although we do not recommend that human normal immunoglobulin should be used to prevent or attenuate serum hepatitis, this is a matter for the clinical discretion of the consultant concerned. However, human normal immunoglobulin has been recommended as a prophylactic measure against infectious hepatitis and should be available for use if exposure to this disease is suspected.

6. FACILITIES FOR THE CARE OF INFECTIVE PATIENTS

6.1 INTRODUCTION

While prevention must be the constant aim, arrangements must be made for the care and segregation of patients found to be infective. Three possible methods of isolation require discussion.

6.2 SPECIAL DIALYSIS CENTRES FOR PATIENTS KNOWN TO BE INFECTIVE

It has been suggested* that the best solution would be to set up a central isolation unit to which all infective patients from the regular dialysis centres in its vicinity would be sent. Whilst this would leave the main dialysis centres free to carry out treatment on uninfected patients, we do not find this concept desirable or practicable. It would involve collecting together patients, possibly infected by different strains of virus, from different centres with different clinical policies and practices. Management, treatment and communication could not be easy. Staffing such a unit of concentrated risk would prove an insuperable problem. Moreover the unit would need to be kept operational but inactive in the absence of infective patients. To all these objections we can see no compensating advantage.

* eg Br.med. J, 1970, iv, 255

6.3 DISPERSED UNITS

It has been suggested that each renal centre might operate two units in separate locations remote from one another, one unit for uninfected patients and the other for patients considered to be infective. This solution has some attractions. Under one director, there should be little difficulty about adjusting policy or practice, and there would appear to be less risk of mingling different strains of the virus. This method has been tried in one centre with a large number of infective patients for whom home dialysis was not feasible. Staffing such a unit did present difficulties and involved an increase of staff. Day-to-day management is made difficult by such dispersal. In our opinion such an arrangement is not a good use of resources, particularly of scarce skilled staff: such a unit would not be in continuous use. Because of this and because of likely difficulties in management and effective supervision, we do not recommend this as a preferred option.

6.4 SEGREGATION WITHIN THE UNIT OR HOSPITAL

The advantages of segregating infective and non-infective patients within the confines of one hospital are simplicity, short lines of communication, easier supervision and management, and ready availability of expert staff. With proper facilities and organisation, it should prove possible within a hospital to achieve the essential aim of segregating infective patients. Segregation between the infective and clean areas must be functionally complete and direct cross traffic between the two should be impossible. In particular, they should have separate lavatories. The two areas may either be separated by a distance or be contiguous depending on local circumstances. When the centre is free from infection, both areas can be used for normal treatment provided that speedy evacuation of one is possible to create an isolation unit. The infective and non-infective components of the centre should be self-contained and have separate entrances. There should normally be 10 bed-stations for routine use and 4 self-contained rooms for infective patients. The isolation area should contain changing rooms, a room for minor surgical procedures and a room in which out-patients may be seen. Similar segregation facilities are required in transplantation units. Having considered three

possibilities and found practical objections to the other two, we therefore strongly recommend that segregation be carried out within the unit or hospital.

6.5 MAJOR SURGERY FOR INFECTIVE PATIENTS

It would be impracticable and unjustifiable to designate a theatre and staff solely for major operations on infective patients. Major surgery should, where possible, take place at the end of the day's list. Emergency surgery on Australia antigen positive patients must entail some risk to staff, but this can be minimised by sound procedure. The precautions required will obviously vary according to circumstances but the suggestions in our model code of practice should be taken as a broad guide. We recommend that when surgery has to be undertaken on such infective patients the staff concerned should be briefed about the risks and the need to report mishaps. They should subsequently be screened for evidence of infection.

6.6 A special surgical problem is the dental care of infective patients. Clinicians should arrange for necessary treatment to be carried out in hospital dental departments, preferably before the patient starts on regular dialysis, and should brief the dental staff on precautions. Appointments should be the last for the day. Where hospital dental treatment is not possible, clinicians should give full details to the general dental practitioner.

7. CODE OF PRACTICE FOR REGULAR DIALYSIS AND RENAL TRANSPLANTATION UNITS
- 7.1 INTRODUCTION
- 7.1.1 The possibility of an outbreak of hepatitis should be clearly appreciated by all who work in regular dialysis and renal transplantation units. In the present limited state of knowledge, there are no sure means of preventing hepatitis in such units. However, certain hazards are now recognised and if these can be avoided there is good prospect of preventing the spread of the infection.
- 7.1.2 This code outlines principles of practice. Many of the measures are necessarily empirical. The detailed procedure adopted in each unit will vary in relation to local conditions and facilities. A detailed local code of practice should be prepared by each unit and should be clearly understood by all staff.
- 7.1.3 Just as disciplined operating theatre practice has a value beyond what can be demonstrated for any particular step, this code is intended to be more than the sum of its parts. Whatever practice is adopted, there is a need for maximum and continuous precaution. Good communication and discipline are required to maintain unit morale.
- 7.1.4 The staff should be kept fully trained and new members should be thoroughly instructed in routine. Ancillary and domestic staff should be taught the importance of good unit and personal hygiene.
- 7.1.5 The exact procedure adopted and unit discipline are clearly the responsibility of the Unit Director. He may delegate the regular supervision and inspection of the practice. The working of the code should be frequently reviewed and discussed. The staff should be given periodic instruction.
- 7.1.6 Nurses are most closely involved with patients and unit routine. Under the Director, therefore, particular responsibility falls to

the nursing officer in charge for ensuring that the code is understood and observed by staff, patients, and relatives and for maintaining communication with senior nursing staff outside the unit.

7.1.7 There is advantage in visits by staff from outside the unit such as a senior nursing officer, the control of infection officer or a microbiologist to observe practice and offer constructive comment.

7.1.8 In addition to normal records, a special book should be maintained with full details of significant mishaps (as defined in 7.3.5 below).

7.1.9 Should infection or a threat of infection occur a concerted plan for speedy action should be ready. This alert procedure should not only deal with communication within the unit, but also within the hospital and with the public health authorities (see 7.12.2).

7.1.10 Facilities must be readily available for the rapid and complete isolation of patients found to be Australia antigen positive or with established or suspected hepatitis.

7.2 ACTION PRIOR TO ADMISSION OF PATIENTS

7.2.1 A likely source of infection to patients with progressive renal disease is blood transfusion. This should be recognised by all clinicians caring for patients with renal disease who may ultimately be referred for dialysis or transplantation. Transfusion should be limited to a minimum before admission as well as after acceptance into the unit and only blood with negative test results for the presence of Australia antigen should be transfused and a careful record maintained (see 5.2.2).

7.2.2 All patients under consideration for regular dialysis or renal transplantation should be screened for evidence of possible infectivity prior to acceptance. (See 5.2.3).

- 7.2.3 Any patient known or suspected to be infective should not be admitted to the main unit. (See 5.2.4).
- 7.3 UNIT PROCEDURES, TECHNIQUES, AND ROUTINE
- 7.3.1 Each dialysing fluid supply unit should be restricted in its use to the same group of patients and each patient must keep to his own Kiil or other reusable dialyser. The routine for the disinfection of dialysers should be clearly established. Disposables should be put in plastic bags, sealed and incinerated.
- 7.3.2 There should always be a principal and an assistant for dialysis procedures, the patient being the assistant whenever possible. Protective clothing should be worn by staff and also by relatives being trained.
- 7.3.3 A disposable water repellent square should always be placed under a shunt or fistula to protect sheets from blood spillage.
- 7.3.4 On completion of dialysis the patient should strip the bed, placing items in appropriate disposal bags, put on protective clothing, and take the artificial kidney to the dismantling area to strip down the Kiil dialyser. If disposable dialysers are used, the patient should place the dialyser in the collection bag. If the patient is not well enough a member of the dialysis staff should wear full protective clothing to undertake these high risk procedures.
- 7.3.5 Accidents and mishaps to patients and staff of the following types should be reported and recorded in detail.
- (a) A cut or other skin penetration caused by any needle, instrument or equipment contaminated with blood, blood components, or body fluids.
 - (b) Aspiration or ingestion of blood or other body fluids.
 - (c) Splashing of blood on to the face, particularly the lips or the eyes.

(d) Extensive splashing with blood over large areas of unprotected body surface or clothing.

(e) Blood contamination of a skin surface that is broken, eg by previous cuts, and which has not been protected.

7.3.6 One member of staff should at all times wear protective clothing in order to deal immediately with emergencies such as haemorrhage due to the disconnection of arterial or venous lines. Protective clothing should be worn when giving injections or washing a patient.

7.3.7 If a nurse has to administer drugs the individual dose should be transferred into a small, disposable container at the cupboard and then brought to the bedside.

7.4 ROUTINES FOR PATIENTS AND RELATIVES

7.4.1 Every patient should be encouraged to become as independent of assistance as possible, whether they are being trained for home dialysis, being prepared for transplantation or are thought to require long term hospital dialysis.

7.4.2 Patients should be fully instructed in unit techniques, procedures and routines.

7.4.3 Patients should not assist one another in assembling or dismantling equipment and casual contact between patients is better avoided.

7.4.4 Wherever possible the patients should take temperature, pulse and blood pressure for themselves.

7.4.5 Where possible each patient should take his own drugs from his individual bottle.

7.4.6 Each patient should have a separate individual thermometer, and, if Cimino-Brescia fistulas are induced a separate tourniquet.

- 7.4.7 Patients should be instructed to place a disposable cloth on lavatory seats before use.
- 7.4.8 Patients should be instructed to report any contamination of wash hand basins by blood, vomitus, bronchial secretions or mouthwash.
- 7.4.9 Male patients should shave with individual electric razors to avoid accidental blood contamination.
- 7.4.10 No patient should be allowed into the unit kitchen.

7.5 PRECAUTIONS FOR TAKING SAMPLES FOR LABORATORY ANALYSIS

- 7.5.1 Routine laboratory investigations should be reduced to a minimum. Staff taking blood specimens should wear protective clothing. A plastic sheet should be placed under the patient's arm. Every effort must be made to avoid needle pricks, blood spillage, and soiling of the outside and top edge of the specimen containers.
- 7.5.2 After the specimen has been taken, the needle should be removed and placed in a rigid container to avoid the risk of injury from the exposed point. The container should later be autoclaved or incinerated. Machines are available which both macerate and disinfect needles, and this is an alternative method of disposal.
- 7.5.3 The blood in the syringe should be transferred gently, avoiding droplet and aerosol formation, into suitable screw-capped containers previously inspected for defects. Care should be taken to avoid contaminating the outside and the top edge of the container. Used syringes, plastic sheets and swabs should be placed in containers for autoclaving or incineration.
- 7.5.4 Collection of a specimen of blood from the blood line is preferable to the use of a syringe and needle.
- 7.5.5 Any spilt blood must be diluted at once with strong hypochlorite* before being wiped up (13).

*weak hypochlorite: a solution yielding 1,000 parts per million of available chlorine

*strong hypochlorite: a solution yielding 10,000 parts per million of available chlorine.

- 7.5.6 The specimen containers should be placed in individual plastic bags which are then heat sealed and marked by self-adhesive labels. Request forms should not be included in the bags with the containers. Gummed labels must not be licked and bags should not be stapled. Containers and forms from patients known or suspected to be infective should be marked distinctively, eg with a red label.
- 7.5.7 Porters, receptionists, van drivers and other staff engaged in delivering the specimens to the laboratory should understand the importance of avoiding breakage, and the need to have any accidental spillage promptly swabbed with strong hypochlorite*.
- 7.6 THE STAFF (see also Laboratory Code: Appendix 3)
- 7.6.1 Members of the staff with open sores or dermatitis should not be allowed into the unit.
- 7.6.2 On entry to the unit staff should change out of mufti or hospital uniform into unit dress (preferably trouser suits with long sleeves) and put on unit footwear or disposable overshoes.
- 7.6.3 Protective clothing (gloves, masks, safety spectacles and lightweight impermeable aprons covered by gowns) should be worn in the following circumstances;
- (a) Whenever there is potential contact with the blood or body fluids of patients.
 - (b) Whenever there is contact with equipment that is being assembled for use, is in use, or is being stripped down after use.
- 7.6.4 Staff should not eat, drink or smoke in the treatment or equipment areas. If refreshment is required, staff should change, wash, and go to the duty room.

- 7.6.5 All staff should appreciate the importance of hand washing and of good personal hygiene. Habits such as nail-biting, head-scratching or pencil-sucking must be avoided.
- 7.7 REGULAR SCREENING OF PATIENTS AND STAFF FOR THE PRESENCE OF AUSTRALIA ANTIGEN
- 7.7.1 Regular screening of patients and all staff working in the unit is essential if early evidence of possible infection is to be obtained. (See 5.2.3).
- 7.7.2 In units with no evidence of infection, screening of patients should be carried out at monthly intervals. If a unit is known to have been exposed to infection, tests should be done more frequently. Patients with undiagnosed intercurrent illness should be tested at once.
- 7.7.3 Patients on home dialysis should also be regularly tested.
- 7.7.4 All staff joining regular dialysis and transplantation units should be screened before being allowed to start work in the unit. Any staff developing an intercurrent febrile illness should be tested. In units with no infection, staff should be tested routinely every 3 months. Where there is infection, testing of staff should be more frequent.
- 7.7.5 No member of the staff who is found to be Australia antigen positive should be allowed in the main unit until 3 consecutive monthly tests prove negative.
- 7.8 SURGICAL ASPECTS
- 7.8.1 Screening results should be available when surgical procedures are being considered. If results are positive, staff should be informed so that they may take appropriate precautions.
- 7.8.2 The decision whether to operate or not remains with the responsible surgeon.

7.8.3 As far as is practicable, patients known or thought to be infective should be last on the day's list. Special attention must then be given to cleansing of the theatre or procedure room.

7.8.4 Whenever practicable the blood of kidney donors should be tested for the presence of Australia antigen.

7.9 UNIT SUPPLIES, EQUIPMENT, AND CATERING

7.9.1 Disposable linen may be used. If this is not available, the recommendations of the Laundry Sterilization Group should be followed (14). All used linen should be doubly bagged, the inner bag being of impermeable polythene and the outer of nylon, and appropriately labelled. Such linen should be washed at a minimum temperature of 93°C (200°F) for 10 minutes, to which should be added the appropriate 'mixing time'. Alginate stitched bags may be used.

7.9.2 All instruments for return to Central Sterile Supply Department (CSSD) are to be soaked in disinfectant (eg 2% glutaraldehyde) after use. Clamps, bubbletrap holders and other instruments which are retained for use in the unit should be soaked likewise after use.

7.9.3 Cuffs used for taking blood pressure should be washed frequently. If a cuff is spotted with blood it should be soaked in hypochlorite before it is washed. If the cuff is badly contaminated with blood it should be autoclaved.

7.9.4 Containers should not be re-used. Any which have to be returned viz, saline, i.v. solutions, should be placed in crates after disinfection in the unit and autoclaved before re-use.

7.9.5 Disposable utensils should be used for all patients' meals and drinks. After meals utensils should be placed in bags for incineration.

- 7.9.6 No staff should enter the patients' kitchen direct from the dialysis area without washing hands and putting on a clean gown over unit dress.
- 7.9.7 No patient should enter the kitchen.
- 7.9.8 Food should be delivered to the unit in a trolley in individual portions. It should be passed through the hatch from the kitchen to the unit nursing staff for distribution to the patients.
- 7.10 UNIT CLEANING
- 7.10.1 The Domestic Superintendent should be fully conversant with the code of practice. There should be adequate domestic staff. One member should be allocated to the dialysis area and one to the kitchen and other clean areas. They should have separate cleaning equipment stored separately. The domestic assistant allocated to the dialysis area should wear protective clothing while working and should not enter the patients' kitchen and other clean areas without removing protective clothing and putting on a clean gown.
- 7.10.2 Bed stations should be cleaned after each dialysis session. Machines, beds and lockers should be wiped with disinfectant (eg weak hypochlorite) and the floor mopped similarly.
- 7.10.3 The breakdown and preparation area should be separate. The breakdown area should be hosed down after each session and surfaces and basins washed and disinfected. The preparation area should be cleaned thoroughly once daily and surfaces wiped over with disinfectant, eg weak hypochlorite.
- 7.10.4 The patients' changing room should be considered a high risk area. After each session its walls, floor areas, wash hand basin, showers and lavatories should be washed with disinfectant, eg weak hypochlorite.

7.11 INTERCURRENT ILLNESS

When patients have to leave the dialysis unit for the general wards, shunt dressings and similar procedures should be carried out in the dialysis unit before the patient leaves it. Whilst the patient is in the general wards, nursing procedures should be kept to the minimum and only staff fully aware of all precautions should take blood.

7.12 THE ALERT CODE OF PRACTICE

When a case of hepatitis is suspected on clinical or laboratory evidence, the following steps should be taken.

7.12.1 The patient should be isolated and special arrangements made for his treatment. Every attempt should be made to complete his training for home dialysis and to get him established in his own home as soon as possible.

7.12.2 The director of the unit should at once warn all staff and notify the chief nursing officer, chief administrative officer or medical superintendent of the hospital, the control of infection officer and the heads of laboratories receiving specimens from the unit. The hospital administrator or superintendent should inform the other staff who may be involved, the Medical Officer of Health and the Public Health Laboratory Service.

7.12.3 The transfusion history of the patient should be reviewed. If he received blood or any blood products during the previous six months, the Regional Transfusion Centre supplying these should be informed and given the reference numbers of the blood donations or blood products.

7.12.4 Screening of patients and staff should be carried out more frequently until the danger of spread is considered to be over.

- 7.12.5 The routine precautions against transmission of infection should be checked and maintained at a high level.
- 7.12.6 Visitors to the unit should be limited and relatives who are being trained to assist patients in home dialysis should be screened.
- 7.12.7 The desirability of admitting new patients should be fully discussed. The director of the unit may wish to stop admission until the situation can be fully assessed and if further cases occur restriction may prove essential.
- 7.12.8 When a patient on home dialysis develops hepatitis and requires to be admitted, this should be to the isolation area. If the infection is sub-clinical or not severe he can continue on dialysis at home, but his relatives must be warned and advised of the necessary precautions. When he attends hospital for review, he should go to the isolation area.

8. EQUIPMENT AND THE PREVENTION AND CONTROL OF HEPATITIS

8.1 INTRODUCTION

The complex machinery used in regular dialysis contains many possible sources of blood-borne infection, even when scrupulous standards of sterility are observed. Since regular dialysis is a relatively new form of treatment, insufficient time has elapsed for all potential modes of infection to be recognised. Analysis of outbreaks has indicated that infection may be acquired in different ways such as, for example, during dismantling or cleaning the Kiil dialyser. Studies in Edinburgh have shown that blood may enter the venous pressure gauge of the proportioning machines and may thus transfer infection from patient to patient. This emphasizes the need for further research and development. Recommendations in the code of practice are intended to meet these hazards.

8.2 TECHNICAL DEVELOPMENTS

Research into the design of artificial kidneys to reduce sources of infection should be pursued as a matter of urgency. Close co-operation between the manufacturers, the Health Departments and directors of regular dialysis units is necessary to detect flaws in existing equipment and to make the appropriate modification with the least possible delay. Particular objectives should be an effective means of isolating the proportioning machines and monitors from the possibility of contamination by blood and the design of a cheap disposable dialyser with a low blood loss which might become standard equipment.

8.3 EXISTING EQUIPMENT

During an outbreak or as an urgent preventive measure, there might be advantage in using a disposable dialyser; however, European experience has not revealed any difference in prevalence of hepatitis between units using disposable coil dialysers and those using non-disposable equipment. Despite this we recommend the use of disposable dialysers for patients who are known or suspected to be infective during their hospital treatment. There would appear to be no objection to the use of the Kiil dialyser in the home even for infective patients.

9. SPECIAL PROBLEMS CONCERNING STAFF

9.1 INTRODUCTION

It must be accepted that there is a special risk to staff involved with regular dialysis and renal transplantation which we hope will be minimized by our recommendations.

9.2 HEALTH OF UNIT STAFF

A close watch on staff health is necessary not only in their own interests, but also to avoid spread of infection throughout the hospital or more widely and to establish information which may prove significant in the event of an outbreak. Accordingly, we recommend that staff should be screened as described in the code of practice, that new staff should be screened before they take up work in the unit, and that they should be screened regularly every 3 months while on the unit and at the end of the tour of duty.

We recommend that staff should be thoroughly briefed on the risks, on the necessary precautions, and on suspicious symptoms to be reported. Such briefing should be given not only to medical, nursing, and technical staff engaged in the care of patients, but also to any supporting staff, eg domestics, porters and secretaries who may come into contact with renal failure patients, the regular dialysis and transplantation units, the theatre, or the laboratory. Although the risk of staff contracting hepatitis cannot be entirely eliminated, it should be materially reduced by precautions. Knowledge that adequate precautions are being taken should help to allay anxiety.

We also recommend that staff presenting suspicious symptoms should be off duty and encouraged to rest until doubts can be resolved.

9.3 STAFFING PROBLEMS

The results of regular dialysis and renal transplantation leave no doubt that these forms of treatment should continue. The service and, more narrowly, the control of hepatitis, depend on adequate staffing. Recruitment may become difficult unless sympathetic consideration is given to the problems peculiar to this form of treatment. (See 9.5) Directors should maintain their workloads at a

level which can be managed without undue stress to staff. It serves no purpose for units to devise safety procedures which cannot be carried out because there are too many patients for effective control. Overcrowding was one of the dangers pointed out by the 1968 report by the Public Health Laboratory Service (3). We therefore recommend that directors and their teams should periodically review their workload.

9.4 NURSE RECRUITMENT AND THE USE OF AGENCY NURSES

A high turnover of staff is undesirable. In particular the employment of agency nurses for a short tour in renal units is inadvisable. It is unlikely that an agency nurse would rapidly acquire the expertise needed for nursing in regular dialysis and transplantation units nor would she be motivated to observe precautions to the same degree as permanent staff.

9.5 SPECIAL PROBLEMS

Three particular sources of anxiety for staff engaged in the field of renal failure treatment have been repeatedly drawn to our notice.

- (a) Problems of compensation for infection arising out of employment, including suspension from work, disability, or death.
- (b) Difficulties in obtaining life assurance.
- (c) The employment outside the unit of staff who, although not clinically ill with hepatitis, are nonetheless Australia antigen or antibody positive.

It is not within our competence to solve these problems. We have drawn the attention of the Health Departments to them with our view that it is of the greatest importance that they should be sympathetically explored and discussed. Solutions have to be found if regular dialysis and renal transplantation are to continue. We recommend accordingly.

9.6 We have also been made aware of anxiety expressed by Post Office Engineers who service the telephones of patients on home dialysis and by other people whose duties take them into the houses of such

patients. The majority of such patients are not infective. In general the risk of callers contracting hepatitis in these circumstances must be extremely small. For particular advice or information application should be made to the director of the dialysis unit concerned. Added reassurance would be provided by the use of "plug-in" telephones which could be collected and then serviced away from the patient's home.

9.7 NURSING AND ACUTE RENAL FAILURE

Patients with acute or reversible renal failure are often treated by haemodialysis or peritoneal dialysis. The techniques of dialysis for these patients are broadly similar to those used for chronic renal failure, but the need for dialysis is short term. Although many such patients receive blood transfusion, we have had no information to suggest a hepatitis infection problem comparable to that in the treatment of chronic renal failure. Normal standards of precaution should be observed. Patients should be screened for the Australia antigen and if positive should be treated in isolation. They should be transfused only with screened blood. (See 5.2.1) We recommend that dialysis facilities and accommodation for the patient with acute renal failure should be separate from those used for the chronic patient with separate nursing staff and equipment.

10. THE PATHOLOGY LABORATORY

10.1 INTRODUCTION

Hepatitis has occurred in staff of hospital laboratories in contact with specimens from a regular dialysis or renal transplantation unit. Contamination of cuts, pricks, broken skin, eyes or mouth from specimens may cause infection. It is an important responsibility of heads of laboratories to arrange that effective precautions are taken by their staffs. They should ensure that all staff are made aware of the hazards of handling such specimens and see to proper training in safety procedures and safe techniques. They should also consult with the directors of regular dialysis and transplantation units to ensure that the number of specimens submitted from these units is kept to the minimum; that such specimens are distinctively marked and that the laboratory is informed whenever viral hepatitis is suspected.

10.2 SAFETY CODE FOR LABORATORY STAFF

The head of the laboratory should prepare instructions for working procedures, distribute copies to all staff and ensure that they are understood and discussed. The details of such a code will require to be adapted to the circumstances of the individual laboratory, and may conveniently be associated with a general safety code dealing with risks of all kinds, eg that recommended by the Central Pathology Committee under the title "Safety in Pathology Laboratories" (15). A code that might be suitable for a clinical chemistry laboratory and can be adapted to meet the needs of laboratories in other disciplines is given in Appendix 3. Many of the precautions recommended are as described by Percy-Robb et al (16) who give details about protective equipment and materials. Laboratories undertaking tests for Australia antigen should be guided by the report of the Advisory Group on Testing for the Presence of Australia (Hepatitis-Associated) Antigen and its Antibody.

10.3 SAFETY OFFICER AND SAFETY COMMITTEE

The director of the laboratory should appoint a suitable member of his staff as Safety Officer responsible for implementation of the safety code, and a Safety Committee of representatives of each grade of staff to assist the Safety Officer and advise on revisions of the code. He should invite a microbiologist experienced in problems of cross infection to visit the laboratory regularly and review its procedures.

10.4 LABORATORY FACILITIES

Observance of the Safety code depends on adequate working space, time and facilities. The head of the laboratory should ensure that the workload is not too great for the available staff, that the laboratory is not overcrowded, and that safe equipment, adequate supplies of protective materials, and appropriately situated wash-hand basins, hand-drying facilities, coat pegs and lockers are provided. Benches should be surfaced with a smooth, impermeable material. A special area should be provided for receiving and opening specimens of blood, centrifugation, and the separation and dispensing of plasma or sera. Centrifuges should be placed behind a

transparent screen to prevent any spraying of coarse droplets, and centrifuges with wind-shields and swing-out heads should be used in preference to open or angle-head centrifuges. Where possible, specimens should be collected from clinical units in racks which hold them upright during transport to the laboratory.

Whilst pathological support for clinical service cannot be withheld because facilities are not ideal, we recommend that the Departments of Health should draw the attention of hospital authorities to the need for special facilities in laboratories dealing with specimens from regular dialysis and renal transplantation units.

10.5 POST-MORTEM EXAMINATIONS

We discussed at some length the important question of post-mortem examination of patients known or suspected to be Australia antigen positive. The need to establish the exact cause of death for medical or other purposes may necessitate acceptance of risk on some occasions. The decision must be left with the responsible pathologist. We recommend that all relevant information about such patients should be made known to the laboratory staff concerned; that experienced staff should carry out such work; and that the post-mortem should be done only in departments in which appropriate facilities are available and special precautions can be taken.

11. EPIDEMIOLOGY

- 11.1 Fuller knowledge of the epidemiology of hepatitis in renal failure is urgently required. We therefore recommend that a reporting system should be set up as an extension of the work being carried out by the Public Health Laboratory Service with voluntary participation by regular dialysis and renal transplantation units. We recommend that all regular dialysis and renal transplantation units should co-operate fully with the Public Health Laboratory Service and that, in

particular, clinicians should give the Public Health Laboratory Service immediate reports of patients suspected of infection whether jaundiced or not. They should also give full information about the course of outbreaks so that case-studies can be compared, and should organise their own records if necessary with the help of the Public Health Laboratory Service so that epidemiologically significant information is readily available. Reports should cover patients on hospital dialysis, on home dialysis or those who have had transplants, also staff, and relatives of both patients and staff.

11.2 THE INCIDENCE OF HEPATITIS IN THE GENERAL POPULATION

We consider that it would be helpful to have a closer definition of hepatitis for reporting cases from the community. At the present time the requirements of statutory notification (17) relate to "infective jaundice". Not only is this not a specific disease, but it includes a number of different conditions. We are, of course, aware of the difficulty of establishing the prevalence of Australia antigen in the general population (see 3.2 above), but despite this it would seem to us that statutory notification could more suitably be based on clinical diagnosis of infectious hepatitis and serum hepatitis. We recommend that the statutory system should be reviewed accordingly.

11.3 INCIDENCE OF AUSTRALIA ANTIGEN

It is important to determine regularly, so far as is practicable, the number of persons in the community found to be positive for the Australia antigen since a rising incidence indicates special risk to regular dialysis and renal transplantation units. We therefore recommend that all hospital laboratories and Blood Transfusion Centres should regularly report Australia antigen positive findings to the Public Health Laboratory Service or its Scottish counterpart.

12. RESEARCH IN GENERAL

Much fundamental work is being done on hepatitis and especially on the nature of the Australia antigen and its antibody. The Medical Research Council convened a conference in April 1971 to review this

work and to make recommendations. One of us* chaired this conference, and we were made aware of its findings. The importance of research in this field needs no emphasis. A solution to the hepatitis problem is vital.

ROSENHEIM (Chairman)

HEDLEY ATKINS

P J DEWAR

J P DUGUID

JAMES HOWIE

J H JONES

A C KENNEDY

MARY H MAGOWAN

W D'A MAYCOCK

J S ROBSON

C E GORDON SMITH

H E DE WARDENER

G M WESTROOK

ROGER WILLIAMS

MICHAEL WOODRUFF

CATHERINE N DENNIS)

W G ROBERTSON)

(Joint Secretaries)

March 1972

* Sir James Howie

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Mrs R E Wynne-Williams.
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CODE OF LABORATORY PRACTICE

This model safety code is intended for a clinical chemistry laboratory, but may be modified for laboratories in other branches of pathology.

(1) DANGER OF INFECTION

Staff are exposed to risk of viral hepatitis when handling specimens of blood, plasma, serum, exudates, tissues, faeces or urine from patients with hepatitis or from patients without clinical hepatitis who are carriers of a hepatitis virus. Specimens from patients who are Australia antigen positive are particularly dangerous, and such specimens may be received from regular dialysis and transplantation units. Infection is most likely to be contracted by pricking the skin with instruments (eg needles) contaminated with the specimen, or by soiling broken skin with blood. Splashing into the eyes and contamination of the mouth are probably also dangerous and infection may possibly be contracted by inhalation of fine aerosol droplets. Aerosols may be produced by the shaking of specimens, mechanical homogenisation, breakages, opening screw caps, expelling the last drop from a pipette, pouring fluids with drop formation, centrifuging tubes or bottles with wet rims, centrifuging nearly filled open tubes in an angle-head centrifuge, and the abrupt braking of centrifuges to save time.

(2) SAFETY CODE

All members of staff should read this Code carefully and follow it closely to minimise the risk of contracting infection.

(3) SAFETY OFFICER AND SAFETY COMMITTEE

Dr/Mr is the laboratory's Safety Officer and
Dr/Mr will deputise for him in his absence. The Safety Officer will supervise implementation of the Code, report breaches to the Head of the Laboratory, instruct new staff in safety procedures, supervise the provision of protective equipment, disposal bags and disinfectants, and keep a record of all laboratory mishaps involving a danger to staff. The Safety Committee consists of the Safety Officer, his deputy, and Messrs
They will keep safety procedures under review and advise on revision of the Code.

(4) DISINFECTANTS

The disinfectant generally to be used for equipment and surfaces soiled with blood or other specimen material is "strong hypochlorite", a solution yielding 10,000 parts per million of available chlorine. The disinfectant for objects not known to be soiled with blood, etc, is "weak hypochlorite" which yields 1,000 p.p.m. chlorine. These disinfectant solutions will be made up freshly each day in carefully cleansed containers (13). Since hypochlorite corrodes metal, 2% glutaraldehyde will be used for the disinfection of centrifuges and other metal-containing equipment. The most reliable means of disinfection is by heat and contaminated equipment should therefore, where practicable, be autoclaved; if it is to be re-used, it should be soaked in disinfectant before autoclaving, to prevent 'baking on' of blood etc.

(5) MISHAPS

Cuts and pricks should at once be washed with soap and water. If the eye is contaminated by a splash it should immediately be rinsed, while open, with tap water or saline. If the mouth is contaminated, it should at once, before swallowing, be rinsed out with water. If the skin is soiled with blood, it should be rinsed with strong hypochlorite and then be washed with soap and water. Spillages of blood or other material from patients should at once be swabbed with strong hypochlorite.

(6) REPORTING OF MISHAPS

Significant mishaps eg cuts and pricks with instruments possibly contaminated with blood, and soiling of broken skin, splashing of the eyes or contamination of the mouth with blood, should be reported to the Safety Officer, who will inform the Head of the Laboratory. Spillage of high-risk specimens, eg Australia antigen positive blood, even if not associated with personal contamination, should also be reported.

(7) PERSONAL HYGIENE

Smoking, eating and drinking are prohibited in the laboratories and passages. Labels must not be licked. Care should be taken not to put the fingers or other objects into the mouth. The mouth should never be used for pipetting. Hands should be washed after any procedure in which they may possibly have become contaminated with traces of blood or other patient material. This

should be done in the wash-hand basin, not in a laboratory sink. The hands should not be wiped on the coat or gown.

(8) PROTECTIVE CLOTHING

All staff will wear a white gown with a closed front or a coat with an overlapping front when in any working area, and, a plastic apron and disposable gloves when opening or processing specimens. Barrier cream should be applied to the hands before putting on gloves, which should not be worn for more than 2 hours at a time. Gown, apron and gloves must be removed, and the hands washed, before leaving the laboratory for any purpose, or going to the staff room. The disposable gloves will be worn only once and then be placed in a disposable bag for incineration. The apron will be placed on the staff member's apron peg and the gown or coat on his gown peg. At the end of each day the apron will be immersed for a few minutes in a pail of weak hypochlorite, then rinsed in warm water and hung up to dry before re-use. The gown or coat should be placed in the laundry bag at the end of each week or more frequently if necessary. If the gown or coat is accidentally soiled with blood or other patient material, it should at once be wiped liberally with strong hypochlorite and within a few minutes be rinsed with water. A vizor or safety spectacles must be worn when there is a danger of splashing of a specimen, eg the shaking and gassing of samples in an Astrup microtonometer.

(9) CARE OF WORK PLACES

Each bench worker should ensure that a wash-bottle and a disposal jar containing strong hypochlorite, a supply of swabs and a plastic disposal bag are provided at his work place. The hypochlorite should be renewed each day and should be tested several times a day with a starch-iodide paper to confirm (by a dark blue reaction) that it is still active. Any spillage of specimens must be swabbed at once with strong hypochlorite, and the bench surface must be wiped with hypochlorite at the end of each day's work. Since accidents and errors are most likely to happen when the work place is crowded with equipment and materials, care should be taken to keep the work place tidy. Tubes and other containers should be placed only in the appropriate rack or tray, never directly on the bench. Equipment must be kept clean.

(10) RECEIPT OF SPECIMENS

Incoming specimens should be scrutinised to confirm that they have been properly closed and packed. Those from patients having, or suspected of having, hepatitis or Australia antigen should bear "high risk" labels and be enclosed in plastic bags; the request form should not be enclosed in the same compartment of the bag as the specimen. Soiled and leaking containers should be shown to the Safety Officer, who may decide that they should be discarded without being removed from their bags. Soiled request forms should be incinerated. The receiving technician, wearing disposable gloves, should remove the specimen from the plastic bag and place the bag in a container for incineration. He should open the specimen container slowly to avoid producing droplet aerosol.

(11) PIPETTING

The mouth should never be used. Pasteur and other pipettes are to be used with a rubber teat or an automatic suction device. Care should be taken never to draw the fluid up as far as the top of the pipette. The contents of the pipette should be expelled gently down the wall of the receptacle so as to avoid splashing and aerosol formation. The pipettes should be held vertically while in use. They must not be placed on the bench when soiled, and they should be discarded gently, with complete submersion, into a jar of strong hypochlorite. Any rubber teat that may have become contaminated should be discarded into hypochlorite.

(12) CENTRIFUGING

Specimens of blood should be centrifuged with the tubes tightly capped. The centrifuges should be used only in their approved, screened positions. If a tube breaks in the centrifuge the bucket containing the spilled blood and broken glass should be placed gently into a jar of 2% glutaraldehyde; the surfaces of the centrifuge head, bowl, trunnions and remaining buckets should be swabbed with 2% glutaraldehyde; alternatively the trunnions and buckets may be autoclaved. The glutaraldehyde should be left to act for at least one hour. Hypochlorite should not be used on centrifuges since it corrodes metal.

(13) AUTOANALYSERS

Gloves and apron should be worn for all procedures with the autoanalyser. Serum will be removed from clotted blood specimens with Pasteur pipettes

and rubber teats, and will be transferred carefully into labelled tubes which will then be capped. After each serum has been transferred the pipette will be discarded into strong hypochlorite. A separate pipette will be used to transfer aliquots of the serum into the autoanalyser cups and it likewise will be discarded into hypochlorite. The effluent from the autoanalyser will be allowed to run only into the designated sink and drain, and care must be taken to ensure that the effluent tube is kept well down into the drain pipe, though not as far down as into the water in the trap. At the end of each session of work the dialyser module will be washed through with a large volume of water, and at the end of each day the sink and drain will be flushed with undiluted proprietary hypochlorite, which will be left in the trap during the next day's work. Samples in cups will be discarded gently with gloved hands into a tough plastic disposal bag for incineration. Plates or rings used for holding samples will, if plastic (non-metal), be soaked in strong hypochlorite overnight, then be rinsed with water and dried for re-use; if they are metal, they will be autoclaved.

For dismantling the dialysis unit of the autoanalyser, full protective clothing, with gloves and safety spectacles, will be worn, and a no-touch technique, using forceps, will be practised. Glutaraldehyde 2% will first be pumped through the unit and left for 30 minutes. The unit will then be dismantled on the designated bench and the parts placed in 2% glutaraldehyde for 30 minutes. Glutaraldehyde will be added to the dialyser bath to a concentration of 2% and, after 30 minutes, the water in the bath will be replaced and the dialyser components will be thoroughly washed with water before the assembly of a new unit. When a spare autoanalyser is unavailable and there is an urgent requirement for operation of the new unit, the use of glutaraldehyde may be omitted and the dismantled unit washed well in running water.

(14) HIGH RISK SPECIMENS

These will be processed only by one of the designated senior technicians. He will wear a visor or safety spectacles in addition to other protective clothing and will centrifuge and prepare specimens only in the designated 'high-risk' working area within the laboratory. The specimens will be loaded on to separate autoanalyser sampler plates and will be analysed at the end of a run.

(15) DISPOSAL

Containers, tubes and autoanalyser cups with the residues of specimens and test mixtures, and used disposable equipment and autoanalyser membranes will be placed directly into a tough plastic disposal bag which, when filled, will be closed tightly and dispatched for incineration. Contaminated containers, pipettes and other equipment to be kept for re-use will be soaked in strong hypochlorite overnight, rinsed thoroughly in water and dried in the drying oven at 100°C. Large volumes of urine or other contaminated fluid will be treated by the addition of undiluted hypochlorite, and after mixing and standing overnight will be poured down the designated disposal drain. This drain will be flushed with strong hypochlorite at the end of each day. Alternatively, the fluids may be autoclaved.

(16) DISPOSAL OF HIGH-RISK SPECIMENS

Serum and other infected fluids should be transferred into screw-capped glass bottles, which should be placed in a metal container with a little water in it and autoclaved. Used glassware, specimen containers and autoanalyser cups should be soaked overnight in strong hypochlorite and then placed in a metal pail to be autoclaved and later destroyed. Where more convenient, they may be placed directly in a metal pail and autoclaved immediately. Contaminated equipment to be kept for re-use should be soaked overnight in strong hypochlorite, and then be autoclaved and cleaned.

TO DEAL WITH HIGH RISK SPECIMENS, THE FOLLOWING POINTS ARE SUGGESTED FOR INCLUSION IN SAFETY CODES FOR HAEMATOLOGY AND BLOOD TRANSFUSION LABORATORIES.

(1) CROSS-MATCHING

Disposable gloves should be worn. Since the outsides of tubes readily become contaminated with dilute serum during the centrifugation of cell suspensions for the anti-human-globulin test, the tubes should be placed in metal racks which are afterwards autoclaved or in plastic racks which are afterwards placed in weak hypochlorite. Soiled areas of the centrifuge should be wiped with 2% glutaraldehyde. Standardised dropping pipettes should be used to distribute reagents for blood grouping and cross-matching, but a separate pipette should be used to distribute the serum and cells from each patient and this pipette should not be rinsed for re-use but should at once be discarded, together with its rubber teat, into strong hypochlorite, or into a pail for autoclaving. When

sedimented cells have been pipetted on to slides for microscopical examination, the pipettes should be rinsed in jars which are later autoclaved with their contents. The slides should be discarded into strong hypochlorite. Tiles and plates used for grouping and anti-human-gloublin tests should be placed in strong hypochlorite overnight.

(2) HAEMATOLOGICAL PROCEDURES

Disposable gloves should be worn. Containers of specimens should be checked for tightness of closure before placing them on the mechanical mixer or centrifuge. Pipetting of specimens and filling of ESR tubes must be done with a rubber teat, never by mouth. Swabs used to wipe the pipette should be thick enough to prevent contamination of the gloved fingers and soiled swabs should be placed in a container for autoclaving or incineration. The capillary tube used to place a drop of blood on a slide and the spreader used to make a film should be discarded into hypochlorite.

The film should be spread in such a way that it does not reach the edges of the slide where it might contaminate the gloved fingers when the slide is handled.

(3) TISSUE TYPING

The supernatant fluid from centrifuged lymphocyte suspensions should be discarded into a container with strong hypochlorite which is later autoclaved. Great care should be taken to avoid pricking the finger with the microsyringe needle, and a thick rubber thimble ('banker's assistant') should be worn on the index finger for protection during the distribution and needle wiping. Microsyringes with detachable needles which are capable of being autoclaved should be used. The metal plunger should be removed gently from the glass barrel of the syringe and the two parts and the needle should be put in a container for autoclaving. Test plates and trays should be autoclaved before discarding.

APPENDIX 4

TEXT OF DEPARTMENT OF HEALTH AND SOCIAL SECURITY LETTER TO LOCAL AUTHORITIES
(LHAL 19/71 of 29 June 1971)

Dear Sir

ADAPTATIONS OF HOMES TO INSTALL ARTIFICIAL KIDNEY MACHINES
MINISTRY OF HEALTH CIRCULAR 2/68

1. You will, doubtless, be aware of the recent article in the British Medical Journal of 12 June 1971 reporting a study of, inter alia, the time taken for adaptations in the home required to permit the installation and use of home dialysis machines for a group of patients. You will also have observed the two recent questions in Parliament on this matter.
2. The Secretary of State knows that in many cases authorities are arranging these adaptations in a reasonably short time. He is, however, concerned that there are indications that for a variety of reasons there are, in some cases, delays which may be avoidable. He asks, therefore, that authorities should review their arrangements for these cases, including their contacts with the hospital and specialist services, to ensure that no avoidable delay occurs.
3. The Department is also writing to hospital authorities reminding them of the need to give the maximum notice to local authorities in each case where it is intended to place a patient on home dialysis.
4. A copy of this letter has been sent to the Medical Officer of Health.

EXTRACT FROM DEPARTMENT OF HEALTH AND SOCIAL SECURITY LETTER TO HOSPITAL
AUTHORITIES (DS 177/71 of 29 June 1971)

INTERMITTENT HAEMODIALYSIS IN THE HOME
NECESSARY ADAPTATIONS IN THE HOME

In accordance with paragraph 3 of [the letter to local authorities] Boards are now reminded of the request made in paragraph 7(iii) of the Department's letter dated 7 September 1967 asking them to give the maximum notice possible to local authorities. The reference there is to a minimum of 4 weeks but in many instances it should be possible to give longer notice than this in respect of those patients who commence training for home dialysis.